

July 29, 2004

Michael C. Farrar, Chairman  
Administrative Judge  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dr. Peter S. Lam  
Administrative Judge  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dr. Paul B. Abramson, Esq.  
Administrative Judge  
Atomic Safety and Licensing Board  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

In the Matter of  
Private Fuel Storage L.L.C.  
(Independent Spent Fuel Storage Installation)  
Docket No. 72-22-ISFSI

Dear Administrative Judges:

In accordance with the schedule adopted by the Licensing Board in this proceeding, the NRC Staff is filing this evening its rebuttal testimony and additional exhibits concerning aircraft crash consequence issues. Inasmuch as the enclosed rebuttal testimony and one exhibit contain Safeguards Information, copies are being served only upon the Licensing Board members, Mr. Julian, Counsel for the State of Utah, and Counsel for the Applicant.

The enclosed rebuttal testimony consists of the following five items:

- |    |                   |  |
|----|-------------------|--|
| 1. | Storage Cask      | NRC Staff's Rebuttal Testimony of Gordon Bjorkman, Robert Shewmaker, Robert Kalan, and Kenneth Gwinn Concerning Cask Structural Issues.                  |
| 2. | CTB               | NRC Staff's Rebuttal Testimony of Gordon Bjorkman, Robert Shewmaker, and Gustavo Aramayo Concerning the NRC Staff's Canister Transfer Building Analysis. |
| 3. | Utah Cask Reports | NRC Staff's Rebuttal Testimony of Gordon Bjorkman and Gustavo Aramayo Concerning the State of Utah's Structural Analyses.                                |
| 4. | Probability       | NRC Staff's Rebuttal Testimony of Dr. Dennis R. Damon Concerning Jettisoned Ordnance Probability Issues.   |
| 5. | Angles & Speeds   | NRC Staff's Rebuttal Testimony of Kazimieras M. Campe and Amitava Ghosh Concerning F-16 Crash Impact Speeds and Angles.                                  |

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In addition, the Staff is filing herewith copies of six additional exhibits that it will offer into evidence. These are Staff Exhibits 89, 90, 92, 93, 103, and 104. To avoid any confusion, please note that the additional exhibits filed herewith utilize exhibit numbers which had not been used in the Staff's previous list of exhibits. A revised list of the Staff's proposed exhibits is enclosed herewith, with the new exhibits highlighted.

Copies of the rebuttal testimony and exhibits filed herewith have been transmitted by Federal Express to Counsel for the State and Counsel for the Applicant earlier today.

Sincerely,

**/RA/**

Sherwin E. Turk  
Counsel for NRC Staff

cc: Paul Gaukler, Esq.  
Denise Chancellor, Esq.  
Emile Julian, Esq.

**In the Matter of: PRIVATE FUEL STORAGE, LLC  
(Independent Spent Fuel Storage Installation)  
Docket No. 72-22-ISFSI**

**NRC Staff Hearing Exhibits**

<b>Staff Exh. No.</b>	<b>Description</b>	<b>Witness</b>	<b>Contention</b>	<b>Offered --- Admitted</b>
	<b>SAFETY HEARINGS - AUGUST-SEPTEMBER, 2004</b>			
<b>66</b> <b>SGI</b>	<b>G.S. Bjorkman, R.E. Shewmaker</b> , "NRC Staff 's Evaluation of the Structural Consequences of an Accidental F-16 Aircraft Crash Event at the Proposed [PFS] Facility," May 11, 2004 (revised through May 19, 2004)	Bjorkman Shewmaker Kalan Gwinn (CASK)	Utah K (crash)	<b>SGI</b>
<b>67</b> <b>SGI</b>	<b>R.J. Kalan, K.W.Gwinn, K.E. Metzinger, D.J. Ammerman</b> , "Confirmatory Structural Analyses of an Accidental F-16 Crash Event onto the Proposed [PFS] Facility (HI-STORM 100 Dry Cask Storage System), May 11, 2004 (revised through May 19, 2004)	Bjorkman Shewmaker Kalan Gwinn (CASK)	Utah K (crash)	<b>SGI</b>
<b>68</b> <b>SGI</b>	<b>R.J. Kalan, K.W.Gwinn</b> , Disk (Exhibits 68 - 69) Animations of Confirmatory Structural Analyses of an Accidental F-16 Crash Event onto the Proposed [PFS] Facility (HI-STORM 100 Dry Cask Storage System), by Sandia National Laboratories	Bjorkman Shewmaker Kalan Gwinn (CASK)	Utah K (crash)	<b>SGI</b>
<b>69</b> <b>SGI</b>	<b>R.J. Kalan, K.W.Gwinn</b> , Disk (Exhibits 68 - 69) Animation of F-16 Crash Event into a Concrete Wall, Compared to Test of an F-4 Aircraft Crash into a Concrete Wall by Sandia National Laboratories	Bjorkman Shewmaker Kalan Gwinn (CASK)	Utah K (crash)	<b>SGI</b>
<b>70</b> <b>SGI</b>	<b>G.A. Aramayo</b> , "Confirmatory Analysis of an Accidental F-16 Crash Event onto the Proposed [PFS] Facility - Canister Transfer Building," May 11, 2004	Bjorkman Shewmaker Aramayo (CTB)	Utah K (crash)	<b>SGI</b>
<b>71</b> <b>SGI</b>	<b>G.S. Bjorkman</b> , "NRC Staff's Evaluation of the State of Utah's Report: Structural Evaluation of Impacts from F-16 Aircraft and Military Ordnance on Holtec HI-STORM 100 Overpack and Multi-Purpose Canister," May 11, 2004	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>

