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USPACOM STUDY PROGRAM: CHEMICAL WARFARE ANALYSIS [redacted]

[redacted]

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25 March 1988

Draft Final Report

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[redacted]

Defense Nuclear Agency
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OCT 14 1993

Dr. Peter R. Wills
Centre for Peace Studies and Department of Physics
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Dear Dr. Wills:

This is in response to your September 9, 1992, Freedom of Information Act (FOIA) appeal of Dr. George W. Ullrich's denial of information from the "USPACOM Study Program: Chemical Warfare Analysis" document. Your September 9, 1992, appeal was received on September 15, 1992, and was assigned Defense Nuclear Agency (DNA) case number FOIA 89-036(A). Although your rationale to support your appeal was never received, we again staffed the document with those Department of Defense (DoD) elements that initially reviewed it.

Your appeal has been given careful and thorough consideration based upon guidance in DoD Regulation 5400.7-R, "DoD Freedom of Information Act Program," as published at 32 C.F.R. 286, and amended by Federal Register notices Volume 55, No. 248, December 26, 1990, and Volume 56, No. 89, May 8, 1991, pursuant to 5 U.S.C. 552 (a)(3). We have thoroughly reviewed the document to determine if any additional information could be provided to you. Based upon the appellate review, we are releasing some of the information withheld on the initial review, but are continuing to deny the release of other information as reflected on the attached copy of the requested report. A revised copy of the document is attached.

You stated that LTC Craig had "...taken a most cavalier attitude toward the Freedom of Information Act...," had chosen to delete what he thought might be more convenient for DoD to withhold, and that he may have imagined he had constructed arguments and used a fanciful interpretation of the FOIA to justify withholding parts of the document. None of your accusations have any basis in fact. The document was staffed with several DoD elements, including the Office of the Secretary of Defense, and it was their professional input in areas of subject matter expertise that formed the basis of our initial response to you. Upon receiving your appeal we again reviewed the report, consulted with subject matter experts, and compared the initial release to the appellate evaluation. The attached document is a product of numerous hours of further review by DoD professionals who are aware of the threat and appropriate security measures that must be applied to national defense information.

You pointed out that entire pages were withheld. We critically reviewed the full page deletions and have determined that in a few places some of the information can be released. In those places where we continue to withhold full pages, we have again determined we cannot release any of the information. Some of those pages contain information which under current security guidelines cannot be disseminated to foreign nationals, even those who may have United States (US)-equivalent security clearances. They also contain information that would reveal intelligence sources or methods, another area which cannot be released. Other pages contain Formerly Restricted Data, a category of information over which DNA has no release discretion. By US law that information must be withheld. Still other unclassified pages are withheld because when taken as a whole and the contents of those pages are analyzed, they become classified by compilation. When combined or associated with the unclassified material being released to you, the detailed information contained in those pages also could easily be used to analyze and compare other portions of the document to the extent that more classified information would be revealed. The basis for such classification is described in Executive Order (EO) 12356, "National Security Information," and DoD Regulation 5200.1-R, "Information Security Program Regulation."

5 U.S.C. 552 (b)(1) (FOIA Exemption 1) requires that currently and properly classified information not be released. That exemption provides that an agency may exempt from disclosure matters that are "(A) specifically authorized under criteria established by an Executive Order to be kept secret in the interest of national defense or foreign policy and (B) are in fact properly classified pursuant to such Executive Order." The classified information, which includes all categories of information we are withholding, falls under Exemption 1 and concerns military plans, weapons, or operations; the vulnerabilities or capabilities of systems, installations, or plans relating to the national security; foreign government information; intelligence sources or methods; scientific or technological matters relating to the national security; and United States Government programs for safeguarding nuclear materials or facilities.

5 U.S.C. 552(b)(3) (FOIA Exemption 3) pertains to information specifically exempted by statute from disclosure "provided that such statute (A) requires that the matters be withheld from the public in such a manner as to leave no discretion on the issue, or (B) established particular criteria for withholding or refers to particular types of matter to be withheld." The Atomic Energy Act of 1954, as amended, is an

Exemption 3 statute. Sections 141-146 of this Act prohibit the disclosure of information about nuclear weapons that is classified as Restricted Data or Formerly Restricted Data.

The information withheld from the report pursuant to Exemption 1 concerns all of the above categories of information that are currently and properly classified under Section 1.3(a) (1), (2), (3), (4), (6) and (7) of EO 12356. The information withheld pursuant to Exemption 3 concerns nuclear weapons related information that is classified as Formerly Restricted Data. I, therefore, am unable to release any of the withheld information.

You are advised you have the right to judicial review of this decision in a United States District Court in accordance with 5 U.S.C. 552 (a)(4)(B).

Sincerely,

KK Hagemann

KENNETH L. HAGEMANN
Major General, USAF
Director

Attachment
as stated

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19 ABSTRACT *(Continue on reverse if necessary and identify by block number)*

[redacted] This study analyzes the effect of CW attacks on NSNF DCA units at [redacted] After describing the existing and projected Soviet/DPRK CW threat, as well as USPACOM DCA NSNF [redacted] the study integrates several previous analyses and tests to determine the net effect of potential CW attacks on air base personnel and operations, and extrapolates the results [redacted] The study also provides recommendations for CW improvements, and assessments of on-going or planned CW improvements.

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18 SUBJECT TERMS

Dual-capable aircraft
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~~(S)~~ SUMMARY

~~(S)~~ The USPACOM Study Program, organized to examine theater nuclear planning issues, has produced a series of analyses on a number of diverse nuclear-related topics. A central issue has been the survivability of theater nuclear weapons, their delivery systems, and the support activities (such as command and control nets) essential to their use.

~~(S)~~ Begun in 1980 as the Theater Nuclear Force Improvement Study (TNFIS), the study program has examined nuclear readiness in the context of a wide variety of conflicts with the Soviet Union in the Asia-Pacific region. Scenario variations have involved strategic assumptions (such as alliance structures and warning time), warfighting strategies (such as the use of sea-based air power), and the conduct of non-nuclear campaigns as they led up to possible nuclear confrontations between the U.S. and the Soviet Union.

~~(S)~~ The question of the effects of introducing chemical weapons arose repeatedly in these past analyses. (One of the earlier war games, for example, included a chemical attack on Guam at the outset of war.) In general, however, the effects of chemical weapons were excluded from any detailed assessment as part of TNFIS. Instead, that analysis focused on the larger "strategic" issues involving force levels, basing structures, etc. The importance of chemical warfare (CW) was recognized, but some specific problems which were identified were reserved for more detailed treatment later.

~~(S)~~ It was judged inappropriate under the terms of the DNA charter to conduct a full-scale CW analysis which covered the entirety of USCINCPAC's mission responsibilities, facilities, and force structure. It was agreed, instead, to conduct a more limited assessment which focused on the impact of CW on the employment of USPACOM's non-strategic nuclear forces (NSNF). This report

summarizes that limited CW assessment, which was performed as part of the FY86-88 PACOM Support Program. Figure 1 shows the relationship between this CW analysis and the other principal elements of the USPACOM study program.

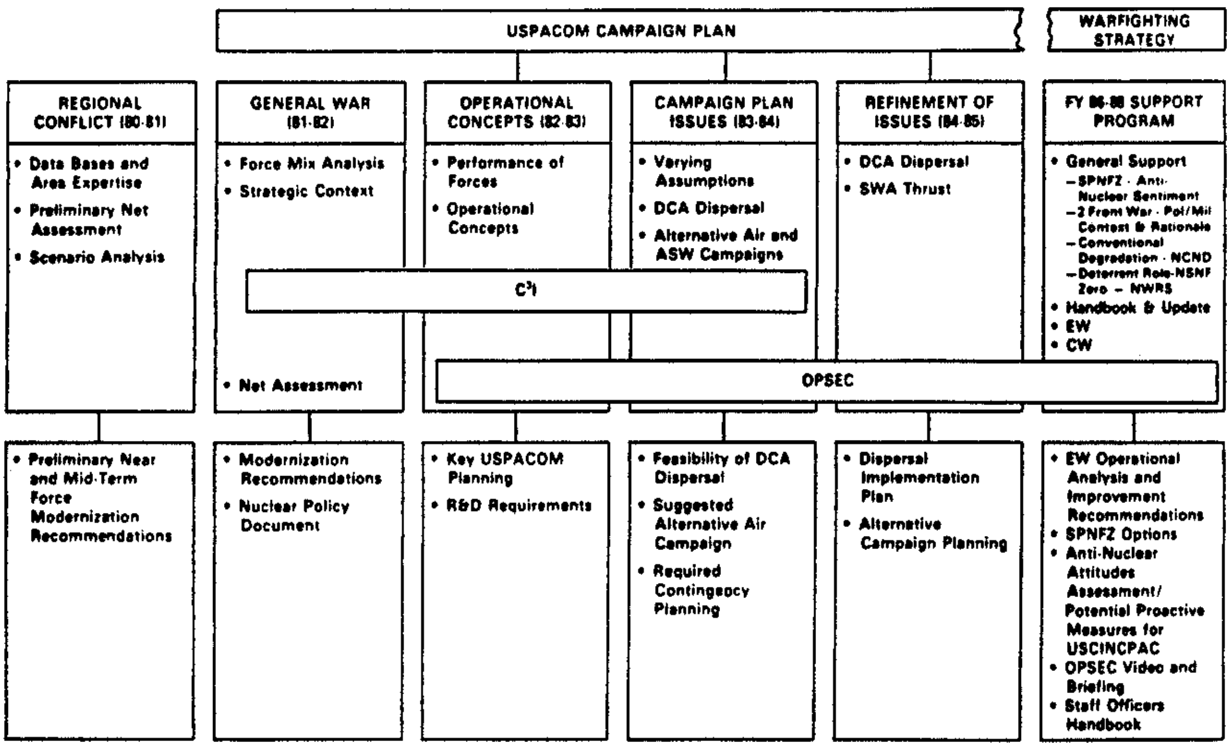

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Figure 1. ~~(S)~~ USPACOM study program overview.

