Independent Oversight Evaluation of the

Pantex Plant

Emergency Response Exercise

November 2000

Office of
Independent
Oversight and
Performance
Assurance

OVERSIGHT

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Abbreviations Used in This Report

AAO	Amarillo Area Office
AL	Albuquerque Operations Office
ARAC	Atmospheric Release Advisory Capability
CHF	Central Health Facility
DOE	U.S. Department of Energy
EAL	Emergency Action Level
ECS	Emergency Control Station
EOC	Emergency Operations Center
EPC	Emergency Press Center
EPZ	Emergency Planning Zone
ERO	Emergency Response Organization
ERTF	Emergency Radiation Treatment Facility
ETO	Emergency Telephone Operations
IC	Incident Commander
ICG	Incident Command Group
JIC	Joint Information Center
MAA	Material Access Area
MHC	Mason & Hanger Corporation
OA	Office of Independent Oversight and Performance Assurance
OSC	On-Scene Commander
OSCG	On-Scene Command Group
OWS	Outside Warning System
PSS	Plant Shift Superintendent
PX EMT	Pantex Emergency Management Team
SPO	Security Police Officer
TOC	Tactical Operations Center

1.0 Introduction

The Office of Independent Oversight and Performance Assurance evaluated the annual emergency response exercise at the Pantex Plant in August 2000.

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (Independent Oversight) conducted an evaluation of the annual emergency response exercise "Verser Partout" at the Pantex Plant during the week of August 28, 2000. The evaluation was conducted by Independent Oversight's Office of Emergency Management Oversight (OA-30). The purposes of the evaluation were to determine how effectively DOE and contractor line management at the Pantex Plant have prepared for and are capable of responding to an accident involving hazardous materials, and how effectively the exercise was planned, conducted, and self-evaluated as a means for testing the plant's emergency response capability and achieving continuous program improvement.

This evaluation included a review of the ten topical areas related to emergency response that are normally in a "standby" mode and would be activated to respond to an emergency involving a release of hazardous material. The topics reviewed include the emergency response organization; emergency facilities and equipment; categorization, classification, termination, and recovery; notifications and communications; offsite response interfaces; consequence assessment; protective actions and reentry; emergency medical support; and emergency public information. In addition, OA-30 reviewed the effectiveness of the exercise planning, conduct, and critique process.

The Deputy Administrator for Defense Programs within the National Nuclear Security Administration is the lead program secretarial officer for the Albuquerque Operations Office (AL) and the cognizant secretarial officer for the Pantex Plant, and has overall Headquarters responsibility for programmatic direction and funding at Pantex. AL, through its Amarillo Area Office (AAO), provides operational direction to the Pantex management and operating contractor, and performs line management oversight of plant activities. At the time of this evaluation, the Pantex Plant was being managed and operated by the Mason & Hanger Corporation (MHC), a subsidiary of Day & Zimmerman, Inc. However, in July 2000, the Department of Energy (DOE) awarded a five-year contract to BWXT Pantex to take over management and operation of the Pantex Plant beginning on October 1, 2000. At the time of this evaluation, the contract award was under protest by MHC. As a result of the protest, DOE implemented a 90-day extension to the current contract (until December 31, 2000) to allow MHC to continue plant operations while the protest is being adjudicated.

Section 2 of this report provides a summary assessment of the evaluation results. Section 3 presents conclusions based on those results, and Section 4 presents an overall rating of exercise performance. Appendix A provides supplemental information on the Independent Oversight team composition and an explanation of the Independent Oversight rating system. Appendix B identifies the findings that require corrective action and follow-up by the Deputy Administrator for Defense Programs, AL, AAO, and the site contractor. The detailed results of the reviews of individual response elements are contained in Appendices C through J, and an evaluation of the planning, conduct, control, and evaluation of the emergency response exercise is contained in Appendix K. In addition to results, each of the topical area appendices begins with an introduction consisting primarily of italicized text and ends with a section titled "opportunities for improvement." The italicized text in the introductory sections is intended to reflect the general performance goal of the response element addressed by the appendix and is for informational purposes only. Opportunities for improvement are suggested enhancements that are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by DOE and contractor line managers and prioritized and modified as appropriate, in accordance with site-specific programmatic and emergency management objectives.

OVERVIEW OF THE 2000 PANTEX PLANT EMERGENCY RESPONSE EXERCISE
"VERSER PARTOUT"

The scenario for this exercise was a radiological accident occurring in the south end of the Pantex Plant inside of a material access area. The simulated accident involved an explosion during routine weapons dismantlement operations that resulted in four fatalities, four injured victims, and an airborne release of plutonium. Two of the injured victims were transported to the offsite Emergency Radiation Treatment Facility in Amarillo for treatment. The other two injured victims were treated at the Plant's Central Health Facility. Simulated winds at the time of the accident caused the postulated puff of plutonium that was released to deposit both on and off the Plant site in the direction of the City of Amarillo.

Numerous offsite organizations participated in this exercise including the Amarillo Police Department, City of Amarillo/Potter County/Randall County and Armstrong and Carson County Emergency Operation Centers, Texas Departments of Health and Public Safety, Federal Aviation Administration - Amarillo Tower, DOE Region IV Radiological Assistance Program, Federal Radiological Monitoring and Assessment Center, and Veterans Affairs Medical Center in Amarillo. The exercise also included limited participation by the Albuquerque Operations Office Emergency Operations Center and DOE Headquarters.

The exercise involved numerous offsite organizations and key emergency response venues.

The Independent Oversight team observed and evaluated the activities at key emergency response venues including the accident scene, on-scene emergency control station, Pantex Emergency Operations Center (EOC), Tactical Operations Center (TOC), Joint Information Center (JIC), Emergency Radiation Treatment Facility (ERTF), and City of Amarillo/Potter County/Randall County EOC. A general overview of the three main functional groups of the Pantex emergency response organization (ERO) is provided in Figure 1. The Pantex Plant shift superintendent serves as both the emergency manager and incident commander in the initial stages of an event until those positions are staffed with senior AAO and MHC managers, respectively, who respond to the plant's EOC when the ERO is activated. Depending on the nature of the event, the on-scene commander is typically the senior fire department or security force officer to arrive at the incident scene.

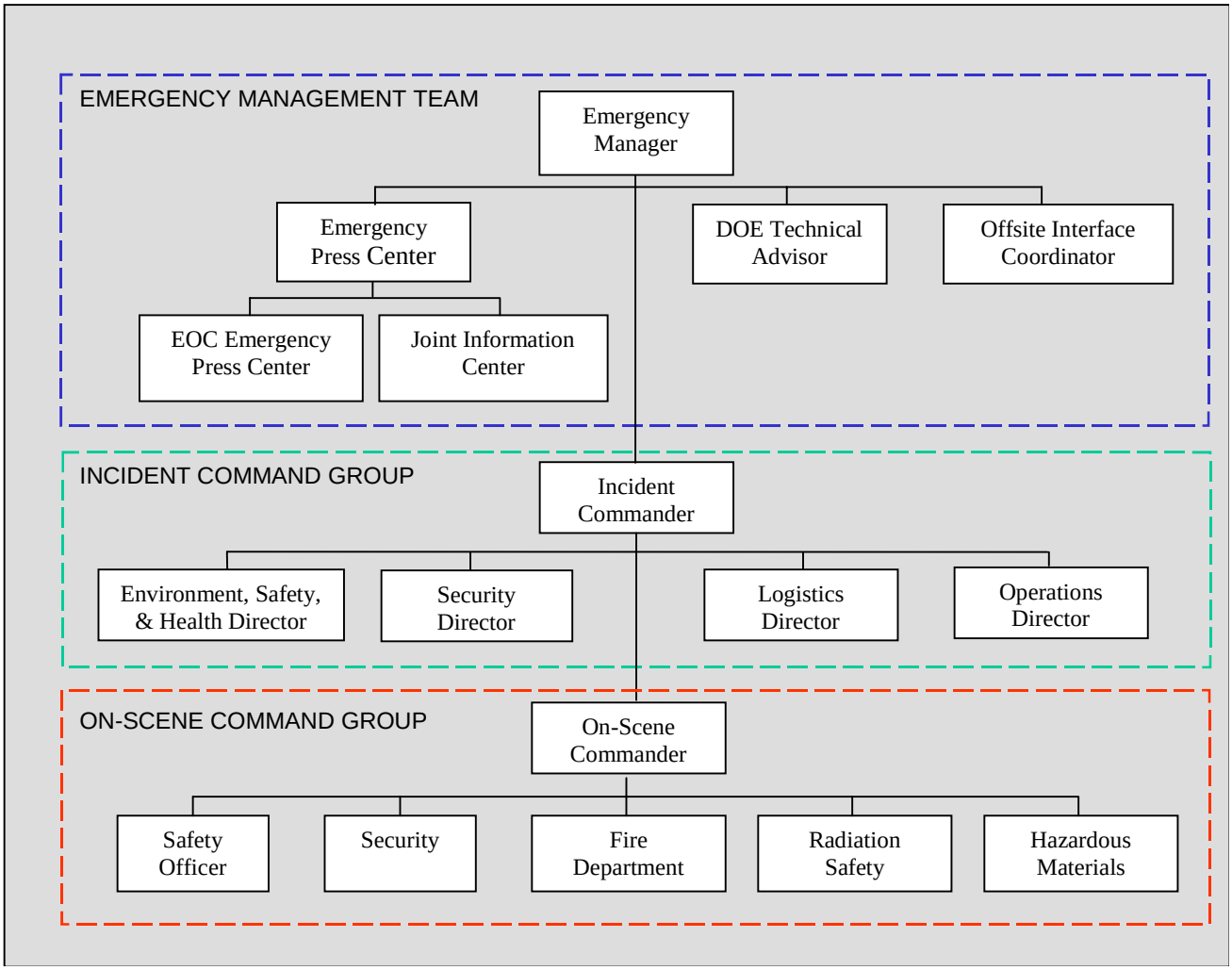

Figure 1. Pantex Plant Emergency Response Organization

2.0 Results

2.1 Positive Program Attributes

The personnel and resources devoted to emergency management show management's commitment to maintaining emergency preparedness and response capabilities.

The Pantex Operations Center

Many individual emergency responders were highly motivated and competent in performing their emergency response duties. The actions taken by many individual responders in responding to the postulated scenario were appropriate and were performed with a high degree of professionalism. Responders generally followed established procedures and protocols and demonstrated that they understand their respective roles, responsibilities, and authorities within the ERO. With few exceptions, the responders acted as though this were a real emergency, and their individual decision-making demonstrated that personnel safety was of utmost concern. Noteworthy examples of responder proficiency and dedication include the actions of the security police officer (SPO) who initially rescued two of the injured victims, the decision-making of the ERTF medical staff, the contamination control and radiological monitoring actions of the onsite field monitoring teams, and the actions of the emergency telephone operations and JIC staffs. However, the effectiveness of these individual actions was diminished by the command, control, and coordination weaknesses described later in this report.

Extensive personnel and material resources are available to respond to an emergency event at Pantex. The Pantex Plant has established an extensive emergency preparedness and response infrastructure that is available to respond to the range of potential emergencies at Pantex. The ERO is well staffed with individuals who have the appropriate experience and expertise to support an emergency response, and it includes positions to facilitate such a response. For example, the Pantex ERO includes individuals from both AAO and the site contractor who are assigned to respond to the four major offsite emergency response centers, a cadre of emergency telephone operators, individuals with expertise in industrial hygiene and nuclear explosives safety, and individuals with expertise to troubleshoot any malfunctioning equipment in the EOC. The ERO also includes a large number of AAO responders, primarily co-located with MHC senior incident command staff, who demonstrated a clear understanding of their respective roles and responsibilities during the exercise. The emergency response program is also supported by the well qualified and motivated staff of the Emergency Management Department, who have developed an appropriate technical basis for establishing the Pantex ERO.

Pantex also maintains a wide variety of facilities and equipment designed for emergency response. The plant shift superintendent's (PSS) office, which is staffed by one superintendent and an assistant 24 hours a day, is equipped with a sophisticated array of weather monitoring instruments and communication systems. These instruments allow the PSS to maintain constant watch for adverse weather conditions that periodically occur at Pantex, such as tornadoes and severe lightning storms, and to provide early warning to plant

personnel of such conditions. Pantex also maintains an Outside Warning System (OWS) consisting of sirens, strobe lights, and, in some areas, voice broadcast capability to warn individuals within the emergency planning zone (EPZ) in the case of an incident. Pantex maintains a tower camera that the PSS can direct to view areas of the plant where an incident might have occurred. The EOC is well equipped and hardened, and access can be controlled such that responders are routed through a decontamination facility before assuming their EOC duties in the event of a radiological incident. AAO and MHC also established and maintain the ERTF, located at the Veterans Affairs Medical Center in Amarillo, to receive and treat radiologically-contaminated accident victims. The extent of the Pantex ERO, the expertise of the Pantex Emergency Management Department personnel, and the availability of essential emergency response facilities and equipment demonstrate that both AAO and the site contractor are committed to maintaining a highly capable emergency preparedness and response organization.

