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19 April 1993

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WILLIAM A. LAMB, Captain, USAF
Nuclear Weapons Concepts Division
HPRF Phase 2 Study Director

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High Power Radio Frequency (HPRF) Phase 2 Study, Meeting #4 Minutes (U), OAS-MM-93-1, 18 Mar 93, (S-RD-CNWDI-NF-WN)

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ROGER F. KROPF, Major, USAF
Chief, Nuclear Weapons Concept Division

JERRY G. COLYER
Technical Director,
Office of Aerospace Studies

(b3)

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High Power Radio Frequency (HPRF) Phase 2 Study

Meeting #4 Minutes (U)

18 March 1993

Captain William A. Lamb

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Meeting #4 Minutes (U)

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(U) ACKNOWLEDGMENTS

(U) I would like to take this opportunity to thank Dr. Joe Sefcik of Lawrence Livermore National Laboratory, Livermore, California, who hosted the third meeting of the HPRF phase 2 Study. Additionally, Ms Jennifer Petersen, also of Lawrence Livermore National Laboratory was a great help during the meeting. Their efforts prior to and during the meeting helped immensely and were appreciated by all in attendance.

(U) INTRODUCTION

(U) The Nuclear Weapons Concept Division of the Office of Aerospace Studies (OAS/XRN) conducted meeting #4 for the High Power Radio Frequency (HPRF) Phase 2 Study on 16-18 March 1993. The meeting was held at Lawrence Livermore National Laboratoty in Livermore, California. The purpose of the meeting was to convene working groups, review working group progress, and update the program status. The individual working groups met during the first two days of the meeting. A general session was held on the final day. The agenda for the general session is contained in appendix A.

(U) These meeting minutes document meeting #4 and include copies of presentations. Additionally, a list of attendees is provided in appendix B. The meeting highlights are presented in the following sections.

(U) The issues discussed during the meeting dealt with the progress of the working groups, funding aspects of phase 2 work, information requirements for warhead design and system engineering work. The study director requested that each working group chair provide milestone statements. The warhead design work will continue, with the final design decision coming after more information becomes available with the optional tradeoffs. The options for engineering will continue until the configuration of the warhead and its employment are decided

(U) CLASSIFICATION AND SECURITY

(S-RD) The study director, Capt Lamb, presented an overview of the classifications involved in the HPRF Phase 2 Study. Specifically, each individual involved in this study needs to be aware of the proper classification of the materials generated or produced. The classification guides for this study are listed on the front of this report.

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requires that the unclassified material not be released that can give uncleared individuals information to piece together classified information.

(U) SURETY WORKING GROUP

(S) The presentation slides are included in appendix C. Members of the System Engineering Working Group (SEWG) attended the SWG meetings. The SWG decided to limit its efforts to the evaluation of Nuclear Safety and Use Control aspects of surety, but not physical security since the systems being considered do not have new or unusual physical security requirements.

Use control is included because DOE requires it for weapons in its custody. The Farr study recommendations may make it required for DOD. Action on use control is deferred until these requirements are defined by DOE and DOD.

(U) The Phase 2 SWG evaluation approach is to use Quality Factors Development (QFD). The members and alternates of the working group received training on February 22 and 23. On February 24, they then met to identify and define the requirements. On March 16 and 17, the SWG met to define the measures by which the achievement of the requirements are judged. Additional work in this area was identified. Difficulty was encountered in defining measures which apply to different safety subsystem implementations. The details of measurement are not the same for both and may even be incompatible. A apparent promising approach is to evaluate different systems using a "broad brush" in an initial evaluation, then in subsequent iterations add details a required. A meeting of the SWG is planned prior to the next general meeting to continue work on defining measures.

(U) REQUIREMENTS WORKING GROUP

(S) The Requirements Working Group (RWG) met during the second day of the working group meetings.

The working group reviewed the action items from their previous meeting and reviewed changes to the draft Stockpile to Target Sequence (STS) document. The review of the draft STS brought about action items for members of the working group. The Military Characteristics (MCs) will be updated at the next working group meeting. The external action items from the RWG are included in the action item section of this report.

