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MINUTES

HIGH POWER RADIO FREQUENCY (HPRF)
PHASE 2 STUDY GENERAL MEETING 95-1 (# 12)
31 JANUARY - 1 FEBRUARY 1995

Keith M. Baird
HPRF Study Director

NUCLEAR ADVANCED CONCEPTS BRANCH
NUCLEAR WEAPONS INTEGRATION DIVISION
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DOE b(3) & DTRA & USAF

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HIGH POWER RADIO FREQUENCY PHASE 2 STUDY GENERAL MEETING 95-1 (#12)

31 JANUARY - 1 FEBRUARY 1995

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HIGH POWER RADIO FREQUENCY
PHASE 2 STUDY GENERAL MEETING 95-1 (#12)

31 JANUARY - 1 FEBRUARY 1995

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MINUTES

HIGH POWER RADIO FREQUENCY
PHASE 2 STUDY GENERAL MEETING 95-1 (#12)

31 JANUARY - 1 FEBRUARY 1995

I. (U) INTRODUCTION. The High Power Radio Frequency (HPRF) Phase 2 Study General Meeting 95-1 (#12) was hosted by the Department of Energy Albuquerque Operations Office (DOE AL), Albuquerque NM on 31 January-1 February 1995. Mr Keith Baird, HPRF Study Director, Nuclear Weapons Directorate, Nuclear Weapons Integration Division (NWI), chaired the meeting.

A. (U) Administration. Mr Baird welcomed the attendees and Mr Dennis Umshler, DOE AL, provided administrative information. A special thanks to Mr Umshler and DOE AL for hosting the meeting. The meeting agenda and list of attendees are attached as Appendices A and B, respectively.

B. (U) Executive Working Group Membership. All members and observers or their representatives, except for the Det 10 Space and Missile Center, Ogden Air Logistics Center, and Phillips Laboratory were present. Current members and observers, and their organizations are identified in Appendix C.

C. (U) Meeting Objectives. Mr Baird presented the objectives for the general meeting and the follow-on Executive Working Group (EWG) meeting (Appendix D).

1. (U) **General Meeting Objective.** The objective was to give the Working Group Chairmen an opportunity to present their group results and conclusions and allow for comments and discussion from all study group participants. Special attention should be given to the Vulnerability Working Group (VWG) test data impact on the Foreign Asset Assessment Team (FAAT) estimates and the VWG/Mission Analysis Working Group (MAWG) agreement on the use of the data in the measures of effectiveness (MOEs) selected for all four mission areas.

2. (U) **EWG Meeting Objective.** The objective was to discuss all options available on the study at this time and reach consensus on which option to pursue and the approach to be taken. The most probable option is to complete the study as planned and draw on the group's expertise to make the appropriate recommendations.

II. (U) DISCUSSION TOPICS.

A. (U) **Program Update.** Mr Baird reviewed the study's schedule/milestones and specific questions that need to be answered as a result of the study (Appendix E).

1. (U) **Schedule/Milestones.** Some study milestones and final report input dates (Appendix E) have slipped since the last meeting. An EWG meeting is planned for 22 March 1995 at the United States Strategic Command (USSTRATCOM) to discuss study conclusions and recommendations. The EWG members will review the final report in April/May 1995, and the final report will be published and distributed in June 1995. Briefings to various organizations will follow the final report distribution in July 1995.

DOE
b(1)

B. (U) **Security Classification Guidance.** Mr Bill Plummer, Sandia National Laboratories (SNL) provided information associated with the HPRF security classification guidance (Appendix F). The draft HPRF classification guide is included in Appendix F to support Working Group Chairmen in classifying their final report inputs. Since the HPRF Classification Guide will not be finalized in time to use in the study's final report, report inputs should be classified at the highest level based on approved referenced guides. Section V of the HPRF Classification Guide, previously presented at the meeting in Colorado Springs on 22 September 1994 and in the minutes of that meeting on

page 40, has been updated and is shown in Appendix F along with the previous version for comparison purposes. Classifiers should be sure to use the highe classification.