Exercise scope and conduct were noteworthy.

The scope of the exercise and the extensive planning and preparations for conducting the exercise were noteworthy. The exercise planning group selected a very challenging exercise scenario, supported by senior management, to test the Pantex Plant emergency response capabilities. The planners elected to conduct an exercise involving an extremely low-probability, high-consequence event that was designed to affect large sectors of the public over a widespread geographical area. The scenario challenged the responders to make some of the same types of difficult decisions that were identified as weaknesses in the response to an explosion at DOE's Hanford site in 1997. For example, this exercise required decision-making under conditions of a possible security threat while injured victims needed to be rescued and extensive plutonium contamination had occurred. It also challenged responders to make key life-safety decisions without having information about possible radioactive contamination. The resources and effort put forth to increase the realism of the event scene and simulate the spread of contamination were excellent. Also noteworthy is the widespread participation in this exercise by offsite response organizations. The Pantex exercise director conducted frequent meetings with the offsite participants to inform them of progress in developing the exercise and to coordinate and integrate onsite and offsite exercise objectives. Pantex personnel were willing and able to accommodate changes to the exercise scenario so that the numerous offsite agencies could exercise specific capabilities and develop measurable performance criteria for their participants. This high degree of coordination provided Pantex managers with an excellent opportunity to continue to foster close working relationships with the communities and response authorities surrounding the plant. Finally, on the day following the exercise, both AAO and MHC conducted comprehensive critiques that were critical yet constructive, and were successful in identifying many of the positive attributes and weaknesses described in this report.

Plant Shift Superintendent Conferring with the Incident Commander and the Emergency Manager

2.2 Weaknesses and Items Requiring Attention

Although many individual emergency responders performed well during this exercise, the effectiveness of the overall response effort was diminished by weaknesses in command and control at both the incident scene and EOC, and by breakdowns in communications to offsite entities.

Weaknesses in coordination and communications limited the ability to tend to the injured, protect workers and responders, and minimize hazards.

Weaknesses in coordinating the initial response effort resulted in unnecessary delays

in providing medical care to the injured victims and jeopardized the safety of emergency responders. Although fire and security response elements arrived at the incident promptly following the recognition of an emergency event, weaknesses in coordinating the initial response effort unnecessarily placed firefighters at risk of inhaling radioactive material and running out of supplied air. A security cordon was established around the accident scene, and an initial investigative entry team of two firefighters was permitted to enter the affected area. After assessing and reporting on the status of the scene, the two firefighters attended to a critically injured victim. Although the condition of the injured victim had been reported to the firefighters before they entered the area, they were not equipped to attend to the victim's injuries or remove her from the accident area. The firefighters decided not to drag the victim to a safer area and were not given any direction from the on-scene commander (OSC) about this action. As a result, the firefighters remained with the victim even though they were beginning to run out of supplied air. A third firefighter then had to enter the accident area to provide replacement air bottles. Due to inadequate command and control of the situation, the two firefighters proceeded to exchange air bottles in the highly contaminated area instead of allowing a second, approaching entry team to take over or moving to an area of potentially lower contamination. Furthermore, it was not clear why the second team of firefighters was sent into the incident area: a previously reported water leak had already been stopped, the security cordon and overall security posture were still in place, and there was no need for additional personnel to support the rescue effort. These actions unnecessarily put the five firefighters involved in the rescue effort at risk.

Further impacts of the lack of coordination during the on-scene response included delays in transporting the injured victims to medical facilities and in obtaining radiological contamination information. For example, despite their quick rescue and removal from the accident scene, an hour elapsed between the time the first two victims arrived at the ambulances and the time when the ambulances departed the material access area (MAA) for medical facilities. In addition, approximately one hour elapsed before the most severely injured victim received needed medical care at the ambulance, and it was approximately one and a half hours after the event was reported that all of the casualties were transported out of the MAA. The radiation safety team available to support the on-scene command group was originally restricted from the plant's MAA for security reasons. However, the team was later authorized access to the area while the incident was still being managed as a security-related event. Due to the team's delay in arriving at the on-scene emergency control station (ECS), none of the injured victims was surveyed for radiological contamination before being transported to medical facilities, and gross characterization of the contamination levels in and around the accident and ECS was significantly delayed. Finally, the safety of both the firefighter and radiation safety entry teams was inadequately monitored. The initial radiation safety entry team was dressed in anti-contamination clothing and waited without any shelter from the heat for 50 minutes before being deployed into the accident area. Later, both the firefighters and radiation safety personnel were appropriately restricted from further exercise play because of possible heat stress. However, after leaving the incident area, these individuals were not allowed to drink water. The controllers did not recommend or require actions to rehydrate these individuals despite real concerns about heat stress.

As a result of weaknesses in integration, coordination, and communications throughout the ERO, protection of workers and responders was not assured and the impact of the postulated radioactive material release was not minimized. There were numerous instances of poor coordination among response elements throughout the exercise. As a result, several important response actions were not effectively implemented, and potential incident consequences were not adequately considered or addressed. For example:

- The turnover briefing from the PSS to the incident commander (IC) consisted of a chronology of events but did not provide key information such as the current actions being taken at the scene, the fact that the OWS had malfunctioned and was undergoing repair, what response assets had been deployed to the incident scene or offsite, or whether there were any outstanding requests for support from the OSC.

- Within 15 minutes of the reported explosion, the PSS was aware that five people might have been in the bay at the time of the explosion, and shortly thereafter, the initial firefighter entry team reported seeing body parts at the incident scene. It was not until more than one hour later that the PSS recommended to the IC that full plant accountability procedures be put into effect, and more than two

and a half hours before the PSS announced that personnel accountability procedures were in effect.

- Two firefighters were directed to enter the incident area with a video camera. They were told to plug the camera into an electrical outlet because the camera batteries had expired, which would have put them at risk of electrical shock because an estimated 360,000 gallons of water had been released in the area.

- The ERTF in Amarillo was appropriately notified and told to expect casualties about 15 minutes after the incident occurred. However, a radiological monitoring team designated to provide support to the ERTF was not dispatched from the site until more than an hour later. As a result, the most severely injured patient was prepared for surgery without ever having been surveyed for contamination, and the initial administration of a chelation agent was delayed.

- Some of the JIC staff who initially reported to Building 16-19 on site to await dispatch off site believed that they were contaminated based on the route that they had taken to get to that building. Since no radiation safety personnel were available to survey them for contamination, they were released off site without any radiological monitoring, and they were not directed to take any personal actions to minimize the possible spread of contamination.

- All of the consequence assessment dispersion plots that were generated during the exercise indicated possible plutonium contamination outside of the Pantex EPZ. Pantex EOC personnel never discussed whether protective action recommendations beyond the EPZ might be warranted, nor did they communicate this concern to any offsite EOCs.

- The EOC directed three nuclear explosives safety experts to go to the incident scene to survey the area for unexploded ordnance. They had no personal protective equipment and were not directed to report first to the OSC. They entered the affected facility, bypassing both the staging area and the OSC, and approached the incident area before being stopped by an SPO. Upon reporting to the OSC 20 minutes later, they were denied access to the incident area because they were not qualified to wear respirators.

- A southern perimeter road outside the MAA but within the main plant site was not blocked to restrict access to contaminated areas downwind of the explosion throughout the event, even after some plant personnel were released from their shelter-in-place restriction to return to their normal duties.

Collectively, these items indicate weaknesses in the overall command of the response effort and coordination among the various response elements. Response issues and actions were not adequately identified, prioritized, addressed, communicated, and tracked to resolution or completion. During the exercise, it was not evident that the EOC cadre adequately considered the impact of their actions beyond the plant boundary.

Public information mechanisms were not always prompt and effective.

Protective action recommendations and information on the nature and extent of the emergency were not communicated effectively to offsite authorities and the public. Pantex maintains many independent mechanisms to communicate protective action recommendations and other essential information to the public and offsite authorities during an emergency. None of these mechanisms fully functioned as intended during the exercise, limiting the information available to offsite authorities who make decisions regarding public safety and delaying the communication of protective action recommendations to the public in the vicinity of the plant. The PSS activated both the OWS and the tone-alert broadcast system to communicate protective action recommendations to the public about 20 minutes after the reported explosion, but the systems malfunctioned. These systems had functioned correctly during a monthly system test (conducted five days earlier) and the malfunctions were readily recognized and addressed, but breakdowns caused a delay of an additional 30 minutes in notifying the public of the protective action recommendations, when a second activation of the warning systems was believed to be successful. Coupled with these equipment problems, the initial notification form transmitted to offsite authorities was completed incorrectly and indicated that the recommended protective action was to evacuate rather than to shelter in place as was dictated by Pantex procedures. Further, none of the notification forms

transmitted off site during the exercise indicated the appropriate sectors that needed to take the recommended protective actions. The City of Amarillo/ Potter County/Randall County EOC did not receive any information from the site regarding the status of a radioactive material release or a projected dispersion model until more than two hours after receiving the report of the emergency; they eventually received this information from an exercise controller who provided the dispersion plots from the exercise package. Contributing to the weaknesses in offsite communications was that the DOE liaison assigned to the Amarillo EOC did not arrive in Amarillo until more than 2 hours and 20 minutes after the explosion. Further, requests for information from the Amarillo EOC via the open communications line with the Pantex EOC went unanswered, and the open communications line was lost for a significant period of time during the exercise. In addition, the public was not given any information about the event or the potential plutonium release when the tone-alert broadcast system was activated, and there was no mention of a possible radioactive material release when a press conference was held 2 hours and 45 minutes after the incident occurred. It was not until the JIC received the fourth news release—three and a half hours after the incident—that the plant acknowledged that any release had occurred.

Plans, procedures, and job aids do not always support prompt, accurate decision-making.

Pantex plans, procedures, and job aids do not always support prompt and accurate decision-making, particularly in the area of emergency categorization and classification. Although the PSS made a prompt and accurate emergency classification during the exercise, the existing emergency action level (EAL) set does not provide clear and unambiguous guidance for categorizing or classifying potential emergencies at Pantex. For example:

- Pantex has not established thresholds for categorizing operational emergencies not requiring classification as required by DOE Order 151.1, *Comprehensive Emergency Management System*, or provisions for notifying DOE and offsite authorities of such events.

- Facility-specific EALs provide lists of "indicators" and items for confirming events. However, it is not clear whether any or all indicators must be present for classification, or whether confirmation is required from one or more of the listed confirmation sources.

- Procedures or guidance regarding application of the EAL tables has not been developed.

- The EALs generally include appropriate onsite protective actions and offsite protective action recommendations. However, the EALs do not specify the geographical area of protective actions relative to meteorological conditions, and the PSS has no guidance on selecting the appropriate pre-established protective action recommendation sectors.

Furthermore, the fact that the PSS did not refer to the EALs when classifying the emergency may have contributed to the delay in activating the OWS, since activation is required by the EAL that was applicable to the scenario for this exercise.

Several plans and procedures also lack specific direction for emergency responders to accomplish their assigned duties. For example, the emergency preparedness procedure for emergency recall and notification does not provide prioritized and well-defined procedural steps, and many of the steps simply state responsibilities or descriptions. Users must refer to a separate procedure to perform emergency notifications to DOE Headquarters and AL. The emergency preparedness procedure for evacuation and shelter is primarily directed toward the actions that workers should take in the event of an emergency. It gives no guidance for decision-makers to determine whether or when evacuation or sheltering is the preferred protective action or how to execute a controlled evacuation of personnel who may have been sheltered for extended periods of time. The field monitoring teams lack definitive procedures or guidance for conducting radiological surveys. As a result, one individual performing field monitoring surveys did not stop surveying when he reached a contaminated area and, thus, got contaminated himself. Lack of definitive guidance regarding the equipment required for deploying field teams and the types of surveys to be performed was also a problem. One of the field monitoring teams went to a downwind field location without an air sampling device. When this was recognized after more than 45 minutes of conducting ground surveys, the team leader drove to the plant's Central Health Facility to retrieve an air sampling device even though there was no evidence of an ongoing radioactive material release and the wind was reportedly blowing at 20 miles per hour.

