20030130089

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SECURITY CLASSIFICATION OF THIS PAGE

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DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

AD-A199 074

DTIC
ELECTE
2 2 1988
H

1b RESTRICTIVE MARKINGS

3 DISTRIBUTION/AVAILABILITY OF REPORT
Approved for public release; distribution is unlimited.

4. PERFORMING ORGANIZATION REPORT NUMBER(S)
CRDEC-SM-2

5 MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
CRDEC	SMCCR-NB	

6c. ADDRESS (City, State, and ZIP Code)	7b. ADDRESS (City, State, and ZIP Code)
Aberdeen Proving Ground, MD 21010-5423	

8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
CRDEC	SMCCR-NB.	

8c. ADDRESS (City, State, and ZIP Code)	10 SOURCE OF FUNDING NUMBERS			
	PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO
Aberdeen Proving Ground, MD 21010-5423		1C463806	DJ30	

11. TITLE (Include Security Classification)
A Program Manager's Guide to Producing Nuclear, Biological, and Chemical Contamination Survivable Systems

12 PERSONAL AUTHOR(S)
Feeney, Joseph J.

13a. TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Special Manuscript	FROM 88 Jan TO 88 May	1988 September	27

16. SUPPLEMENTARY NOTATION
Submitted 2 August 88 to Program Manager Magazine, Defense Systems Management College, Ft. Belvoir, VA.

17 COSATI CODES		
FIELD	GROUP	SUB-GROUP
11	01	
11	03	

18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
NBC contamination survivability, Decontaminability, Hardness, Compatibility, Contamination, Design Materials, Survivability.

19. ABSTRACT (Continue on reverse if necessary and identify by block number)
General management and documentation requirements for the survivability of DOD systems designed and acquired to perform mission essential functions in an NBC-contaminated environment are provided in DOD Instruction 4245.13, "Design and Acquisition of Nuclear, Biological and Chemical (NBC) Contamination-Survivable Systems", dated 15 June 87. Each DOD component has been tasked with assessing NBC contamination survivability and identifying vulnerabilities and associated risks for systems with NBC contamination survivability requirements. This report is intended to guide DOD combat and material developers and their contractors in understanding the survivability requirements needed in designing for and determining the NBC contamination survivability of military equipment. This report is provided to assist DOD components in implementing DOD Instruction 4245.13.

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS

21 ABSTRACT SECURITY CLASSIFICATION
UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
SANDRA J. JOHNSON	(301) 671-2914	SMCCR-SPS-T

DD Form 1473, JUN 86 Previous editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

17. COSATI CODES (Continued)

11	09
11	10

A PROGRAM MANAGER'S GUIDE TO PRODUCING **NUCLEAR, BIOLOGICAL & CHEMICAL CONTAMINATION SURVIVABLE** SYSTEMS

by

Joseph J. Feeney

Attaining survivability on the nuclear, biological and chemical (NBC) contaminated battlefield requires a system's approach initiated during development of the system.

What is Nuclear, Biological and Chemical Contamination?

NBC contamination results from the deposition and/or sorption of residual radioactive material, or biological, or chemical agents on or by structures, areas, personnel, or objects. Initial nuclear effects such as blast, thermal, etc., are not encompassed by this area. This article is patterned after a previous one on nuclear survivability [1] and is intended to provide corresponding information and guidance on NBC contamination survivability.

Nuclear (N) Contamination. Residual radioactive material resulting from fallout, rainout, or irradiation produced by a nuclear explosion and persisting longer than one minute after burst.[2]

Biological (B) Contamination. Micro-organisms and toxins that cause disease in man, plants, or animals or cause the deterioration of materiel.[2]

Chemical (C) Contamination. Chemical substances intended for use in military operations to kill, seriously injure, incapacitate, or temporarily irritate or disable man

through their physiological effects.[2]

Program managers control development and acquisition of systems that may be required to survive in a nuclear,biological or chemical contaminated environment. This article outlines DOD military and service NBC contamination survivability requirements, recommends actions for program managers, and identifies resources supporting NBC contamination survivability efforts.

What is NBC Contamination Survivability?