<b>Staff Exh. No.</b>	<b>Description</b>	<b>Witness</b>	<b>Contention</b>	<b>Offered --- Admitted</b>
<b>72</b> <b>SGI</b>	<b>G.A. Aramayo</b> , "Review of State of Utah's Analysis of the [PFS] Facility for Impact from MK-84 Ordnance and F-16 Aircraft," May 11, 2004	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>73</b> <b>SGI</b>	C.M. Hoffmann, M. Sozen, S. Kilic, "Structural Evaluation of Impacts from F-16 Aircraft and Military Ordnance on Holtec HI-STORM 100 Overpack and Multi-Purpose Canister," Sept. 2003 (cover page only; complete report to be provided later)	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>74</b> <b>SGI</b>	<b>G. Bjorkman</b> , Preliminary hand calculations of kinetic energy for a rigid MK-84 bomb impact into the HI-STORM 100 cask lid	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>75</b>	Naval Air Systems Command, drawings of 2000 lb class bomb body, Drawings Nos. 1380527 and 1380528 (July 2000)	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>76</b> <b>SGI</b>	<b>G. Bjorkman, G. Aramayo</b> , Disk Computer graphics showing NRC Staff/ORNL computer runs with State of Utah's LS-DYNA F-16 aircraft crash and munitions impacts into the PFS Facility	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>77</b> <b>SGI</b>	<b>G. Bjorkman, G. Aramayo</b> , Disk Films (AVI format) showing computer graphics of the NRC Staff/ORNL computer runs of the State of Utah's analyses	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>78</b>	Excerpts from LS-DYNA Examples Manual	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>79</b>	Excerpts from LS-DYNA Keyword Users and Theoretical Manual	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>80</b>	J.D. Riera, "On the Stress Analysis of Structures Subjected to Aircraft Impact Forces, Nuclear Engineering and Design 8 (1968), pp. 415-426	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>81</b>	T. Sugano, et al., "Full-scale Aircraft Impact Test for Evaluation of Impact Force," Nuclear Engineering and Design 140 (1993), pp. 373-385	Bjorkman, Aramayo (UTAH)	Utah K (crash)	

