

**SUMMARY HIGHLIGHTS OF THE
U.S. DEPARTMENT OF ENERGY/U.S. NUCLEAR REGULATORY COMMISSION
TECHNICAL EXCHANGE ON AIRCRAFT HAZARDS ANALYSIS
SEPTEMBER 30, 2003**

INTRODUCTION

On Tuesday, September 30, 2003, the U.S. Department of Energy (DOE) and U.S. Nuclear Regulatory Commission (NRC) staff conducted a Technical Exchange in Las Vegas, Nevada, in which DOE presented its approach to addressing NRC staff information needs associated with Preclosure (PRE) Agreement 3.01. The DOE presentations covered the following: 1) a summary of the status of PRE 3.01, 2) the identification of aircraft hazards, and 3) the estimation of aircraft crash frequencies. The agreement is focused on DOE's development of a plan to identify and estimate aircraft hazards to support the license application (LA) for the proposed geologic high-level waste repository at Yucca Mountain. In addition, the agreement committed DOE to provide a map delineating the vicinity to be considered in the analysis, taking into account available information for both civilian and military aircraft. The goal of issue resolution during the pre-licensing period is for DOE to assemble sufficient information on a given issue for NRC to accept an LA for review.

The detailed agenda for this meeting can be found in Attachment 1. To support staff and stakeholder interactions, the Technical Exchange included a video connection at NRC offices in Rockville, MD and Arlington, TX, and at the Center for Nuclear Waste Regulatory Analyses (CNWRA) in San Antonio, Texas and via teleconferencing, and provided access for all stakeholders via teleconference.

In addition to staff from DOE and NRC, the meeting was attended by staff of CNWRA, and representatives from the State of Nevada, Clark County, White Pine County, Nye County, Lincoln County, Nevada, the National Spent Nuclear Fuel Program, Navy, and the Nevada Nuclear Waste Task Force. Attachment 2 contains the list of attendees who were present at the above noted locations. Attachment 3 contains the slides presented by DOE.

OPENING REMARKS

The meeting commenced with opening remarks by NRC and DOE. The NRC stated that the purpose of the meeting was to discuss DOE's response to PRE 3.01. DOE's response was submitted in separate documents: 1) Identification of Aircraft Hazards, TDR-WHS-RL-000001, Rev. 00, and 2) Frequency Analysis of Aircraft Hazards for License Application, CAL-WHS-RL-000001, Rev. 00B. DOE added that it would provide an overview of its response and how it believed it had successfully addressed the issues raised in the agreement.

PRESENTATIONS AND DISCUSSION

DOE presented an overview of agreement PRE 3.01:

Provide a plan for identification and estimation of aircraft hazards for the License Application. This plan should be consistent with the guidelines in NUREG-0800 and other applicable DOE standards, as appropriate, to a nuclear waste repository. Provide a map delineating the vicinity to be considered in the detailed analysis, taking into

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consideration available information for civilian and military aircraft, including information from federal and local agencies concerning how such activities may reasonably change. Participate in an Appendix 7 meeting to discuss the aircraft hazards plan, initial data collection and analysis, development of the vicinity map, and the appropriate level of detail for analyses to be presented in the License Application assessment. DOE agrees with the request and will provide the plan and the map in June 2002. DOE agrees to participate in an Appendix 7 meeting which will be scheduled after the plan and map are provided.

Aircraft Hazards Identification Report

DOE's presentation provided an overview of the purpose of the report noting that it described aircraft-related activities and hazards over a wide regional setting surrounding the repository, provided a map delineating the vicinity to be considered for detailed frequency analysis, and identified those aircraft-related activities that require quantitative frequency analysis.

