REQUEST FOR ADDITIONAL INFORMATION
VOLUME 2 - Preclosure
CHAPTER 2.1.1.3 - Identification of Hazards and Initiating Events
1ST SET (RAIs #1 to #11)

RAI #1

Provide information on how the applicant plans to implement the aircraft operational constraints in the flight-restricted airspace specified in SAR Section 1.6.3.4.1. Specifically, provide information on the applicant's plans to:

1) inform affected organizations about the proposed flight-restricted airspace

2) monitor the annual number of flights over the flight-restricted airspace, inform affected organizations when the limit of annually permitted overflights is being approached, and restrict overflights if this limit is reached

3) ensure that the following activities do not occur over the flight-restricted airspace: unauthorized flights, maneuvering of aircraft, carrying ordnance, and electronic jamming activity

4) prohibit helicopter flights within 0.5 mile of the surface facilities that handle Spent Nuclear Fuel and high-level radioactive waste, especially given the location of the heliport in Figure 1.1-155 of the SAR

5) prohibit pilots from using a piddle-pack while transiting over the flight-restricted airspace and monitor compliance with this prohibition

The applicant specifies a flight-restricted airspace with many aircraft operational constraints (SAR Section 1.6.3.4.1 and BSC 2007c, as referred to in SAR Section 1.6.5 General References). The applicant also specifies that there will be no use of a piddle-pack while transiting the flight-restricted airspace - "the use of piddle pack is not considered straight and normal flight but a special activity for personal comfort […] Straight and normal flight is required over the flight-restricted airspace" (BSC, 2007c at page 42). However, the applicant does not indicate how these constraints will be implemented and how the effectiveness of these controls will be monitored. Information on implementation of the aircraft operational constraints is needed to assess the effectiveness of the flight-restricted airspace and thus, verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #2

Justify the applicant's assumed values of the exponential decay factor,γ, in the Solomon model for flights through the Beatty Corridor and also provide the full text for reference 2.2.54 in BSC 2007c (SAR Section 1.6.5).

The applicant's sensitivity analysis indicates that the calculated aircraft crash frequency in the Beatty Corridor is sensitive to the assumed values of γ (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at pages VI-11 and VI-12). The applicant cites reference 2.2.54 to justify its assumed values, but this reference was not included in the references submitted with the License Application. Additionally, the applicant's sensitivity analysis was limited to values of γ between 1.0 and 2.0, whereas a value of γ lower than 1.0 appears credible. A justification of the applicant's assumed γ values is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #3

Provide the basis for not including those mishaps with unknown distances to crash, ejections, and/or glide ratios in analyzing aircraft crash frequencies (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at pages 52 to 59).

The applicant lists many mishaps with "unknown" distances to crash, ejection altitudes, and/or glide ratios (BSC, 2007c at pages III-3 to III-37). By not including mishaps with unknown parameters, the applicant may underestimate aircraft crash frequency. A clarification of the analysis of initiating events with unknown parameters is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #4

Provide the details of the applicant's sensitivity analysis of "Altitude of Overflights" (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at pages VI-3 to VI-4). Specifically for each altitude investigated, provide the level of detail equivalent to Table 10 of BSC (2007c at page 56).

The applicant conducted a sensitivity analysis of altitude on the crash frequency for flights over the flight-restricted airspace, but only presented a brief summary of the results in Table VI-1 (BSC 2007c at page VI-3). The details of this sensitivity analysis are needed to confirm the applicant's conclusion that it is conservative to assume that overflights of the flight-restricted airspace occur at an altitude of 14,000 ft above mean sea level (BSC 2007c at page 28) and thus, verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #5

Confirm that all of the midair collisions and controlled flights into terrain in Table III-1 of BSC 2007c, as referred to in SAR Section 1.6.5 General References at pages III-3 to III-37, occurred during maneuvering.

The applicant concludes that initiating events due to midair collision and controlled flight into terrain are not applicable to flights over the flight-restricted airspace because maneuvering is prohibited over that airspace (BSC 2007c, at page 42 Section 3.2.17). Confirmation that all midair collisions and controlled flight into terrains occurred during maneuvering is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #6

Explain, using an example of a specific section, how Table 10 was constructed (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at page 56). Also explain how the unequal areas of the sections were considered in the applicant's analysis.