NBC contamination survivability is the capability of a system and its crew to withstand an NBC-contaminated environment and relevant decontamination without losing the ability to accomplish the assigned mission. Characteristics of NBC contamination survivability are decontaminability, hardness, and compatibility.

You will encounter these three characteristics of NBC contamination survivability repeatedly throughout the life cycle of your system.

Decontaminability. The ability of a system to be decontaminated to reduce the hazard to personnel operating, maintaining, and resupplying it. Decontaminability is enhanced by maximum use of materials that do not sorb NBC contaminants and facilitate their rapid removal with decontaminants, by incorporating designs that reduce or prevent accumulation of NBC contamination and provide ready accessibility for decontamination, by incorporating contamination control devices and techniques to reduce the amount of contamination, and by providing space and mounting

brackets for installation of NBC detection, decontamination, measurement, and contamination control devices where appropriate.

Hardness. The ability of a system to withstand the damaging effects of NBC contamination and any decontaminants and procedures required to decontaminate it. Hardness refers to the condition of the equipment, including critical operational/functional performance characteristics, after it has been subjected to contamination and decontamination cycles.

Compatibility. The ability of a system to be operated, maintained, and resupplied by personnel wearing the full NBC protective ensemble. Compatibility requires consideration of the NBC-protected man and machine interface.

These characteristics are based upon engineering design criteria, intended for use only in a development setting. They do not define doctrinal or operational requirements for decontamination nor establish NBC protection requirements.

The degree or level of NBC contamination survivability to be integrated into a system's design is based on the required operational effectiveness and survivability characteristics of the system. Once these NBC contamination survivability criteria have been formally established, they are documented in the System Specification and delineated in the Developmental Specifications written for each system.

A key point is that NBC contamination survivability is no different from any other performance characteristic. Since NBC contamination survivability falls within the purview of performance, you should manage it as a required operational capability.

Why Build a NBC Contamination-Survivable System?

> It is DOD policy that NBC contamination survivability shall be included in the design and acquisition of systems that must perform mission essential functions in an NBC environment. This includes conventional forces, non-strategic nuclear forces, strategic nuclear forces, special operations forces, and supporting command, control, communications and intelligence systems.[2]

This policy was developed because the primary strategy for ensuring the security of the United States is the continued deterrence of chemical, biological and nuclear warfare. The design and acquisition of NBC contamination survivable systems enhances the deterrent value of our forces by increasing the degree of uncertainty about the effectiveness of a chemical, biological or nuclear attack by the enemy. In the event that deterrence fails and chemical, biological or nuclear weapons are employed against the United States, deployment of NBC contamination survivable systems ensures that our forces will have the military equipment necessary to perform critical wartime missions on the NBC-contaminated battlefield.

What Are DOD NBC Contamination Survivability Requirements?

DOD Instruction 4245.13, "Design and Acquisition of Nuclear, Biological and Chemical Contamination Survivable Systems",[2] is the central DOD document providing NBC contamination survivability policy. This Instruction provides general management and documentation requirements for the survivability of systems designed and acquired to perform mission essential functions in an NBC-contaminated environ-

ment. This Instruction, intended for use in conjunction with DOD Instruction 4245.4 "Acquisition of Nuclear-Survivable Systems",[3] calls for consideration of the effects of residual radiological contamination and chemical/biological agents and their decontaminants on the design and acquisition of systems. DOD Instruction 4245.13 applies to all programs, systems and subsystems designated as major system acquisition programs as defined in DOD Directive 5000.1,[4] as well as any other program reviewed periodically by the Under Secretary of Defense for Acquisition, USD(A), under exceptional management procedures. Execution of the provisions of the Instruction for nonmajor systems is the responsibility of the military services.

DOD Instruction 4245.13 supplements the existing DOD series 5000 Acquisition Directives and Instructions.[4-6] Military service Regulations and Instructions[7-9] have been revised or created to address NBC contamination survivability requirements.

What Is Required to Satisfy These OSD Requirements?

For those military services and DOD agencies designing and acquiring systems to be NBC contamination survivable, DOD Instruction 4245.13 contains the following additional requirements.