~~(S)~~ The assessment is based on the significant body of analysis conducted during the 8-year USPACOM study program and on existing CW analyses. A comprehensive CW data base was assembled for this purpose, and an annotated bibliography of this CW-related literature, which is contained in the Appendix to this report, represents a significant output of the study.

~~(S)~~ [redacted]

[redacted]

(U) Successful operations in a CW environment require a judicious balance between survivability considerations and sustained combat operations. The survivability part of this equation is based in large measure on the chemical/biological warfare defense (CBWD) defense equipment available to operating units.

(U) Studies have shown that non-use, misuse or lack of understanding of this equipment can have devastating effects on operations. Even under the best of circumstances, use of the equipment degrades performance and increases the physiological and psychological stress on personnel in combat situations. On the other hand, mission accomplishment requires a capability to conduct sustained operations. The challenge for commanders at all levels is to balance these two considerations.

(U) This same challenge is faced by the commanders of all NSNF dual-capable forces, be they DCA, artillery units, Navy aircraft patrol squadrons or Lance missile battalions. For those forces that cannot practice contamination avoidance, the problem is even more acute. The DCA [redacted] offer a case in point.

(U) Forward deployed, [redacted] operate in peacetime from large, well-equipped, main operating bases (MOBs). [redacted]

[redacted] The limited number of [redacted] makes the problem even more acute, because it permits the enemy to concentrate his efforts on a very small target set.

~~(S)~~ For example, [redacted]

~~(S)~~ [redacted]

~~(S)~~ [redacted] Nevertheless, equipment that is available does provide a measure of protection and capability that the tactical commander must use to best advantage to sustain operations.

~~(U)~~ Interruption, disruption or cessation of one or several of those activities associated with sortie generation can slow the sortie generation process or cause it to come to a complete halt. A combined conventional/chemical attack could achieve these results depending on the readiness, preparation and sustainability of airbase personnel and equipment.

~~(S)~~ The literature surveyed for this study provides abundant evidence that concentrated, sustained chemical attacks [redacted] will cause significant degradation to the operational capability of [redacted] This is especially true for those [redacted]

~~(S)~~ Based on the threat [redacted] it is possible to envision combined conventional/chemical attacks on [redacted] These attacks could be repeated over time unless US retaliatory action forced their cessation.

~~(S)~~ The dilemma for US commanders is very clear. As [redacted] capability wanes in a CW environment, [redacted]

[redacted]

[redacted] To improve the capability of PACOM DCA to operate in a CW environment, measures can be taken which would be effective both for the immediate timeframe and for the longer term. For the near term the approach is to employ fixes and workarounds using current equipment. For the longer term, improvements can be based on new equipment in all CBWD functional areas.

[redacted] Fixes and workarounds recommended by this study to improve current operations in a CW environment are focused on "fixing" those symptoms and conditions that studies, analyses and tests have shown to be most detrimental to mission accomplishment, i.e., [redacted] provide the foundation for combat operations in a CW environment. Other actions and workarounds identified by this study [redacted]

[redacted] New generations of CBWD equipment that are moving into the inventory [redacted] They consequently provide higher confidence that [redacted] can be executed under CW conditions. These improvements will occur in all CBWD functional areas but some, [redacted]. The most important of

[redacted]

(U) [redacted] similarly equipped and prepared for CBWD would suffer similar degradation in a sustained CW environment [redacted] Other facilities [redacted] which lack collective protection features would be subject to a corresponding decrease in combat effectiveness.

(U) There are three areas where actions can be taken by USCINCPAC which would significantly improve the capability of NSNF to operate in a CW environment. These are 1) the USPACOM Major Exercise Program, 2) NSNF Dispersal Planning, and 3) CW Retaliation Plans.

(U) • USPACOM Exercise Program. Through this major CPX and field exercise program, USCINCPAC could verify and promote CW training by component forces by requiring that each major exercise include a sustained period of CW play (at least 72 hours) that tests the performance of all CW and CBWD operations under conditions that require the highest level of Mission-Oriented Protective Posture (MOPP) for all participants.

(U) • [redacted]

(U) • [redacted]

[redacted]

PREFACE

[redacted]

This report addresses the analyses carried out for Task 5: Chemical Warfare (CW), of the FY86-88 USPACOM Study Program, which was conducted by the contractor team of Science Applications International Corporation (SAIC) and The BDM Corporation (BDM), with the former serving as the lead.

Overall writing, editing and production was accomplished by Joseph J. Daigneault, Kenneth Bohlin, and Richard Gasparre (all of SAIC), with Thomas Lott (SAIC) providing technical review of CW issues. Robert Welander and Pete White (BDM) authored Section 2, which describes the USPACOM non-strategic nuclear forces (NSNF) and the CW threat to these forces. John Ostrich (SAIC) provided support in assembling the CW studies and analyses data base.

The authors wish to thank LTC Robert Laird (USA), DNA Contract Technical Monitor, for his assistance throughout this task.

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SECTION 1
[redacted] INTRODUCTION

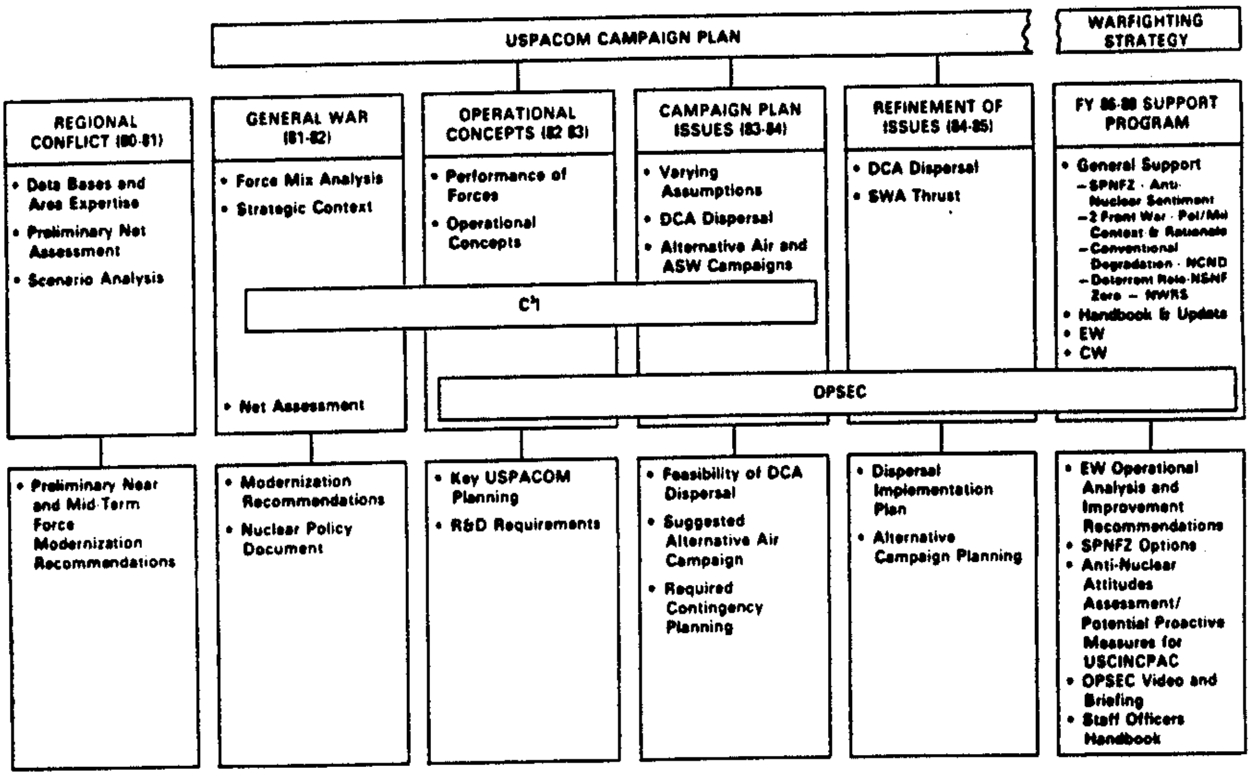
1.1 [redacted] BACKGROUND.

[redacted] The USPACOM Study Program, organized to examine theater nuclear planning issues, has produced a series of analyses on a number of diverse nuclear-related topics. A central issue has been the survivability of theater nuclear weapons, their delivery systems, and the support activities (such as command and control nets) essential to their use.

[redacted] Begun in 1980 as the Theater Nuclear Force Improvement Study (TNFIS), the study program has examined nuclear readiness in the context of a wide variety of conflicts with the Soviet Union in the Asia-Pacific region. Scenario variations have involved strategic assumptions (such as alliance structures and warning time), warfighting strategies (such as the use of sea-based air power), and the conduct of non-nuclear campaigns as they led up to possible nuclear confrontations between the U.S. and the Soviet Union.

[redacted] The question of the effects of introducing chemical weapons arose repeatedly in these past analyses. (One of the earlier war games, for example, included a chemical attack on Guam at the outset of war.) In general, however, the effects of chemical weapons were excluded from any detailed assessment as part of TNFIS. Instead, that analysis focused on the larger "strategic" issues involving force levels, basing structures, etc. The importance of chemical warfare (CW) was recognized, but some specific problems which were identified were reserved for more detailed treatment later.

[redacted] It was judged inappropriate under the terms of the DNA charter to conduct a full-scale CW analysis which covered the entirety of USCINCPAC's mission responsibilities, facilities, and force structure. It was agreed, instead, to conduct a more limited assessment which focused on the impact of CW on the employment of USPACOM's non-strategic nuclear forces (NSNF). This report summarizes that limited CW assessment, which was performed as part of the FY 86-88 PACOM Support Program. Figure 2 shows the relationship between this CW analysis and the other principal elements of the USPACOM study program.



[redacted]

Figure 2. [redacted] USPACOM study program.

1.2 [redacted] PURPOSE AND SCOPE OF THE STUDY.