3.0 Conclusions

This emergency response exercise, which is the second such exercise that Pantex has conducted with extensive offsite participation this year, was very well planned, constructed, and executed. Individual responders and exercise controllers demonstrated motivation and initiative in responding to and conducting the exercise. The exercise was predicated on an extreme, worst-case scenario in order to accommodate the many offsite participants and to critically challenge all facets of the Pantex ERO. The exercise was a comprehensive test of the plant's emergency response capabilities and therefore presented abundant opportunities for revealing weaknesses and identifying lessons learned. The post-exercise critique process was critical but constructive, and served to identify many of the positive attributes and weaknesses addressed in this report. Collectively, these attributes indicate the strong management commitment by both AAO and MHC to establish and maintain an effective emergency preparedness and response program and to continuously improve the program through comprehensive and rigorous performance testing.

AAO and the Pantex Plant site operating contractor have established a solid organizational infrastructure that is staffed with dedicated, motivated, and generally competent personnel who demonstrated their individual abilities to respond to a simulated major emergency event. The ERO is supported by a well qualified and competent staff of emergency managers and planners who have developed the necessary emergency preparedness foundation of hazards surveys, hazards assessments, training, drills, and exercises.

Firefighters Transporting a Victim to an Ambulance

Deficiencies in command and control, communications, and decision-making adversely impacted the site's ability to marshal its well-developed resources during this exercise.

The possible extent of the emergency was quickly recognized and assessed by the PSS, who promptly and accurately classified the emergency and issued onsite protective actions. Emergency response assets, such as the fire department and security personnel, were quickly dispatched to the incident scene, and the initial rescue actions performed by a SPO were exemplary. However, the overall response effort was adversely impacted by deficiencies in command and control, and by weaknesses in notifications and communications to offsite authorities. In addition, several response elements are not supported by clear, unambiguous, and well structured procedures or job aids for use in an emergency. As a result of these weaknesses, emergency medical care to the injured victims was unnecessarily delayed, the safety of many emergency responders was jeopardized, the possibility that personnel were missing was readily identified but not resolved, and actions to minimize the potential spread of radioactive contamination were not implemented. Additional management attention is warranted to ensure successful implementation of the highest priority actions: protecting emergency responders, workers, and the public; assessing the feasibility of victim rescue; mitigating the effects of a radioactive material release; and providing candid and timely emergency information to the public and offsite authorities.

4.0 Rating

The Pantex Plant has established the fundamental elements and programs necessary to respond effectively to a wide range of potential emergencies, including those involving hazardous materials. AAO, MHC, and offsite response organizations frequently and routinely test their performance through a program of limited-scope drills, site-level drills, and larger-scale exercises.

AAO and MHC deserve to be commended for the challenging nature and broad scope of the exercise and its objectives. This exercise scenario presented difficult decision-making and response challenges to virtually all of the onsite and offsite organizations that could be involved in responding to a major emergency event at the Pantex Plant. The scenario presented superior opportunities for identifying systemic program deficiencies for correction and improvement.

Nevertheless, on-scene command and control and strategic direction from the ERO staff were insufficient to ensure the safety of emergency responders and to mitigate the impact of the simulated explosion and radioactive material release on victims and the public.

An overall rating of MARGINAL is assigned for the emergency response performance demonstrated during this exercise.

APPENDIX A
EVALUATION PROCESS AND TEAM COMPOSITION

The evaluation was conducted under the direction of the Secretary of Energy's Office of Independent Oversight and Performance Assurance. The evaluation was performed according to formal protocols and procedures, including an Appraisal Process Guide, which provides the general procedures used by Independent Oversight to conduct inspections and reviews, and the evaluation plan that was developed specifically for this activity, which outlines the scope and conduct of this assessment. Planning discussions were conducted to ensure that all team members were informed of the review objectives, procedures, and evaluation methods.

Explanation of Rating System

The Office of Independent Oversight and Performance Assurance assigns an overall rating to the performance demonstrated during the emergency response exercise, and the quality and value of the exercise that was conducted. Ratings are also assigned to selected program elements. The rating process involves the critical consideration of all evaluation results, particularly the identified strengths and weaknesses. The importance and impact of observed weaknesses are analyzed both individually and collectively, and balanced against any strengths and mitigating factors to determine their impact on the overall goal of protecting emergency responders, site workers, and the public. The Office of Independent Oversight and Performance Assurance uses three rating categories—Satisfactory, Marginal, and Unsatisfactory—which are also depicted by colors as Green, Yellow, and Red, respectively.

Satisfactory (Green): An overall rating of ***Satisfactory*** is assigned when the emergency management program being evaluated provides reasonable assurance that all of the site's emergency responders are ready to respond promptly and effectively to an emergency event or condition.

An emergency management element being evaluated would normally be rated Satisfactory if the emergency management function is effectively implemented. An element would also normally be rated as Satisfactory if, for any applicable standards that are not met, other compensatory factors exist that provide equivalent protection to workers and the public, or the impact is minimal and does not significantly degrade the response.

Marginal (Yellow): An overall rating of ***Marginal*** is assigned when the emergency management program being evaluated provides questionable assurance that site workers and the public can be protected following an emergency event or condition.

An emergency management element being evaluated would normally be rated Marginal if one or more applicable standards are not met and are only partially compensated for by other measures, and the resulting deficiencies in the emergency management function degrade the ability of the emergency responders to protect site workers and the public.

Unsatisfactory (Red): An overall rating of ***Unsatisfactory*** is assigned when the emergency management program being evaluated does not provide adequate assurance that site workers and the public can be protected following an emergency event or condition.

An emergency management element being evaluated would normally be rated Unsatisfactory if one or more applicable standards are not met, there are no compensating factors, and the resulting deficiencies in the emergency management function seriously degrade the ability of the emergency responders to protect site workers and the public.

Team Composition

Director, Independent Oversight and Performance Assurance

Glenn Podonsky
Michael A. Kilpatrick, Deputy Director

Director, Office of Emergency Management Oversight

Charles Lewis

Team Leader

Kathy McCarty

Team Members

J.R. Dillenback
William Greendyke
Robert Murawski
James O'Brien
Jeffrey Robertson
Ross Scarano
Kathleen Schmidt
David Schultz
Steven Simonson
Douglas Trout

Quality Review Board

Michael A. Kilpatrick
Charles Lewis
Dean Hickman
Tom Davis
Robert Nelson

APPENDIX B
FINDINGS FOR CORRECTIVE ACTION AND FOLLOW-UP

This appendix summarizes the significant findings identified during the Office of Independent Oversight and Performance Assurance emergency response exercise evaluation at the Pantex Plant. The findings identified in this appendix will be formally tracked in accordance with DOE Order 470.2A, *Security and Emergency Management Independent Oversight and Performance Assurance Program*, and require a formal corrective action plan. The DOE Deputy Administrator for Defense Programs, the Albuquerque Operations Office, the Amarillo Area Office, and the site operating contractor need to specifically address these findings in the corrective action plan. Other weaknesses and/or deficiencies identified in this report should be addressed by line management but need not be included in the formal corrective action plan.

FINDINGS

1. Command and control of the response effort did not ensure timely rescue and treatment of the injured, ensure the safety of emergency responders, and ensure common understanding of event scene status.

2. Radiological surveys of injured personnel were not performed in a timely manner to minimize the spread of contamination on and off site and to support decisions regarding medical care and treatment. Surveys of emergency responders were not performed such that the possibility of internal contamination was minimized.

3. The structure and content of the Pantex emergency actions levels do not always facilitate prompt and accurate categorization and classification. Thresholds for declaring and notifying offsite agencies and DOE Headquarters of operational emergencies not requiring classification have not been established as required by DOE Order 151.1.

4. Offsite response agencies were not provided accurate and sufficient information for making protective action decisions regarding public safety in accordance with DOE Order 151.1. Assessment and monitoring of event consequences by onsite and offsite authorities were not adequately coordinated as required by DOE Order 151.1. Communication of recommended protective actions to the public was delayed by breakdowns in communications equipment.

5. Entry team personnel were not provided adequate rehabilitation and monitoring to ensure their safety.

APPENDIX C
EMERGENCY RESPONSE ORGANIZATION

Introduction

A structured organization is established and maintained for each site/facility with overall responsibility for initial and ongoing response to and mitigation of an emergency. The emergency response organization (ERO) establishes effective control at the event/incident scene and integrates local agencies and organizations that provide onsite response services. An adequate number of experienced and trained personnel, including designated alternates, is available on demand, for timely and effective performance of ERO functions. Subelements of the ERO response functions include ERO staffing, control, activation, and operations; the incident command system; fire and rescue; security staff; hazardous material survey, sampling, and sample analysis teams; and equipment repair and maintenance.

The Pantex ERO consists of three main functional groups: an Emergency Management Team (PX EMT), an Incident Command Group (ICG), and an On-Scene Command Group (OSCG). The roles and responsibilities of these respective groups during a Pantex emergency are defined in the plant's emergency plan and implementing procedures. The PX EMT, which is composed primarily of DOE Amarillo Area Office (AAO) personnel and is headed by a Department of Energy (DOE) emergency manager, who operates from the Pantex emergency operations center (EOC) and is responsible for overseeing the emergency response effort, communicating and coordinating with local authorities and higher levels of the DOE organizational structure, and disseminating emergency public information. The ICG is also located in the EOC and is co-located with the PX EMT. The ICG is headed by an incident commander (IC) who is typically the Pantex Plant general manager. The ICG is responsible for overall onsite command, control, response, and mitigation of the emergency situation; providing support to the OSCG; containing the incident by employing the appropriate response teams; analyzing the scope and nature of the event; and minimizing consequences to the public, plant personnel, and the environment. The OSCG, headed by the on-scene commander (OSC), is responsible for incident scene command and for implementing the on-scene tactics necessary to resolve and mitigate the emergency. The OSC is typically either a security force officer or a fire department officer, depending upon the nature of the event. The OSC receives direction from the IC. If the nature of the emergency is not clear, the IC determines who will be in charge of the field-level response.

The 24 hour-per-day plant shift superintendent (PSS) who resides in the operations center, a part of the EOC, is responsible for activating the Pantex Plant emergency plan in the event of an emergency and serves as both the initial emergency manager and IC until relieved by senior DOE and contractor managers. As such, the PSS is responsible for categorizing and, if necessary, classifying the event, notifying plant response organizations, recalling the ERO, taking immediate and appropriate actions within the plant boundary, completing initial notifications to DOE Headquarters and the Albuquerque Operations Office (AL), and notifying and providing protective action recommendations to state and local jurisdictions.

Status and Results

The Pantex ERO generally responded in a timely manner to their assigned locations and positions. Incident command in the EOC and on-scene command were staffed with appropriate response personnel, who possessed the capability to respond adequately to postulated events. Many responders demonstrated professionalism, competence, and initiative in responding to the event. Early coordination among security and fire department responders and the PSS was effective in providing the fire department responders quick access to a secured area of the plant. The responding fire apparatus approached the event scene from upwind, and arrived at an appropriate access gate approximately two minutes after being notified of an event. Security personnel arrived two minutes later to open the fence, and the fire apparatus was positioned two minutes later to begin the initial investigation activities required by procedure. Within 15 minutes of the report of an explosion, the fire department responders appropriately established an emergency contact station (ECS) and a

staging area for additional response equipment in a safe area upwind and away from the event scene.

A security police officer (SPO) wearing a respirator and driving a cart was the first to arrive on the incident scene. The SPO quickly found and transported two ambulatory victims to the northeast (upwind) corner of the building and radioed a request for an ambulance to evacuate a non-ambulatory, critically injured victim. The ambulatory victims, one with obvious multiple compound fractures of the forearm, were escorted the 75 feet from the northeast corner of the building to waiting ambulances. Despite their quick rescue and removal from the accident scene, an hour elapsed between the time these two victims arrived at the ambulances and the time when the ambulances departed the material access area (MAA) for medical facilities.