Each DOD component is required to:

- Assess NBC-contamination survivability and identify vulnerabilities and associated risks for systems with NBC contamination survivability requirements.
- Present cost and operational trade-offs to the Defense Acquisition Board (DAB) at Milestone I. For the Army Streamlined Acquisition Process (ASAP), this will occur at the Milestone I/II Program Decision.

- Ensure that nonmajor mission-essential systems are scrutinized closely for potential impacts on mission-essential functions.
- Develop and employ procedures similar to those contained in DOD Instruction 4245.13 to ensure that these nonmajor mission-essential systems exhibit appropriate NBC contamination survivability.
- Advise the USD(A) at each milestone review if another major or nonmajor system has become a critical survivability limitation in the operation of the major system under development.
- Develop NBC contamination survivability criteria and standards and submit them to USD(A) for review.

Although not specified as program manager responsibilities, you may be required to execute the following NBC contamination survivability procedures to achieve and verify your system's NBC contamination survivability:

- Employ a proper combination of cost-effective survivability techniques to enhance NBC contamination survivability of individual force elements. To accomplish this, you should consider 1) materials and coatings that resist or minimize absorption of NBC contamination and facilitate rapid decontamination; 2) designs that [illegible]

[illegible]

mission.

- Define NBC contamination survivability requirements using system performance and environmental criteria and verifiable design specifications that are insensitive to minor changes in the threat environment.
- Validate and confirm NBC contamination survivability through a combination of realistic testing, simulation testing and analysis.
- Establish procedures for system survivability reassessments during the system's life cycle. As a minimum, survivability should be reassessed in conjunction with major modifications, changes in mission or changes in the threat.
- Include in the acquisition strategy an NBC contamination survivability maintenance and surveillance program to support the operational phase of life-cycle NBC survivability.
- Include in the JAS process a careful examination of system NBC contamination survivability and the potential impact of each system on larger wartime functions.
- Include NBC contamination survivability management-level summaries and resource allocation summaries in these documents: Justification for Major System New Start (JMSNS), System Concept Paper (SCP), Decision Coordinating Paper (DCP), and Test and Evaluation Master Plan (TEMP).
- Document plans for validating and confirming NBC contamination survivability, including specification of adequate resources for test and evaluation, for each major and non-major system TEMP.
- Include an NBC contamination survivability summary as a part of the scheduled test and evaluation [illegible]

working days before a DAB meeting according to the Milestone Review process.

The single, most important thing you must do is to document your actions pertaining to the NBC contamination survivability of mission-essential systems, subsystems and components. This is especially important if you trade-off achieving certain aspects of NBC contamination survivability for cost and/or operational effectiveness considerations.

- At present there is no DOD level agency that provides NBC contamination survivability guidance. Nevertheless, with the Army in the forefront in the NBC contamination survivability area, the Army has designated its Chemical Research, Development and Engineering Center (CRDEC) as the Army's lead agency in NBC contamination survivability. CRDEC has established a focal point, the NBC Survivability Office, to provide technical advice on all aspects of NBC contamination survivability. CRDEC can assist you in the development of the NBC Contamination Survivability Program Plan for your system and provide information concerning state-of-the-art NBC contamination survivability technology and management techniques. The Army's Nuclear and Chemical Agency (USANCA) is the staff manager for the NBC contamination survivability [illegible] and the [illegible] and [illegible] Command (USATECOM) [illegible] you in identifying [illegible] test facilities for [illegible] testing in the NBC [illegible] area.
- CRDEC has [illegible]

1) CRDEC, ATTN: SMCCR-NB, Aberdeen Proving Ground, MD 21010-5423; 2) Defense Technical Information Center (DTIC), Cameron Station, Alexandria, VA 22304-6145; and 3) Chemical/Biological Information Analysis Center (CBIAC), Edgewood, MD 21040. These handbooks include design guidelines to minimize contamination and to facilitate decontamination, test information on some NBC materials, general guidance for addressing NBC contamination survivability, and methodology for applying the Army's NBC contamination survivability criteria to a specific piece of equipment (0.5 Kw generator). These handbooks provide guidance that is applicable to all development and acquisition programs of mission-essential equipment within the Army and can be utilized by other DOD components in addressing their NBC contamination survivability requirements.