[redacted] In general, the objective of this study has been to examine the effects of CW on USPACOM's theater nuclear capabilities and to identify measures that would enhance the capability of NSNF to operate in a CW environment. The specific NSNF tasks that address this objective, as described in the statement of work, are as follows:

- (U) Assess the current and projected chemical warfare threat (USSR and DPRK) to USPACOM NSNF capabilities, [redacted] delivery systems from various locations [redacted]

- (U) Evaluate the adequacy of currently programmed improvements to USPACOM's CW defensive posture and NSNF modernization in the context of an evolving threat and identify potential "fixes" to enhance NSNF survivability and/or operational readiness in a CW environment.

(U) The NSNF on which USPACOM relies for deterrence and nuclear warfighting, if necessary, are comprised of a number of dissimilar systems, as follows:

- (U) Land and sea-based tactical aircraft with nuclear bombs,
- (U) Lance missiles and artillery-fired atomic projectiles,
- (U) Land and sea-based ASW aircraft with nuclear depth bombs,
- (U) Naval surface combatants with nuclear ASW weapons,
- (U) Submarines and surface forces armed with land attack cruise missiles.

(U) [redacted]. Mobile forces, such as ships and aircraft, are more difficult to target with chemical weapons and can be more easily evacuated from contaminated areas. Submerged submarines, of course, are essentially immune from chemical attack. The most vulnerable targets are [redacted]

(U) Even when limited to these systems, the assessment set comprised a very large target system. Early on, a decision was required as to how best to demonstrate the effect of CW on this system. On one hand, the study could give a broad overview of the general effects of CW on NSNF systems based on published studies. On the other hand, it could focus specifically on one element of the NSNF, and, applying quantitative data from published studies and field tests concerning the effects of CW, demonstrate how these data affected the specific functional processes that supported its operation. [redacted]

1.3 [redacted] ANALYTICAL APPROACH.

[redacted] The assessment is based on the significant body of analysis conducted during the 8-year USPACOM study program and on existing CW analyses. A comprehensive CW data base was assembled for this purpose, and an annotated bibliography of this CW-related literature represents a significant output of the study.

[redacted] A review of these data, in conjunction with a review of the potential CW threat systems arrayed against [redacted] indicated [redacted] Because of this, [redacted] it became clear that a detailed assessment of the effects of CW on them could be used to adequately demonstrate the effects of CW [redacted]

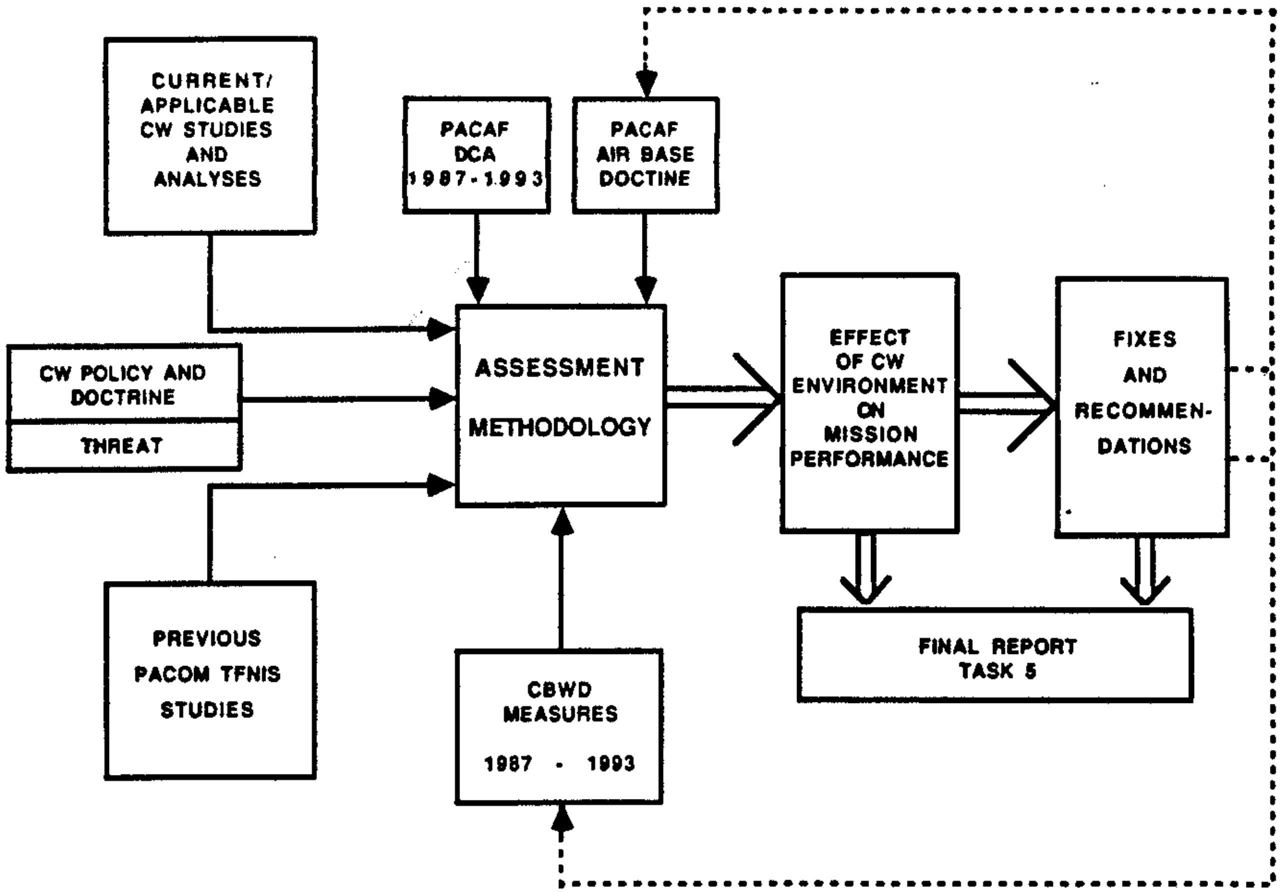
[redacted] For example, the data base included computer simulations of CW attacks on typical airbases, and studies and tests of the effect of CW on aircrews, groundcrews, maintenance personnel, airbase ground defense (ABGD) personnel, rapid runway repair (RRR) personnel and others. This not only permitted an assessment of an airbase as an operating system, but also allowed for evaluations of groups and functions that have counterparts in all other NSNF elements.

With the data described above in hand, the technical approach concentrated on assessing the potential effects of chemical attacks against [redacted] The results of this case study were translated into a set of conclusions relative to the adequacy of current and programmed CWBD measures. [redacted]

[redacted]

The steps followed in the analysis are illustrated in Figure 2. These steps included the following:

- [redacted]
- [redacted]
- Identifying potential "fixes" to enhance DCA survivability and operational readiness under sustained CW attack,
- Evaluating the adequacy of current and programmed improvements to PACAF's CW defensive posture along with DCA modernization in the context of a 1993 CW threat,
- Drawing conclusions as to the implications of the DCA case study for other USPACOM NSNF.



[redacted]

Figure 3. [redacted] CW task analytical approach.

1.4 [redacted] ORGANIZATION OF THE REPORT.

[redacted] The remainder of this report is organized into the following sections:

- [redacted] Section 2 describes the various elements of the USPACOM NSNF and the potential CW threats to them.
- [redacted] Section 3 describes, in broad terms, the defensive measures that are integral to NSNF survivability in general, and in particular airbase survivability and operations in a CW environment.

- [redacted] Section 4 assesses the effects of CW on the combat effectiveness of airbase personnel and operations[redacted] and the implications of this for PACAF air ope[redacted]

- [redacted] Section 5 describes procedures, "workarounds", and improvements that will mitigate the effects of CW on the operations of DCA[redacted]

- [redacted] Section 6 offers conclusions as to the effects of CW on PACAF's DCA nuclear missions, describes the implications of the DCA assessment for other NSNF and provides recommendations for consideration by USPACOM.

[redacted] A selected bibliography of relevant documents is provided as an appendix to this report.

SECTION 2
(U) ASSESSMENT OF THE THREAT TO NSNF

2.1 (U) GENERAL.

(U) This section provides an assessment of the CW threat to USPACOM NSNF, both now and in the near future. It begins with a survey of the NSNF system elements, followed by threat analyses based on these forces and their associated installations. Both discussions offer a baseline assessment reflecting systems existing in 1987 and a variation that incorporates changes to 1993. The treatment is generally organized on a geographic basis.

2.2 (U) USPACOM NON-STRATEGIC NUCLEAR FORCES.

(U) USPACOM NSNF are essentially those dual-capable forces deployed throughout the Pacific Region that are capable, in terms of training, weapons, delivery vehicles, and command and control, of executing nuclear strikes against enemy forces and installations.

2.2.1 [redacted]

[redacted]

[redacted] Even if this is initially deployed for conventional use only, it can be considered an element of the NSNF,

[redacted]

~~([illegible])~~ [redacted]

~~(S/FRD)~~ [redacted]

~~(S)~~ [redacted]

2.2.2 ~~(U)~~ [redacted]

~~(S)~~ [redacted]

[redacted]

[redacted]

Figure 4. [redacted]

[redacted] those USPACOM NSNF C^3 facilities [redacted] likely to be targeted [redacted] degrade the overall theater nuclear threat. [redacted].

[redacted]

~~SECRET~~

Figure 5. ~~(U)~~ [redacted]

2.2.3 ~~(U)~~ [redacted]

~~(S)~~ [redacted]

~~(S/FRD)~~ [redacted]

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[redacted]

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Figure 6. ~~(U)~~ [redacted]

2.2.4 ~~(U)~~ [redacted]

~~(S)~~ [redacted]

~~(S/FRD)~~ [redacted]

~~(S)~~ [redacted]

2.2.5 ~~(U)~~ [redacted]

~~(S)~~ [redacted]

2.2.6 ~~(U)~~ [redacted]

~~(S)~~ [redacted]

~~(S/FRD)~~ [redacted].

~~(S)~~ [redacted]

2.2.7 ~~(U)~~ [redacted].

~~(S)~~ [redacted].

~~(U)~~ [redacted]

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Figure 7. ~~(S)~~ [redacted]

2.2.8 ~~(S)~~ Naval Forces.