Although fire and security response elements arrived promptly, weaknesses in coordinating the initial response effort unnecessarily placed firefighters at risk of inhaling radioactive material. Consistent with the assumption that the event had security implications until proven otherwise, a security cordon was established around the accident scene, and an initial investigative entry team of two firefighters was permitted to enter the affected area. After reporting the scene status to the senior on-scene fire officer via radio, the two firefighters attended to the critically-injured victim. Her injuries were promptly identified and communicated to medical professionals, and she was kept informed and calm by the actions of the team. Despite the SPO's initial report of the severity of her injuries, the entry team did not bring a backboard or any other means for transporting the victim, and an additional 30 minutes passed before a backboard was located and brought to the victim. Although she was not ambulatory, the two firefighters chose not to drag her to safety and remained with her in the highly contaminated area, even though they could not attend to her immediate medical needs: severe abdominal pain and a closed fracture of the femur. While waiting for a backboard, the firefighters did not consider any additional actions that might have reduced the overall impact to the victim. For example, they did not give her any ad hoc respiratory protection in the form of a cloth or other material to cover her nose and mouth to reduce the potential for continuous intake of radioactive material. When the two firefighters began to run out of supplied air, a third firefighter was sent into the accident area to provide replacement air bottles. Due to inadequate command and control of the situation, the two firefighters proceeded to exchange air bottles in the highly contaminated area instead of allowing a second, approaching entry team to take over or moving to an area of potentially lower contamination. Furthermore, it was not clear why the second team of firefighters was sent into the incident area: a previously reported water leak had already been stopped, the security cordon and overall security posture were still in place, and there was no need for additional personnel to support the rescue effort. These actions unnecessarily put the five firefighters involved in the rescue effort at risk. In addition, approximately one hour elapsed before the most severely injured victim received needed medical care at the ambulance, and it was approximately one and a half hours after the event was reported that all of the casualties were transported out of the MAA.

FINDING: Command and control of the response effort did not ensure timely rescue and treatment of the injured, ensure the safety of emergency responders, and ensure common understanding of event scene status.

Unlike the initial fire responders, the radiation safety support team for the ECS was denied entry into the MAA for security considerations. When the team arrived at the gate approximately 20 minutes into the event, the team leader was promptly admitted into the MAA but his team members were not. Approximately 30 minutes later, the OSC authorized the radiation safety support team to access the MAA, even though the incident was still being managed as a security-related event. Ultimately, the team arrived at the ECS about 50 minutes after they were available to support the OSCG. The consequences of this delay were significant; no radiological surveys of the injured victims were performed before they were transported from the MAA, and habitability surveys of the air and ground at the ECS were not available for more than an hour and a half. Once the radiation safety support team arrived at the incident scene and began conducting surveys, there were additional weaknesses. The firefighters who were donning and doffing personal protective equipment inside of the area where the contamination control line had been established were not surveyed during the response effort. The firefighters indicated that the necessary surveying would be performed at the contamination control line when their presence was no longer required at the scene. However, this practice places the firefighters at risk of unnecessary or excessive intakes of radioactive material. The security officer who

performed a security check of the first ambulance leaving the MAA could have become contaminated when he entered the ambulance and came into contact with the gurney and the patient. However, he was never monitored for radiological contamination and subsequently moved freely throughout the ECS, potentially spreading the contamination. Instead, he was assumed not to have been contaminated because surveys of the exterior of the ambulance detected no contamination.

FINDING: Radiological surveys of injured personnel were not performed in a timely manner to minimize the spread of contamination on and off site and to support decisions regarding medical care and treatment. Surveys of emergency responders were not performed such that the possibility of internal contamination was minimized.

With regard to the workers near the incident, an on-scene command group member did not recognize until about 2 hours and 15 minutes had elapsed that no action had been taken to manage the workers who remained sheltered in the non-affected bays of Building 12-104. At that time, the OSC voiced his opinion that they had all been evacuated, but, in fact, no action had been taken.

About 20 minutes after the explosion, the ERO responders were released from being sheltered in place to report to the EOC. About 25 minutes after that recall message, the IC determined that he had adequate staff to assume command and appropriately requested a turnover briefing from the PSS. The briefing, which was broadcast throughout the EOC, consisted of reading a log of events leading up to the present time. The briefing did not give the IC important information that had not been recorded on this log, such as the failure of the Outside Warning System (OWS) when initially activated, the current actions being taken at the scene, or outstanding requests for assistance from the OSC. The DOE emergency manager assumed his duties immediately after transfer of command and control to the IC.

The IC and his assistant used a white board in the EOC to list action items throughout the exercise. The information identified on this board was not always consistent with the items identified in the Electronic Information System, which the Pantex EOC uses to track event information and to log information requests from the various EOC functional areas. When an item on the white board was considered complete, the item was erased from the board and its resolution was not documented in the Electronic Information System for legal, historical, or review purposes. Although frequent briefings were broadcast throughout the EOC, they did not always convey important information regarding the current status of key incident scene actions, new issues, or ICG action items that had been successfully resolved.

Response issues and actions were not always identified, prioritized, addressed, communicated, and tracked to resolution or completion. As a result, several important response actions were not effectively implemented, and potential incident consequences were not adequately considered or addressed. For example:

- Within 15 minutes of the reported explosion, the PSS was aware that five people might have been in the bay at the time of the explosion, and shortly thereafter the initial firefighter entry team reported seeing body parts at the incident scene. However, it was not until more than one hour later that the PSS recommended to the IC that full plant accountability procedures be put into effect, and more than two and a half hours before the PSS announced that personnel accountability procedures were in effect.

- Two firefighters were directed to enter the incident area with a video camera. They were told to plug the camera into an electrical outlet because the camera batteries had expired, which would have put them at risk of electrical shock because an estimated 360,000 gallons of water had been released in the area.

- The EOC directed three nuclear explosives engineers to go to the incident scene to survey for unexploded ordnance. They had no personal protective equipment and were not directed to report first to the OSC. They entered the affected facility, bypassing both the staging area and the OSC, and approached the incident area near enough to observe scene debris before being stopped by an SPO. The EOC then told them to report to the OSC. When they reported to the OSC about 20 minutes later, they were denied entry to the scene because they were not qualified to wear respiratory protective equipment.

- The ERTF in Amarillo was appropriately notified and told to expect casualties about 15 minutes after the incident occurred. However, a radiological monitoring team designated to provide support to the ERTF was not dispatched from the site until more

than an hour later. As a result, the most severely injured patient was prepared for surgery without ever having been surveyed for contamination, and the initial administration of a chelation agent was delayed.

- Some of the JIC staff who initially reported to Building 16-19 onsite to await dispatch offsite believed that they were contaminated based on the route that they had taken to get to that building. Since no radiation safety personnel were available to survey them for contamination, they were released offsite without any radiological monitoring, and they were not directed to take any personal actions to minimize the possible spread of contamination.

- All of the consequence assessment dispersion plots that were generated during the exercise indicated possible plutonium contamination outside of the Pantex emergency planning zone (EPZ). The Pantex EOC never discussed whether protective action recommendations beyond the EPZ might be warranted, nor did they communicate this concern to any offsite EOCs.

- A southern perimeter road outside the MAA but within the main plant site was not blocked to restrict access to contaminated areas downwind of the explosion throughout the event, even after some plant personnel were released from their shelter-in-place restriction to return to their normal duties.

In some cases, the EOC cadre did not adequately consider the impact of their actions beyond the plant boundary. For example, the EOC did not provide timely information to offsite authorities regarding the extent of potential contamination from the explosion and did not address whether any individuals responding from the plant to offsite locations might be contaminated or should be radiologically surveyed before being dispatched. Finally, the PX EMT and ICG staffs did not accommodate requests for radiological information from the public affairs personnel in the EOC, and the news releases approved by the emergency manager did not contain sufficient information regarding the possible extent of a radioactive material release.

Conclusions

Fire and security responders promptly responded to the incident scene to perform their immediate response actions of scene isolation and investigation, and the ERO was promptly activated and appropriately staffed in the EOC. However, weaknesses in coordinating and directing the initial firefighter response efforts at the scene resulted in unnecessary risks to the entry teams. Weaknesses in radiation monitoring protocols placed other responders at risk of inhaling radioactive material and increased the potential for spreading contamination. Furthermore, weaknesses in the sharing of information across the three major response groups, the OSCG, ICG, and PX EMT, and inconsistent performance in identifying, prioritizing, and tracking response issues inhibited the degree of integration necessary to ensure that all aspects of the response effort were managed effectively. Additionally, the EOC cadre did not adequately focus on the needs of offsite organizations, resulting in significant confusion among offsite decision-makers and impacting those decision-makers' ability to make informed decisions regarding public health and safety.

Rating

The emergency response element Emergency Response Organization is rated as Marginal.

Opportunities for Improvement

- Emphasize incident command priorities and responsibilities, and communication of response actions and results during training, drills, and exercises for emergency responders to improve response actions, command and control, communications, and functional unit integration.

- Consider developing and implementing job aids for the on-scene command group to facilitate response asset planning and management, and identification, prioritization, and resolution of response tasks.

- Clarify expectations for establishing and performing operations within the "hot," "warm," and "cold" zones for purposes of contamination control and monitoring, and placement of radiological support resources.

- Evaluate the feasibility of requiring the initial investigative entry team to carry medical supplies and support equipment when injured accident victims are awaiting rescue.

- Consider expanded use of the visual display capabilities available in the EOC to prioritize, track, and resolve response issues and action items. Develop a mechanism to accurately and consistently capture critical response actions in the Electronic Information System to ensure that such actions are being actively pursued or have been adequately addressed or resolved.

APPENDIX D
EMERGENCY FACILITIES AND EQUIPMENT

Introduction

Facilities and equipment adequate to support emergency response are available, operable, and maintained. Specifically, an adequate and viable command center is available, as necessary, and adequate personnel protective equipment meets the needs of the response.

Status and Results

The facilities and equipment available to respond to the emergency postulated by the exercise and available in general to respond to an emergency at the Pantex Plant are adequate. The plant shift superintendent (PSS) work space and the security central alarm station, in particular, are well equipped to respond to incidents that are more commonly expected at Pantex, such as tornadoes and severe lightning storms, as well as less probable incidents, such as a security threat. However, during this particular exercise, the available equipment failed to operate as intended in several instances.

The emergency response vehicles deployed to the incident scene during the exercise were properly equipped and maintained. Upon notification of the incident, the fire department responded to the scene with two firefighting vehicles, a hazardous material response vehicle, two ambulances, and a firefighting command vehicle. Both the fire department responders and initial security responders were equipped with appropriate personal protective equipment to minimize their potential exposure to the plutonium hazard. The radiation protection personnel dispatched to the scene had appropriate and operable equipment. They used electric carts and tricycles available in the area to facilitate the transport of personnel and equipment, and to establish a central location for hard-copy procedures to reference at the emergency control station (ECS). On the other hand, one of the field monitoring teams dispatched downwind did not bring the necessary equipment to perform required air sampling. A large security mobile command vehicle was also used during the exercise. This command vehicle is extremely well equipped with a multi-channel base radio, facsimile machine, multiple cellular telephones, site maps, building prints, and white boards. Unfortunately, however, this command vehicle was not used to establish a physically unified command structure of key decision-makers at the event scene during the exercise. Communications equipment used by personnel at the scene was adequate and performed effectively during the response effort. Finally, when responders at the scene requested resources to contain several hundred thousand gallons of water that had leaked from a broken fire suppression line, several pieces of heavy earth-moving equipment were sent to the scene. On the other hand, when on-scene responders requested a video camera for filming the incident scene, the camera dispatched to the scene had an inoperable battery pack.

The Pantex Plant, in coordination with the surrounding communities, maintains an Outside Warning System (OWS) to warn individuals within the 10-mile Pantex emergency planning zone (EPZ) of an impending or actual emergency. The system includes sirens, strobe lights, and a radio tone-alert and communications system. The sirens are supplemented with strobe lights to warn individuals in farm areas who may be enclosed in heavy machinery and thus not able to hear the siren. In outlying areas, tone-alert radios have been installed in some homes. With this system, the tone-alert sounds and is immediately followed by a PSS announcement in the case of a Pantex emergency. Although the OWS and tone-alert radios were tested just five days before the exercise during a routine monthly test, they failed to operate when initially activated during the exercise. There were indications that when the OWS was activated for a second time during the exercise, it functioned correctly. However, the emergency operations center (EOC) did not confirm that sirens sounded, except to note that the PSS did not receive a trouble alarm when the system was activated the second time.

The PSS's office, which is staffed by one superintendent and an assistant 24 hours a day, is equipped with a sophisticated array of weather monitoring instruments, a direct communications line to the Federal Aviation Administration's Amarillo Tower, and dedicated direct phone lines for discussing classified information. Pantex also maintains a tower camera, the direction of which can be controlled by the PSS to view vehicles responding to an incident scene

or to view locations of the plant where an incident might have occurred.