Each DOD component can use different procedures to attain NBC contamination survivability, including trade-offs for cost, operational effectiveness, etc. It is your job to implement the most cost-effective approach for achieving NBC contamination survivability.

What Does My Military Service Require from Me?

Each military service has, or is developing, Regulations and Instruction for implementing policy concerning the design and acquisition of NBC contamination survivable systems.[7,8,9] In general, military service policies extend NBC contamination survivability requirements from major systems to include non-major systems. They provide guidance on commercially-procured items, system retrofits, and modifications to existing item specifications, delineate procedures and specific responsibilities, establish control

over waivers of NBC contamination survivability criteria, and provide establishment of post-production assurance and maintenance procedures.

NBC Contamination Survivability Criteria

During program initiation, your military service decides whether the system is mission essential in a NBC contaminated environment. **If it is, the system must be NBC contamination survivable.** If NBC contamination survivability is determined to be a necessary requirement, criteria need to be established. For example, NBC contamination survivability criteria for Army systems are established[7] and monitored by USANCA. These criteria, expressed in terms of percent degradation, have been provided for Army systems. You integrate the NBC contamination survivability criteria into your system via the normal systems engineering process.

How Does OSD Review Systems for NBC Contamination Survivability?

At the OSD level, the acquisition of major systems is monitored during a sequence of DAB milestone reviews, beginning with Milestone I (which initiates the Demonstration and Validation Phase), for the Army Streamlined Acquisition Process, Milestone I/II (Proof of Principle Phase); and perhaps, through Milestone III (which begins the Production-Deployment Phase). A system's NBC contamination survivability may be reviewed by OSD before any milestone in accordance with DOD Instruction 4245.13. These reviews may be requested at any time by the Under Secretary of Defense for Acquisition, through the cognizant Deputy Under Secretary of Defense (DUSD), Assistant Secretary of Defense (ASD), and in consonance with the Assistant to the Secretary of Defense (Atomic Energy). These reviews usually will take place before

Milestones I and II (Milestone I/II for the Army's acquisition process). A review of the NBC contamination survivability status of supporting systems that must operate jointly in NBC contaminated environments may also be conducted.

These OSD reviews examine: (1) the requirement for NBC contamination survivability; (2) the plan to achieve the required degree of survivability, including documentation and funding; (3) the plan to validate NBC contamination survivability, and (4) the plan for achieving NBC contamination survivability assurance and maintenance during the Production and Operational Phase of the system's life cycle. These plans provide the basis for your NBC Contamination Survivability Program Plan. The following NBC Contamination Survivability Program Questions will help you prepare for an OSD NBC contamination survivability program review. You can anticipate being asked these or similar questions during any OSD reviews your system may undergo.

NBC Contamination Survivability Program Questions

1. System Mission: **What is the mission of your system?**

Is system mission critical/mission essential?

Is the system an essential component of other systems? Are the supported systems mission critical/mission essential?

Are other systems an essential component of this system? Are those systems in NBC contamination survivable as this system?

What is the [illegible] of this system as it relates to NBC contamination survivability? For Army systems, for example, the

mission profile is based on up to a 12 hour period and is determined as follows: If the soldier performs duties like maintenance, refueling etc., for 30 minutes every 12 hour period, then the mission profile of this system/item for NBC contamination survivability purposes is 30 minutes, even though the system/item may operate continuously.

2. NBC Contamination Survivability Requirements. **Does system have a NBC contamination survivability requirement?**

If no, why not? Where is the rationale documented?

If yes, how is NBC contamination survivability obtained? Were cost, operational effectiveness, and other trade-offs utilized? Where is the rationale for these trade-offs documented? For Army systems, but applicable throughout DOD, is a cost and operational trade-off protocol being developed by USANCA. This trade-off protocol will contain two sample Army systems each being evaluated against the NBC contamination survivability, as well as nuclear survivability, criteria. Is NBC contamination survivability reflected in the sub-system level documentation; Are funds budgeted for addressing NBC contamination survivability through the sub-system level?