C. (U) Surety Working Group Final Report. USAF b(1)

presented a summary of the SWG's final report (Appendix G). The SWG used a Quality Function Deployment (QFD) approach to evaluate surety of HPRF warhead candidates in the areas of nuclear detonation safety, operational safety, nuclear material dispersal and use control. QFD is a relatively new methodology as applied to Phase 1 and Phase 2 studies. As the study proceeded, candidate designs changed in accordance with the QFD evaluation measures. To the extent that the design changes were valid, the ongoing QFD evaluation positively contributed to developing better candidate designs.

1. (U) Nuclear Detonation Safety. The six HPRF safety themes fall into three general groups. DOE b(3)

The remaining three candidates, which use the most modern safety enhancements, scored the highest by implementing safety technology that addresses known safety soft spots in the stockpile.

2. Operational Safety. Results of the operational safety QFD evaluation revealed desirable features which could enhance candidate safety design. DOE b(3) & DTRA & USAF

USAF **3. (U) Nuclear Material Dispersal.** USAF b(1)

DTRA b(1) DOE b(3)

All other candidates are considered to have more dispersal safety and are equivalent in terms of plutonium dispersal. DOE b(3) & DTRA & USAF

4. [redacted] Use Control. Both systems engineering and use control features of candidate designs were evaluated. From the use control perspective, Category (CAT) F Permissive Action Link (PAL) candidates scored the highest. DOE b(3) & USAF

Both the New Mexico and California teams provided candidates with composite scores that were generally comparable. Use control is not a significant discriminator in candidates, but it has emphasized the communication issues between the missile and the warhead as well as documenting differences in use control architectures and technologies. Resolution of CAT F PAL comparability and interface issues is difficult. The SWG recommends a joint DOE/Department of Defense (DoD) study or panel to address the main issue on use control or CAT F PAL comparability as it applies to an Intercontinental Ballistic Missile (ICBM) weapon system. The issue is how much CAT F PAL like use control is already designed into the ICBM system to include its launch control facility and launch control center when compared to the real threat.

DOE b(3)

5. (U) Overall QFD Evaluation of Candidates.

New Mexico candidates

featuring the latest ENDS technology scored the highest.

DOE b(3) & DTRA & USAF

There was no significant difference with the candidates in use control.

DOE b(1) & DTRA & USAF

1. (U) Military Characteristics. The MCs state the performance requirements and physical characteristics for those parts of the HPRF warhead that are the sole responsibility of the DOE to design, develop, certify, and produce. The draft MCs were written to ensure unresolved issues get addressed during Phase 2A of the program. The draft MCs were written in a two-column format. The left-hand column contains the MC requirement and the right-hand column documents any remarks/comments associated with the MC requirement. The purpose for this format is to ensure MC concerns and/or issues identified during Phase 2 are fully documented.

DOE b(3) & DTRA & USAF

2. (U) Unique Issues. The HPRF Phase 2 Study has shown there are issues unique to the HPRF warhead when compared with other warheads. In writing the MCs and STS, it became apparent to the Study Director and RWG that these issues needed to be documented during Phase 2 for review in Phase 2A of the program.

DOE b(3) & USAF

[redacted] DOE b(3) & USAF

[redacted] It was decided at this meeting to have the MAWG cover the MOE issues in their final report, since the MOEs specifically apply to the four mission areas. [redacted] DOE b(3) & USAF

3. (U) **Stockpile-to-Target Sequence.** The STS document provides the DOE and the Air Force with requirements, design goals, and supplemental data which amplify the MCs by providing additional detailed information necessary for development of the HPRF warhead. [redacted] DOE b(3)

[redacted] The STS provides the description of the logistics, employment concepts, and associated environments the HPRF warhead has to live with. The environmental requirements reflect the most current environmental threat data until better information becomes available.

E. [redacted] **Systems Engineering Working Group Final Report.** [redacted] DOE b(3) & DTRA & USAF

USAF b(1)

DOE b(3) & DTRA & USAF

1. [redacted] **Use Control.** There are technical options up to CAT F PAL in the various warhead candidates but many issues need further study. There is currently no consensus on the definition of CAT F PAL comparable system. Assumptions regarding existence of the Minuteman III Guidance Replacement Program (GRP) are critical.