The applicant concludes that, based on the information presented in Table 10 (BSC 2007c at page 56) "10.5% of the flights that suffer crash-initiating events during overflight of the flight-restricted airspace could pose a risk to repository surface facilities." However, it is not clear to NRC staff how Table 10 was constructed. A clarification about Table 10 is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #7

Justify the 0.59 (i.e., 1 – 0.41) factor used in the crash frequency analysis for overflights of the flight-restricted airspace (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at page 54).

Assuming that flights over the flight-restricted airspace are uniformly distributed, the applicant calculates that 41% of those flights will have flown beyond the repository surface facilities when a crash-initiating event occurs (BSC 2007c at page 54). DOE concludes that these 41% of flights do not pose a threat to repository surface facilities. However, it appears that these 41% of flights could pose a threat because the aircraft could glide in any direction. A justification of the 0.59 factor is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #8

Justify the applicant's assumption (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at pages 38 to 39) that the crash frequency density outside the flight-restricted airspace is independent of the number of sorties flown in a year and that this density would not be affected by future increases in flight activities.

The applicant estimates the aircraft frequency density outside the flight-restricted airspace, by using historical crash data occurring in the Nevada Test and Training Range and the Military Operating Areas over a 16.5-year period. The density is assumed to be **independent** of the number of sorties that took place in each of these years. On the other hand, in calculating crash frequency density for overflights in the flight-restricted airspace, the applicant assumes that the density is **proportional** to the number of flights. A justification for the applicant's assumptions concerning crash frequency density outside the flight-restricted airspace is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #9

Provide justification that the applicant's analysis of the aircraft crash frequency outside the flight-restricted airspace reasonably estimates crash frequency (BSC 2007c, as referred to in SAR Section 1.6.5 General References, at pages 56 to 59).

The applicant assumes that "for flights that are outside of the flight-restricted airspace, the ejection (as the result of a crash-initiating event that results in a crash) occurs before the aircraft enters the flight-restricted airspace" (BSC 2007c at page 43). The applicant develops a cumulative distribution function of crash distances based on "historical data on distances that fixed-wing aircraft traveled ***after the pilot ejected***" (BSC 2007c at page 59). However, for engine failure mishaps, the pilot will often remain with his aircraft, attempt to resolve the failure, and eject only when the aircraft reaches a low altitude. Therefore, it is possible that, for an engine failure mishap that occurs outside of the flight-restricted airspace, the pilot will eject in the flight-restricted airspace. Furthermore, the total distance traveled (i.e., the distance traveled from mishap to pilot ejection plus the distance traveled from pilot ejection to landing) may significantly exceed the distances shown in the applicant's cumulative distribution function based only on the distance from pilot ejection to landing. A justification of the applicant's analysis of the aircraft crash frequency outside the flight-restricted airspace is needed to verify compliance with 10 CFR 63.112(b) and 63.112(d).

RAI #10

Justify the rationale for eliminating analysis of ground-to-ground missile testing at the Nevada Test Site in SAR Section 1.6.3.4.1.

SAR Section 1.6.3.4.1 bases the decision to eliminate analysis of ground-to-ground missile testing at Nevada Test Site on an email from M. J. Childers to R. Morissette, dated January 31, 2002, in which Childers states that "no future launches are anticipated in the near future" (BSC 2007b, as referred to in SAR Section 1.6.5 General References). The applicant should clarify the rationale of apparently equating "near future" with the entire preclosure period. This information is necessary to assess compliance with 10 CFR 63.112(d).

RAI #11

Justify the rationale for eliminating analysis of inert ordnance, live ordnance, air-to-ground ordnance, air-to-ground missiles and rockets (including cruise missiles) and general ammunitions in Section 7.2.1 of (BSC 2007b, as referred to in SAR Section 1.6.5).

In Section 7.2.1 of BSC (2007b), the applicant bases the decision to not consider any ordnance affecting the repository facilities on the information that no such ordnance have impacted outside the Nevada Test and Training Range and that no flight-related mishaps involved ordnance delivered outside the NTTR and inside the NTS during 1993 through 2003 (BSC 2007b). However, this information does not preclude any ordnance being delivered outside the designated area or accidently discharged while carried onboard. This information is needed to assess compliance with 10 CFR 63.112(d).