At the conclusion of the formal presentation, DOE responded to questions and comments from NRC. The following are the highlights of those discussions:

- NRC had questions about the flight altitudes of military aircraft in the vicinity of the proposed Yucca Mountain site. DOE replied that Appendix B of the report contains the information. NRC pointed out that there might be some differences between what is specified in U.S. Air Force procedures and what is actually practiced by pilots. NRC also questioned whether the majority of the flights were at specific altitudes or if they were evenly distributed. DOE responded that the U.S. Air Force has radar stations across the Nevada Test and Training Range (NTTR) and collects altitude information of the aircraft; however, it was not important to know the flight altitudes. NRC noted that this information is important for the frequency analysis which will be discussed later during the technical exchange.
- NRC asked if night maneuvers were performed in the NTTR. DOE responded that, as noted in Appendix B of the report, most maneuvers occur during the daytime, although some night flights take place in the NTTR.
- NRC questioned the extent of the use of U.S. Air Force data in the report. DOE responded that the U.S. Air Force provided information for the report and reviewed the information contained in the report. The report included some U.S. Air Force data collected in 2002. DOE stated that to support the license application the data would be updated before the submittal of the LA.
- DOE National Nuclear Security Administration (NNSA) has the responsibility for the airspace over the NTS (including the Yucca Mountain site). There is a memorandum of understanding between the U.S. Air Force and DOE NNSA regarding flight activities while transiting the airspace over NTS. NRC inquired whether DOE has a similar agreement regarding the airspace over the Electronic Combat Area South. DOE responded that this air space is off the NTS and is controlled by the U.S. Air Force.
- DOE noted that the Federal Aviation Administration has relaxed its rule requiring commercial airlines to stay on federal airways during flight and allows the use of

extended flight corridors, if available, because of better navigational equipment. This changes the width of the flight corridor considered from a nominal 8 miles to 25 miles.

- NRC and DOE discussed the reliance on pilot actions in response to an initiating event. NRC expressed concern that if pilot actions and procedures are relied on to mitigate an initiating event sufficient data should be provided to justify DOE taking credit for those actions in the report. The data should include technical bases considering appropriate factors (e.g., weather, visibility, etc.).
- NRC asked whether there had been an evaluation of crash sites in the vicinity of the Yucca Mountain site. DOE responded that, while data have been collected for these crashes (e.g., aircraft types, flight characteristics, and flight profiles), a detailed evaluation has not been performed. NRC indicated that an analysis using these crash sites may give a quantitative verification of the exclusion region used by the analysis. A map showing these crash sites may give a qualitative idea of how close the crashes have come to the Yucca Mountain site. DOE stated that it had collected data on the locations of crashes associated with the NTTR operations between 1970 and 1991 but had not included it on the map. DOE also obtained National Transportation Safety Board data; however, the data only describe general areas, without the specific coordinates needed to plot the crash on a map. A member of the public also expressed concern that the data were only for fatal accidents and did not take into account non-fatal accidents that may impact the Yucca Mountain site.
- DOE noted that for flights outside of the 30-mile radius, the screening criteria focused on how far a plane can glide. The formula for the maximum glide capability came from a report entitled *Quest for Performance, The Evolution of Modern Aircraft*, (L. K. Loftin, Jr., 1985, NASA SP-468, quoted in the 1999 report) and is based on altitude, wing area of the plane, and other factors. The report used 18,000 ft. for the airplanes under consideration; which resulted in a glide distance of 30 miles. The NRC noted that DOE should provide data to support that pilots would not eject above 18,000 ft.
- DOE stated that the U.S. Air Force uses a Safe Range Methodology. This methodology is used to ensure a 99.99% success rate for ordnances to hit within the safety footprint. Because personnel and equipment on the ground could be affected, this high success rate is essential for Air Force safety. Since the ordnance testing and training (and thus the safety footprints) occur more than 30 miles from the Yucca Mountain site, ordnance is not considered credible to impact the Yucca Mountain site; however, this does not include any ordnance jettisoned by a pilot experiencing trouble with the aircraft. DOE added that U.S. Air Force pilots are not allowed to arm ordnance while inside the NTS. NRC questioned whether DOE has collected information about run-in headings for ordnance delivery and if any of the run-in headings were near the proposed site. DOE replied that this information was not required for the crash frequency analysis.
- NRC noted that flight activity in the vicinity may change over time and asked whether DOE intended to update the data and re-analyze before submitting the LA. In addition, NRC asked whether DOE would commit to a program to continue to collect and assess the implications of data in the future. DOE recognizes that it is important to maintain communication with the U.S. Air Force and to monitor U.S. Air Force activities during the licensing process.