Have NBC contamination survivability areas of high risk and uncertainty been identified?

3. Decontaminability: **Is the system decontaminable?**

Is the man-system interface for decontaminating the system/item been specified?

Is the system going to be painted with Chemical Agent Resistant Coating (CARC) to enhance decontaminability?

Has decontamination equipment been determined and procedures for decontaminating the system/item in the field been established?

4. Hardness: **Is the system hardened against exposure to NBC contaminants and their decontaminants?**

Have the critical performance/operational criteria, e.g., RAM, MTBF, error probable requirements, etc., been specified?

5. Compatibility: **Is the system compatible with soldiers dressed in the full NBC protective ensemble?**

Have mission essential tasks, e.g., sighting a target, loading ammunition, etc., been specified? Human engineering comparisons of shirtsleeve performance of these tasks versus these tasks performed in MOPP IV attire are needed.

Has collective protection equipment been considered for use where applicable, e.g., vans, shelters, etc?

6. Critical Function Analysis: **Have all critical materials, critical components and critical operational functions for system and subsystem levels been specified?** Where is this documented?

7. Program Plan: **Is there a NBC Contamination Survivability Program Plan?**

What concepts are addressed in the plan?

Where is the program documented?

Has there been management interface between NBC contamination survivability program and other related programs such as nuclear survivability, engineering design, human factors engineering,

quality assurance and producibility programs?

Has a NBC contamination survivability program manager been identified for you and your contractors?

8. Documentation: **Is the NBC contamination survivability requirement documented in requirement documents, decision coordinating papers, request for proposals, statements of work, contracts, et al.?** List documents and appropriate pages.

9. Validation: **What is the plan for validating NBC contamination survivability?**

What is the validation concept?

Do facilities and procedures for validating exist? Where?

Has testing requirements for system and sub-system levels been determined? Has funding for required testing been budgeted? What is the status of needed testing?

Is this plan documented in the Test and Evaluation Master Plan?

Are NBC contamination survivability test reports/results from completed testing available?

10. Design Parameters: **What are the features that constitute and control the system and sub-system levels of NBC contamination survivability?** Where documented?

Were any assumptions made in the interpretation of the NBC contamination survivability criteria, operational specifications, etc., that affect the system and sub-system's response on the NBC contaminated battlefield? Are there any such assumptions for

Government Furnished Equipment (GFE) associated with the system or sub-system?

11. Life-cycle Maintenance: How will life-cycle maintenance be addressed for NBC contamination survivable systems?

To what extent will contractors do life-cycle maintenance planning? Is it required in the RFP?

Does an NBC contamination survivability assurance plan exist? Where documented? If no assurance plan exists, what measures will be taken to assure that the specific design parameters are maintained during production?

Does an NBC contamination survivability maintenance plan exist? Where documented? If no maintenance plan exists, what measures will be taken to assure that routine maintenance, operations, and logistics will not degrade the design parameters?

Do facilities exist for NBC contamination survivability surveillance testing? If not, are they planned?

Is the life-cycle NBC contamination survivability maintenance program budgeted?

How Do I Implement NBC Contamination Survivability?

Program management activities for developing a NBC contamination survivable system are the same as for any other system acquisition activity: acquire an operational capability and acquire life-cycle support for the capability. Once developed and/or acquired, maintaining your NBC contamination survivability capability is a must

including periodic retest and/or inspection, as required.

You are required to document the NBC contamination survivability plans for your system within existing Program Management documentation. The above NBC Contamination Survivability Program Questions identify the minimum essential elements which should be addressed in your NBC Contamination Survivability Program Plan. The intent of the NBC Contamination Survivability Program Plan is to outline management approaches and procedures by which you propose to achieve and demonstrate NBC contamination survivability program tasks, incorporate design requirements when applicable, and conduct demonstrations, tests, or validations. Your NBC Contamination Survivability Program Plan describes how you will execute your system NBC Contamination Survivability Program.

What Should My NBC Contamination Survivability Program Plan Contain?