The EOC is a well designed facility that provides a centralized, glass-enclosed Executive Room in which Department of Energy (DOE) and contractor management teams are co-located, and a horseshoe configuration of breakout rooms nearby to house the individual support teams of health and safety, operations, security, and logistics. The Executive Room is well equipped with audio/visual aids to assist the management teams in their decision-making. The EOC is also equipped with a decontamination facility in the event that a release of radioactive material is suspected, as was the case during this exercise. The main entrances to the EOC facility can be "locked down," thereby requiring all personnel reporting to the EOC to enter through the decontamination facility wearing prescribed protective clothing. The EOC also provides space for a cadre of emergency telephone operators and equipment for conducting video conferences with DOE Headquarters and the Albuquerque Operations Office (AL), which were demonstrated during the exercise.

The Joint Information Center (JIC) in Amarillo is very well designed to facilitate its function. The news conference auditorium is spacious and has excellent audio/visual capabilities. However, equipment problems in the Pantex EOC, primarily due to limitations in facsimile transmission capability, significantly delayed the transmittal of approved news releases from the emergency press center (EPC) to the JIC, which, in turn, delayed the dissemination of this information to the public. The Pantex EOC also has the capability to establish open communications lines with offsite EOCs, DOE Headquarters, AL, and the JIC. However, during the exercise, the open communications line from the Pantex EOC to offsite EOCs was disrupted for approximately 30 minutes, thereby compounding weaknesses in offsite response interfaces that are discussed in Appendix F of this report.

The onsite Central Health Facility (CHF) and the Emergency Radiation Treatment Facility (ERTF) at the Amarillo Veterans Administration Medical Center are well equipped to treat contaminated patients in the event of an emergency at Pantex. Treatment capability at the CHF includes acute cardiac life support, acute trauma life support, and radiological decontamination facilities. Electrocardiographic equipment with defibrillation units is also available, as are routine laboratory and x-ray support. Adequate communications equipment is available, including a radio scanner for physicians to monitor firefighter rescue operations in real time.

Conclusions

Pantex maintains adequate facilities and equipment to respond to the range of potential emergencies at the plant. In some cases, Pantex has established or developed specialized facilities or equipment to enhance emergency response. However, during this exercise, many different types of equipment did not operate as expected. Most of these breakdowns were quickly identified by response personnel, and appropriate actions were taken to restore the systems to operability.

Rating

The Emergency Facilities and Equipment emergency response element is rated as Satisfactory.

Opportunities for Improvement

- Consider mounting permanent site and vicinity maps that can be written on and erased in the EOC Executive Room.

- Implement mechanisms that promote the concept of physically unifying the incident command structure when both the fire department and security force have primary roles in responding to an incident.

APPENDIX E
CATEGORIZATION, CLASSIFICATION, TERMINATION, AND RECOVERY

Introduction

Unplanned, non-routine, and significant abnormal events or conditions caused by, involving, or affecting DOE facilities, sites, or activities, are promptly recognized, categorized, and declared as Operational Emergencies if they require time-urgent response from outside the immediate facility or area of the incident to supplement the normal initial response, and time-urgent notifications to initiate response activities beyond the local event scene. In addition to categorization as Operational Emergencies, events involving the actual or potential airborne release of hazardous materials from a site/facility also require prompt and accurate classification based on health effect thresholds measured or estimated at specific receptor locations. A set of emergency action levels (EALs) for classifying emergencies should provide for early recognition and response; relate as directly as possible to the consequences of the event; and be reliable, internally consistent, anticipatory of future consequences, redundant, complete and comprehensive, conservative, and usable. Associated with the classification of these Operational Emergencies are default conservative onsite protective actions and offsite protective action recommendations.

The termination of an Operational Emergency is accomplished by meeting a predetermined set of criteria and coordinating the termination with offsite agencies. Recovery from a terminated Operational Emergency involves: communicating and coordinating with state, tribal, local, and other Federal agencies; planning, managing, and organizing the associated recovery activities; and ensuring the health and safety of workers and the public.

Categorization and classification of an Operational Emergency at Pantex is the responsibility of the plant shift superintendent (PSS). Pantex has established a voluminous set of EALs for the PSS to use in classifying an emergency. These EALs also include predetermined onsite protective actions and offsite protective action recommendations. The termination of a Pantex Operational Emergency is the responsibility of the incident commander (IC) and was not demonstrated during this exercise. As part of this exercise, the Pantex emergency operations center (EOC) appointed a recovery manager and began initial recovery planning. At a later date, site plans call for continuing the time line of this exercise to test and evaluate actual recovery operations and implementation.

The scenario for this exercise did not require an in-depth assessment or analysis of the accident conditions initially reported in order for the PSS to determine the correct and conservative emergency classification; that is, all explosion scenarios in the material access area (MAA) result in a General Emergency at Pantex. However, in planning for this evaluation, the Office of Emergency Management Oversight (OA-30) observed that EALs for other types of initiating events were not nearly as straightforward in providing an unambiguous emergency classification. The results of this review of additional Pantex EALs are provided in this section.

Status and Results

The categorization and classification for the postulated event was correct and timely, and the process for transitioning from the emergency phase to the recovery phase was initiated early, implemented logically, and well under way at the time the exercise ended. Within one minute of confirming initial reports of the event, the PSS initiated initial site protective actions, and within eight minutes classified and declared the event as a General Emergency. However, since the PSS was aware that all explosions in nuclear explosive handling facilities at the site are classified as a General Emergency and that essentially all of the Pantex EALs contain a consistent set of protective actions, he performed both the emergency declaration and the formulation of protective actions without referring to the EAL tables.

Although not a factor in this exercise because of the obvious nature of the initiating event, the emergency categorization, classification, and declaration methodologies have several important weaknesses.

Concerns include the absence of any formal procedural guidance for the process, ambiguities in the EAL thresholds, and inconsistencies with Department of Energy (DOE) requirements. For example, Pantex has not prepared an emergency plan implementing procedure for emergency categorization and classification. Instead, various operator aids have been developed that, along with the EAL tables, are a supplement to the Pantex hazards assessment, and have been assembled for use by the PSS to categorize and classify an emergency. As a result, specific guidance is not available to the PSS and IC on subjects such as declaring and making notifications for Operational Emergencies not requiring classification, and actions to take when events are not addressed by existing EAL tables. Although the facility EALs include two items that broadly consider severe weather and unidentified hazards, the specific, objective thresholds required by the order have not been developed. For non-emergency significant plant events, there is a PSS operator aid for conducting offsite courtesy calls; however, there is no guidance provided on what type of events warrant its use.

Several concerns were noted with the EAL tables. The EALs are not sufficiently specific to ensure that proper classification is achieved in a timely manner. For example, the indicators specified for a General Emergency based on fire with a release of radioactive material for Building 12-26 are water flow, deluge activation, duct detector alarm, radiation air monitoring system (RAMS) alarms, and a smoke plume. The indicators specified for a Site Area Emergency for the same event differ only in that the "smoke plume" indicator has been replaced by "water flowing out of the vault." Both cases indicate a breach of vault integrity, which could result in General Emergency conditions, but neither EAL specifies the difference between the emergency severities as a function of the integrity of the release barrier. In addition, there is no guidance in the EAL tables regarding the number of listed indicators or confirmatory observations that are required to meet the classification thresholds. This latter omission is particularly important since some confirmatory indicators may not be able to be observed in a timely manner in all cases. For example, a confirmatory indicator of a General Emergency involving a fire with release of hazardous material is "protective action criteria exceeded or expected to be exceeded at or beyond the site boundary." This, as well as other EAL thresholds based on a protective action criteria being exceeded at a specified boundary, cannot be evaluated until a quantitative consequence assessment projection has been generated by the emergency response organization (ERO) consequence assessment staff.

The EAL thresholds for emergency declarations for security-related events are not graded according to the potential for a release of hazardous material or the threat to facility safety systems. The EAL tables only provide for declaration of a General Emergency when security events related to the loss of control of nuclear material occur, which may be inappropriate under certain circumstances. EALs appropriately include predetermined onsite protective actions to evacuate the immediate area and shelter in place in adjacent facilities, and offsite protective action recommendations to shelter in place. However, no guidance has been developed regarding the determination of specific sectors to which the offsite protective action recommendations apply.

FINDING: The structure and content of the Pantex emergency actions levels do not always facilitate prompt and accurate categorization and classification. Thresholds for declaring and notifying offsite agencies and DOE Headquarters of operational emergencies not requiring classification have not been established as required by DOE Order 151.1.

The process for transitioning into the recovery phase was initiated relatively early in the exercise. Within approximately two hours of the initiating event, a recovery manager had been appointed and a recovery team roster had been approved by the IC. In addition, preparations were under way to preserve the accident scene to support a post-accident investigation. These efforts were conducted in accordance with the *Pantex Plant Post-Emergency Recovery Planning Guide*. This document defines the emergency recovery organization and provides general guidance for establishing a post-emergency recovery team and developing a recovery plan to govern recovery operations. It specifies the requirements for terminating the emergency phase, which include having an approved recovery plan and requiring the recovery manager to brief the IC and emergency manager of the recovery plans. When the exercise ended, the initial draft of the recovery plan had been developed, the IC/emergency manager briefing by the recovery team was in progress, and some of the initial recovery preparations such as procuring a fixative for surface contamination were being addressed.

Conclusions

The PSS correctly and quickly categorized and classified the postulated emergency for this exercise, and the exercise illustrated several positive elements of the process for transitioning from the emergency phase to the recovery phase. However, existing mechanisms for determining the appropriate emergency category or class do not readily facilitate accurate and timely emergency decision-making.

Rating

The Categorization, Classification, Termination, and Recovery response elements are collectively rated as Marginal.

Opportunities for Improvement

- Consider developing a Pantex emergency response procedure or guidance document that orchestrates the emergency categorization, classification, and declaration actions of the PSS and operations center staff during the early stages of an emergency event. Validate emergency response implementing procedures to ensure that they are usable in a high-stress, time-urgent environment, and that they accurately reflect management's expectations for performing emergency response.

- Clearly document the thresholds and conditions that warrant the declaration of an Operational Emergency that does not involve the actual or potential release of hazardous materials and expectations for notifying DOE and offsite authorities of non-emergency significant events using the existing courtesy notification process.

APPENDIX F
NOTIFICATIONS, COMMUNICATIONS, AND OFFSITE RESPONSE INTERFACES

Introduction

For Operational Emergencies, prompt initial emergency notifications are accurately and efficiently made to workers and emergency response personnel/organizations, including appropriate DOE elements and state, tribal, local, and other Federal organizations. Proper, accurate, and timely follow-up notifications are made when conditions change or when the emergency classification is upgraded or terminated. Continuous, effective, and accurate communications, among response components and/or organizations, is reliably maintained throughout an Operational Emergency. Effective interfaces are established and maintained to ensure that emergency response activities are integrated and coordinated with the state, tribal, local, and Federal agencies and organizations responsible for emergency response and the protection of workers, the public, and the environment.

Prompt and accurate notifications and communications during an emergency serve to activate onsite and offsite response organizations, notify offsite agencies with a role in protecting the public, and provide the information on which to base protective actions decisions. As the initial incident commander (IC), the plant shift superintendent (PSS) is responsible for activating the Pantex emergency management plan and completing initial notifications to workers, emergency response personnel, Department of Energy (DOE), and offsite authorities.

Status and Results

Notifications

During the early stages of the exercise, the initial emergency notifications were made to cognizant offsite agencies and DOE in a timely manner, and the PSS effectively communicated protective actions and event information to site personnel. Immediately following the initial report of the explosion, the PSS rapidly notified emergency responders of the event and communicated a shelter-in-place protective action via the plant-wide paging system. Shortly thereafter, other site personnel were notified of the event via the site public address system.

Following the General Emergency declaration, the PSS, with the aid of an administrative assistant, quickly began the initial verbal emergency notifications to the Albuquerque Operations Office (AL) and DOE Headquarters, and initial written notifications to state and local agencies by completing a preformatted notification form and transmitting it via facsimile. The contents of the written notification form were then read to the recipients during a follow-up telephone conference call, which also served to confirm receipt of the facsimile transmissions. However, the benefit of the timely notifications was substantially diminished by the numerous errors made in completing the initial notification form. Specifically, the notification form recommended that three sectors of the emergency planning zone (EPZ) be evacuated rather than sheltered-in-place, which is the predetermined offsite protective action recommendation specified in the applicable emergency action level (EAL). In addition, two of the specified EPZ sectors were incorrect, given the prevailing (exercise-specific) wind direction. The PSS was informed of most of these errors when he was contacted by two of the affected offsite EOCs after they received the initial notification form. Because the PSS administrative assistant was still conducting the initial verbal notifications and confirmations, corrections were immediately communicated to all but one of the state and local offsite agencies via telephone. Subsequently, the original initial notification form was marked up by hand and retransmitted shortly after the call. However, the amended notification form also contained errors in identifying the appropriate affected EPZ sectors. An update notification form later transmitted to the offsite authorities contained the appropriate downwind sectors but also identified a sector that would not have been impacted by a release. In fact, throughout the exercise, the offsite agencies did not receive a notification form correctly identifying the appropriate affected EPZ sectors based on wind direction. As a result, there was significant confusion within the offsite response organizations regarding the protective actions recommended by the PSS.