DTRA b(3)

the greater the impact on the existing Minuteman III communication system. If the GRP is implemented, however, the existing power delivery and communication system can be used. The use control data and safety intent signals can piggyback on the GRP hardware. The SEWG recommends a joint DoD/DOE study on use control for the Minuteman III system.

DOE b(3) & DTRA & USAF

2. (U)

Solutions satisfying the physics requirements discussed earlier are technically feasible.

DOE b(3) & USAF

DOE b(3) & USAF

3. (U) **Warhead Packaging.**

UAS 2 820 3 8.18

4. (U) **Missile Integration.**

RA (1)

The payload support deck design must

be reviewed. The warhead to missile interface is critical in implementing use control and nuclear safety.

DOE b(3) & DTRA & USAF

5. **Flight Performance.** The flight performance results are based on calculations not flight tests.

DOE b(3) & DTRA & USAF

6. (U) **Nuclear Safety.** The goal for nuclear safety was to propose designs with ENDS, IHE and FRP technology.

DOE b(3)

DOE b(3) & DTRA USAF

7. (U) **Other Issues.**

The question of flight testing needs further exploration but could be performed if required.

F. (U) **Warhead Design Working Group Final Report.**

USAF b(1)

and Dr Michael Bernardin, LANL, presented results of the high level vulnerability test pogram and conclusions of the New Mexico design team candidates (Appendix J). The California design team portion of the final report was not presented, since it was presented at a previous meeting.

DOE b(3) & DTRA & USAF

1. [redacted] **New Mexico Candidates Output.** The New Mexico design team concentrated on four design candidates during the study.

DOE b(3)

2. [redacted] **Vulnerability Test Program Results.**

TRA b(1)

Details of the test results and limitations will be included in the final report. Also, included will be a statement on "first shot" effects and repeatability of results.

USAF b(1)

3. [redacted] **New Mexico Design Team Candidates Conclusions.** Detailed conclusions and lessons learned on each of the three New Mexico candidates are included in Appendix J.

DOE b(3) & DTRA & USA

G. [redacted] **Vulnerability Working Group Final Report.** Dr Phil Castillo, Logicon/RDA, presented a summary of the VWG's final report (Appendix K). The objectives of the VWG were to develop vulnerability data to support the MAWG, identify appropriate MOE criteria, and update and validate vulnerability models from the Phase 1 study.

DOE b(3) & DTRA & USAF

1. [redacted] The study approach used analysis and empirical data to estimate the probability of effect for systems of interest. Data was gathered by the FAAT and vulnerability test program.

DOE b(3) & USAF

DOE b(3) & DTRA & USA

DTRA & DOE b(3) & USA

DTRA & DOE b(3) & USAF

2. [redacted]

DOE b(3) & DTRA USAF

Preliminary results are presented in paragraph II.H.1 of these minutes. Findings and conclusions are currently pending.

3. [redacted]

DOE b(3) & DTRA & USAF

Results describe tests of possible fault mechanisms and suggests likely thresholds. Conclusions of the assessment are presented in paragraph II.H.2 of these minutes.

4. [redacted]

DOE b(3) & DTRA USAF

The Level of effort has not been as high as other mission areas throughout the study. Preliminary results are presented in paragraph II.H.3 of these minutes. Findings and conclusions are currently pending.

DOE b(3) & DTR & USA

H. [redacted] **Mission Analysis Working Group Final Report.**

This study can not demonstrate a difference in overall kills

DOE b(3)

between the current baseline and any of the warhead candidate design options.

DTRA & USAF

DOE b(3)

1. [redacted]

TRA & SAF

DOE b(3)

2. [redacted]

TRA & SAF

DOE & DTRA & USAF

These values are one form of a MOE for these environments.

DOE b(3) & DTRA & USAF

3. [redacted]

DOE b(3) & DTRA & USAF

I. (U) **Executive Working Group Session.** Mr Baird, NWI, led a discussion of study conclusions and recommendations with the EWG members. It was agreed that the Working Group Chairmen would provide conclusions and recommendations including any follow-on activities of their study areas to the Study Director by 15 February 1995. The Study Director will distribute the conclusions/recommendations to the EWG members for their review prior to the next EWG meeting on 22 March 1995 at USSTRATCOM. An initial list of working group conclusions and recommendations is provided below.

