Detailed Justification

(dollars in thousands)

	FY 2003	FY 2004	FY 2005
Enhanced Surety	**31,588**	**32,781**	**38,121**

Demonstrates enhanced use-denial and advanced initiation options for the entire stockpile directly supporting the first NNSA goal to ensure the safety, security, and control of the enduring nuclear weapons stockpile. This activity provides validated technology for inclusion in the stockpile refurbishment program to assure that modern nuclear safety standards are fully met and a new level of use-denial performance is achieved. A multi-technology approach is pursued to develop options for possible selection by weapon system designers during scheduled life extension programs (LEP) or other refurbishments. This multi-technology development also opens the design space and results in synergistic improvements in other weapon components

A joint program between laboratories includes the development of a laser fired optical initiation system for the W78 and future Navy Submarine-Launched Ballistic Missile warheads that offers significant improvements in safety by eliminating the possibility of any naturally occurring stimuli (such as lightning) from causing the weapon to initiate, while providing important use control features as well. In FY 2005, the completion of the development of a fiber optic controlled detonator is planned.

In FY 2005, a two-pronged effort in the development of advanced initiation technologies focused at improving safety at the detonator interface to the nuclear explosive package will take place. The first involves the development of an insensitive high explosive booster for stockpile weapons, coupled with a new compact initiator stronglink. The second effort involves the development of miniature, high energy density components.

Weapons Systems Engineering Assessment Technology (Formerly Weapons Systems Engineering Certification)	**25,814**	**27,079**	**27,270**

The Weapons Systems Engineering Assessment Technology activity has two major technical elements: (1) establishing a science-based engineering certification methodology and defining required underlying engineering research; and (2) conducting experiments and providing data necessary to develop and validate engineering computational models in collaboration with Advanced Simulation and Computing. These computational models are used to predict weapon system response to three Stockpile to Target Sequence (STS) environments: normal, abnormal and hostile. The activity also supports manufacturing development of critical components and subsystems; e.g., neutron generators, gas transfer systems, and microsystems. The campaign's objective is to establish the capability to predict engineering margins by integrating numerical simulations with experimental data. Validated computational tools are required to explore the operational parameter space of the nuclear weapons stockpile. Exploration of operational parameter space identifies failure modes and boundaries, thus, establishing engineering margins.

In FY 2005, non-intrusive instrumentation and telemetry systems to monitor non-fissile primary

(dollars in thousands)

FY 2003	FY 2004	FY 2005

In FY 2005, non-intrusive instrumentation and telemetry systems to monitor non-fissile primary component response during primary detonation will be developed and component tested.

A High Explosive Radio Telemetry (HERT)-instrumented Enhanced Fidelity Instrumentation (EFI)-B-1 flight test unit in support of test FCET-34 is planned. The data and capability to assess the response of explosives in abnormal and hostile environments will be developed with work ranging from material response experiments to weapon system level experiments. Assessments will be made of the response of a Chemical High Explosive (CHE) system to combined abnormal environments.

Weapon qualification and certification efforts support: (1) establishing component design requirements for hostile impulse events for with application to the W76 Life Extension Program (2) conducting validation experiments for two manufacturing processes (neutron tube encapsulation and laser welding) and (3) achieving fully-operational status of the Thermal Test Complex in support of weapon system abnormal thermal environment qualification, and of the Aerial Cable Facility in support of weapon system alteration qualification.

Nuclear Survivability **22,521** **22,843** **24,460**

The Nuclear Survivability activity develops and validates tools needed to design and qualify nuclear warheads that meet requirements for nuclear survivability and effectiveness. It develops radiation-hardening approaches and hardened components, develops and validates experimental and analytical tools for qualifying warheads to nuclear survivability requirements, modernizes tools for weapon outputs, and develops and validates tools to translate military effects requirements to warhead design specifications (design-to-effects) and to assess and optimize the effectiveness of warhead designs without underground nuclear tests

The nuclear survivability capabilities developed in this activity are driven by the need to improve tools to support near term limited life component replacements, life extension activities, and the long-term stewardship of the stockpile.

Specific efforts in FY 2005 will include developing validated computational tools to re-evaluate the threat posed by nuclear weapon radiation environments and system radiation responses with initial applications of nuclear survivability assessment technologies supporting qualification of replacement limited life components (LLCs) and the life extension program activities.