- NRC asked whether the staff's comments provided by letter dated September 16, 2003 were understood by DOE. DOE noted that it had not had sufficient time to fully research the comments; however, in response to Review Comment 2, DOE agreed to provide more information regarding the safety footprint and the Air Force Safe Range Methodology to justify that ordnance will not be dropped so as to hit the Yucca Mountain site.
- NRC concurred that frequency screening can be used to screen out events that are not credible and thus justify that consequence analyses need not be performed in such instances.

Public Comments on the Aircraft Hazards Identification Report

Mr. Baughman, representing White Pine County, requested that the NRC consider the following questions with regard to the aircraft hazards issue; however, he added that he did not require a response from NRC during the meeting or in the future:

- Has the work at the Private Fuel Storage (PFS) facility in Utah been considered? Is the NRC staff who are reviewing the Yucca Mountain site involved with the PFS facility as well? NRC responded that it was using the same staff to review both PFS and the Yucca Mountain site. DOE added that it has also been keeping up to date with activities associated with the PFS aircraft hazards.
- Has the presence of military aircraft in the area of the Yucca Mountain site been considered as a deterrent to sabotage or terrorism? NRC stated that sabotage and terrorism were outside the scope of this meeting and that the Yucca Mountain site's potential vulnerability to malevolent acts will be addressed separately, in other forums.
- What assumptions have been made about future aircraft characteristics and their impacts on glide path, etc.? DOE stated that, in accordance with 10 CFR 63.44, it will evaluate changes in aircraft hazards that could impact the safety case for the Yucca Mountain site and would include this information in the LA.
- Why is a glide from 50,000 ft. not considered? Might a pilot not eject from 50,000 ft.? Wouldn't this result in a glide of approximately 80 miles? DOE responded that the analyses would evaluate all credible events.
- Has the data been confirmed? The public reports C-130 landings that are not shown in the report and uses of the Alamo airport, which the report shows at zero usage.
- The 40-year projections on Table F-1, of the Aircraft Hazards Report, for commercial and military flights are too high. DOE noted that the data source for the Alamo airport (in Table F-1) was 2001 data from the State of Nevada. DOE added that this data will be updated as appropriate for license application.
- Has DOE considered the potential for future relocation of some Nellis operations to other airports, such as Indian Springs?

- DOE is using one week of data on commercial flights in its analysis and questioned whether the paucity of data would affect the analysis.
- Is this work considered quality-affecting?

Judy Treichel, representing the Nevada Nuclear Task Force, indicated that while the analogy to PFS is good, the Yucca Mountain site is different because of McCarran International Airport and the mission of the Yucca Mountain site. She also asked that the following questions be considered during the resolution of this issue but said she did not require a response from NRC during the meeting or in the future :

- McCarran and North Las Vegas airport traffic is rapidly increasing. Is this properly addressed in the analyses?
- Why are nonfatal crashes not considered, especially military plane crashes in the vicinity of the Yucca Mountain site?
- Are Air Force flight activities that are not allowed by procedure (e.g., buzzing of cars and “playing cowboy”) considered in the analyses?