The NBC Contamination Survivability Program Plan should describe the design, analyses, tests, and management activities to be performed to satisfy the full spectrum of NBC contamination survivability criteria which are decontaminability, hardness and compatibility. In the NBC Contamination Survivability Program Plan prepared by your staff or contractor, the functional relationship with other program tasks and milestones should be described clearly. This plan should identify each task with the work breakdown structure so that you can track and monitor the funds expended and planned for NBC contamination survivability activities, and so that you can document the NBC contamination survivability status of your system when called upon to do so.

Your NBC Contamination Survivability Program Plan needs to include the specific tasks necessary for design, analyses, test,

evaluation, and management of NBC contamination survivability requirements. Your plan should include preparation and approval of a time and event schedule for the initiation, review, and accomplishment of each NBC contamination survivability task. Parts, materials, facilities, equipments, subsystems, and systems requirements for each NBC contamination survivability task should be identified. Labor hours, caliber of labor, and the various costs, such as labor, material, travel, testing, etc., required for planned NBC contamination survivability activities should be estimated. Your NBC Contamination Survivability Program Plan should:

- Clearly relate NBC contamination survivability activity to critical technical and operational issues.
- Delineate the analytical efforts that supplement or replace testing to include the identification of computer software simulations, and the ways that these and other analytical techniques will be used.
- Identify piece-part, component, and subsystem tests to be performed for the appropriate NBC contaminated environments, with details such as test methods, test parameters to be characterized, etc.
- Describe system level tests to be performed, including the method of extrapolation from the test environment to the threat environment, and the rationale for simulants chosen.
- Identify simulants to be employed, test configurations, exposure levels, test data to be obtained, and their relationship to analytical efforts.
- Provide the NBC contamination survivability design philosophy to include the basis for selection of materials, finishes, device

technologies, circuit/mechanical designs; trade-offs or assumptions concerning the system design margins, contaminants and decontaminants, planned operational fixes, and any trade-off or assumption concerning system/subsystem/equipment operation, function, deployment or configuration that has been used in developing the NBC Contamination Survivability Program.

- Describe the application of NBC Contamination Survivability Program results to the production and maintenance of the deployed system/subsystem/equipment.
- Identify the projected requirements, driven by the NBC Contamination Survivability Program of the system/subsystem/equipment, for special or custom parts, materials, components, finishes or processes; the basis of need for these requirements; and the impacts of these requirements on the development program and design, costs, operation, maintenance, function, or deployment.
- Identify NBC contamination survivability areas of high risk and uncertainty. Assumptions, conclusions, and reasons used in risk analysis and identification, as well as the actions to be taken to minimize impact of risks and uncertainties identified, should be specified.
- Describe the methodology and procedures by which the prime contractor will ensure that NBC contamination survivability, meeting the policy requirements of your military service Regulations and Instructions, are contained in subcontracts.
- Identify actions to be taken to ensure NBC contamination survivability for material developed elsewhere, such as commercial off-the-shelf items and performance-type military specification items.

- Identify special requirements to be included in source or product selection criteria.
- Describe the contractor's improvement action(s) when an item does not meet system or material requirements.
- Define the interactions of the noncontractor-developed equipment with the contractor-developed equipment and the approach to integrate the NBC contamination survivability of these equipments.
- Identify your Preplanned Product Improvement efforts and how NBC contamination survivability requirements will be validated.
- Describe the interface in the acquisition cycle where potential NBC contamination survivability solutions will be correlated with nuclear and other survivability issues to ensure that what enhances survivability in one area does not degrade survivability in another area.

Your NBC Contamination Survivability Program Plan should be no longer than necessary to present the required information. It will be used by you, your military service, and OSD for planning, budget justification, and performance measurement of NBC contamination survivability. This Plan provides the basis and authority for all other detailed NBC contamination survivability documents and should be capable of explaining the intent of your NBC contamination survivability approach.

How Do I Manage My NBC Contamination Survivability Activities?

Without a doubt, the first and most important step is to state clearly your NBC contamination survivability objectives in your program documents and contracts. This is to ensure that your contractor(s), vendors, operational test and evaluation command,

etc., know that NBC contamination survivability is required.