The State of Texas Department of Public Safety was the offsite agency that did not receive the initial verbal notification, due to an incorrectly recorded telephone number. Therefore, this organization was unaware of the corrections to the initial erroneous protective action recommendations until they received the second amended notification form by facsimile. Finally, despite the fact that both the PSS emergency response checklist and notification procedure imply that the Outside Warning System (OWS) should be activated before the notification form is prepared, the first attempt to activate the system did not occur until approximately ten minutes after the initial notification form had been faxed to the state and local response agencies.

Other less significant errors were also made in completing the emergency notification forms. These included not indicating the time of the emergency classification, and indicating in the update that the emergency classification of General Emergency was "new" and the meteorological information was unchanged (although one of the parameters was different). A contributing factor to these errors is likely the absence of a formal process for correcting written notification errors. Such a process could have served to re-establish a notification baseline to prevent the initial errors from inadvertently being propagated.

In addition to the implementation errors noted above, the overall emergency notification process at Pantex has several important weaknesses. The notification form lacks a space for indicating the time that it was completed, and therefore impedes reconstructing the sequence of events when the facsimile machine clocks are inaccurate, as was the case during this exercise. The procedural guidance for performing notifications mixes responsibilities and descriptive statements with action statements. As a result, use of the procedure is cumbersome, especially considering the high stress, time-sensitive environment in which emergency notifications are performed. Some steps are poorly defined, and there are unexplained differences between the sections for performing exercise notifications and actual emergency notifications, most notably in the area of making the notification conference call. The "actual emergency" section appears to require a confirmation conference call following a notification and notification update, but the exercise section does not explicitly require this call for the updates. During the exercise, it was noted that the PSS administrative assistant was following the "actual emergency" section, but these follow-up telephone calls were not made. Lacking these confirmations, until the open communication line with the offsite agencies is established, there is no mechanism to ensure that those agencies have received the notification updates transmitted by facsimile. Such confirmation is particularly important for notification updates that include a change in the offsite protective action recommendations provided on prior notification forms.

Communications

The quality of both face-to-face and radio communications was generally satisfactory during the exercise. One innovative method of communicating was the use of hand signals by field monitoring teams to communicate detected levels of ground contamination back to the individual who remained in the team's transport vehicle. On the other hand, at the incident scene, some verbal communications from the initial entry team to the senior fire officer were unclear as a result of speaking too quickly while wearing self-contained breathing apparatus and not confirming the accurate transfer of information by repeating the information received (i.e., using repeat-backs). In at least one instance, the lack of repeat-backs by personnel wearing respiratory protection contributed to a delay in getting the two ambulatory victims to an ambulance because of confusion between the fire officer at the scene and the affected responder regarding movement of the victims to the ambulances. In addition, the clarity of communications was impeded by inconsistent use of individual responder names rather than designated call signs.

The EOC made effective use of the site public address system to provide periodic plant status reports to site personnel, and conducted frequent EOC-wide briefings using the EOC public address system, including during the turnover from the PSS to the IC and emergency manager. Although EOC personnel were closely attentive to the initial EOC-wide briefings, later briefings were characterized by numerous distractions such as multiple side conversations and high noise levels.

Offsite Response Interfaces

Pantex has expended significant effort and resources to implement mechanisms to integrate and coordinate onsite and state/local agency emergency response activities. The relationships with state and local agencies and mutually agreed upon responsibilities

are formally documented via numerous, up-to-date memoranda of understanding and agency-specific response plans. Monthly agreement-in-principle meetings are used to foster the working relationship between the emergency management personnel from the site and the state/local response agencies. The effectiveness of these interfaces is regularly tested during Pantex Plant exercises.

The overall concept for integrating the emergency response efforts of the state/local agencies with that of the site and keeping them informed about the progression of events is sound, and reflects DOE's expectations for two-way information exchange. It involves assigning site emergency response organization (ERO) personnel to each offsite emergency operations center (EOC) to communicate via an open telephone line with an offsite coordinator stationed in the site EOC. The site individuals stationed in the offsite EOCs are tasked with identifying and resolving issues that might affect the coordination of onsite and offsite actions, as well as providing technical information and advice to the offsite facilities. The coordinator is tasked with ensuring that offsite agencies are kept informed of significant information concerning the status of the emergency, response efforts, and any release of hazardous materials.

While the quality of the communications with DOE Headquarters and AL was generally satisfactory, communication between the Pantex EOC and local offsite response authorities was inadequate. DOE Headquarters and AL received periodic updates on the status of the plant and emergency response efforts. In addition to the updates via telephone, the emergency manager conducted an audio/video conference call with DOE Headquarters at approximately two hours into the exercise. This update briefing included the status of protective actions in effect and the site's resource/asset needs, and permitted the emergency manager to answer various questions. However, due to a lack of information, the emergency manager could not answer questions regarding whether the injured victims were contaminated.

Despite the extensive preparations and sound concept, significant weaknesses were demonstrated during this exercise in providing state/local agencies with the information they needed to ensure the protection of the public. Beyond the erroneous emergency notifications discussed previously, offsite EOC managers were frustrated by the lack of information regarding the status of the site's emergency response efforts and the projected estimates of the hazardous material release. While DOE Order 151.1 requires that consequence assessments be coordinated with Federal, state, local, and tribal organizations, the Pantex EOC did not provide its assessment of the potential magnitude and boundaries of the release to offsite government officials until two hours after the release. An issue related to the delay in conveying this information is the lack of clear policy or guidance concerning the dissemination of data, such as plume models, during a national security-related event. Furthermore, the Pantex EOC did not request information from the offsite officials regarding their assessments of the potential consequences of the event to ensure consistency. For example, the Pantex EOC did not request information on dose consequence predictions generated by offsite agencies, the status of offsite field monitoring team deployments, and offsite field monitoring team measurement results. In addition, the Pantex EOC did not provide support to public information personnel in characterizing or interpreting the health and safety impact of the projected levels of contamination. This lack of coordination impacted the ability of offsite emergency response organizations to understand the areas potentially affected by the plutonium release and to evaluate the adequacy of public protective actions recommended by the site.

FINDING: Offsite response agencies were not provided accurate and sufficient information for making protective action decisions regarding public safety in accordance with DOE Order 151.1. Assessment and monitoring of event consequences by onsite and offsite authorities were not adequately coordinated as required by DOE Order 151.1. Communication of recommended protective actions to the public was delayed by breakdowns in communications equipment.

In response to the absence of information, the manager of the City of Amarillo/Potter County/Randall County EOC asked to speak to the DOE emergency manager over a separate telephone line just before the open communication line was lost (two hours into the event). Although he was told that the emergency manager would call back, a technical advisor called back instead, but was unable to provide any new event or plume model information. Other indications that the information exchange between the site and state/local EOCs was ineffective include:

- Confusion at the City of Amarillo/Potter County/Randall County EOC regarding whether the OWS

and tone-alert radios had been activated and, if so, by whom

- Significant concerns within the City of Amarillo regarding the impact of the lack of information from the plant on the formulation of recommendations for a controlled evacuation of the public

- Disagreement between the DOE emergency manager's recommendation that the airport be closed, which was based on a projected plume model, and the city's decision to keep the airport open, which was based on the absence of any indication from their field monitoring teams of contamination in the area.

Conclusions

Initial notification of site personnel and offsite agencies of the postulated event was timely, and the PSS was clearly sensitive to the importance of protecting site workers and the public. However, errors in completing the notification forms caused substantial confusion in the offsite EOCs early on, which was compounded by problems in maintaining open lines of communication later in the exercise. Although conceptually sound, the process for establishing and maintaining accurate and timely information exchange between the site and state/local EOCs was not effectively implemented during the exercise. As a result, the offsite authorities were not provided adequate information for making decisions regarding public health and safety.

Rating

The Notifications and Communication and Offsite Response Interfaces emergency response elements are collectively rated as Marginal.

Opportunities for Improvement

- Revise the ERO notification and recall procedure so that it facilitates the accurate development and transmittal of emergency notification forms in a high-stress, time-urgent environment. Consider combining the "for exercise/drill" and "actual emergency" sections. Implement a requirement for a telephone call to confirm receipt of all follow-up facsimile notifications. Clarify expectations regarding the priority of OWS activation in comparison to other near-term actions such as notification transmittal, and provide guidance on how to handle errors in the notification form that are discovered after being transmitted by facsimile.

- Formalize the quality assurance process to ensure that changes in notification telephone numbers are accurately and thoroughly reflected in the notification procedure.

- Revise the emergency notification form to address non-emergency significant events and Operational Emergencies not requiring further classification.

- Consider acquiring throat microphones or other communications equipment that is designed to be used while wearing respiratory protection equipment.

- Consider developing and formalizing communications protocols for radio and telephone use by emergency responders.

APPENDIX G
CONSEQUENCE ASSESSMENT

Introduction

Estimates of onsite and offsite consequences of actual or potential releases of hazardous materials are correctly computed and assessed in a timely manner throughout the emergency. Consequence assessments are integrated with classification and protective action decisions, incorporate facility and field indications and measurements, and are coordinated with offsite agencies.

Timely and accurate estimates of the onsite and offsite consequences of the release of hazardous materials are needed to support emergency response actions for protecting site workers, the public, and the environment. Following activation of the emergency response organization (ERO), consequence assessment is performed by the health and safety team located in the Pantex emergency operations center (EOC).

Status and Results

The Pantex ERO developed consequence assessments in a timely manner. The emergency management department staff, who responded to the EOC before the ERO was recalled, promptly obtained information regarding the release source term and meteorological conditions. Initially, the computer code HOTSPOT was used to provide an estimate of the geographic area potentially affected by the event. More sophisticated consequence assessments were subsequently generated using the Atmosphere Release Advisory Capability (ARAC) computer code with support from the staff at the National Atmospheric Release Advisory Center in Livermore, California. The resulting outputs of these computer models in terms of plutonium inhalation dose and ground deposition as a function of distance from the source of the release were generated and displayed in the EOC Executive Team Room.

Four field monitoring teams were promptly dispatched to locate the edges of the plume; two teams at opposite edges of the projected plume on the main plant site and two teams at opposite edges of the projected plume at the Pantex site boundary. Field monitoring results were reported in units of counts per minute to the health and safety team, who then applied standard conversion factors to calculate the magnitude of ground contamination for comparison with the levels predicted by the ARAC code. One field monitoring team observed during the exercise demonstrated good radiological survey techniques. In particular, this team demonstrated excellent contamination control and decontamination techniques. On the other hand, the field monitoring teams do not have a procedure that requires them to perform an inventory of their monitoring instruments before being deployed on an emergency response. In addition, they do not have any specific procedures or protocols for conducting, recording, or communicating field monitoring measurements during an emergency.

A concern was identified with the operation of the HOTSPOT computer code. The problem was that the initial dispersion plot developed using HOTSPOT showed the plume being transported in a direction that was inconsistent with the prevailing (exercise-specific) wind direction. This plot was generated by an emergency management department staff member who arrived at the EOC before the ERO was recalled. This individual did not verify that the plot was consistent with meteorological conditions before the plot was projected in the EOC Executive Team Room. After the ERO was recalled, one of the first ERO responders promptly identified the error and had the display terminated. Subsequently, the dispersion modelers were unable to fix the display orientation problem with the HOTSPOT code and had to rely on the ARAC code for consequence assessments.

The results of the dispersion models that were generated were communicated to the incident commander (IC) and his staff and used to assess the adequacy of the existing onsite protective actions. The health and safety team leader demonstrated good control and communications with his team members. In addition, the health and safety team radio communicator maintained good communications with the field teams and frequently updated the health and safety team leader on the status of the field teams.

Conclusions

The Pantex ERO performed well in developing timely assessments of the consequences of the radioactive material release and in confirming these estimates with field team measurements. Problems with the graphical outputs of the HOTSPOT computer code were quickly identified, and a plume display that was incorrect was promptly terminated.

Rating

The emergency response element of Consequence Assessment is rated as Satisfactory.

Opportunities for Improvement

- Modify field monitoring team emergency response equipment inventory lists to ensure that field monitoring teams are deployed with appropriate and operable radiological monitoring devices.