1. (U) SWG Conclusions/Recommendations.

a. (U) Safety evaluation of all warhead candidates was completed.

b. (U) Use control needs study for strategic systems (existing and new systems).

2. (U) SEWG Conclusions/Recommendations.

a. (U) Technical options for system integration have been identified.

b. (U) Trade-offs are required to achieve optimum point design.

3. (U) **WDWG Conclusions/Recommendations.**

a. (U) Several concepts were examined.

DOE b(3) & DTRA & USAF

4. (U) **VWG Conclusions/Recommendations.**

DOE b(3) & DTRA & USAF

c. (U) Tri-Services methodology provides roadmap for evaluation (limitations with level of completeness identified).

DOE b(3) & DTRA & USAF

5. (U) **MAWG Conclusions/Recommendations.**

DOE b(3) & DTRA & USAF

b. (U) Hard and fast conclusions are problematical.

III. (U) <u>ACTION ITEMS.</u> There were four action items closed from previous meetings. Three action items remain open from previous meetings. No new action items were assigned at this meeting.

DOE b(3)

DTRA & USAF

This action item is closed.

USAF b(1)

(U) 94-3-1. Assigned to EWG Membership. Review and provide comments/additions on accuracy and completeness of draft HPRF Security Classification Guide to HPRF Study Director. A subgroup made up of SNL, LANL, LLNL, NWI and FCDNA has been formed to review guide. Mr Bill Plummer, SNL (NM), provided information on HPRF security classification guidance. This action item is **closed.**

(U) 94-4-1. Assigned to Working Group Chairmen. Identify all documentation that supports working group inputs to include that published as part of the study as well as that referenced in either the final report or supporting reports. This information is being provided with the final report inputs. This action item is **closed.**

DOE b(3) & USAF

(U) 94-4-2. Assigned to LANL, Dr Calahan

DTRA

In mid-December 1994 only part of system was in country. USSTRATCOM says rest of system is now in country. Defense Intelligence Agency says system has been tested. **Suspense: 28 February 1995.**

(U) 94-4-3. Assigned to LANL, Dr Calahan. Visit study test agencies to obtain appropriate sets of transfer functions for each test item for use in candidate optimization evaluation. Transfer functions have been obtained on all test items except for one set of transfer functions at the Phillips Laboratory. **Suspense: 7 February 1995.**

(U) 94-4-4. Assigned to LANL, Dr Bernardin. Prepare quantitative results of candidate performance using each candidates output and transfer functions from action

item 94-4-3 to determine candidate performance. If the transfer functions are provided on 7 February 1995, then the quantitative results will be completed on 15 February 1995. **Suspense: 15 February 1995.**

DOE b(3)
DTRA & USAF

This action item is **closed.**

IV. (U) **NEXT MEETING.** There will be an HPRF Phase 2 Study EWG Meeting on 22 March 1995 at USSTRATCOM to discuss overall study conclusions and recommendations.

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APPENDIX A
AGENDA

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APPENDIX B
LIST OF ATTENDEES

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HPRF Mtg 95-1 Attendance 31 JANUARY 1995 @ DOE/AL

