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**COMMITMENT RESOLUTION LETTER 36**  
**DOCKET NO. 72-22 / TAC NO. L22462**  
**PRIVATE FUEL STORAGE FACILITY**  
**PRIVATE FUEL STORAGE L.L.C.**

- Reference: 1. PFS, Aircraft Crash Impact Hazard at the Private Fuel Storage Facility, Revision 4 (August 10, 2000)  
2. [www-afsc.saia.af.mil/AFSC/RDBMS/Flight/stats](http://www-afsc.saia.af.mil/AFSC/RDBMS/Flight/stats)  
3. Fax from Paul Price, HQ Air Force Safety Center, to Brig. Gen. James Cole, USAF (Ret.) (Jan. 26, 2000).

On September 19, 2000, the Nuclear Regulatory Commission (NRC) asked Private Fuel Storage (PFS) to provide information on the number of times U.S. Air Force aircraft had jettisoned live, but unarmed, ordnance in the last 20 years.

As set forth in Reference 1 (p. 83b), the Air Force has advised PFS that the probability that live but unarmed ordnance would explode upon being jettisoned is "remote." The Air Force had no records of such ordnance exploding in the last 10 years and had records of only two instances earlier, one in Fiscal Year 1989 and one in Fiscal Year 1985, in which jettisoned live but unarmed ordnance did explode. (Reference 1, p. 83b, note 88A2). Based on this information and the expert judgment of Brigadier General James Cole, USAF (Ret.), Major General Wayne Jefferson USAF (Ret.), and Colonel Ron Fly USAF (Ret.), PFS assumed (for the purpose of calculating the probability that jettisoned ordnance landing near the PFSF would explode and adversely impact the storage casks) that the probability the unarmed ordnance would explode after being jettisoned was 1 percent.<sup>1</sup> (Reference 1, p. 83i)

As PFS stated in Reference 1 (p. 83b, note 88A2), in response to PFS FOIA requests, the Air Force stated that it had no records of the number of times its aircraft had jettisoned live, but unarmed, ordnance in the last 20 years. Nevertheless, a rough estimate can be made of the number of sorties on which live ordnance was jettisoned based on the

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<sup>1</sup> PFS defined an adverse impact as a cask tip over, which would not necessarily result in a release of radioactive material. (Reference 1, pp. 83b-83c)

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fraction of sorties that carry live ordnance, the number of mishaps in the last 20 years, and the fraction of mishaps attributable to engine failure, in which the pilot would normally jettison the aircraft's ordnance. This estimate does not include any other situations in which the pilot could jettison ordnance, such as when a pilot has attempted to release ordnance normally and the ordnance has failed to separate from the aircraft.

The number of sorties on which ordnance was jettisoned because of an aircraft mishap,  $J$ , may be calculated as follows:

$$J = M \times f_{lo} \times f_e \text{ where}$$

$M$  is the number of mishaps in the last 20 years involving aircraft that carry jettisonable ordnance

$f_{lo}$  is the fraction of sorties on which live ordnance was carried

$f_e$  is the fraction of mishaps resulting from engine failures

The number of mishaps involving Air Force aircraft that carry jettisonable ordnance in the last 20 years includes all mishaps involving the following fighter and attack aircraft: F-4, F-15E, F-16, F-104, F-105, F-111, FB-111, F-117, A-7, A-10, and A-37. To be consistent with PFS's approach to calculating aircraft crash rates, PFS determined, from an Air Force database (Reference 2), the number of mishaps involving the listed aircraft from FY 1979 to FY 1998. To best capture the number of engine failures PFS used Class A mishaps. Thus,  $M = 641$ .

The fraction of sorties on which live ordnance was carried can be estimated on the basis of current Air Force practice at Hill Air Force Base, where approximately 5 percent of the F-16 sorties carry live ordnance. (Reference 1, p. 83h) Thus,  $f_{lo} = 0.05$ .

The fraction of mishaps attributable to engine failure, in which the pilot would normally jettison the aircraft's ordnance in response to the mishap, may be estimated on the basis of the fraction of F-16 mishaps attributable to engine failure. (Reference 1, Tab H, p. 12) Thus,  $f_e = 58/121$  or 48 percent.

Therefore,

$$J = 641 \times 0.05 \times 0.48 = 15$$

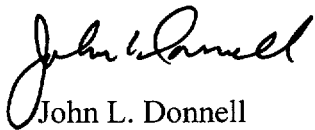
This estimate of 15 instances of jettisoned live, but unarmed ordnance (based on engine failure alone) in the last 20 years is understated, as stated above, in that it does not account for instances in which the pilot jettisoned ordnance in situations other than mishaps. It is unknown how often such instances occurred; however, PFS notes that both instances in which jettisoned unarmed ordnance exploded in the last 20 years were intentional jettisons under controlled conditions and thus neither occurred during a mishap. (Reference 3)

Although the above calculated instances of jettisoned live, but unarmed, ordnance suggests that the likelihood of such ordnance exploding could be greater than 1%, the calculation only accounts for jettisoned ordnance occurring as a result of engine failure. Because this calculation does not take into account the other situations in which live, but unarmed, ordnance may be jettisoned, it remains the judgment of PFS's experts that the order of magnitude estimate of 1% of jettisoned ordnance exploding, based on the Air Force's statement that such an event is "remote," provided in Reference 1, is both reasonable and conservative.

Finally, PFS notes that even if it is assumed for the purpose of analysis that the probability that unarmed jettisoned ordnance would explode is 100 percent, instead of the 1 percent that PFS assumed in Reference 1, the probability that an explosion of jettisoned ordnance that landed near the PFSF would adversely impact the storage casks would increase from  $2.43 \times 10^{-10}$  to approximately  $2.43 \times 10^{-8}$ . (See Reference 1, p. 831) If that probability is added to the cumulative probability that an aircraft crash would result in an impact at the PFSF ( $6.6 \times 10^{-7}$ , Reference 1, p. 87), the resultant probability ( $6.8 \times 10^{-7}$ ) remains well below the NRC regulatory limit of  $10^{-6}$  per year. The assumption that 100 percent of all jettisoned live, but unarmed, ordnance would explode is unreasonably conservative in light of the Air Force's statement that the probability is "remote." Nevertheless, it serves to illustrate the insensitivity of PFS's aircraft crash hazard assessment to this issue.

If you have any questions regarding this response, please contact me at 303-741-7009.

Sincerely



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Private Fuel Storage L.L.C.

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