(U) SYSTEM ENGINEERING WORKING GROUP

(S-RD) These inputs are provided as appendix D. As stated previously, the SEWG met with the

SWG during the working group session. During the SEWG meeting, working group members discussed the design options available. A review of the solution for the baseline design and the variables for the design were discussed. Additionally, three options for Limited Life Component (LLC) exchange were presented with the preferred option identified.

b(1) DOE, DTRA USAF

The meeting discussions centered on the formulation of design questions and scheduling of the system integration tasks. The design questions will initially be sent to identified points of contact with a response expected within the month. The SEWG needs inputs from the Mission Analysis Working Group (MAWG) and WDWG to determine the timeline of events for design information.

(U) WARHEAD DESIGN WORKING GROUP

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Third, warhead design certification is a consideration. Considerable time during the meeting was spent discussing the certification procedure and the limitations imposed with the testing moratorium. Military characteristics (MCs) of the HPRF device need to be identified as soon as possible so flexibility's in design can be identified and design tradeoffs considered. The work involved doing parallel designs could be maximized with a decision about the MCs. Action items external to the working group are provided in the action item section this report.

(U) MISSION ANALYSIS WORKING GROUP

(U) The Mission Analysis Working Group (MAWG) met during the working group sessions. The areas discussed included the activities since the last meeting, the status of the mission need statement (MNS), and the modeling work completed within the working group. The draft MNS is being worked at Headquarters, Air Combat Command (ACC) to identify a deficiency in the capability to complete an Air Force mission.

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However, it is important to note that a phase 2 study does not require a MNS.

(S) Work on mission modeling is continuing in the areas defined for the study.

b(3) DOE, US AF DTRA

b(3)
DOE, USAF, DTRA

The MAWG and VWG are working together to insure the information being provided will satisfy their needs. Action items external to the MAWG are provided in the action item section this report.

(U) VULNERABILITY WORKING GROUP

(S) [redacted] USAF b(1)

His slides are provided in appendix H. The results of work completed since the previous meeting were presented. The phase 2 integrated test program was discussed at length to determine the status of individual test programs. The work by all organizations involved is proceeding as identified in the test plan. Problem areas within testing of foreign assets will be identified as soon as possible to remedy any issues involved. Future meetings to conduct FAAT analysis of foreign assets are scheduled. [redacted] b(3) DOE, USAF DTRA

Action items external to the VWG are provided in the action item section this report.

(U) ACTION ITEMS

(U) Table 1 provides the list of action items assigned during meeting #4. The action items assigned during previous meetings are listed in table 2. Figure 1 shows a timeline for the study.

