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OPNAVINST 3401.3B  
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OPNAV INSTRUCTION 3401.3B

From: Chief of Naval Operations

Subj: NUCLEAR SURVIVABILITY POLICY FOR NAVY AND MARINE CORPS  
SYSTEMS

Ref: (a) DoD Instruction 3150.09 of 17 September 2008  
(b) CJCS 3170.01H  
(c) OPNAVINST 5430.48E  
(d) OPNAVINST 9070.1A  
(e) MIL-STD 3023, High-Altitude Electromagnetic Pulse  
Protection for Military Aircraft  
(f) MIL-STD 2169B, High-Altitude Electromagnetic Pulse  
Environment  
(g) SECNAVINST 5000.2E  
(h) OPNAVINST 2400.20F  
(i) OPNAVINST 3400.10G  
(j) OPNAVINST 3400.11

Encl: (1) U.S. Navy Nuclear Survivability Definitions  
(2) Platform and System Survivability Requirements  
Generation Process

1. Purpose. To establish policy and assign responsibility for implementing nuclear survivability into Navy and Marine Corps systems and platforms; to incorporate nuclear survivability functions within the existing Navy decision process; to synchronize and align the naval nuclear survivability guidance with references (a) through (j); and to ensure warfighters are provided with nuclear survivable systems.

2. Cancellation. OPNAVINST 3401.3A.

3. Background

a. Naval systems and platforms are required to perform missions in nuclear environments. The details of the specific technical design criteria that enable survivability are not included herein but are referenced by the applicable policy and requirements documents provided below.

(1) Reference (a) assigns responsibilities for the execution of the Department of Defense (DoD) Chemical, Biological, Radiological, and Nuclear (CBRN) Survivability Policy. It establishes processes for ensuring the survivability of CBRN mission critical systems in a CBRN environment. It also describes how CBRN mission critical systems shall be identified, reviewed, reported, and considered in the context of the Joint Capabilities Integration and Development System (JCIDS).

(2) Reference (b) is a deliberate and analytical capabilities-based assessment process that formally articulates future warfighter needs in an initial capabilities document (ICD) and or a doctrine, organization, training, materiel, leadership and education, personnel, and facilities change recommendation.

(3) Reference (c) outlines the Chief of Naval Operations (CNO) executive decision-making process and identifies supporting deliberative venues, for senior Navy leadership to raise, discuss, and resolve significant issues.

(4) Reference (d) establishes the Navy's survivability policy for surface ships and craft.

(5) Reference (e) establishes DoD military standards for aircraft high-altitude electromagnetic pulse (HEMP) survivability.

(6) Reference (f) establishes the HEMP threat environment.

(7) Reference (g) establishes Secretary of the Navy (SECNAV) policy for the implementation and operation of the Defense Acquisition System and the JCIDS.

(8) Reference (h) establishes the Navy electromagnetic environmental effects and spectrum supportability policy and procedures.

(9) Reference (i) establishes mission requirements and implements policy governing chemical, biological, and radiological (CBR) defense capabilities in association with the DoD Counter Proliferation Initiative.

(10) Reference (j) establishes Navy policy and alignment for combating weapons of mass destruction.

b. Per references (b), (c), and (g), responsibilities previously assigned to the former Office of the Chief of Naval Operations (OPNAV) code, OP-07, the Aircraft Characteristics and Improvement Board, and the Ship's Characteristics and Improvement Board are now assigned to Deputy Chief of Naval Operations, for Warfare Systems (CNO (N9)), the Resources Requirements Review Board (R3B) and the Navy Capabilities Board (NCB). Per references (a) and (g), this revision requires that all Navy and Marine Corps major defense acquisition programs and mission critical acquisition programs establish appropriate nuclear survivability requirements in their requirements documents.

4. Discussion. Nuclear survivability may be achieved through tactics, techniques, and procedures (TTPs), hardening, proliferation, redundancy, reconstitution, avoidance, deception, or any other mitigation procedure. Hardening, if selected, is less expensive if incorporated in the original design of the system and if accomplished in a selective manner in concert with other techniques. In broad terms it is necessary:

a. To define which systems are mission critical and are required to survive in a nuclear environment to provide an acceptable combat capability to the force.

b. To define the nuclear environment to which those mission critical systems are likely to be exposed.

c. To develop hardening thresholds.

d. To express thresholds as specifications for developer use.

e. To conduct a hardness assessment program that includes:

(1) Tests and evaluation to confirm hardness.

(2) Hardness assurance during production.

(3) Hardness maintenance and hardness surveillance to prevent degradation of design during system service life.

hardness assurance, hardness maintenance, hardness surveillance, and other terms used in this policy are defined by enclosure (1).

