

## CHAPTER 6

### NUCLEAR WEAPON SYSTEM SAFETY ASSESSMENTS

#### A. GENERAL

1. The STS document of a nuclear weapon system provides the operating environments that the nuclear weapon system may encounter, either as part of or independent of its delivery vehicle. Testing is conducted on the weapon system to assess the effects of as many of those environments as possible. Credible combinations of abnormal environments pose an 'additional risk to nuclear weapon systems and have not been tested extensively for their combined effects.

2. The Military Departments will use qualitative and quantitative assessment techniques to evaluate the risk throughout the STS. Those assessments identify external influences on all components and/or equipment that, through natural occurrence, faulty design, misuse, failure, degradation, and/or manufacturing defects, may result in noncompliance with a nuclear safety standard. Those assessments also include a determination of the modes of failure and the effects on safety when failure occurs in systems, subsystems, components, or software. The NWSSGS will consider the results of those assessments during their evaluations of system safety.

3. This Chapter presents three assessment techniques; i.e., Probabilistic Risk Assessment (PRA); ULA; and ILA. The DoD Nuclear Weapon System Safety Program encourages the development and use of other safety assessment methodologies.

#### B. PROBABILISTIC RISK ASSESSMENT

1. A PRA provides a quantitative analysis of weapon system safety activities. It uses variables such as frequency of accidents, degree of severity of a possible accident, probability of exposure to the population and possible effects of an accident to identify where positive measures can be taken to reduce risk. Those positive measures then serve as the basis for assessing and rendering judgments on the reduction of risks associated with a nuclear weapon system activity.

2. A PRA report may include recommendations for system design modifications or operating procedure changes. When available, PRA reports shall be provided to the NWSSG. The NWSSG will use the PRA reports to help evaluate the nuclear weapon system's compliance with the first and third DoD nuclear weapon system safety standards.

#### C. UNAUTHORIZED LAUNCH ANALYSIS

1. In the context of an ULA, the term "unauthorized launch" refers to deliberate launching or releasing of a nuclear missile or bomb (except jettisoning) before execution of an emergency war order. An ULA provides a qualitative or quantitative assessment of a specific nuclear weapon system safety risk. The purpose of the ULA, while recognizing that the chance of an unauthorized launch cannot be completely eliminated, is to ensure that the possibility of such an event is minimized to the fullest extent possible.

2. The objective of an ULA is to reveal facts about a nuclear weapon system's design and the potential vulnerabilities of the design and its operation, which will form the basis for a determination on the likelihood of such an event. The systems are evaluated for human actions which

may affect nuclear safety design safeguards. The ULA reports shall be made available to the NWSSG and shall be controlled on a strict “need to know” basis. The NWSSG will use the ULA reports to help evaluate the nuclear weapon system’s compliance with the second DoD nuclear weapon system safety standard and to make recommendations for system design modifications and/or operating procedure changes.

3. An ULA is normally conducted for each nuclear weapon system or launch platform as soon as sufficient weapon system design data is available to complete a thorough evaluation. ULAS shall be updated periodically as the weapon system is modified and, will be verified as current, in support of required safety studies.

4. An ULA considers all subsystems of the entire weapon system (e.g., missiles, bombs, launch platforms, weapon control and launching systems, and support systems).

#### **D. INADVERTENT LAUNCH ANALYSIS**

1. In the context of an II-A, the term “inadvertent launch” refers to the accidental or unintentional launching or releasing of a nuclear missile or bomb in either a normal or credible abnormal environment. An ILA investigates how an unforeseen launch of a nuclear weapon could occur. It is usually based on a fault tree analysis or probabilistic risk analysis approach. It may or may not be quantitative and identifies things that can go wrong, the likelihood of occurrence, and probable outcomes. Its purpose, while recognizing that the chance for an inadvertent launch may not be completely eliminated, is to ensure that the possibility of such an event is minimized to the fullest extent possible throughout the STS.

2. The objective of an ILA is to reveal facts about a nuclear weapon system’s design that will form the basis for a determination concerning the likelihood of such an event. The systems are evaluated for human actions, component failures, and combinations thereof that may affect nuclear safety design safeguards. ILA reports shall be made available to an NWSSG. The NWSSG will use the ILA results to help evaluate the nuclear weapon system’s compliance with the third DoD nuclear weapon system safety standard.

3. An ILA is normally conducted for each nuclear weapon system or launch platform when sufficient weapon system design data is available to complete a thorough evaluation. ILAs will be updated periodically as the weapon system is modified and in support of required safety studies.

4. An ILA considers all subsystems of the entire weapon system (e.g., missiles, bombs, launch platforms, weapon control and launching systems, and support systems).