A strong Program Manager and contractor management role is needed and is crucial to ensure that survivability goals are met. You need to manage carefully the NBC contamination survivability activities in the following areas: system engineering, human factors engineering, test and evaluation, manufacturing, and integrated logistic support.

During the system engineering process, treat NBC contamination survivability criteria as a mission requirement that will be translated into design requirements at successively lower levels of detail. If possible, assign an engineer with NBC contamination survivability experience as your NBC Contamination Survivability Manager to integrate NBC contamination survivability solutions into your system design. If you do not have NBC contamination survivability experience within your staff, use the Army's Chemical Research, Development and Engineering Center or a contractor with NBC contamination survivability experience for technical assistance. Periodic reviews of NBC contamination survivability documentation will help you maintain control of your NBC contamination survivability effort.

Your NBC Contamination Survivability Manager prepares your NBC Contamination Survivability Program Plan detailing the methods, policies, and guidelines necessary for incorporating NBC contamination survivability criteria into your system.

Your Contractor's Responsibilities

You should make clear to your contractor that he will be required to perform certain NBC contamination survivability tasks. He should assign his own NBC contamination survivability manager to assist your corresponding manager in addressing NBC contamination

survivability issues. Your contractor, as well as his assigned NBC contamination survivability manager, must fully understand your expectations for providing and evaluating system NBC contamination survivability.

Your contractor must understand that he needs to specify all NBC contamination survivability critical design parameters for piece-parts, materials, design and design tolerances. He must plan for sufficient lead time in scheduling test facilities and must coordinate overall test schedule with the U.S. Army's Test and Evaluation Command.

Your contractor will subject your system's equipment to analysis and testing for compliance with the NBC contamination survivability criteria, which it will be expected to pass. Once you are satisfied that your system has been verified as being survivable, the contractor must be held responsible for the evaluation of every proposed design and procedural change to determine whether it would jeopardize your equipment's NBC contamination survivability. Also, he should be explicitly required to develop and furnish plans and procedures for NBC contamination survivability assurance and maintenance.

How Do I Validate My Design?

Tests to validate your system's NBC contamination survivability is considered destructive testing. Therefore, due to the limited number of prototypes available for most systems, you most likely will not be exposing your full system to NBC contamination and subsequent decontamination. Accordingly, simulation of NBC contamination and trade-off analyses are essential activities for test and

evaluation of NBC contamination survivability. No set of NBC simulants currently exists that duplicates every NBC environment.

Since your full system may not be exposed to NBC contamination and decontamination, you will need to have critical components and materials evaluated for the effects of NBC contamination and decontamination. Existing databases may be able to provide degradation results and eliminate some testing of components and materials. Simulant testing of your full system, after all critical components and materials have been evaluated, may be a viable alternative. The impact of trade-offs, such as cost, operational effectiveness, etc., of certain NBC contamination survivability criteria needs to be determined.

You need to develop a comprehensive NBC contamination survivability test and evaluation program that includes testing, simulation and trade-off analyses. Your methodology must validate that your system meets the NBC contamination survivability criteria. Your Test and Evaluation Master Plan will be used by OSD to assess the adequacy of the planned testing and evaluation for your system, including the NBC contamination survivability test and evaluation portions. You must ensure that your system's test plans for NBC contamination survivability details the overall verification program from piece-part to system-level testing and analysis.

How Do I Integrate Logistic Support?

Your planning for logistics begins on the Concept Exploration Phase of the acquisition process with the development of logistics support assessment plans and criteria. These criteria should include NBC contamination survivability requirements. These requirements are

placed in the systems specifications to ensure that they are considered in the design of the system and serve as a basis for the Logistic Support Analysis (LSA) Plan. The LSA Plan is developed during the Demonstration and Validation Phase (Proof of Principle for the Army's Streamlined Acquisition Process) and implemented in the Full-Scale Engineering Development Phase (Development Prove-Out for the Army's process).

What Is This Going To Cost Me?

There is a lack of sufficient data to indicate the NBC contamination survivability costs on total development of a system. However, starting as early as possible in the development and/or acquisition of your system would lower your costs. A later redesign or retrofit to achieve NBC contamination survivability can only increase the cost of your system. Starting early saves a lot of time and effort later, which further increases your dollar savings.