5. Objective. To establish processes for the development of nuclear survivability requirements for naval systems and platforms that:

a. Emphasize the necessity for properly assessing and incorporating nuclear survivability features early in the system's design and implement nuclear survivability features within the Fleet Modernization Program, service life extension programs, weapons improvement programs, or other in-service life-cycle programs.

b. Establish a systems engineering approach which supports the generation, modification, and refinement of specific nuclear survivability requirements while addressing the specific missions, threats, and projected operating environment and program specific issues. These requirements are further modified and refined as the system's design progresses. Mission critical systems need to be identified to ensure mission requirements are met. Enclosure (2) defines the recommended process for deriving nuclear survivability requirements.

c. Provide the basis for developing an investment strategy to relate affordability and mission effectiveness issues while applying priorities to implement nuclear survivability enhancements in new construction and critical equipment and systems upgrades.

6. Applicability and Scope. This instruction applies to all naval major defense acquisition programs (acquisition category (ACAT I)). This instruction applies to any defense-critical system, non-major system, or acquisition program deemed mission critical by nature of its impact on strategic or tactical missions. In addition, it also applies to new construction and operational platforms (ships, submarines, craft, and aircraft etc.), including associated weapon systems and components, as well as United States Marine Corps (USMC) vehicles and equipment and shore-based systems. Its nuclear survivability initiatives encompass development, acquisition, deployment, and support of systems and equipment improvements to prevent or minimize the

broad degrading effects of nuclear engagement on mission performance. It implements procedures established by reference (a) and supplements references (b) through (j).

7. Policy. All Navy and Marine Corps acquisition programs (ACAT I and mission critical) and fielded mission critical systems shall report compliance with nuclear survivability per references (a) and (g).

a. Nuclear survivability shall be considered a fundamental design requirement of no less significance than other inherent system capabilities.

b. There are three categories of nuclear survivability:

(1) Nuclear Survivable. This category applies to systems that must operate and remain mission capable under conditions of the nuclear environment. These systems have need of comprehensive survivability efforts. It is appropriate for any system which must perform vital missions in a nuclear environment and or conflict, including specific nuclear command and control and delivery systems.

(2) Nuclear Hardened for Electromagnetic Pulse (EMP) or HEMP Only. This category applies to systems that must operate and remain mission capable in an EMP environment only. It is appropriate for systems supporting strategic or tactical missions. Examples include fire control radars; weapon control components; warfare mission computers, command, control, communication and intelligence equipment; and critical ships service systems, etc. EMP and HEMP standards are specified in references (e) and (f).

(3) Not Nuclear Survivable or Hardened. This category applies to systems which have no role in a nuclear environment and or conflict. They provide non-essential, warfighting capabilities. An example might be a training aircraft with no combat mission.

c. Deployable manned systems requiring nuclear survivability shall be designed or, where determined affordable, backfitted so that failure will not occur in a nuclear environment less severe than that in which personnel lose the ability to operate and maintain the equipment. Unless otherwise

specified by the CNO or the Commandant of the Marine Corps (CMC), loss is assumed to occur at nuclear environment levels which would result in 30 percent immediate temporary incapacitation of system personnel. Other system configurations, such as deployable unmanned and non-deployable, will achieve a degree of survivability necessary to operate in projected threat levels, dependent upon acceptable attrition rates, ease of replacement, reconstitution, repair and or re-manning.

d. For new system starts, nuclear survivability shall be considered during the concept refinement phase (pre-milestone A) and continue throughout the life of the system.

e. Overhauled and modernization programs shall employ practical applications of nuclear hardening improvements and or appropriate TTPs, particularly in cases where known deficiencies exist.

f. As set forth in paragraph 7a, capability requirements documents shall address nuclear survivability, particularly with respect to integrated warfare requirements and cross-platform issues.

g. Nuclear survivability requirements per references (a), (d), (e), (f), (g), (h), (i), and (j) will be met at each milestone for acquisition programs deemed mission critical.

## 8. Responsibilities and Actions

a. CNO (N9) shall exercise primary responsibility and authority for the coordination, direction, and development of naval warfare survivability guidance and shall provide management focus to ensure balance among mission effectiveness versus projected threat, platform commonality, and affordability issues.

(1) Provide continuous coordination and management focus to ensure the implementation of affordable nuclear survivability initiatives with naval warfare systems.

(2) Translate nuclear survivability policy into operationally relevant platform and weapon hardening system capabilities that support capability requirements documents.

(3) Based upon recommendation from resource sponsors, determine the nuclear hardening thresholds for major systems; determine the nuclear hardening thresholds for non-major systems which have operational impacts on critical functions supporting vital missions; and determine the range of nuclear survivability methods to be employed for the system.