<b>Staff Exh. No.</b>	<b>Description</b>	<b>Witness</b>	<b>Contention</b>	<b>Offered --- Admitted</b>
<b>82</b>	"DOE Standard: Accident Analysis for Aircraft Crash into Hazardous Facilities," DOE STD-3014-96 (October 1996), Chapter 6	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>83</b>	Q.A. Hossain, et al., "Structures, Systems, and Components Evaluation Technical Support Document - DOE Standard Accident Analysis for Aircraft Crash into Hazardous Facilities, UCRL-ID-123577 (Jan. 23, 1997)	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>84</b>	R.J. Roark, et al., "Formulas for Stress and Strain," 5 <sup>th</sup> Ed. (1975), pp. 12-13	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>85</b> <b>SGI</b>	<b>G. Bjorkman</b> , Disk LS-DYNA analyses of State of Utah's "Supplement" report dated May 11, 2004	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>86</b> <b>SGI</b>	<b>G. Bjorkman</b> , Disk Films (in AVI format) showing Staff's LS-DYNA analyses of State of Utah's "Supplement" report dated May 11, 2004	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>87</b> <b>SGI</b>	<b>G. Bjorkman</b> , Figures developed in evaluation of State of Utah's "Supplement" report dated May 11, 2004"	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>88</b>	Textbook, "Physics for Students of Science and Engineering," pp. 144-45	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>89</b> <b>NEW</b>	ASME Code, Section III, Subsection NB, Paragraph NB-3225(a)	Bjorkman, Aramayo (UTAH)		
<b>90</b> <b>NEW</b>	ASME Code, Appendix F	Bjorkman, Aramayo (UTAH)		
<b>91</b>	Excerpts from "Engineering Properties of Steel," P. Harvey, Ed.	Bjorkman, Aramayo (UTAH)	Utah K (crash)	
<b>92</b> <b>NEW</b>	Excerpts from "Structural Alloys Handbook" (Purdue University)	Bjorkman, Aramayo (UTAH)		
<b>93</b> <b>NEW</b>	Excerpts from "Atlas of Stress Strain Curves"	Bjorkman, Aramayo (UTAH)		

Staff Exh. No.	Description	Witness	Contention	Offered --- Admitted
94 SGI	C.M. Hoffmann, M. Sozen, S. Kilic, "Supplement Structural Evaluation of Impacts from F-16 Aircraft and Military Ordnance on Holtec HI-STORM 100 Overpack and Multi-Purpose Canister," May 2004 (cover page only; complete report to be provided later)	Bjorkman, Aramayo (UTAH)	Utah K (crash)	SGI
95 SGI	R.E. Shewmaker, "NRC Staff's Evaluation of Jettisoned Ordnance Impact Effects on the Proposed [PFS] Facility," May 11, 2004	Shewmaker (Ordnance)	Utah K (crash)	SGI
96	Letter from Col. L. Bauer (USAF-HQ) to Connie Nakahara (Utah), Dec. 28, 2000	Shewmaker (Ordnance)	Utah K (crash)	
97	Letter from Denise L. King (Eglin AFB) to Connie Nakahara (Utah), Jan. 18, 2001	Shewmaker (Ordnance)	Utah K (crash)	
98 SGI	C.S. Bajwa, "NRC Staff's Evaluation of Potential Jet Fuel Fire at the Proposed [PFS] Facility in an Accidental F-16 Aircraft Crash Event," May 11, 2004	Bajwa, Kalan, Lopez (Fuel Fire)	Utah K (crash)	SGI
99 SGI	C. Lopez, R.J. Kalan, "Confirmatory Thermal Analyses of an Accidental F-16 Crash Event Onto the Proposed [PFS] Facility (HI-STORM 100 Dry Cask Storage System," May 11, 2004	Bajwa, Kalan, Lopez (Fuel Fire)	Utah K (crash)	SGI
100	K. Campe, A. Ghosh, "NRC Staff's Evaluation of Aircraft Crash Impact Speeds and Angles Considered by [PFS] in Its Analyses of Skull Valley Type Events," April 20, 2003	Campe, Ghosh (Angles & Speeds)	Utah K (crash)	
101	K. Campe, Drawing of aircraft flight angles and related parameters	Campe, Ghosh (Angles & Speeds)	Utah K (crash)	
102 SGI	D.R. Damon, "NRC Staff's Evaluation of [PFS] Aircraft Crash Probability Assessment," May 11, 2004	Damon (Probability)	Utah K (crash)	SGI
103 NEW	ANSI-N690, Section Q1.0 (Scope, Definitions, References)	Bjorkman Shewmaker Kalan Gwinn (CASK) Bjorkman, Aramayo (UTAH)	Utah K (crash)	

<b>Staff Exh. No.</b>	<b>Description</b>	<b>Witness</b>	<b>Contention</b>	<b>Offered --- Admitted</b>
<b>104 NEW SGI</b>	DVD containing NRC Staff's Revised Bomb Analyses, Inputs/Outputs	Bjorkman, Aramayo (UTAH)	Utah K (crash)	<b>SGI</b>
<b>105</b>	RESERVED		Utah K (crash)	