- Establish guidance or procedures to convey the expected actions of field monitoring teams in responding to emergencies, performing field contamination surveys, and communicating survey results.

APPENDIX H
PROTECTIVE ACTIONS AND REENTRY

Introduction

Protective actions are promptly and effectively implemented or recommended for implementation, as needed, to minimize the consequences of emergencies and to protect the health and safety of workers and the public. Protective actions are reassessed throughout an emergency and modified as conditions change. Reentry activities are properly planned, coordinated, and safely accomplished.

The Pantex Plant Shift Superintendent (PSS) is responsible for initial formulation of protective actions for site workers and for communicating recommended protective actions to offsite authorities through the formal notification process and to the public by activating the Outside Warning System (OWS). Protective actions for emergency responders at the scene and provisions and planning for the safety of entry team personnel is the responsibility of the on-scene commander (OSC). For the purposes of this appendix, the actions of an initial event investigation/search and rescue team consisting of two to five firefighters, radiation safety personnel who conducted contamination surveys at the event scene, and fire department personnel performing damage assessment are considered to be reentry activities.

Status and Results

Protective Actions

The initial protective actions implemented by emergency responders at the scene were appropriate, and protective actions for onsite workers were rapidly identified and effectively communicated by the PSS. At the onset of the exercise, the PSS rapidly and accurately assessed the event and directed all plant personnel, including the emergency response organization (ERO), to shelter in place and to shut down all facility air handling units. However, in making these decisions, the PSS never referred to the emergency action level (EAL) applicable to the affected facility. About 20 minutes later, the ERO was notified to leave their shelters and report to their assigned emergency duty stations. The responders were also directed to process through the emergency operations center (EOC) decontamination station upon arrival at the EOC. The PSS had conservatively elected to activate the decontamination station based on the strong possibility that radioactive material might have been released by the reported explosion.

Adherence to some protective actions was inconsistent near the incident scene. For example, the security police officer (SPO) who unlocked the entry door to the affected building for the initial radiation safety monitoring entry team was not wearing any personal protective equipment, while the radiation safety team was dressed in anti-contamination clothing and had self-contained breathing apparatus. Although the initial plant-wide public address announcement instructed personnel to shelter in place and prohibited drinking, eating, and the use of tobacco, the workers sheltered in at least one of the affected areas violated all three of these instructions. Additionally, the shelter-in-place protective action began to break down in the same area about three hours into the exercise when some personnel left the bays for restroom breaks and some supervisors released their employees for lunch.

Obtaining a reliable accounting for potential fatalities during the exercise was also a problem because of a misunderstanding regarding the ability to perform accountability with the work force sheltered in place. Within 35 minutes of the first report of the explosion, the PSS identified a discrepancy between the badge numbers of those personnel apparently working in the affected bay and the badge numbers of the injured personnel. Later, he appropriately recommended to the incident commander that plant-wide accountability be conducted due to the likelihood of fatalities within the bay. Shortly thereafter, the plant public address system and pagers were effectively utilized in an attempt to locate individuals who were suspected fatalities. However, plant-wide accountability was not initiated until almost three hours into the event after the release of the shelter-in-place order, and had not been completed by the end of the exercise over an hour later.

There were several weaknesses in the identification and communication of protective action recommendations to offsite authorities (as discussed

in Appendix F). As a result, the protective action recommendations communicated to the state/local EOCs via the notification forms did not include all of the affected downwind emergency planning zone (EPZ) sectors until approximately 50 minutes into the event. With regard to warning the public, a preformulated tone-alert radio announcement has been developed for use by the PSS when a General Emergency is declared. The announcement appropriately directs all residents within the EPZ to shelter immediately, consistent with the predetermined protective action recommendation provided in the applicable EAL. However, the message does not include any of the specified offsite actions for persons in vehicles that are also identified in the EAL. In addition, the warning system was not initially activated until about 20 minutes into the event. Finally, although all of the consequence assessment dispersion plots that were generated indicated the possibility for plutonium contamination outside of the Pantex EPZ, concerns regarding protective action recommendations beyond the EPZ were neither discussed within the Pantex EOC nor communicated to any offsite EOCs.

In several cases, emergency responders who might have been contaminated left the site without first being radiologically surveyed, thus creating a potential offsite contamination hazard. For example, some of the joint information center (JIC) staff who initially reported to Building 16-19 onsite to await dispatch offsite believed that they were contaminated based on the route that they had taken to get to that building. However, because radiation safety personnel were not available to survey them for contamination, they were released off site without any radiological monitoring and were not directed, as a compensatory measure, to take any personal actions to minimize the possible spread of contamination. Although the health and safety team leader in the EOC believed that the individuals were not likely to be contaminated based upon their presumed routes of travel while on site, he was unaware of the exact location of all the JIC personnel when they were dispatched.

The first site public address announcement releasing certain workers from the shelter-in-place requirement appropriately directed them to stay away from the affected area of the explosion. However, this was not specifically mentioned in subsequent plant-wide announcements. A southern perimeter road outside the material access area but within the main plant site was never blocked to restrict access to contaminated areas downwind of the explosion, so plant personnel could easily have traversed this area as they returned to their normal duties.

Reentry

There were significant safety-related weaknesses in the management and control of the reentry teams. Although the initial entry team of firefighters reported the time that they started using supplied air, stay times for these individuals were not tracked by anyone at the emergency control station (ECS). As a result, two firefighters began to run out of supplied air while in a highly contaminated area of the accident scene. They elected to remain in this area, and were not directed otherwise, accompanying the most severely injured victim while replacement air supply bottles were brought to them. The air supplies were then exchanged while the firefighters remained in the contaminated area, thereby exposing them to ambient air that could easily have resulted in their inhaling radioactive material.

There were early indications that the reentry and recovery phases would be complex and that the combination of expected high temperatures and the need to wear full firefighter or anti-contamination clothing with self-contained breathing apparatus would likely induce heat stress. Four firefighters were actually taken out of play by an exercise controller after approximately one hour because some of them were suffering from heat stress. The initial radiation safety entry team experienced similar problems. They were dressed in the appropriate personal protective equipment and then waited without any shelter from the heat for 50 minutes before being deployed into the accident area. They too were appropriately restricted from further exercise play because of possible heat stress. However, after leaving the incident area, they were inappropriately kept from drinking water because the exercise prohibited eating and drinking; the controllers did not recommend or require actions to rehydrate these individuals even though their actual symptoms put them at risk. Additionally, no rehabilitation area was set up at the scene to provide shade from the sun and medical attention, such as oxygen for breathing assistance, for distressed emergency workers.

FINDING: Entry team personnel were not provided adequate rehabilitation and monitoring to ensure their safety.

Other reentry problems delayed the recovery of the injured victims or resulted in the potential for spreading contamination. The senior fire officer initially deployed one of the Pantex fire apparatus to an area that was inside the "hot zone" of the incident scene. Although the firefighters donned and doffed protective clothing and respiratory protective equipment in this area and entered and exited their vehicle at various times during the exercise, there was no radiation safety support at their location. When they were asked by an SPO upon exiting the area about whether to call radiation safety personnel to monitor them for contamination, they responded that that was not necessary because they had been told that the area was not contaminated. At that time, however, no radiological surveys of the area had been conducted. Also, as mentioned in the Appendix C, no contamination surveys of the injured victims were ever performed.

Conclusions

Initial protective actions at the event scene and those implemented plant-wide were appropriate and implemented in a timely manner. However, significant weaknesses in onsite protective actions during the course of the exercise could have resulted in the potential for serious responder injuries and the unnecessary spread of contamination both on and off site. The OSC failed to implement standard methods for preventing the spread of contamination and minimizing the potential for radioactive material intakes by response personnel. Protective action recommendations provided to state/local response agencies suffered from several weaknesses, including inaccurate downwind sector identification on written notification forms, an unnecessary delay in the initial activation of the OWS, and the absence of protective action considerations or recommendations beyond the EPZ.

Rating

The emergency response element Protective Actions and Reentry is rated as Marginal.

Opportunities for Improvement

- Establish standard requirements for monitoring the well-being of emergency responders; protecting them from adverse environmental conditions, such as extreme heat, cold, or wind, whenever possible; and ensuring the availability of appropriate and adequate rehabilitation supplies.

- Consider revising procedures to facilitate building- or zone-specific personnel accountability.

- Consider developing an on-scene command group guidance document that identifies, discusses, and prioritizes important incident command considerations, such as backup rescue team requirements and precautions for performing response under adverse conditions (e.g., highly contaminated areas).

APPENDIX I
EMERGENCY MEDICAL SUPPORT

Introduction

Medical support is provided in accordance with DOE Order 440.1A for workers contaminated by hazardous materials. Onsite and offsite medical facilities provide support to transport, accept, and treat contaminated and injured personnel.

Pantex has a full range of medical capabilities including an onsite Occupational Medicine Department with a staff of 18, three basic life support ambulances and associated crews, and emergency medical technician-trained firefighters. In an event where the number of injured/contaminated personnel exceeds the limits of the Pantex occupational medicine department, personnel are transported to the Emergency Radiation Treatment Facility (ERTF) at the Veterans Administration Medical Center in Amarillo. The ERTF was constructed and equipped with DOE funding to provide emergency treatment for accident victims with radiological contamination and serious or life-threatening injuries. The Office of Emergency Management Oversight evaluated the medical support activities at the incident scene and the ERTF during this exercise.

Status and Results

During this exercise, medical support was provided to four workers with simulated injuries. Due to weaknesses in on-scene command and control, none of the injured were surveyed to determine whether they were radiologically contaminated before they were transported to onsite and offsite medical facilities. Recognizing this, the medical professionals appropriately treated all of the patients as potentially contaminated.

Approximately 12 minutes after the explosion was reported, the ERTF was informed that injured workers might be involved. The ERTF communications center was then promptly staffed with a pair of nurses who stayed at their posts throughout the exercise. They monitored incoming communications using telephones (land lines and cellular), a facsimile machine, and a radio scanner, which allowed them to hear the radio communications of the Pantex fire department. They communicated information to decontamination and operating rooms via cellular phones that were used as a backup to an inoperative wall mounted intercom system. The nurses communicated with the Pantex ambulance crew to obtain patient status reports and estimated arrival information, which was relayed to the decontamination room and triage team.

The ERTF is staffed with well-trained and credentialed medical and nursing personnel, many of whom have received training at the Radiation Emergency Assistance Center/Training Site in Oak Ridge, Tennessee. The staff responded promptly to the recall for participation in this exercise and appeared well trained in their preparation of the facility for contaminated patient arrival. Delays in onsite rescue and transport (discussed in Appendix C) resulted in it taking about two hours for the patients to arrive at the ERTF. When two patients arrived at the ERTF about two hours after the explosion, the staff made appropriate medical decisions to treat these patients despite the lack of information regarding radiological contamination.

Initially, the patients were stripped of their outer clothing and moved into the decontamination room. The triage physician examined the victims and correctly ordered the abdominal injury patient to the adjacent operating suite for immediate life-saving surgery. By this time, Pantex radiological assistance team personnel had not yet arrived at the ERTF. When the radiological support team did arrive in the busy decontamination room, they were not proactive in announcing their presence and offering their expertise in surveying the patients. They were subsequently "discovered" and conducted a contamination survey of the patient who was being prepared for surgery in the operating room. The survey detected 15,000 counts per minute on the patient's face. Nasal smears were then taken, and the surgeon properly decided to begin chelation therapy before the patient's surgery. The patient's consent for chelation therapy was obtained in accordance with Pantex Occupational Medicine Department protocols.

The other accident victim was then surveyed for contamination and prepared for surgical treatment of the compound fracture of his left forearm. Several personnel worked to decontaminate his right leg and left shoulder in the decontamination room. However,

the left shoulder wash was not properly performed, allowing uncontrolled runoff to flow to the patient's back and down his arm near the wound site. The patient was then moved to the second operating room suite and his compound fracture was surgically reduced and repaired. In reality, the outcome of treatment for injured victims such as these is often directly related to the time elapsed to surgical care. Delays in onsite rescue and transport of these victims significantly compromised their prognosis.

Conclusions

The victims received appropriate medical care from onsite and ERTF medical support staff. The staff demonstrated sound training, medical judgment, and decision-making throughout the exercise. The ERTF staff adjusted well to the delayed arrival of the seriously injured and the tardy appearance of radiological support personnel. Overall, the delay in critical surgical treatment significantly degraded the prognosis of one exercise victim.

Rating

The Emergency Medical Support response element is rated as Satisfactory.

