

**Title:** Evolution of the Modern U.S. Nuclear Weapon System Design Safety Principles

**Abstract:**

The tutorial provides a brief overview of the key historical events that have shaped the modern U.S. nuclear weapon system safety design philosophy, followed by a brief overview of the nuclear weapon safety process after which there is a focus on describing the nuclear safety design principles of incompatibility, isolation, and inoperability, and the way they are implemented. Key considerations include subtle aspects of the incompatibility and isolation design principles and techniques for developing and integrating multiple safety layers (a.k.a., subsystems) of safety features each having independent failure causes such that the resulting system safety can be asserted to meet stringent safety requirements in a predictable manner in all relevant environments.



**Biography:**

Jeffrey D. Brewer is a Distinguished Member of the Technical Staff at Sandia National Laboratories with over 15 years of experience investigating the safety of high consequence technologies, with 10 of those years focused on topics within the nuclear weapon complex. Jeff serves as an Independent Safety Assessment Engineer for multiple weapon systems, is the lead for technical basis, implementation, and training involving the Unique Signal (UQS) Methodology, and is an instructor for multiple Nuclear Weapon system safety courses. Jeff also takes tremendous pleasure in mentoring the next generation of weaponeers.

Jeff joined Sandia National Laboratories (SNL) in 2004 as a Risk Analyst. That first assignment was spent dividing time between various systems analysis and human reliability analysis projects in the commercial nuclear power sector, as well as unique signals analysis and implementation to support nuclear weapon safety. In 2010 he decided to focus exclusively on nuclear weapon safety and transferred to the Nuclear Safety Assessment Department. At Sandia Jeff has led projects for the U.S. Navy (e.g., aircraft carrier workload distribution), U.S. Nuclear Regulatory Commission, e.g., State-of-the-Art Reactor Consequence Analyses (SOARCA), Spent Fuel Handling (NUREG/CR-7016 and NUREG/CR-7017), Probabilistic Risk Assessment technical guidance development, and Nuclear Weapon Safety at SNL (e.g., Safety Assessment Methodology Improvement) and is periodically called upon to perform safety-related technical analyses and training for multiple U.S. Government agencies.

Prior to joining Sandia, Jeff redesigned assembly processes at Raytheon (multiple military weapons systems), and earlier at Bausch & Lomb (civilian commercial products). His military background includes 8 years in the U.S. Marine Corps Reserve serving as a Reconnaissance Marine. He holds a B.S. in Industrial Engineering from St. Mary's University, San Antonio, TX along with an M.S. and Ph.D. in Industrial Engineering from Texas Tech University. Industrial Engineering specializations included Human Factors and Operations Research.