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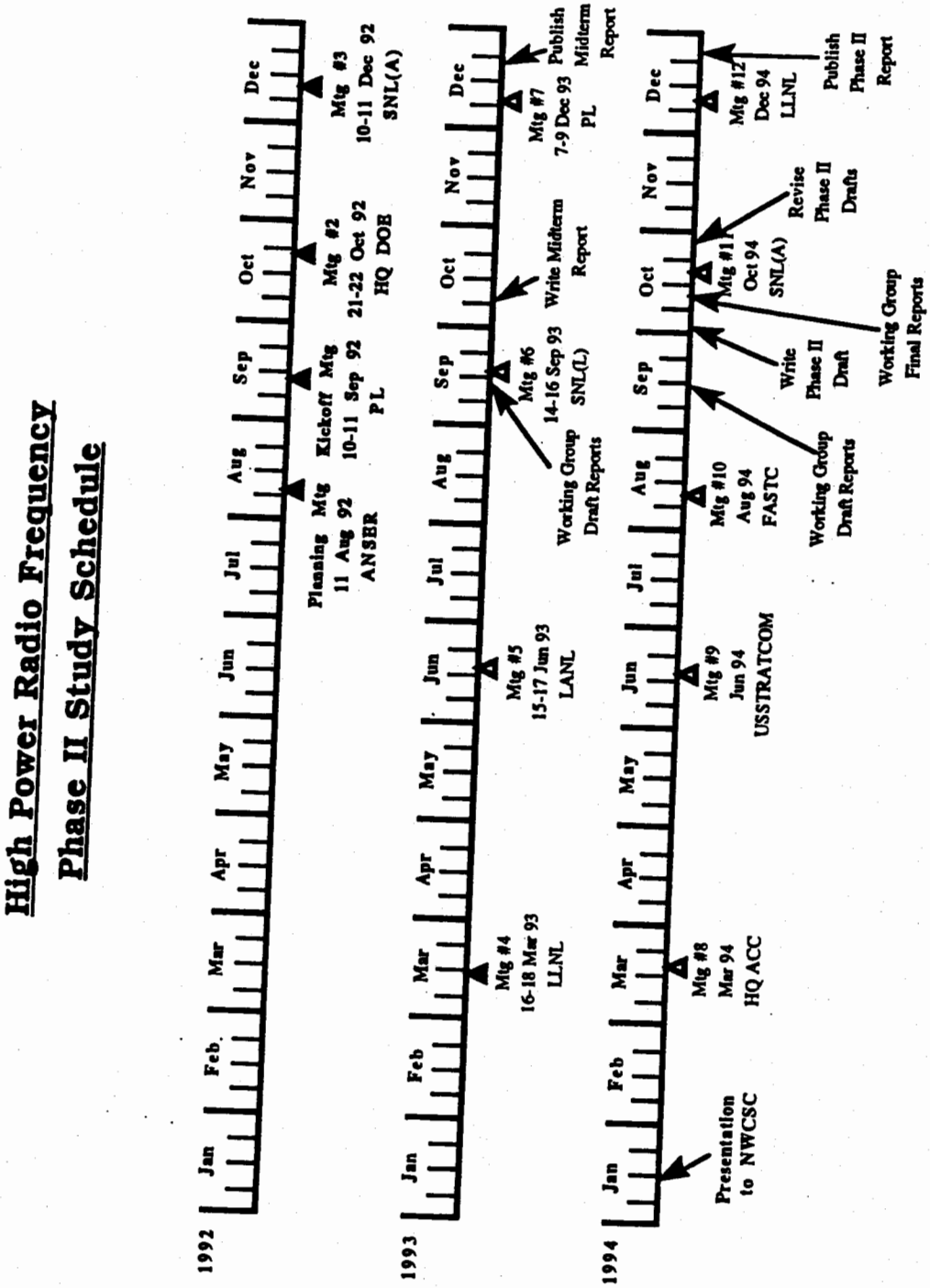

Figure 1. (U) HPRF Phase 2 schedule.

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APPENDIX A

(U) MEETING AGENDA

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High Power Radio Frequency Phase 2 Study

Agenda - March 18, 1993

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APPENDIX B

(U) MEETING ATTENDANCE LIST

High Power Radio Frequency Phase 2 Study
Meeting #4, 18 March 1993
Attendance List

	Name/Initials	Address *For Classified Mailings*	Phone Numbers
1	Ade, Ed Initials EA 1680	FCDNA/FCSAC ~~1909~~ Texas St SE 5516 Kirtland AFB NM 87117-~~5669~~	Com: (505) 846-8575 DSN: 246-8575 FAX: (505) 846-8611
2	Andersen, John Initials	Sandia National Laboratories, Albuquerque ~~Division~~ 5161, PO Box ~~585~~ 5800 Albuquerque NM 87185-5800 Dept.	Com: (505) 844-0391 DSN: 244-0391 FAX: (505) 844 8745
3	Angelotti, Philip Initials	Commander, US ARMY ARDEC, ~~SMAR-FS9-E~~ SMCAR-FSS-E Picatinny Arsenal NJ 07806-5000	Com: (201) 724-5451 DSN: 880-5451 FAX: (201) 724-2996
4	Atchison, Walt Initials WA	FCDNA/FCPRA 1800 Texas St SE Kirtland AFB NM 87117-5000	Com: (505) 846-8584 DSN: 246-8584 FAX: (505) 846-8611
5	Baker, Al Initials	DOE/HQ, DP-25 PO Box A Germantown MD 20874	Com: (301) 903-6937 DSN: FAX: (301) 903-5658
6	Baker, George Initials	HQDNA/RAEE 6801 Telegraph Rd Washington DC 22310	Com: (703) 325-6622 DSN: 221-6622 FAX: (703) 325-2959
7	Bernardin, Michael Initials	Los Alamos National Laboratory, X-2 PO Box 1663, MS B259 Los Alamos NM 87545	Com: (505) 667-1439 DSN: FAX: (505) 665-7725
8	Bland, Mike Initials	Lawrence Livermore National Laboratory L-13, PO Box 808 Livermore CA 94550	Com: (510) 422-9882 DSN: FAX: (510) 423-5080
9	Cabayan, Hriar Initials HSC	Lawrence Livermore National Laboratory L-13, PO Box 808 Livermore CA 94550	Com: (510) 422-8871 DSN: FAX: (510) 422-5576 STU III (510) 422-2988
10	Calahan, Ken Initials	Los Alamos National Laboratory Mail Station 5000, MS-H818, PO Box 1663 Los Alamos NM 87545	Com: (505) 665-4297 DSN: FAX: (505) 667-8207
11	Castillo, Phil Initials	Logicon/RDA PO Box 9377 Albuquerque NM 87119	Com: (505) 842-8156 DSN: FAX: (505) 242-4121
12	Chen, Ken Initials	Sandia National Laboratories, Albuquerque Division 2753 Albuquerque NM 87185-5000	Com: (505) 844-8133 DSN: 244-8133 FAX: (505)
13	Chow, Charles Initials	Lawrence Livermore National Laboratory L-125, PO Box 808 Livermore CA 94550	Com: (510) 422-4639 DSN: FAX: (510) 422-8185