Agency	Rank	First Nar	Last Name	DSN	Phone #	FAX #	City or Base	ST	ZIP Code
Dept of Defense									
USSTRATCOM/J533	Mr	Stan	Gooch	271-[illegible]	294-5254	294-6148	Offutt AFB	NE	68113-6500
USSTRATCOM/J5231	Maj	Steven	Langer	271-[illegible]	294-8304	294-1323	Offutt AFB	NE	68113-6500
FCDNA/FCPR	LtCol	Mark	Cranfill	246	846-8584	846-8611	Kirtland AFB	NM	87117-5616
FCDNA/FCPRA	Capt	Skip	Langbehn	246-[illegible]	846-8584	846-8611	Kirtland AFB	NM	87117-5616
US AIR FORCE									
SAF/AQQS(N)	LtCol	Billy W.	Mullins	223-[illegible]	693-6303	695-0220	Washington	DC	20330-1060
HQ AFSPC/DOXN	Capt	Kirk	Dickenson	692-[illegible]	554-3776	554-5079	Peterson AFB	CO	80914-4120
HQ AFSPC/DOXN	Maj	John T.	Valverde	692-[illegible]	554-5995	554-5079	Peterson AFB	CO	80914-4120
SA-ALC/NWIW	Mr	Keith	Baird	246-[illegible]	846-6767	846-4620	Kirtland AFB	NM	87117-5617
SA-ALC/NWIW	Mr	Frank	Carrillo	246-[illegible]	846-6767	846-2038	Kirtland AFB	NM	87117-5617
US ARMY									
US ARMY ARDEC	Mr	Philip	Angelotti	880-[illegible]	724-5451	724-2375	Picatinny Arsnl	NJ	07806-5000
US NAVY									
Dept of Navy, SSPO	Mr	Richard	Hess		742-4929	743-0072	Sunnyvale	CA	94088-3504
Dept of Energy									
DOE/HQ, DP-12	Dr	Alvin	Baker		903-8455	903-5658	Germantown	MD	20874-5000
DOE/AL-WPD	Mr	Dennis	Umshler		845-4740	845-6459	Albuquerque	NM	87185-5400
Los Alamos Nat Labs									
LANL/X-5	Dr	Michael	Bernardin		667-1439	665-7725	Los Alamos	NM	87545-2345
LANL	Mr	Troy	Eddleman		667-6811		Los Alamos	NM	87544
LANL	Mr	John	Hutchinson		665-3665	665-2017	Los Alamos	NM	87545-2345
LANL	Dr	Ronald	McFee		667-1682	665-2227	Los Alamos	NM	87545-2345
LANL/NWT	Mr	Thomas	Scheber		665-0045	665-2213	Los Alamos	NM	87545-2345
LANL	Mr	Ed	Whitted		665-0038	665-2017	Los Alamos	NM	87545-5000

HPRF Mtg 95-1 Attendance 31 JANUARY 1995 @ DOE/AL

Agency	Rank	First Nar	Last Name	DSN	Phone #	FAX #	City or Base	ST	ZIP Code
Livermore Nat Labs									
LLNL/L-153	Dr	Mike	Ong		422-0206	423-5080	Livermore	CA	94550-0808
LLNL	Mr	Steven	Patonacure		422-6698	423-5864	Livermore	CA	94551-0808
LLNL/L-13	Dr	Joe	Sefcik		423-0671	423-0925	Livermore	CA	94550-0808
LLNL	Dr	D. Lynn	Shaeffer		422-2092	423-5804	Livermore	CA	94550-0808
Sandia Labs (NM)									
SNL(NM)	Mr	Jerrry	Adams		844-3662	844-2189	Albuquerque	NM	87185-0482
SNL(NM)	Dr	Roger	Breeding		844-1532	844-8867	Albuquerque	NM	87185-0405
SNL(NM)	Dr	Jerry	Cuderman	244-[illegible]	844-8063	844-8745	Albuquerque	NM	87185-0482
SNL(NM)	Mr	Dave	Fordham		844-8968	844-9293	Albuquerque	NM	87185-0417
SNL(NM)	Mr	Larry	Moore			844-9524	Albuquerque	NM	87185-0486
SNL(NM)	Mr	Kazuo	Oishi	244-[illegible]	844-0159	844-8745	Albuquerque	NM	87185-0482
SNL(NM)	Mr	William	Plummer		845-8356	844-1977	Albuquerque	NM	87185-0175
SNL(NM)	Mr	Jim	Solberg	244-[illegible]	844-1135	844-7857	Albuquerque	NM	87185-0865
Sandia Labs (CA)									
SNL(CA)	Dr	Jim	Hogan		294-2853	294-1015	Livermore	CA	94550-0969
CONTRACTORS									
Teledyne Brown	Mr	Jack	Bogusch	246-[illegible]	846-8575	846-8611	Albuquerque	NM	87117
Logicon/RDA	Dr	Phil	Castillo		842-8156	242-4121	Albuquerque	NM	87119-5000
Orion International Te	Mr	Mike	Rafferty		881-2500	881-5060	Albuquerque	NM	87110-6501
KSC,Adv Electronics	Dr	F.C.	Yang		450-5772	450-2553	Santa Monica	CA	90405