~~(S)~~ [redacted]

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[redacted]

2.2.9 ([redacted]) Other Deployed and Dispersed Forces.

[redacted]) It is conceivable that under certain scenarios [redacted] could be deployed in geographic areas other than those discussed above and, [redacted], face [redacted] threat. However, the effect of CW on [redacted] would be similar to that described [redacted]

2.3 ~~(U)~~ THE GENERIC CW/TOXIN THREAT.

2.3.1 ~~(U)~~ Background.

~~(U)~~ The guidance to the study team has been to use the Defense Intelligence Agency as the principal source of intelligence data, with back-up information provided by the Naval Intelligence Command as appropriate for maritime matters. The threat portrayed in this section is a distillation of documents published by DIA and the Naval Intelligence Support Center.

~~(S/NF/WN)~~ [redacted] This section provides an assessment of [redacted] capabilities rather than scenario-driven intentions.

2.3.2 ~~(U)~~ DPRK 1987.

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

[redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

[redacted] troops are routinely issued gas masks [redacted] CW protective equipment is stored in storage depots. [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]

~~(S)~~ [redacted] Depending on the length of the conflict, [redacted] could be produced or imported over time. [redacted]

[redacted]

~~(S)~~ [redacted]

2.3.3 ~~(U)~~ USSR 1987.

~~(S/NF/WN)~~ The following are chemical warfare agents which [redacted] are the most common agents [redacted]:

- ~~(S)~~ [redacted]
- ~~(S)~~ Tabun (GA)
- ~~(S)~~ Sarin (GB)
- ~~(S)~~ Soman (GD) and Thickened Soman (GD-T) [redacted]
- ~~(S)~~ Mustard (H/HD)
- ~~(S)~~ Mustard-Lewisite (HL) and Thickened Mustard-Lewisite (HL-T)
- ~~(S)~~ Chloropicrin (PS)
- ~~(S)~~ Vx [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(U)~~ Tables 1, 2 and 3 list the known or suspected [redacted] massive-fill and cluster air-delivered chemical bombs and their associated chemical agents.

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~

Type Aircraft	[redacted]	[redacted]	TOTAL
[redacted]	[redacted]	[redacted]	[redacted]

* ~~(S/NF/WN)~~ [redacted]

Table 1. ~~(S)~~ Soviet massive-fill chemical bombs.

~~SECRET/WNINTEL/NOFORN~~

[redacted]

Table 2. (U) Soviet massive-fill fragmentation chemical bombs.

~~SECRET/WNINTEL/NOFORN~~

[redacted]

Table 3. (U) Soviet chemical cluster bombs.

~~SECRET/WNINTEL/NOFORN~~

[redacted]

~~(S/NF/WN)~~ [redacted] A portion of these -- but certainly not all -- could be "swung" to [redacted] for combat duty should national priorities so dictate.

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted] -- are possible candidate fills. [redacted]

~~(S/NF/WN)~~ Virtually all Soviet artillery, multiple rocket launching systems, and missile systems [redacted] Table 4 lists the representative weapons and associated agents. [redacted]

Table 4. Representative Soviet chemical projectiles and probable agent fills.

~~SECRET/WNINTEL/NOFORN~~

[redacted]

NOTES:

1 GB = Sarin, [redacted] H = Sulfur Mustard, HL = Sulfur Mustard and Lewisite.
2 All AC-filled rounds would be fitted with low-order bursters and PD fuzes.
3 All H- and HL-(mixed) filled rounds could be fitted with low-order bursters and PD-fuzes, high-order bursters and PD fuzes, or low-order bursters and air-burst, (for naval ship targets PD fuzes).
4 NA = Not available.
5 PR = Probable but weight not computed.

~~SECRET~~

~~( )~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

([redacted]/WN) [redacted]

Table 5. [redacted] Ships with gun calibers compatible with ground force chemical munitions.

~~SECRET/WNINTEL/~~[redacted]

[redacted]

[redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

[redacted]

[illegible]) Virtually all Soviet military personnel are issued personal protective ensembles, including masks, impermeable rubberized jackets, gloves, buskins or boots, and, for ground forces, disposable paper capes and capes-groundsheets. Agent alarms are also provided but therapeutic kits are stored for wartime issue. [redacted] Specialized decontamination equipment is widely available in all services for decontamination of personnel and equipment, from tanks to aircraft to submarines.

~~(S/NF/WN)~~ [redacted]

[redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]
- ~~(S/NF/WN)~~ [redacted]

~~(S/NF/WN)~~ [redacted]

~~(S)~~ [redacted]

(S[redacted]/WN) [redacted]

(S[redacted] [redacted]

2.3.4 [redacted]) Estimated 1993 Changes/Capabilities.

2.3.4.1 [redacted]/WN) [redacted]

2.3.4.2 [redacted]/WN) [redacted]

[redacted]

~~(S/NF/WN)~~

[redacted]

~~(S/NF/WN)~~

[redacted]

~~(S/NF/WN)~~

[redacted]

[redacted]

~~(S/NF/WN)~~ [redacted]

~~(S)~~ [redacted] the following highly lethal natural toxins are potential warfare agents: botulinum, saxitoxin, and other "red tide" toxins, plant alkaloids (recin, curare, and aconitine), tetradotoxin (Japanese puffer fish), various snakes (cobra, sea snake) and frog (batrachotoxin) venoms, marine organism toxins (palytoxin, pahutotoxin), and fungal toxins (mycotoxins). [redacted] viable as warfare agents, as evidenced by the suspected use of mycotoxins such as "yellow rain" by Soviet allies in Southeast Asia.

~~(S)~~ [redacted]

~~(S)~~ Finally, continued progress is expected in the improvement and proliferation of individual and collective protective systems, decontaminants, and decontaminating equipments.

SECTION 3

[redacted] NSNF OPERATIONS AND CHEMICAL WARFARE DEFENSE

3.1 [redacted] INTRODUCTION.

[redacted] Successful operations in a CW environment require a judicious balance between survivability considerations and sustained combat operations. The survivability part of this equation is based in large measure on the CBWD defense equipment available to operating units. This equipment includes:

[redacted] • Detection, identification and warning systems (D&W)

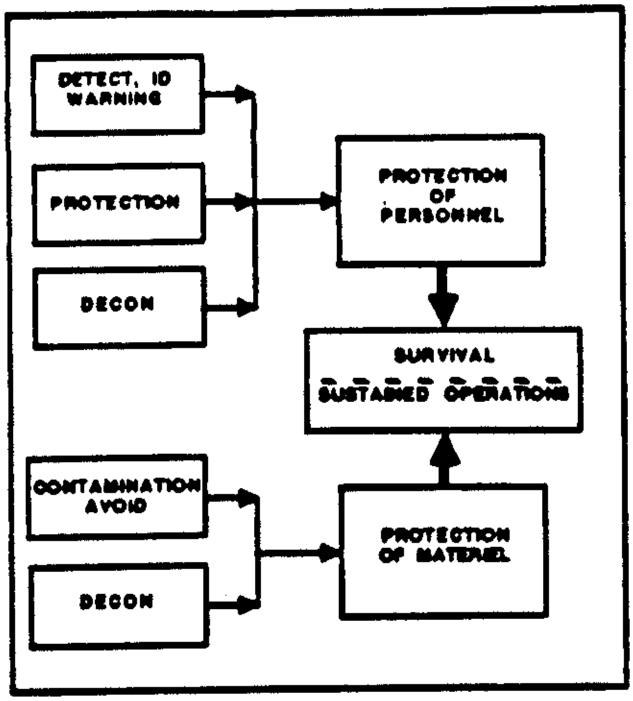
[redacted] • Individual protective equipment (IPE) for both combat, combat service, and combat service support personnel

[redacted] • Collective protection equipment (CP)

[redacted] • Contamination control (CC) equipment to neutralize, remove (decontaminate) toxic agents and covers or coatings that protect from agent effects. Contamination control can also be achieved through contamination avoidance.

[redacted] In addition, policies for use of this equipment and training in its use are essential to its effectiveness. Studies have shown that non-use, misuse or lack of understanding of this equipment can have devastating effects on operations. Even under the best of circumstances, use of the equipment degrades performance and increases the physiological and psychological stress on personnel in combat situations.

[redacted] On the other hand, mission accomplishment requires a capability to conduct sustained operations. The challenge for commanders is to balance these two considerations. Figure 8 places this challenge into perspective.



[redacted]IED

Figure 8. [redacted] Command challenge.

[redacted] This is the same challenge faced by the commanders of NSNF dual-capable forces, be they DCA, artillery units, Navy aircraft patrol squadrons or Lance missile battalions. For those forces that cannot practice contamination avoidance, the problem is even more acute. The sections that follow discuss this problem and its implications for the operations of USAF DCA in a chemical warfare environment.

3.2 [redacted] DCA OPERATIONAL CONSIDERATIONS.

[redacted] The mission of any DCA strike force [redacted] to help deter the initiation of conflict [redacted] latter, the strike force must [redacted] be capable of carrying out the strike mission, [redacted] the strike force must also be perceived as being survivable.

(U) The dilemma faced by the US commander is that of [redacted] based on appropriate indication and warning (I&W) of enemy intentions. [redacted]

3.3 (U) USAF DCA BASING.

(U) Forward deployed, land-based DCA [redacted] operate in peacetime from large, well-equipped, main-operating bases (MOBs). [redacted]. Significant efforts have been made to increase the survivability of aircraft and support facilities at these MOBs through [redacted]

[redacted]

[redacted]

The pertinent operational questions are: How well prepared are these bases to withstand chemical attack? What are the CBWD measures that must be taken by the commander to sustain combat operations? If taken, what is the effect of these measures on operations? These questions are addressed in detail later in this report.

3.4 AIRBASE CBWD READINESS AND OPERATIONS.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted] this equipment does provide a measure of protection and capability that the DCA commander must use to best advantage to sustain operations. In general, his approach is described in the following paragraphs.

3.4.1 ~~(U)~~ Detection, Identification and Warning (D&W).