Estimation of Aircraft Crash Frequencies

DOE stated that the purpose of this report was to use the information gathered from the Identification of Aircraft Hazards report to evaluate the frequency of aircraft crashing into the surface facilities. During the formal presentation DOE summarized the methodologies used and conclusions reached in the report. At the conclusion of the formal presentation DOE responded to questions and comments from NRC. The following are the highlights of those discussions:

- DOE clarified that the dropped objects category refers only to military aircraft excluding ordnance. This would include panels, bolts, rivets, cowlings, etc. NRC questioned why the dropped object frequency was not added to the overall crash frequency. DOE indicated that more detailed information would be provided in the LA.
- NRC and DOE discussed the basis for assuming uniform distribution of flights on the NTS. DOE stated that it is now collecting data on aircraft crossing the airspace defined by concentric circles around the repository site to address the assumption of uniform flight density over a large area.
- NRC and DOE discussed how much credit should be taken for topographical features in light of the possibility of zooming actions taken by pilots experiencing problems with their aircraft. DOE acknowledged that this will require further evaluation and will be addressed when the analysis is updated.
- There was discussion on why the Kistler Aerospace proposal was not discussed in the report. DOE replied that it is discussed in another analysis that deals with nearby industrial and military hazards.

- NRC asked whether the comments it provided on the report by letter dated September 17, 2003, were clearly understood. DOE requested clarification on Review Comments 2 and 3. NRC stated that the comments were requesting clarification on the definition of crash initiation density discussed in the analysis. DOE agreed to provide more detail in the license application.
- NRC questioned the representativeness of using one-week flight information for commercial flights and general aviation flights near the proposed site. DOE acknowledged that there is some uncertainty on the data as flights below 10,000 ft. were not recorded. DOE agreed to collect appropriate information and conduct the analysis appropriately.
- NRC asked whether DOE is collecting information on the types of military aircraft that fly in the vicinity of the proposed site. Current monitoring activities using radar do not provide information on aircraft types. Therefore, DOE agreed to approach the U.S. Air Force for this type of information. NRC pointed out that this information directly affects the crash rate(s) to be used in the analysis.

Public Comments on the Estimation of Aircraft Crash Frequencies

Steve Frishman, representing the State of Nevada, questioned whether these two reports actually address the overall hazards. Specifically:

- Above ground storage and retrievability should also be included in the analysis. These may provide the largest affective area. With this larger affective area, the calculated frequency may not be able to be screened out based on frequency.
- How is the affective area calculated? A better calculation method may look at the analogy of the aging facility and retrieved waste as bowling pins and the airplane as a bowling ball.
- Beatty Bend (the air space between the Yucca Mountain site and the California state line) has a large concentration of aircraft and is approximately 20 miles from the North Portal. This area is a pinch point at the Nevada border; commercial airlines do not want to fly in California unless they originate or terminate there, because of the fuel tax. Therefore, this skews the map for the public airspace in that area.
- These considerations could impact the analysis by several orders of magnitude. In addition, PFS considers another factor, R, which is defined as the probability that the pilot can avoid the facility and asked NRC to ensure that it was not used for the Yucca Mountain site.

CLOSING REMARKS

The NRC closed by stating that DOE had made substantial progress in addressing the issues identified in PRE 3.01. The areas reviewed by DOE were appropriate.

Notwithstanding, the NRC considers PRE 3.01 open for the following reasons:

1. The documents discussed during the technical exchange did not supply a sufficient amount of current data to support DOE's conclusions. The references relied on older data (more than 5 years) to support its conclusions and did not fully consider relevant U.S. Air Force flight and crash data.
2. The vicinity maps developed by DOE did not provide specific information needed to develop the scenarios necessary for estimation of annual crash frequency (e.g., crash sites, flight altitude(s), flight paths, flight activities in specific areas, topography, etc.).

DOE believed that it had adequately addressed the stipulations of PRE 3.01 but agreed to proceed as follows before the LA is submitted:

1. DOE will review the 38 comments provided by the NRC in letters dated September 16 and 17, 2003, and will consider them in its future updates to the documents discussed during the technical exchange, as necessary.
2. DOE will update the Frequency Analysis of Aircraft Hazards for License Application by March 2004 and, if necessary, revise the Identification of Aircraft Hazards, with updated flight and crash information. The update(s) will address the 38 comments provided by NRC, as applicable.
3. DOE will meet with NRC after it completes its updates to discuss new data and analysis used, and the extent to which the NRC comments were addressed.

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