APPENDIX C
EXECUTIVE WORKING GROUP MEMBERSHIP

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APPENDIX D
MEETING OBJECTIVES

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Meeting Objective

To give the Working Group Chairman an opportunity to present their groups results and conclusions allowing for comments and discussion from all study group participants. Close attention should be given to the VWG test data impact on the FAAT estimates. Particular attention should be given to VWG/MAWG agreement on the use of that data in the MOEs selected for all four mission areas.

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EWG Meeting Objective

To discuss all options available on the HPRF Phase 2 Feasibility Study at this time and reach consensus on which one to take and how we get there. Most probable option is to complete study as planned and draw on groups expertise to make the appropriate recommendations.

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APPENDIX E
PROGRAM UPDATE

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SCHEDULE/MILESTONES

HPRF Phase 2 Study Milestones

	Milestone	Due	Complete	Remarks
☐	**Meetings**			
☑	Completed Meetings			12 mtgs completed fr 11 Aug 92 Planning Mtg
☐	Future Meetings			
☐	STRATCOM EWG Conclusions Mtg	3/22/95		Offutt AFB, Omaha, NE
☐	NWI EWG Final Mtg to review report	5/16/95		Albuquerque, NM
☐	**Working Groups Milestones**			
☑	RWG	12/15/94	1/24/95	Summary & Draft Report
☐	SWG	1/17/95	2/2/95	Draft Report, Summary due 15 Feb 95
☐	WDWG	12/15/94	1/31/95	Draft Report, Summary due 15 Feb 95
☐	SEWG	1/17/95	1/31/95	Summary, Draft Report due 1 Mar 95
☐	VWG	2/28/95		Summary, Draft Report due 31 Mar 95
☐	MAWG	2/28/95		Summary, Draft Report due 31 Mar 95
☐	**Reports**			
☑	Mid Term Report		2/2/94	Complete & Distributed
☐	Final Report			
☑	Draft Layout & Content		5/3/94	
☑	Receive WG Outlines		5/31/94	
☐	Prepare Draft	7/1/94	4/14/95	
☐	Distribute Draft		4/21/95	
☐	Final to printer		5/31/95	
☐	Distribute		6/15/95	
☐	**Briefings**			
☑	Mid-Term Briefings			
☐	Final Briefings			
☐	SAF/AQQ	7/11/95		Wash DC
☐	NWCSC	7/12/95		Wash DC
☐	HQs DOE	7/13/95		Wash DC
☐	HQs DNA	7/13/95		Wash DC
☐	AFSPC	7/25/95		Colorado Springs, CO
☐	USSTRATCOM	7/31/95		Omaha, NE

Working Group Inputs to Final Report

31 January 1995

Working Group Items Due	Date Due	Date Received
RWG		
MCs**	15 Dec 94	24 Jan 95
STS**	15 Dec 94	24 Jan 95
Unique Issues*	15 Dec 94	24 Jan 95
Summary for Study Group Report*	15 Dec 94	24 Jan 95
SWG		
Draft SWG Final Report***	17 Jan 95	2 Feb 1995
Summary for Study Group Report*	15 Feb 95	
Final SWG Report****	31 Mar 95	
SEWG		
Draft SEWG Final Report***	1 Mar 95	
Summary for Study Group Report*	17 Jan 95	31 Jan 1995
Final SEWG Report****	31 Mar 95	
WDWG		
Draft WDWG Final Report**	15 Dec 94	31 Jan 1995
Summary for Study Group Report*	15 Feb 95	
Final WDWG Report**	31 Mar 95	
VWG		
Draft VWG Final Report***	31 Mar 95	
Summary for Study Group Report*	28 Feb 95	
Final VWG Report****	28 Apr 95	
MAWG		
Draft MAWG Final Report***	31 Mar 95	
Summary for Study Group Report*	28 Feb 95	
Final MAWG Report****	28 Apr 95	

* Dist to Study Group Chairman & included in main body of Study Group Report.