~~(U)~~ The first indication of a chemical agent attack will probably be the detonation of chemical munitions on the airbase. Under this scenario, D&W equipment will not provide advanced warning of a lethal situation. Consequently, commanders must assume that every attack is a chemical attack until proven otherwise. In this situation, the function of D&W equipment is to localize and describe contaminated areas and structures, and provide verification that the agent threat, either through decontamination (DECON) or evaporation, has passed permitting relaxation of personal encapsulation. The latter is of fundamental importance to sustaining planned operations by eliminating the encumbrance of IPE.

3.4.2 ~~(U)~~ Individual Protective Equipment (IPE).

~~(U)~~ Loss of operational capability can be caused by no individual protection or too much individual protection for too long and without relief. [redacted] On the other hand, sustained performance in full encapsulation will cause rapid physical exhaustion. Consequently, the services have developed criteria for the level of individual encapsulation appropriate for the situation.

~~(U)~~ The commonly used description for this is the Army's nomenclature "Mission-Oriented Protective Posture" (MOPP) that describes the condition of the individual protective ensemble or MOPP level (Ref. 37). Depending on the expected threat and its imminency, commanders can raise or lower individual protection through five levels of MOPP as follows:

- ~~(U)~~ MOPP ZERO - Mask carried, other articles readily available;
- ~~(U)~~ MOPP 1 - Overgarment worn, other articles carried;
- ~~(U)~~ MOPP 2 - Overgarment and boots worn, other articles carried;
- ~~(U)~~ MOPP 3 - Overgarment, boots and mask/hood worn, other articles carried;
- ~~(U)~~ MOPP 4 - Complete ensemble worn.

[redacted] The commander's judgement is essential to the MOPP level adopted versus risk to personnel and operations. D&W equipment is vital to this process, and for controling the contamination of chemical-free areas, such as shelters. The following section shows the effects of MOPP 4 on standard airbase functional operations and highlights the importance of work-rest cycles for personnel in MOPP 4.

3.4.3 [redacted] Contamination Control (CC).

[redacted] Protective paint known as CARC (Chemical Agent Resistant Coating) is now available for protection of equipment surfaces, and chemical agent resistant encapsulation techniques are being developed by the DoD to protect equipment and items such as food and medical supplies. However, current airbase contamination control procedures consist primarily of decontamination (individual and equipment) and contamination avoidance. Again, the commander's judgement is vital to balancing these measures against operational requirements. Decontamination is a time consuming and manpower intensive operation. The need to decontaminate runways, other working areas, equipment, and individuals creates a trade-off in time between achieving minimum essential contamination-free areas and maintaining sortie generation. For contamination avoidance, work areas can be relocated out of the contaminated areas, overhead shelter will protect from falling liquid, and collective protection will provide clean areas to rest, recover and eat.

3.4.4 [redacted] Collective Protection (CP).

[redacted]

[redacted] Use of the CP tools by the commander again represent a balance between survivability and operational efficiency[redacted] CP is essential for sustained operations in a CW environment. [redacted]

3.4.5 [redacted] Implications for Commanders.

[redacted] Optimum application of CBWD measures are all necessary to achieve a capability for sustained operation in a CW environment. These include training, fixes (workarounds) to address shortcoming or shortages of CBWD equipment, new equipment such as the MCU-2/P mask for ground support personnel, and modification or design of combat equipment to prevent contamination and ease decontamination. Until the new equipment for all functional areas is fielded, commanders must ensure 100% CBWD equipment fill, and implementation of policies, procedures and fixes that permit the maximum attainable capability for sustained operations. In the USAF, this means a capability to meet or exceed the planned/required number of sorties needed to support an operation or campaign. Figure 9 shows the relationship between this sortie generation requirement and the CBWD measures discussed above. Assuming that airbase personnel were prepared for the initial CW attack, increasing the MOPP level will degrade sortie generation, but various measures can and must be taken to restore operational capability.

[redacted] The results of tests and analyses on the ability of USAF units to generate sorties and sustain operations in a CW environment are described in the next section.

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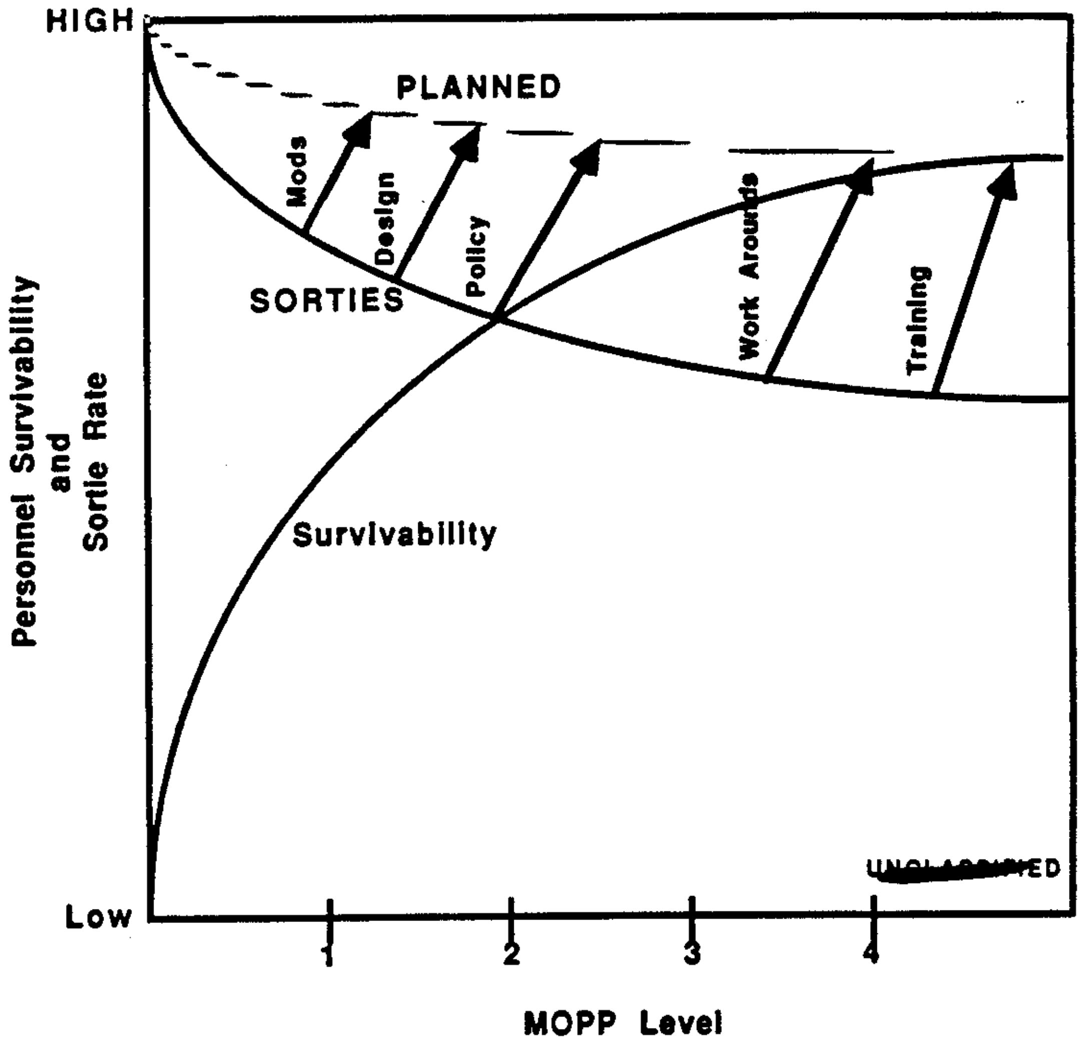

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Figure 9. [redacted] Relationship between sortie generation and survivability.

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SECTION 4

[redacted] CW AND CBWD DEGRADATIONS TO AIR BASE OPERATIONS

4.1 [redacted] INTRODUCTION.

[redacted] This section addresses the USAF sortie generation process and looks at the results of selected exercises and tests that have demonstrated or assessed the effects of CW and CBWD on sortie generation. Sortie generation is highlighted in this study because it is a measure of effectiveness (MOE) used by the USAF to assess the mission performance of operational units and organizations. DCA represent an essential part of the sortie generation process and are also likely targets of CW attack. For this reason, the study has focused on sortie generation and airbase operations. Additional studies and analyses of the CW effects on other US military forces are used, as appropriate, to corroborate the USAF experience.

4.1.1 [redacted] Sortie Generation.

[redacted] DCA sortie generation is an involved process that requires close coordination of all airbase functional activities. Under actual combat situations, active defense functions such as point defense and airbase ground defense (ABGD) are considered the protective envelope that permits the sortie generation process to continue despite enemy attempts to disrupt or halt air operations. Operational success is evaluated in part by comparing the number of sorties actually generated to the number planned or required for an operation or campaign.

[redacted] Figure 10 describes the principal functions involved in the sortie generation process. Integrated Combat Turn (ICT) activities that involve rearming and refueling, together with minimum essential inspections, are designed to return aircraft to the ready pool for additional sorties as soon as possible. Functional groups participating in this process include air crews, ground crews, and other support personnel (maintenance, battle damage repair (BDR) and operations personnel) supported by disaster preparedness, rapid runway repair (RRR), and active defense personnel.

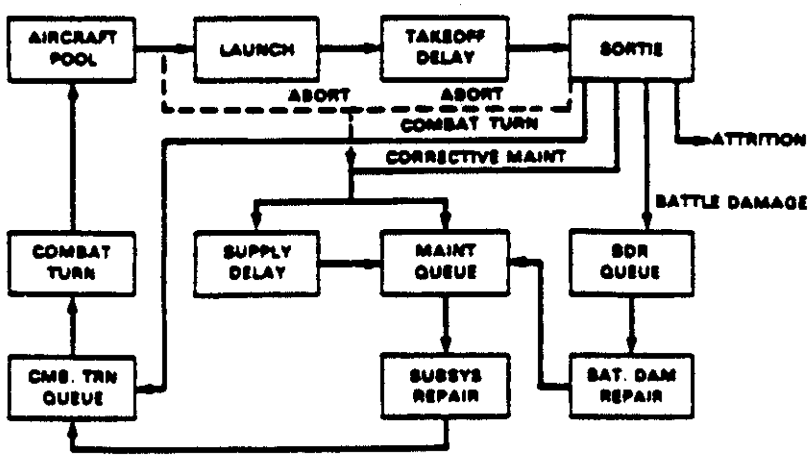

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Figure 10. ~~(U)~~ Sortie generation process.