(4) Include a formal determination as to the satisfaction of the nuclear survivability criteria in the low-rate initial production report prior to milestone C.

(5) Preview the hardness assurance, hardness maintenance, and hardness surveillance plan for systems requiring hardening to achieve nuclear survivability.

(6) Review all survivability documentation prepared by program managers (PM) or warfare systems sponsors for program milestones.

(7) In those instances where nuclear survivability involves either an integrated warfare requirement or a major cross platform warfare system issue, CNO (N9) shall request a recommendation from the R3B or NCB.

b. Director, Warfare Integration (OPNAV (N9I)) shall ensure development of an integrated force architecture that preserves and extends naval warfighting capability into the future by integrating all warfare programs. When requested, advise the governing R3B or NCB on nuclear survivability involving integrated warfare requirements or major cross-platform issues.

c. Director, Innovation, Test and Evaluation, and Technology Requirement (OPNAV (N84)) shall ensure that test and evaluation master plans comply with reference (a).

d. Director, Surface Warfare (OPNAV (N96)) shall implement the responsibilities of the CNO with regard to the determination of nuclear survivability requirements and capabilities of naval systems and platforms as follows:

(1) Per references (i) and (j), OPNAV (N96) is designated as the CNO's executive agent (EA) for CBRN defense (CBRND).

(2) OPNAV's EA for CBRND shall review all naval system and platform requirements documents to ensure compliance with nuclear survivability requirements.

(3) Shall direct appropriate programming and budgeting actions to ensure nuclear survivability initiatives are supported to the maximum extent practicable.

(4) Ensure compliance with reference (a) and ensure Navy CBRN mission critical systems be CBRN survivable per reference (g).

(5) Coordinate with resource sponsors and report all Navy CBRN mission critical systems and platforms per reference (a).

e. Resource sponsors within Deputy Chief of Naval Operations for Information Dominance (N2/N6), Deputy Chief of Naval Operations for Fleet Readiness and Logistics (N4), Deputy Chief of Naval Operations for Integration of Capabilities & Resources (N8), and CNO (N9) shall:

(1) Ensure warfare systems survivability assessments address all aspects of nuclear survivability, and are conducted for all acquisition programs, conversions, and backfits.

(2) Review nuclear survivability cost-effectiveness assessments and recommendations, presented by program executive offices (PEO), PMs, and systems commands (SYSCOMs) for naval systems and platforms at all phases of their life-cycle, and recommend approval or disapproval to the CNO.

(3) Use enclosure (2) to determine if a system or platform is mission critical and recommend to the EA for CBRND the nuclear survivability criteria, per reference (a):

(a) For each major acquisition program.

(b) For any CBRN mission critical system (major or non-major) that impacts or support strategic or tactical missions.

(4) Ensure all documentation meets requirements of references (a), (d), (e), (f), (h), (g), and (i).



(5) Ensure establishment of a hardness maintenance or hardness surveillance plan and provide required programmatic support.

(6) When nuclear hardening is specified as a mode of survivability, the hardness criteria established shall guide requirement and specification development.

(7) Prepare documentation for major programs undergoing milestone decisions by the milestone decision authority.

(8) Report CBRN mission critical systems, nuclear survivability, system compliance, hardness maintenance and hardness surveillance plans annually per reference (a).

f. SYSCOMs shall:

(1) Support the CNO and CMC by providing comprehensive technical management, direction, coordination, assessments, focus for implementing nuclear survivability requirements, and assist in documenting capability requirements documents.

(2) Appoint and maintain SYSCOM nuclear survivability technical warrants who shall function as the single point of contact for such matters.

(3) Establish, issue, validate and certify Navy nuclear hardening criteria.

(4) Develop appropriate methodologies to assess feasibility; and provide a cost and benefit analysis that examines the implementation of nuclear survivability improvements including, but not limited to EMP, transient radiation effects on electronics (TREE), blast and thermal effects, airblast-induced shock, and underwater shock.

(5) Ensure that nuclear survivability requirements are validated at the appropriate points during system development.

(6) Incorporate a total life-cycle cost and maintenance estimate once a determination has been made for nuclear survivability.

(7) Ensure there is life-cycle maintenance of nuclear survivability in cases where hardness is the method used to achieve nuclear survivability.

g. USMC shall:

(1) For programs developed for the USMC by agencies or DoD components outside the Department of the Navy (DON) acquisition cycle, apply the nuclear survivability guidelines of that agency or component.

(2) Through Marine Corps Systems Command monitor U.S. Navy nuclear survivability issues that impact USMC programs and operations.