1

14	Colvin, Roger Initials_____	FCDNA/FCPRW Kirtland AFB NM 87115	Com: (505) 846-8575 DSN: 246-8575 FAX: (505) 846-8611
15	Crawford, Mike Initials_____	ATSD(AE) Pentagon, Room 3C124 Washington DC 20301-5000	Com: (703) 695-7936 DSN: 225-7936 FAX: (703)
16	Cuderman, Jerry Initials_____	Sandia National Laboratories, Albuquerque Division 5161, PO Box ~~598~~ Albuquerque NM 87185-5800	Com: (505) 844-8063 DSN: 244-8063 FAX: (505)
17	DeJong, Clifford Initials COO	Kaman Sciences PO Box 7463 Colorado Springs CO 80933	Com: (719) 599-1932 DSN: FAX: (719) 599-~~1436~~ 1420
18	Ericksen, David Initials_____	OO-ALC/LMAA Attn: May Wilcox Hill AFB UT 84056	Com: (#) 777-1752 DSN: 458-1752 FAX: (#) 777- 1974
19	Fattor, Todd Initials_____	OL-NS/ENM 1651 First St SE Kirtland AFB NM 87117-5617	Com: (505) 846-6767 DSN: 246-6767 FAX: (505) 846-4620
20	Fordham, Dave Initials_____ Dept.	Sandia National Laboratories, ~~Albuquerque~~ ~~Division~~ 4113, PO Box 58~~8~~00 Albuquerque NM 87185-5800	Com: (505) 844-8968 DSN: 244-8968 FAX: (505) 844-9293
21	Gazda, Joe Initials_____	DOE/HQ, DP-251 PO Box A Germantown MD 20874	Com: (301) 903-2984 DSN: FAX: (301) 903-5658
22	Gooch, Stan Initials_____	USSTRATCOM/J541 901 SAC Blvd Offutt AFB NE 68113-6500	Com: (402) 294-2580 DSN: 271-2580 FAX: (402)
23	Gutierrez, Sam Initials_____	PL/WSM Bldg 909 Kirtland AFB NM 87117-6008	Com: (505) 846-4823 DSN: 246-4823 FAX: (505) 846-7836
24	Guzik, Joyce Initials_____	Los Alamos National Laboratory, X-2 X-2, Mail Stop B220, PO Box 1663 Los Alamos NM 87545-2345	Com: (505) 667-8927 DSN: FAX: (505)
25	Haertling, Mike Initials_____	Los Alamos National Laboratory, ~~X-2~~ WX-1 WX-1, ~~PO Box~~ 5000, MS C936 Los Alamos NM 87545-2345	Com: (505) 667-0592 DSN: FAX: (505) 667-1878
26	Henson, Doug Initials_____	Sandia National Laboratories, Livermore Division 5371, PO Box 969 Livermore CA 94550	Com: (510) 294-2729 DSN: FAX: (510) 294-1015
27	Hoffman, Jim Initials_____	Sandia National Laboratories, Albuquerque Division 1208, PO Box 588 Albuquerque NM 87185-5800	Com: (505) 845-7055 DSN: FAX: (505) 845-7003