** Dist to Study Group Chairman & included in appendix of Study Group Report.

*** Distributed to Executive WG (21 copies required).

**** Published as separate stand alone report & distributed to list established.

Note: WG summary & Final Reports will be paragraph classified marked.

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APPENDIX F
SECURITY CLASSIFICATION GUIDANCE

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FORMERLY RESTRICTED DATA
UNAUTHORIZED DISCLOSURE SUBJECT
TO ADMINISTRATIVE AND CRIMINAL
SANCTIONS. HANDLE AS RESTRICTED
DATA IN FOREIGN DISSEMINATION
SECTION 144B, ATOMIC ENERGY ACT

USA

APPENDIX G

SURETY WORKING GROUP FINAL REPORT

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SURETY WORKING GROUP REPORT

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January 31, 1995

SANDIA NATIONAL LABORATORIES

SWG Approach, Activities

- Used QFD approach to evaluate surety of warhead candidates
  - Nuclear Safety
  - Operational Safety
  - Material Dispersion
  - Use Control
- All evaluations complete and peer reviewed
- Completed 1st draft of SWG final report: SWG reviewed it on January 11
- Draft #2 is complete

DOE b(3)

PRELIMINARY NUCLEAR SAFETY ASSESSMENT OF HPRF

EVALUATION CRITERIA	Weight												
DIRECT INITIATION RESISTANCE	5	2	10	1	5	2	10	-1	-5	1	5	1	5
INSENSITIVITY OF DETONATORS	2	0	0	1	2	2	4	-1	-2	1	2	1	2
ER THERMAL RESISTANCE	10	2	20	2	20	2	20	0	0	1	10	1	10
ER MECHANICAL RESISTANCE	10	2	20	1	10	2	20	0	0	0	[illegible]	1	10
SL DISCRIMINATION	5	2	10	2	10	2	10	-1	-5	-1	[illegible]	-1	[illegible]
SL BYPASS RESISTANCE	8	2	16	1	8	1	8	-2	-16	0	0	0	0
STRONGLINK LOCATION	8	0	0	2	16	0	0	0	0	2	16	2	16
WEAKLINKS	6	0	0	2	12	1	6	0	0	0	0	0	0
TOTAL		10	76	12	83	12	78	-5	-28	4	28	5	38
Weighted Total													

NUCLEAR DETONATION SAFETY

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APPENDIX H

REQUIREMENTS WORKING GROUP FINAL REPORT

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APPENDIX I
SYSTEMS ENGINEERING WORKING GROUP
FINAL REPORT

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APPENDIX J
WARHEAD DESIGN WORKING GROUP
FINAL REPORT

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NEW MEXICO CANDIDATES OUTPUT

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VULNERABILITY TEST PROGRAM RESULTS

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NEW MEXICO DESIGN TEAM CANDIDATES
CONCLUSIONS

Subject:
Warhead Candidates (U)

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JOHN H. BROWNELL
X-6 GROUP LEADER

APPENDIX K
VULNERABILITY WORKING GROUP
FINAL REPORT

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Vulnerability Working Group

Preliminary Findings and Conclusions

Field Command, Defense Nuclear Agency
31 Jan 95

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Topics of Discussion

- Background and Objectives
- Mission Area Descriptions
- FAAT Analysis Method
- Vulnerability Test Program
- Summary Vulnerability Assessments
- Preliminary Conclusions
- Remaining Activities

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VWG Objectives

- Develop vulnerability data to support Mission Analysis Working Group
- Identify appropriate measure of effectiveness (MOE) criteria
- Update and validate vulnerability models from the Phase 1 study

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Primary Participants by Mission Area

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HPRF Phase 2 Study

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FAAT Methodology

- Threat Characteristics
- Susceptibility (strength)
- Limitations

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VWG

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- By Target Class
- Stress Distributions
- Strength Distributions
- Probability of Effect/Confidence

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Accomplishments

- Tested 15 systems/subsystems and obtained data for model updates
- Defined measures of effectiveness together with the Mission Analysis Working Group
- Updated vulnerability models used in Phase 1 based on test data
- Developed interface between vulnerability and mission analysis models to support simulation-based studies (P_e statistics)