Opportunities for Improvement

- Evaluate and minimize barriers that prevent the rapid evacuation and transport of seriously injured persons to onsite or offsite medical facilities.
- Conduct periodic proficiency training for all decontamination room personnel who are expected to help cleanse and care for contaminated patients, including the proper technique for protecting wounds from contaminated irrigation flow.

APPENDIX J
EMERGENCY PUBLIC INFORMATION

Introduction

Accurate, candid, and timely information is provided to workers, the news media, and the public during an emergency to establish facts and avoid speculation. Emergency public information efforts are coordinated with state, local, and tribal governments, and Federal emergency response plans, as appropriate. Workers and the public are informed of Department of Energy (DOE) emergency plans and planned protective actions before emergencies.

During this exercise, the Office of Emergency Management Oversight evaluated the emergency public information activities in the emergency press center (EPC) and emergency telephone operations (ETO) room in the Pantex emergency operations center (EOC), and the joint information center (JIC) located in Amarillo.

Status and Results

The emergency response organization (ERO) staff demonstrated a good understanding of their roles and responsibilities in performing their assigned emergency public information tasks. The EPC and ETO teams clearly understood their procedures and responsibilities, as well as those of their coworkers. For example, the ETO staff knew to accept only approved information for release to the public and media over the phone. The recall and activation of the emergency public information teams was prompt, and the EPC worked efficiently to complete four news releases and draft a fifth release during the exercise.

JIC participants supported and interacted well with offsite organizations. Upon arrival, they set up the JIC quickly. The Department of Energy (DOE) spokesperson took a proactive role in setting up the JIC and getting information from the Pantex EOC and EPC. Security staff from the Amarillo Police Department promptly secured access to the JIC and continued to provide firm access control throughout the exercise. The deputy JIC director provided excellent guidance to spokespersons regarding news conference coordination and conduct. The onsite and offsite spokespersons conducted a news conference to inform the public and media of the accident at Pantex.

A number of concerns were also identified during the exercise. The EOC, EPC, and ETO did not demonstrate the ability to provide the JIC and the public with accurate and timely information regarding the release of radioactive material. Information regarding the release was not provided to the JIC for release to the public until the fourth news release was issued about three and a half hours after the incident occurred. In addition, it was not addressed in the one news conference that was held during the exercise. Further, neither the news conference nor the news releases included information regarding the activation of offsite EOCs, reception center issues, and school children injuries. Then, despite having received new information regarding radioactive contamination detected by field monitoring teams, injuries at the reception center, and updates regarding injured employees, DOE decided not to hold a second news conference. Consequently, the public was unaware of significant emergency issues throughout the duration of the exercise. For example, the public was not made aware of the potential consequences of not taking shelter. The absence of information forthcoming from DOE created fertile ground for the generation and circulation of misinformation and rumors.

Although the ERO staff understood their duties well, there were a number of instances in which the lack of procedures to guide the staff hampered their response actions. For example, public information personnel did not use a pre-formatted and pre-approved template to support the process for quickly issuing the first news release. The lack of such a template, and ensuing problems with the EOC facsimile machines, resulted in a two-hour lapse between the incident and the initial release of public information via a news release. In addition, although the staff remembered the protocols for initial setup of JIC operations, procedural guidelines were not immediately available to support this effort. As a result, with the exception of the Texas State Bureau of Radiological Control, offsite agencies were not formally notified that the JIC had been activated. Therefore, offsite agencies were late to arrive at the JIC, causing them to miss important emergency information and have only limited opportunities to share their information with DOE.

Conclusions

While the emergency public information teams were knowledgeable about their roles and responsibilities and understood those of their coworkers, the lack of comprehensive, detailed procedures did not ensure that information reached its intended destination. The process for preparing and approving news releases was well defined and efficient, but equipment failures caused lengthy delays in transmitting news releases to the JIC, offsite agencies, and, ultimately, the public. The news releases lacked timely and important information, such as information about the radioactive material release, and the news conference lacked critical health and safety information. Overall, DOE was not able to provide enough information to offsite emergency response agencies and the public to prevent speculation and to demonstrate candor on the part of DOE in managing the postulated emergency.

Rating

The Emergency Public Information response element is rated as Marginal.

Opportunities for Improvement

- Clarify expectations for the timeliness of the initial news release in emergency preparedness procedures. Emphasize the use of a pre-formatted, pre-approved initial news release to rapidly disseminate information in the early stages of an emergency.

- Identify contingency plans for distributing public information if the available facsimile (fax) machines fail. Consider using a burst fax with a prioritized distribution list and dedicating a fax machine for EPC/JIC use only. Implement a requirement to routinely update and verify fax telephone numbers and emergency notification lists. Also, consider using the Internet as a communication tool in both the EPC and JIC.

- Formalize procedures or guidelines for identifying essential health and safety information that should be communicated promptly from the EOC executive teams to the EPC. Conduct training for affected response personnel within the Pantex emergency management team and incident command group.

- Consider developing standard responses for ETO personnel to give in reply to commonly expected questions. For example, consider pre-formatted responses to questions regarding injured or missing employees, potential radiological releases; contamination events; radiological, chemical, and explosive hazards; and protective measures.

APPENDIX K
EXERCISE PLANNING, CONDUCT, AND EVALUATION

Introduction

A formal exercise program is established to validate all elements of an emergency management program over a multi-year period by initiating response (i.e., exercise) to realistic, simulated emergency events and conditions in a manner that, as nearly as possible, replicates an actual, integrated emergency response. The planning and preparation for exercises requires an effective and structured approach. In addition, to be successful, the exercises must be effectively and faithfully conducted, controlled, evaluated, and critiqued. Lessons-learned are developed, resulting in corrective actions and improvements.

Status and Results

Overall, Pantex performed well in planning, conducting, and evaluating the "Verser Partout" exercise. The exercise involved significant participation by onsite and offsite personnel. Exercise planning was well coordinated among the participating organizations. Individual responders and exercise controllers demonstrated motivation and initiative in responding to and conducting the exercise. The exercise was predicated on an extreme, worst-case scenario in order to accommodate the many offsite participants and to critically challenge all facets of the Pantex emergency response organization (ERO). The exercise was a comprehensive test of the plant's emergency response capabilities and therefore presented abundant opportunities for revealing weaknesses and identifying lessons learned. The exercise was conducted in accordance with the exercise plan such that opportunities were provided to demonstrate the exercise objectives. The site used a large number of evaluators, including emergency management personnel from other Department of Energy (DOE) sites, to provide for a good evaluation of the exercise.

Exercise Planning

The exercise planners elected to conduct an exercise involving an extremely low-probability, high-consequence event that was designed to affect large sectors of the public over a widespread geographical area. The challenging nature and broad scope of the exercise were supported by Amarillo Area Office (AAO) and Mason & Hanger Corporation (MHC) management. Numerous offsite organizations participated in the exercise including the Amarillo Police Department, City of Amarillo/Potter County/Randall County emergency operations center (EOC), Armstrong and Carson County EOCs, Texas Departments of Health and Public Safety, Federal Aviation Administration - Amarillo Tower, Veterans Affairs Medical Center in Amarillo, Department of Energy (DOE) Region IV Radiological Assistance Program, the Federal Radiological Monitoring and Assessment Center, and the Albuquerque Operations Office (AL) and DOE Headquarters EOCs. The site coordinated effectively with the offsite organizations in planning the exercise so that these organizations were also able to test their own emergency response capabilities. Onsite participation was also extensive. The scenario presented difficult decision-making and response challenges to essentially all of the onsite organizations that could be involved in the response to a major emergency event at Pantex. The exercise package provided sufficient information for the conduct, control, and evaluation of the exercise. The exercise package included specific exercise objectives, scope, participants, simulations, time lines, "injects" (i.e., exercise-related messages), technical data, safety and security provisions, controller instructions, and evaluation criteria.

Exercise Conduct

In conducting exercises, actions are taken to provide information consistent with what would be available during a real event and to ensure the safety of exercise participants and site workers during the exercise. To assist in responder actions, Pantex prepared digitized photographs simulating an explosion at the event scene. These photographs provided a view of the event scene from various aspects and angles to support response from different directions. The event scene setup was excellent. Raw meat and liver were used to simulate the body parts of persons killed in the

explosion, and simulated weapons parts were clearly visible to responders entering the area. The actors performed their simulation roles very well. An exercise safety officer was present and approved all simulations. Pantex contracted with the Los Alamos National Laboratory to use the Los Alamos-designed "plume-in-a-box" system to enhance the realism of field monitoring activities conducted during the exercise. This system can be programmed to provide simulated radiological survey instrument readings in the field that mimic projected ground contamination levels that might actually occur for a particular accident scenario. Also, the Pantex exercise controllers assigned to oversee the field monitoring activities were trained on and practiced with the system prior to the exercise.

Very little prompting of responders by controllers and evaluators was observed. On the other hand, the "injured" actors provided their "cue cards" containing contamination and vital sign data to the responders instead of having the responders earn the information. In addition, at various locations, evaluators and controllers were observed talking about scenario information and responder performance during the exercise where they could be overheard by responders. There was some indication that some responders may have had prior knowledge of the scenario. For example, an individual in the environmental restoration group described the exercise scenario to his co-workers in tremendous detail on the morning of the exercise and before the exercise began.

Some concerns were noted in the conduct of the exercise. For example, an exercise control problem occurred when controllers took responders "out of play" for heat stress. In some cases, the information earned by these responders was allowed to be used in the exercise, and in other cases it was not reported and was therefore lost. Inadequate provisions were established to support responders who were or could have been affected by heat stress. Although heat stress was identified as a safety concern during the exercise planning, rehydration of responders was sometimes discouraged (by players and controllers) because of the ban on smoking, eating, and drinking during the exercise.

Finally, in several areas it was unclear whether site workers were exercise participants or were exempt from exercise play. For example, it was never clear to the Independent Oversight team whether the security police officers (SPOs) stationed around Building 12-104A were players or "shadow forces." Likewise, with the exception of construction-related traffic, it was never clear whether other vehicular traffic around the plant during the exercise was exempt from exercise play. In addition, when the shelter-in-place protective action was lifted for some of the site workers, many of them stopped behaving as exercise participants although it was not clear whether this was authorized.

Exercise Evaluation

A large number of personnel were utilized to evaluate the Pantex exercise. One noteworthy aspect of the evaluation was the use of emergency management personnel from other DOE sites. They provided an outsider's perspective on the Pantex emergency response performance during the exercise.

The effectiveness of the post-exercise critiques conducted immediately after the exercise ("hot washes") varied from organization to organization. One hot wash did not provide for individual responder input and lasted less than two minutes, while others lasted more than an hour, with free and open discussions with the exercise responders. The hot washes that were poorly conducted represent a missed opportunity to clarify responder actions and to obtain valuable feedback from the participants.

During the more formal critiques conducted the day after the exercise, each exercise objective was critically evaluated. The critiques were successful in identifying many of the positive and negative attributes of the response presented in this report, as well as additional items that were not observed by Independent Oversight. The critiques also revealed an area of concern. Exercise controllers for the fire department and security responders indicated that emergency responders approach exercises and actual responses differently because, in an actual response, the responders do not have to worry about being evaluated. This is inconsistent with the basic philosophy for conducting exercises, which is to realistically test emergency response capabilities under conditions that simulate actual emergency conditions.

Conclusions

In conclusion, Pantex performed well in planning, conducting, and evaluating the "Verser Partout" exercise. Emergency management department personnel are knowledgeable in the planning process and are adept in forming and managing exercise

development teams from vastly different disciplines and organizations. The conduct and control of the exercise were realistic and challenged all of the onsite response organizations available to respond to an emergency at Pantex. AAO and MHC deserve to be commended for the challenging nature and broad scope of the exercise and its objectives. The exercise provided a superior basis for identifying systemic program deficiencies for lessons learned and for achieving continuous program improvement. Improvements in exercise safety are needed to ensure that adequate provisions are established to monitor and care for individuals who may suffer adverse consequences in the exercise environment.

Rating

The planning, conduct, and evaluation of this exercise are rated as Satisfactory.

Opportunities for Improvement

- Develop more formal exercise suspension and termination requirements and document them in the exercise package. Consider the use of code words for actual emergencies to clearly identify and communicate an actual emergency condition during an exercise.

- Enhance the pre-exercise controller and evaluator briefings to provide controllers and evaluators with more detailed knowledge of the response actions expected to occur during the exercise, when and where problems may require intervention, and specific responses to player concerns and safety issues.

- Clarify the expectations of controllers with regard to handling players “in play” and “out of play” to ensure consistency.

- Clearly distinguish exercise players from those who are exempt from exercise play to enhance realism and to maximize the value of the exercise.