~~(U)~~ Interruption, disruption or cessation of one or several of these activities can slow the sortie generation process or cause it to come to a complete halt. A combined conventional/chemical attack could achieve these results depending on the readiness, preparation and sustainability of airbase personnel and equipment.

4.1.2 ~~(U)~~ CW Policy and Concepts.

~~(S)~~ U.S. Policy, JCS guidance, and service doctrine clearly prescribe that U.S. forces can employ chemical munitions only in retaliation to first use by an enemy. The process resulting from this correct but very rigid position, involves [redacted]

[redacted], U.S. forces must be prepared [redacted]

4.1.3 (U) Chemical Agent Attack

(U) Section 2 has described the threat in terms of agent types and delivery vehicles. [redacted].

(U) Figure 11 gives a pictoral description of the liquid and vapor threat from a representative missile attack as simulated by the NUSSE-2 computer model, a chemical cloud generator (See Reference 3).* This model describes the contaminant by four phases. The first phase is the munition's dissemination system, where the delivery system is modeled to disperse the contaminant as pure droplets, pure vapor, or a mixture of both. As the droplets settle to the ground, they evaporate and generate a primary vapor, described as the second phase. The liquid droplet deposition pattern on the ground forms the third phase. The fourth phase portrays the evaporation of the

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* (U) NUSSE-3, an updated version of the model which has superseded NUSSE-2, was introduced after completion of the referenced report.

liquid agent over time from the surface. Evaporation and diffusion from this contaminated surface generate the secondary vapor.

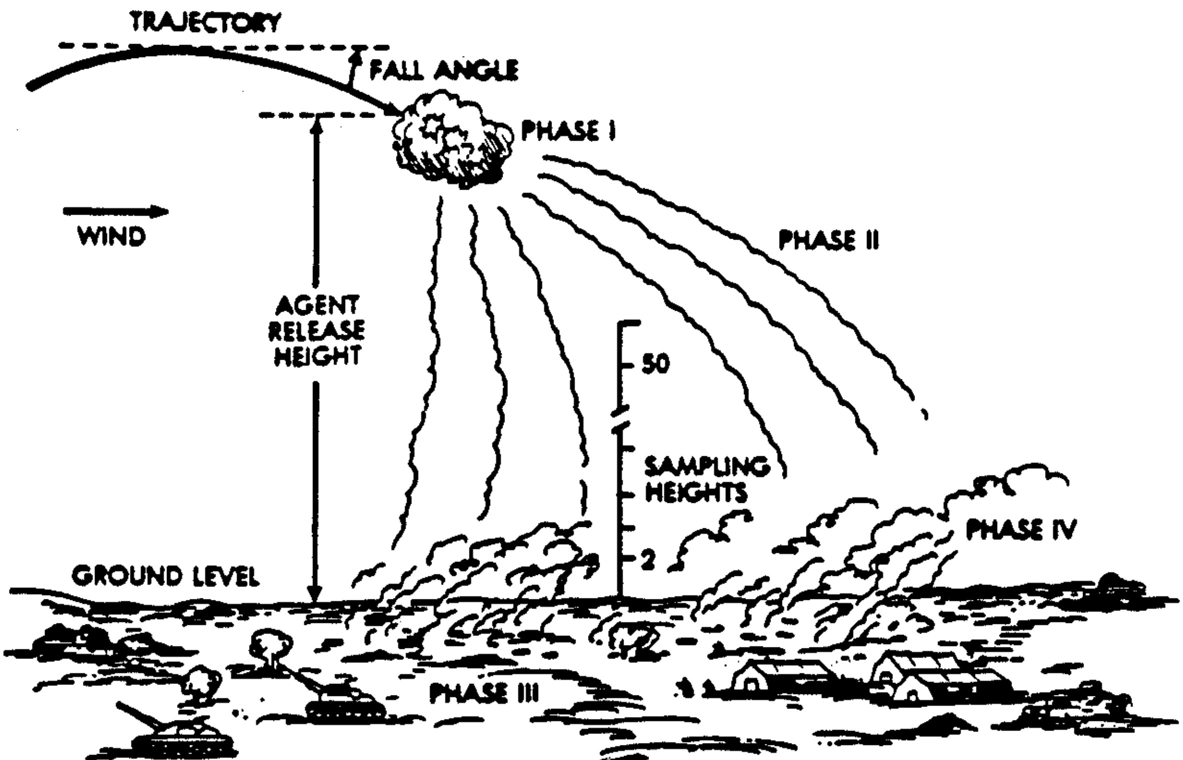

Figure 11. ~~(U)~~ Illustration of four phases of chemical hazards.

~~(S)~~ In this representative attack, [redacted] The contamination resulting from a chemical attack such as portrayed here persists for the longest time when stable atmospheric conditions prevail. The difference in average temperature between comparable seasons in Europe and the Middle East which can be as great as 20 degrees, is the factor that causes the greatest difference in the chemical contamination shown in Table 6. [redacted]

Table 6. [redacted] Contamination profile of a missile filled with thickened soman.

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	MIDDLE EAST				EUROPE			
	Spring Morning	Spring Evening	Autumn Morning	Autumn Evening	Spring Morning	Spring Evening	Autumn Morning	Autumn Evening
Deposition (liquid)								
Length of contaminated area (km) downwind	5	6	7	5	5	5	11	5
Maximum deposition (g/m^2)	2	1	3	2	3	2	3	3
Largest droplet (microns)	5500	5500	5400	5500	5500	5500	5500	5500
Last impact time (min)	13	11	11	12	14	13	16	14
Total evaporation time (hr)	18	11	16	9	126	70	98	64
Dosage (vapor)								
Length of contaminated area (km) downwind	104	135	152	105	99	111	243	104
Maximum dosage (mg-min/m^3)	290	120	660	220	430	290	600	370

[redacted] As shown in this table, liquid contamination covers an area several thousand meters long. [redacted] windspeed has a great influence on the length of the contaminated area downwind.

[redacted] In addition to the liquid deposition hazard, a vapor hazard results from the chemical munition, and it extends over an area two orders of magnitude larger than the liquid. Although the maximum vapor dosages extend over only a small area, the chemical cloud encompasses large areas, but with smaller dosages. The computer generated agent deposition curves in Figure 12 are for a typical spring morning in Europe.