Lessons Learned

Start Early. Start NBC contamination survivability planning as early as possible; plan for NBC contamination survivability "up front." An early start will reduce the cost and risk associated with retrofitting your system to address NBC contamination survivability.

Experience. The U.S. Army's CRDEC can provide technical support to your NBC contamination survivability effort. Involve military service and DOD Developmental Test and Evaluation and Operational Test and Evaluation organizations early to identify the testing and evaluation necessary to validate your NBC contamination survivability design.

Contracts. Before you contract out tasks on your system, get

experienced NBC contamination survivability advisors or consultants to review your procurement package so that you clearly state to your contractors the needed NBC contamination survivability efforts, including system performance requirements and the measures to be undertaken to verify NBC contamination survivability. Make sure that your contractor has access to all pertinent documentation.

Delays in Implementation. You must make your schedules known early, enforce milestones and conscientiously evaluate contractor task performance. This should ensure that long lead-time NBC contamination survivable components are available for required prototypes, that allocated space and supporting resources are available for NBC contamination survivability requirements, and that your acquisition schedule is not delayed while you retrofit necessary design changes to address NBC contamination survivability.

Contractor Task Appraisals. You and your staff must keep on top of contractor progress in completing assigned tasks. This will keep your effort on schedule. Use your staff's and your contractor's NBC contamination survivability managers. Seek assistance from other appropriate government organizations as required.

Contractor Access To Documentation. You must ensure that your contractor is provided with, or has access to, any needed documentation. Ensure that your contractor is provided specific, detailed information from preliminary designs through all NBC contamination survivability related activities needed for OSD review. Appropriate classified documents will need to be reviewed by your contractor.

System Survivability. All mission-essential parts of a NBC contamination survivable system must be NBC contamination survivable.

You must ensure that the NBC contamination survivability of your system is not degraded by any Government Furnished Equipment (GFE) that is not survivable in a NBC contaminated environment. Whether the equipment is developmental or off-the-shelf, you need to ensure that the GFE you use meets your system's NBC contamination survivability criteria.

Maintaining NBC Contamination Survivability. Develop NBC contamination survivability maintenance and assurance plans to protect your system's program for adequately addressing NBC contamination survivability. Incorporate those plans into your Integrated Logistics Support Plan.

The impact of NBC contamination survivability problems can be reduced if your NBC Contamination Survivability Program Plan is accurate and if it is followed throughout the development and/or acquisition of your system. Assistance with NBC contamination survivability policy, technical, and programmatic matters is available from your military service staffs, the Army's CRDEC, and DOD and Service databases and information centers.

Summary

The development and acquisition of sustainable, NBC contamination survivable, mission essential systems is necessary to enable mission accomplishment on the NBC contaminated battlefield. When properly addressed early in the development and/or acquisition cycles, NBC contamination survivability costs are reasonable.

To develop or acquire a NBC contamination survivable system, develop a NBC Contamination Survivability Program Plan, assign NBC contamination survivability early, [illegible]

document your rationale and decisions, and use your staff's and your contractor's NBC Contamination Survivability Managers. Ensure that NBC contamination survivability is planned for and maintained throughout the life cycle of your system.

Avail you and your staff to current technology and management assistance existing throughout DOD, the military services, and contractors. Keep abreast of your program.

References

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3. DOD Instruction 4245.4, "Acquisition of Nuclear-Survivable Systems", 2 September 1983.

4. DOD Directive 5000.1, "Major System Acquisition", 12 March 1986.

5. DOD Instruction 5000.2, "Major System Acquisition Procedures", 12 March 1986.

6. DOD Directive 5000.3, "Test and Evaluation", 12 March 1986.

7. Army Regulation 70-71, "Nuclear, Biological and Chemical (NBC) Contamination Survivability of Army Materiel", 1 April 1984.

8. Draft Air Force Regulation 80-38, " The Air Force Systems Survivability Program", 25 November 1987.

9. Draft SECNAV Instruction, "Design and Acquisition of Nuclear, Biological and Chemical (NBC) Contamination-Survivable Systems", undated.