(3) Through the Expeditionary Force Development System (EFDS) and Marine Corps Combat Development Command, determine the survivability criteria developed within the DON for USMC systems. The nuclear survivability criteria shall be documented in capability development documents (CDD) and capability production documents (CPD) for systems that are considered CBRN mission critical per reference (a).

9. Records Management. Records created as a result of this instruction, regardless of media and format, shall be managed per SECNAV Manual 5210.1 of January 2012.

10. Reports Controls. Reporting requirements contained within this instruction are exempt from reports control per SECNAV Manual 5214.1 of December 2005.



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U.S. NAVY NUCLEAR SURVIVABILITY DEFINITIONS

1. Airblast. The shockwave in air produced by the detonation of a nuclear or conventional weapon. This shockwave imparts pressure loads that can damage or destroy exposed structures.
2. Airblast-Induced Shock. The shock induced to structure and topside equipment by the impact of a shock wave from the detonation of an above water nuclear weapon
3. Base Surge. The large waves generated by the surface detonation of nuclear weapons.
4. CBRN Mission Critical. That subset of mission critical systems with operational concepts requiring employment and survivability in a CBR environment or in a nuclear environment.
5. CBRN Survivability. The capability of a system to avoid, withstand, or operate during and or after exposure to a CBR environment (and relevant decontamination) or a nuclear environment, without losing the ability to accomplish the assigned mission. CBRN survivability is divided into CBR survivability, which is concerned with CBR contamination including fallout, and nuclear survivability, which covers nuclear weapon effects such as airblast, EMP, radiation, base surge, and underwater shockwave effects.
6. Defense-Critical System. A defense-critical system is a mission critical system.
7. Deployable System. A mobile system intended for use outside the 48 contiguous states and their associated airspace and territorial waters, during all or part of its service life.
8. Electromagnetic Pulse (EMP). The electromagnetic radiation from a nuclear explosion caused by Compton-recoil electrons and photoelectrons from photons scattered in the materials of the nuclear device or in a surrounding medium. The resulting electric and magnetic fields may couple with electrical or electronic systems to produce damaging current and voltage surges. This includes HEMP.

9. Hardness Assurance. Procedures applied during the production of a system to ensure that the end product is in compliance with the hardness design specifications or requirements.
10. Hardness Maintenance. Procedures applied during the service life of a system to ensure that the system's operation, logistics support, and or maintenance do not degrade the system's designed hardness.
11. Hardness Surveillance. A lifetime cycle of tests and inspections performed in order to evaluate the efficacy of hardness maintenance and support SYSCOM Hardness Certification.
12. Ground Shock. The shock wave produced in the ground after a sub-surface, surface, or near-surface nuclear burst.
13. Initial Nuclear Radiation. The neutron, gamma, and X-ray radiation occurring immediately following a nuclear detonation.
14. Mission Critical System. A system whose operational effectiveness and operational suitability are essential to successful mission completion or to aggregate residual combat capability. If this system fails, the mission likely will not be completed. Such a system can be an auxiliary or supporting system, as well as a primary mission system.
15. Nuclear Command and Control System. The combination of facilities, equipment, communications, procedures, and personnel essential for planning, directing, and controlling nuclear weapons, weapons systems, and associated operations.
16. Nuclear Environment. The environment created by initial nuclear weapon effects (airblast, thermal radiation, initial nuclear radiation, and EMP).
17. Nuclear Hardening. The employment of any design or manufacturing technique applied to an item or system that allows it to resist malfunction (temporary or permanent) and or degraded performance induced by nuclear weapon effects. Such systems are considered to be nuclear hardened.

18. Nuclear Survivability. The capability of a system to withstand exposure to a nuclear environment without suffering loss of ability to accomplish its designated mission throughout its life-cycle. Nuclear survivability may be accomplished by hardening, timely re-supply, redundancy, mitigation techniques (including operational techniques), or a combination thereof.

19. Thermal Radiation. Electromagnetic radiation emitted from a nuclear weapon that can rapidly heat exposed structure and may weaken the structure prior to the arrival of the airblast.

20. Transient Radiation Effects on Electronics (TREE). TREE can occur from the exposure to radiation emissions produced by the above water detonation of a nuclear weapon. Depending on the proximity and yield of the nuclear weapon, TREE exposure can alter the basic physical structure of electronic circuits and their components and cause temporary or permanent failure.

21. Underwater Shock. The shock wave produced in water after the proximity detonation of an underwater or near-surface nuclear burst.

**PLATFORM AND SYSTEM SURVIVABILITY REQUIREMENTS GENERATION PROCESS**