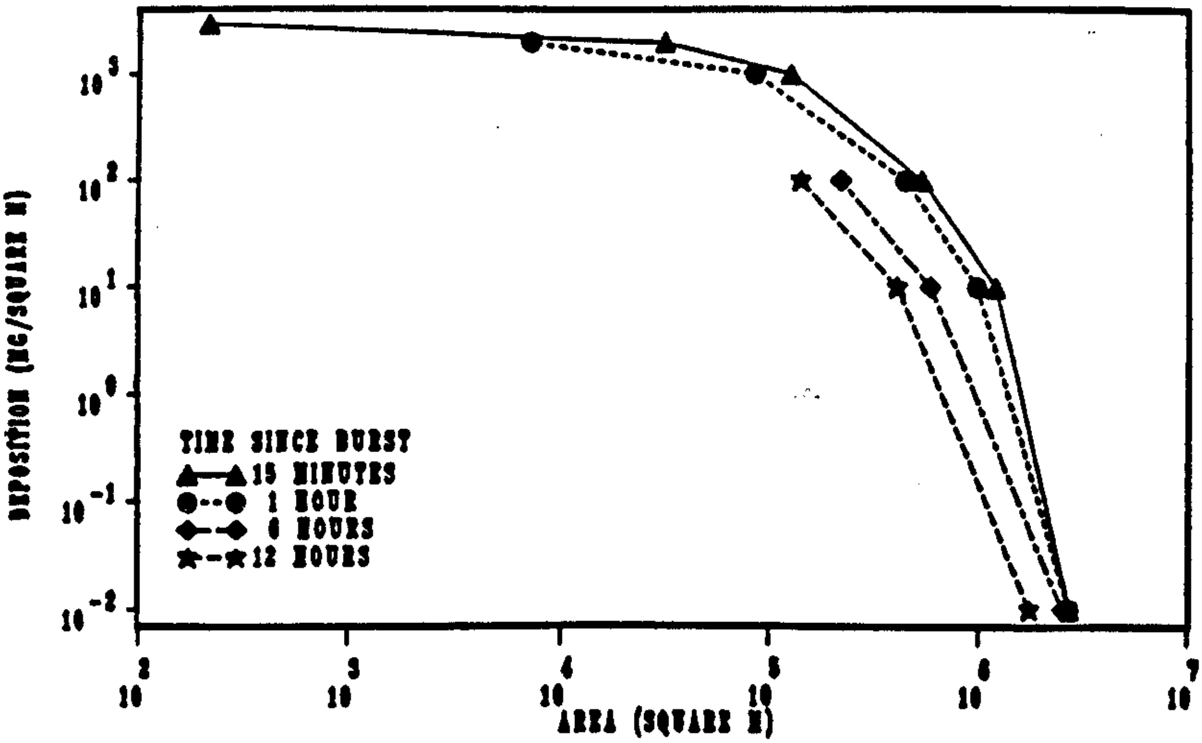

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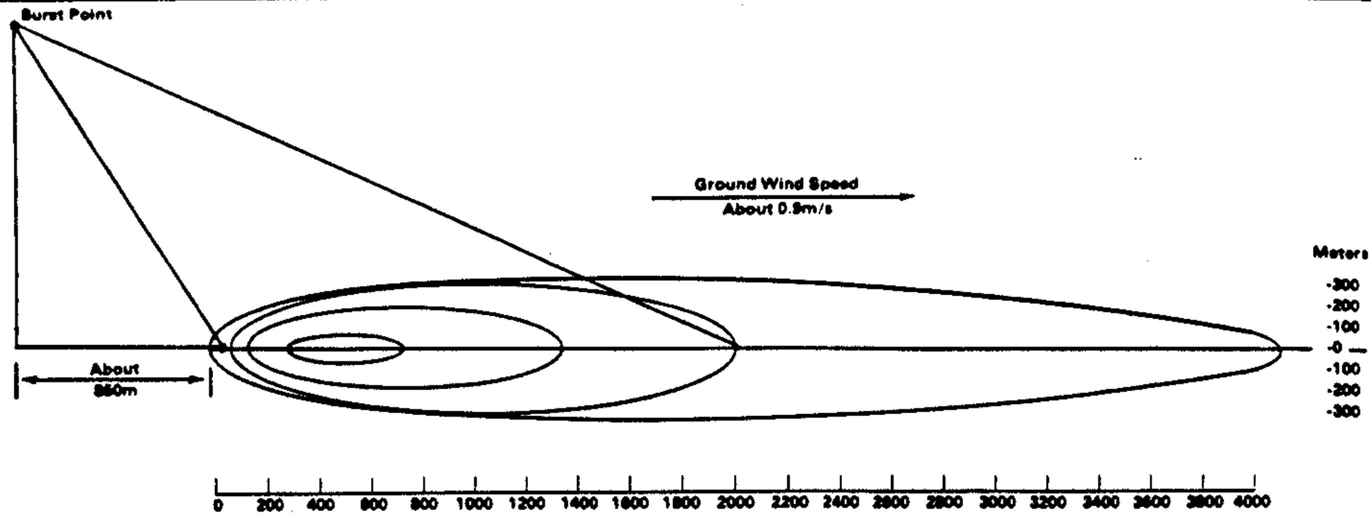
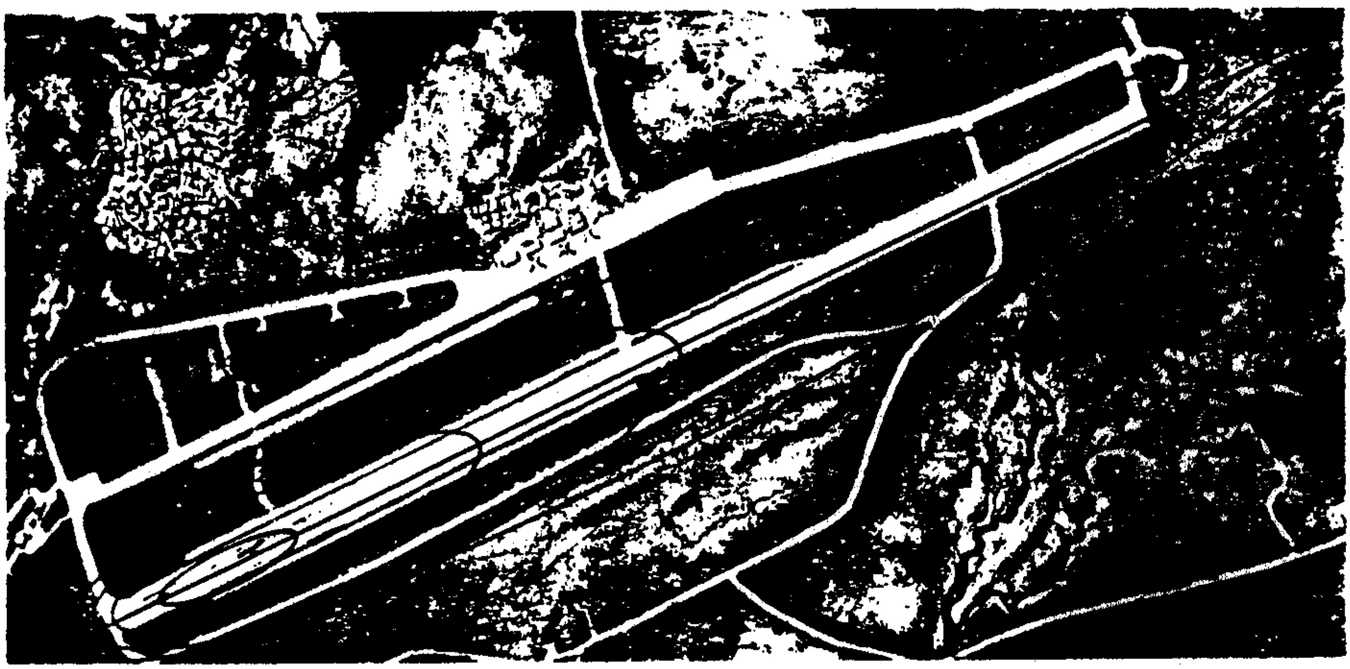
Figure 12. ~~(U)~~ Area deposition curves - TGD-filled missile: temperate, neutral conditions, 4.7°C, 2.9 M/S.

~~(S)~~ [redacted], Figure 13 gives a picture of the expected SCUD-B contamination pattern derived from a deposition profile similiar to that described in Table 6. [redacted]





A SCUD-B ground contamination pattern is shown superimposed on a military runway. Operational flights from contaminated runways are extremely hazardous. In a chemical attack against a tactical airbase, several SCUB missiles would be used to ensure coverage.

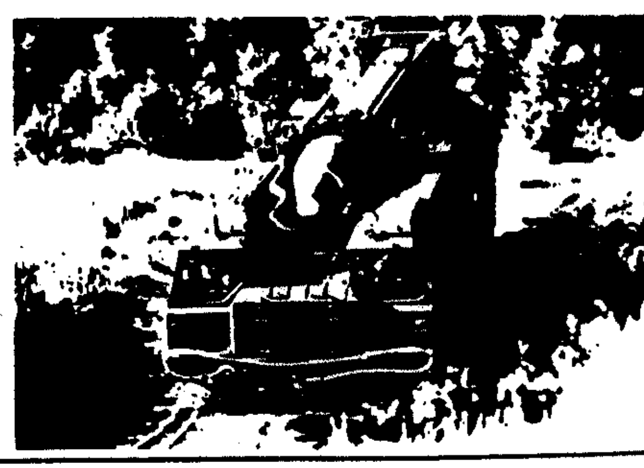


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Figure 13. ~~(U)~~ SCUD-B ground contamination pattern.

[redacted]

4.2 (~~S~~) SELECTED STUDIES ON CW AND CBWD

(~~U~~) In addition to casualties that result from direct exposure to lethal chemical agents stemming from lack of, misuse, or damage to the protective ensemble, degradation of individual and unit efficiency can be attributed to several inherent characteristics associated with the individual items that comprise the IPE. These are:

- (U) Heat stress or heat buildup due to the insulating qualities of the overgarment, its weight and bulkiness,
- (U) Respiratory stress due to the air resistance of mask filters and outlet valves and moisture buildup within the mask,
- (U) Reduced dexterity in the forearm portion of the overgarment and reduced manual dexterity and tactile sense due to gloves,
- (U) Restriction of movement due to the overboots,
- (U) Restricted vision and hearing due to mask design.

(U) Each of these factors, including possible exposure to chemical agents, must be addressed and alleviated if the mission is to be accomplished.

(U) [redacted]

4.2.1 (U) Sortie Generation and CW Attack

(U) During the past several years, a number of studies and tests have been conducted to assess the effect of CW and CBWD on sortie generation and airbase operations. Most of these focus on one or two of the functions associated with sortie generation (as depicted in Figure 9) or with air base operations.

(S) [redacted]

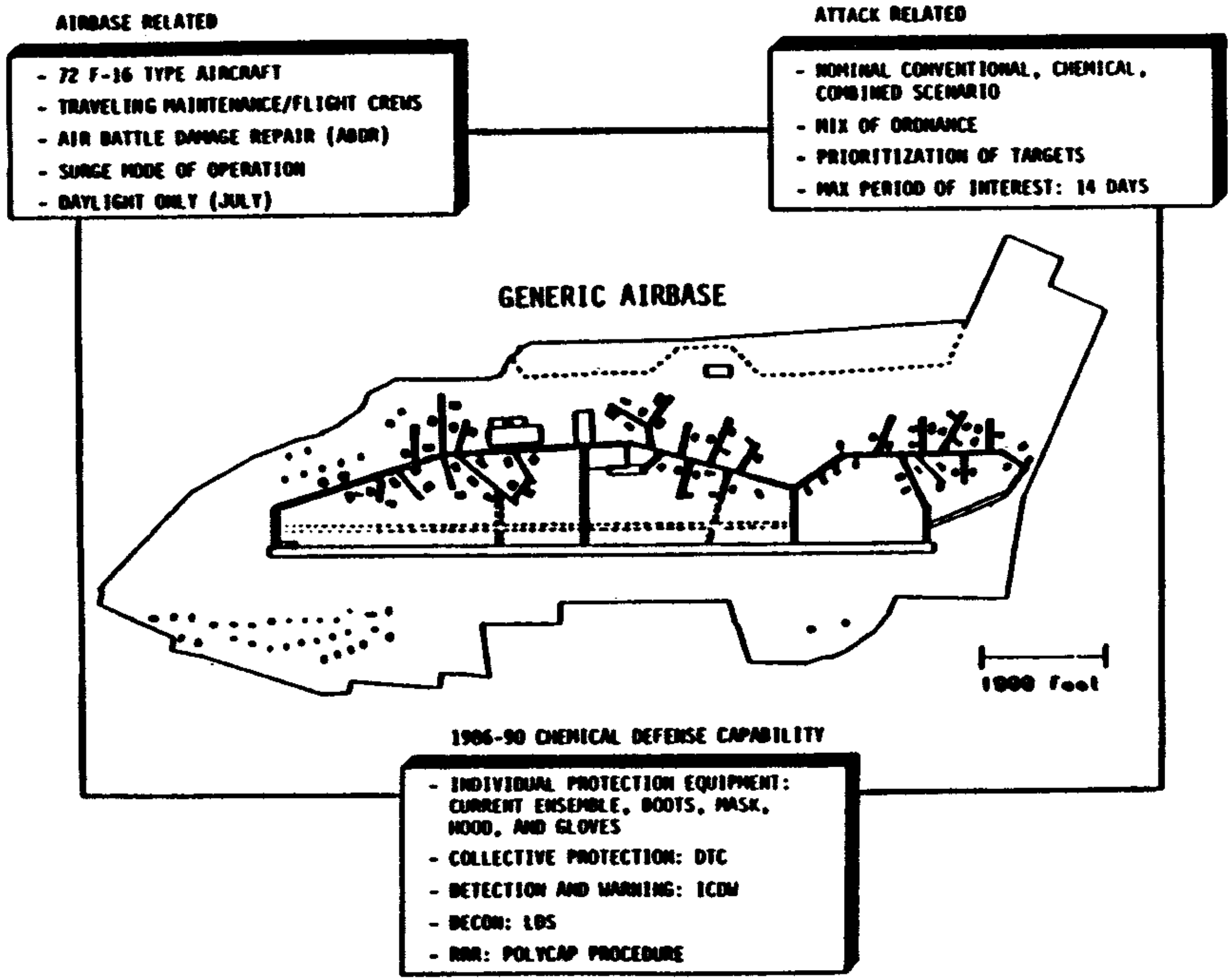

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Figure 14. (~~U~~) Inputs and assumptions: baseline summary.