28	Hogan, Jim Initials JH	Sandia National Laboratories, Livermore Division 5371, PO Box 969 Livermore CA 94550	Com: (510) 294-2853 DSN: FAX: (510) 294-1015
29	Howard, Joseph Initials_____	Los Alamos National Laboratory Mail Station 5000, Attn: A-5, MS-F602 Los Alamos NM 87545	Com: (505) 667-6451 DSN: FAX: (505) 667-2017
30	Hughes, Peter Initials_____	OAS/XRS 2350 Maxwell St SE Kirtland AFB NM 87117-6008	Com: (505) 846-8233 DSN: 246-8233 FAX: (505) 846-4668
31	Kammerdiener, John Initials_____	Los Alamos National Laboratory Los Alamos NM 87545	Com: (505) 667-2213 DSN: FAX: (505)
32	Kaufman, Al Initials AMK.	Lawrence Livermore National Laboratory L-85, PO Box 808 Livermore CA 94550	Com: (510) 422-1599 DSN: FAX: (510) 423-0708
33	Keyser, Richard Initials_____	Los Alamos National Laboratory Mail Station 5000, MS-G780, PO Box 1663 Los Alamos NM 87545	Com: (505) 667-9582 DSN: FAX: (505) 667-7809
34	Kropf, Roger Initials RK	OAS/XRN 2350 Maxwell St SE Kirtland AFB NM 87117-6008	Com: (505) 846-7996 DSN: 246-7996 FAX: (505) 846-4668
35	Lamb, Bill Initials_____	OAS/XRN 2350 Maxwell St SE Kirtland AFB NM 87117-6008	Com: (505) 846-8330 DSN: 246-8330 FAX: (505) 846-4668
36	Lampe, Tim Initials TJL	USSTRATCOM/J5243 901 SAC Blvd, Suite L-118 Offutt AFB NE 68113-6500	Com: (402) 294-[illegible]5621 DSN: 271-[illegible]5621 FAX: (402) 294-1323
37	Lawry, Dean Initials_____	PL/WSR Kirtland AFB NM 87117-6008	Com: (505) 846-0273 DSN: 246-0273 FAX: (505) 846-0417
38	Lorang, Luke Initials_____	PL/WSA Kirtland AFB NM 87117-6008	Com: (505) 846-9768 DSN: 246-9768 FAX: (505) 846-4374
39	Mangeng, Carolyn Initials CM	Los Alamos National Laboratory Mail Station 5000, MS-F633, PO Box 1663 Los Alamos NM 87545	Com: (505) 667-3460 DSN: FAX: (505) 665-4833
40	Mardiguian, Armand Initials_____	SAF/AQQS(N) Pentagon Washington DC 20330-5040	Com: (703) 693-6303 DSN: 223-6303 FAX: (703) 697-7399
41	Martin, Charles Initials_____	SAF/AQQS(N) Pentagon Washington DC 20330-5040	Com: (703) 693-6303 DSN: 223-6303 FAX: (703) 697-7399
42	Martinez, Manuel Initials M.M.	Los Alamos National Laboratory Mail Station ~~5000, PO Box 1663~~ MS C936 Los Alamos NM 87545	Com: (505) 667-2019 DSN: FAX: (505) 667-1878