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Preliminary Conclusions

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Preliminary Conclusions
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- The equipment which was tested is less susceptible than predicted in the Phase 1 study

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- **Findings and conclusions pending input from SNL**

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- Mission area conclusions pending input from LLNL

- Findings and conclusions pending input from SNL

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Final Steps

- Remaining mission area inputs are necessary to complete vulnerability report
- Updated schedule for study group final report input and working group report

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APPENDIX L
MISSION ANALYSIS WORKING GROUP
FINAL REPORT

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Sandia National Laboratories

HPRF PHASE II MEETING *(U)*
MISSION ANALYSIS

David Fordham
Sandia National Laboratories
Strategic Offense Studies

January 31, 1995

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NATIONAL SECURITY INFORMATION Unauthorized disclosure subject to Administrative and Criminal Sanctions. Classified by: W.H. Ling.

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MEASURES OF EFFECTIVENESS

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DAMAGE ASSESSMENT
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- Results are low confidence

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WHEN IT RAINS, IT POURS

After a long drought, I find myself flooded with models

- Possible causes:
  - Units
  - Strength esitmates

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CHARACTERIZATION OF VULNERABILITY INPUTS

WILL THEY JUSTIFY ANY CONCLUSION

- There is no test data available for damage assessment purposes

- Estimates are conservative

  - anecdoctal evidence suggests quality lapses exist

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APPENDIX M

RESPONSE TO AI 94-4-5

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ATTN: G BAKER/TAIC 6801 TELEGRAPH ROAD ALEXANDRIA VA 22310-3398	6
FCDNA ATTN: S LANGBEHN/FCPRA	7
ATTN: J WARZINSKI/FCPRA 1680 TEXAS STREET SE KIRTLAND AIR FORCE BASE NM 87117-5616	8
AIR FORCE	
SAF/AQQS(N) ATTN: W MULLINS 1060 AIR FORCE PENTAGON WASHINGTON DC 20330-1060	9
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SA-ALC ATTN: K BAIRD/NWIW	11-15
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US DOE/DP-12 ATTN: A BAKER PO BOX A GERMANTOWN MD 20874-5000	33
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ATTN: M BERNARDIN/X-5/MAIL STOP B259	34
ATTN: K CALAHAN/AT-9/MAIL STOP H818	35
ATTN: T EDDLEMAN/MAIL STOP F664	36
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ATTN: C MANGENG/NWT/MAIL STOP F630	38
ATTN: R MCFEE/MAIL STOP B220	39
ATTN: T SCHEBER/NWT/MAIL STOP F630	40
ATTN: E WHITTED/TSA-5/MAIL STOP F602	41
MAIL STOP 5000 (CLASSIFIED) PO BOX 1663 LOS ALAMOS NM 87545-2345	

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ATTN: M ONG/L-153/PO BOX 808/LIVERMORE CA 94550-0808	46
ATTN: J SEFCIK/L-13/PO BOX 808/LIVERMORE CA 94550-0808	47
ATTN: L SHAEFFER/L-313/PO BOX 808/LIVERMORE CA 94550-0808	48
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ATTN: D FORDHAM/4113/MAIL STOP 0417/PO BOX 5800/ALBUQUERQUE NM 87185-0417	51
ATTN: L MOORE/5122/MAIL STOP 0486/PO BOX 5800/ALBUQUERQUE NM 87185-0486	52
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ATTN: W TEDESCHI/5161/MAIL STOP 0482/PO BOX 5800/ALBUQUERQUE NM 87185-0482	55
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KAMAN SCIENCES CORPORATION ATTN: C DEJONG PO BOX 7463 COLORADO SPRINGS CO 80933-7463	59
KAMAN SCIENCES CORPORATION ATTN: F C YANG 2800 28th STREET, SUITE 370 SANTA MONICA CA 90405	60

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ORION INTERNATIONAL TECHNOLOGIES, INCORPORATED ATTN: J M RAFFERTY 6501 AMERICAS PARKWAY NE, SUITE 200 ALBUQUERQUE NM 87110-5372	63