[redacted]

~~(U)~~ The overall results of the study are as follows:

- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(S)~~ [redacted]
- ~~(U)~~ Partial DECON for aircrew ingress and egress seems to be adequate;
- ~~(U)~~ Improved aircraft maintenance, operational procedures and training will significantly enhance sortie generation;
- ~~(U)~~ Dispersed basing may reduce the impact of the chemical attack;

[redacted]

~~SECRET~~

Figure 15. 1986-1990 chemical defense capabilities assessment: sorties per day.

[redacted]

~~SECRET~~

Figure 16. 1986-1990 chemical defense capabilities assessment: cumulative sorties.

(U) • Sortie rate begins to degrade with announcement of a chemical agent threat.

(S) The estimates and predictions of the mission analysis study are corroborated by many of the other tests and analyses listed in the Appendix that address the following areas of degradation:

(S) • [redacted]

(S) • [redacted]

(S) • [redacted]

(S) • [redacted]

(S) • [redacted]

(S) • [redacted]

(S) [redacted]

[redacted]

~~(U)~~ The remainder of this section discusses the effect that the degradation to mission would have on NSNF and, in particular, on the PACAF DCA [redacted]

4.3 ~~(U)~~ EFFECT OF CW ON DCA OPERATIONS [redacted]

~~(S)~~ [redacted]

~~(S)~~ [redacted]

[redacted] The foregoing is the situation if the airbase had warning or had instituted a MOPP readiness level as part of an increasing Defense Condition; without warning or preparation, the scenario would be significantly worse.

~~(S)~~ [redacted]

~~(S)~~ [redacted]

SECTION 5
~~(U)~~ FIXES (WORKAROUNDS) AND IMPROVEMENTS FOR CW OPERATIONS

5.1 ~~(U)~~ GENERAL.

~~(U)~~ The approach to improved DCA capability in a CW environment essentially has two thrusts: fixes and workarounds using current equipment, and longer term improvements based on new equipment in all CBWD functional areas, i.e., individual protection equipment (IPE), detection and warning (D&W), collective protection (CP), contamination control (CC), and medical and equipment design.

5.2 ~~(U)~~ SHORT TERM FIXES.

~~(S)~~ Fixes and workarounds intended to improve current operations in a CW environment must be focused on "fixing" those symptoms and conditions that studies, analyses and tests have shown to be most detrimental to mission accomplishment, [redacted] There is no question that D&W, MOPP Level procedures and CW operational guidelines must be in place to provide the foundation for combat operations in a CW environment. Other factors and processes that need fixes to ensure DCA mission capability are discussed below.

5.2.1 ~~(U)~~ Training.

~~(S)~~ [redacted] crews, [redacted] must be prepared to operate in a CW environment for extended periods. Their training in a simulated CW environment should include scenarios that require [redacted] the duration of this training period should be at least 72 hours. [redacted] will be a major factor in their readiness to conduct operations in a CW environment.

5.2.2 (~~U~~) Collective Protection (CP).

(~~S~~) [redacted]

(~~S~~) [redacted]

5.2.3 Contamination Control (CC).

~~(S)~~ [redacted]

~~(S)~~ [redacted]

[redacted]

The expansion of [redacted]

5.2.4 ~~(U)~~ Individual Protective Equipment (IPE).

~~(S)~~ [redacted]

[redacted]

(~~S~~) [redacted] fixes (workarounds) to degradation caused by use of IPE that if taken would raise confidence [redacted]. They are as follows:

(~~S~~) • CBWD Equipment [redacted] all personnel will be available to assist in sortie generation and air base operations, or be available to relieve exhausted ICT, BDR, maintenance and RRR personnel, or have the equipment required for ensemble changes after exposure to toxic agents. [redacted] additional sets of [redacted] operations as follows:

-- [redacted]

-- Overgarments [redacted] ensure availability [redacted] being decontaminated and to cover loss due to damage;* and

-- Gloves at [redacted] to cover damage that [redacted], BDR and RRR tasks [redacted]

(~~S~~) • Personnel Allowance. Standard tables of organization describe the number of personnel in standard organizational units such as aircraft maintenance teams and RRR teams.

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* (~~S~~) [redacted]

[redacted]

- Contamination Control. [redacted] plans must be made to provide for rest, relaxation, personal hygiene, etc., for at least selected groups of personnel essential to sortie generation and airbase operations [redacted] move selected personnel [redacted] to toxic free areas where IPE and equipment can be decontaminated and personnel rested until ready to return to airbase operations.

- Improvisation. [redacted] there will be very high thermal loading for [redacted] under conditions of intense combat in a CW environment. This is especially true for heavy equipment operators [redacted] These same concepts can be applied to the heavy equipment used by RRR teams to enhance the capability of these teams to operate in a CW environment.

5.3 LONG TERM FIXES.

New generations of CBWD equipment that are moving into the inventory now and in the 1990 timeframe offer the best solutions for [redacted] operations in a CW environment and consequently provide higher confidence [redacted] These improvements will occur in all CBWD functional areas but some, [redacted]

(U) For this study, the most important of these improvements involve CP, IPE and decontamination.

5.3.1 (U) Collective Protection (CP).

(U) [redacted] the absolute need for collective protection [redacted] This is especially true for aircraft wings [redacted]. SCPS-2 should be modified and supported as recommended [redacted]

5.3.2 (U) Individual Protective Equipment (IPE).

(U) [redacted]. This should substantially reduce the degradation caused by current IPE. [redacted]

[redacted] is by far the best current answer to the fatigue and degradation problems attendant with the current standard ensemble. [redacted], this suit may very well be the prototype ensemble for personnel [redacted] who must operate in highly toxic environments over extended periods of time during combat.

5.3.3 (~~S~~) Decontamination.

(~~S~~) [redacted] Since fixed installations cannot avoid contaminated areas as can mobile forces, their capability to decontaminate is very important. [redacted] The additional complication caused by current decontamination methods is that [redacted]

(~~S~~) The full implication of this situation may not be readily apparent to airbase personnel. [redacted]

[redacted]

~~(S)~~ [redacted]

~~(U)~~ If the actions described herein are taken by the USAF and DCA commanders [redacted], then the DCA forces [redacted] will not only be able to conduct sustained operations in a CW environment, but will be able to carry out their nuclear mission under any chemical warfare conditions.

SECTION 6
(U) CONCLUSIONS AND RECOMMENDATIONS

6.1 (U) INTRODUCTION.

(U) This study has investigated the probable effect of CW on the capability of USPACOM NSNF, [redacted] This section summarizes the results of this investigation and suggests appropriate actions that might be considered by USCINCPAC.

6.2 (U) CONCLUSIONS.

[redacted]

(U) [redacted] This is equally

applicable to any facility [redacted] collective protection features. [redacted] would be similarly affected if they were without CP or the means to decontaminate equipment and munitions. [redacted] in high firing rate situations would face the same fatigue and heat load degradation documented herein for airbase heavy work situations [redacted] In each instance, disruption by CW of the functions necessary for the operation of a particular element [redacted] would severely delay if not halt its ability [redacted] This would be especially true for personnel ill prepared and trained to operate in a CW environment when faced with a high intensity combat situation.

6.3 (U) RECOMMENDATIONS.

(U) The fixes, workarounds and equipment procurements described in Section 5 can alleviate degradations to operational performance caused by CW. These measures, which can be pursued by USPACOM's field commands and service components, comprise hardware, training, and operational improvements. Additionally, there are three areas where actions can be taken directly by USCINCPAC to significantly improve the capability of NSNF to operate in a CW environment. These are 1) the USPACOM Major Exercise Program, 2) NSNF Dispersal Planning, and 3) CW Retaliation Plans.

6.3.1 (U) USPACOM Exercise Program.

(U) Lack of training in a sustained CW environment [redacted] is a major factor in degradation to task performance, casualties and personnel fatigue. This report outlines the type of training that [redacted] should practice on a routine basis. Through his major CPX and field exercise program, USCINCPAC could verify and promote CW training by component forces by requiring that each major exercise include a sustained period of CW play that tests the performance of all CW and CBWD operations under conditions that require the highest level MOPP for all participants. [redacted] Such a program would provide the rationale for future requisitioning action and/or direct submission to the Secretary of Defense of shortfalls in [redacted] capability stemming from the lack or inadequacy of CBWD equipment.

6.3.2 ([redacted]) NSNF Dispersal Planning.

[redacted]

[redacted]. These options, if expanded to include portable CBWD collective protection and decontamination equipment, would also serve [redacted] survivability in a CW environment. [redacted]

[redacted]

~~(S)~~ [redacted]

6.3.3 ~~(S)~~ CW Retaliation Planning.

~~(S)~~ [redacted] One of the major tenets in US CW retaliation planning is that chemical weapons will be used to convince an enemy who initiates CW to cease CW operations. To do this effectively requires swift, sure retaliation with chemical munitions.

~~(S)~~ [redacted]

~~(S)~~ [redacted]

[redacted]

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