Aircraft

The working group evaluated the likelihood of aircraft crashing into a nuclear power plant site and seriously damaging the spent fuel pool or its support systems (details are in Appendix 6). The generic data provided in DOE-STD-3014-96, "Accident Analysis for Aircraft Crash Into Hazardous Facilities," U.S. Department of Energy, October 1996, were used to assess the likelihood of an aircraft crash into or near a decommissioning spent fuel pool. Aircraft damage can affect the structural integrity of the spent fuel pool or affect the availability of nearby support systems, such as power supplies, heat exchangers and water makeup sources, and may also affect recovery actions.

The working group's estimate of the frequency of significant PWR spent fuel pool damage resulting from a direct hit is based on the point target area model for a (100 x 50) foot pool with an probability of 0.3 (large aircraft penetrating 6-ft of reinforced concrete) that the crash results in significant damage. If 1-of-2 aircraft are large and 1-of-2 crashes result in spent fuel uncovery, then the estimated range is 4.3×10^{-8} to 9.6×10^{-12} per year. The average (mean) value is estimated to be 2.9×10^{-9} per year. The frequency of a significant BWR spent fuel pool damage resulting from a direct hit is the same as that for the PWR. Mark-I and Mark-II secondary containments generally do not appear to offer any significant structures to reduce the likelihood of penetration, although a crash into one of four sides of a BWR secondary containment may have a reduced likelihood of penetration due to other structures being in the way of the aircraft. Mark-III secondary containments may reduce the likelihood of penetration as the spent fuel pool may be considered to be protected on one side by additional structures. These frequencies of catastrophic spent fuel pool failure are bounded by other initiators.

The working group's estimate of the frequency of significant damage to a spent fuel pool support system (power supply, heat exchanger or makeup water supply) is estimated based on the DOE model including wing and skid area for a 400x200x30 foot area with a conditional probability of 0.01 that one of these systems is hit. The estimated value range is 1.0×10^{-6} to 1.0×10^{-10} per year. The average (mean) value is estimated to be 7.0×10^{-8} per year. Alternatively, the value for the loss of a support system (power supply, heat exchanger or makeup water supply) is estimated based on the DOE model including wing and skid area for a 10x10x10 foot structure. The estimated value range is 1.1×10^{-5} to 1.1×10^{-9} per year with the wing and skid area modeled, with the average estimated to be 7.3×10^{-7} per year. Using the point model for this structure, the estimated value range is 1.1×10^{-8} to 2.4×10^{-12} per year without the wing and skid area modeled, with the average (mean) estimated to be 7.4×10^{-10} per year. As an initiator to failure of a support system, an aircraft crash is bounded by other more probable events.

Overall, the likelihood of significant spent fuel pool damage from aircraft crashes is bounded by other more likely catastrophic spent fuel pool failure and loss of cooling modes.

B/40