HPRF Meeting #4

43	McFee, Ronald Initials RLM	Los Alamos National Laboratory Mail Station 5000, MS-B220, PO Box 1663 Los Alamos NM 87545	Com: (505) 667-1682 DSN: FAX: (505)
44	Mercer-Smith, James Initials_____	Los Alamos National Laboratory X-2, Mail Stop B220, PO Box 1663 Los Alamos NM 87545	Com: (505) 667-9635 DSN: FAX: (505) 665-4080
45	Mo, Charles Initials_____	Logicon/RDA 6053 W Century Blvd, PO Box 92500 Los Angeles CA 90009	Com: (310) 645-1122 DSN: FAX: (310) 645-2553
46	Morgan, Mike Initials MM	HQ ACC/DONM 205 Dodd Blvd, Suite 101 Langley AFB VA 23665-2788	Com: (804) 764-~~6411~~ 6415 DSN: 574-~~6411~~ 6415 FAX: (804) 764-2088
47	Morris, Marvin Initials_____	Sandia National Laboratories, Albuquerque Division 2753, PO Box 588 Albuquerque NM 87185-5800	Com: (505) 844-8647 DSN: 244-8647 FAX: (505) 844-7857
48	Oishi, Kazuo Initials KO	Sandia National Laboratories, Albuquerque Division 5161, PO Box 5800 Albuquerque NM 87185-5800	Com: (505) 844-0159 DSN: 244-0159 FAX: (505) 844-8745
49	Oldham, Jim Initials_____	OO-ALC/LMAA Bldg 1258, Rm 4 Hill AFB UT 84056	Com: () DSN: FAX: () 458-1408
50	Okagawa, Bob Initials OKO	Los Alamos National Laboratory Mail Station 5000, PO Box 1663 Los Alamos NM 87545	Com: (505) 667-3545 DSN: FAX: (505) 667-9582
51	Ong, Mike Initials_____	Lawrence Livermore National Laboratory L-153, PO Box 808 Livermore CA 94550	Com: (510) 422-0206 DSN: FAX: (510) 423-5080
52	Powell, Chris Initials JLP	HQ ACC/DONM 205 Dodd Blvd, Suite 101 Langley AFB VA 23665	Com: (804) 764-~~6411~~ 6415 DSN: 574-~~6411~~ 6415 FAX: (804) 764-2088
53	~~Reilly, Kevin~~ KINKEAD, CHARLES Initials CK	HQ ACC/DONB 205 Dodd Blvd, Suite 101 Langley AFB VA 23665	Com: (804) 764-6411 DSN: 574-6411 FAX: (804) 764-7759
54	Robbins, Jack Initials_____	HQ ACC/DONM 205 Dodd Blvd, Suite 101 Langley AFB VA 23665	Com: (804) 764-6403 DSN: 574-6403 FAX: (804) 764-2088
55	Rolls, ~~Els~~ ELLSWORTH Initials RLR	OL-NS/ENN 1651 First St SE Kirtland AFB NM 87117-5617	Com: (505) 846-6767 DSN: 246-6767 FAX: (505) 846-~~4626~~ 2038 CFAX: 505-846-6767
56	Rouillard, Laurie Initials LWR	FCDNA/~~FCSRA~~ FCSAC 1168 ~~1000~~ Texas St SE 5616 Kirtland AFB NM 87117-~~5600~~	Com: (505) 846-8586 DSN: 246-8586 FAX: (505) 846-8611

4

57	Rueb, Karl Initials KKR	DOE/AL-WPD PO Box 5400 Albuquerque NM 87185-5400	Com: (505) 845-5189 DSN: 245-5189 FAX: (505) 845-5188
~~58~~	Sanders, Dave Initials DWS	BMO/~~MYSC~~ CYRR Norton AFB CA 92409-6468	Com: (714) 382-2231 DSN: 876-2231 FAX: (714) 382-5425
59	Selcik, Joe Initials	Lawrence Livermore National Laboratory L-13, PO Box 808 Livermore CA 94550	Com: (510) 423-0671 DSN: FAX: (510) 423-0925
60	Seyler, Don Initials	DOE/HQ DP 20.1, PO Box A Germantown MD 20874	Com: 0 DSN: FAX: 0
61	Shover, Don Initials	TRW Defense Systems Group, PO Box 1310 San Bernadino CA 92402	Com: (714) 382-6461 DSN: FAX: (714) 382-2867
62	Solberg, Jim Initials	Sandia National Laboratories, Albuquerque Division 5161, PO Box 588 Albuquerque NM 87185-5800	Com: (505) 844-1135 DSN: 244-1135 FAX: (505)
63	Tedeschi, William Initials	Sandia National Laboratories, Albuquerque Divsion 5161, PO Box 5800 Albuquerque NM 87185-5800	Com: (505) 845-9851 DSN: 244-9851 FAX: (505) 844-8745
64	Tingley, Tom Initials TT	FASTC/TACS 4115 Hebble Creek Rd., Suite 25 Wright-Patterson AFB OH 45433-5629	Com: (513) 257-3552 DSN: 787-3556 FAX: 0
65	Tran, Tyrone Initials	PL/WSR Kirtland AFB NM 87117-6008	Com: (505) 846-0299 DSN: 246-0299 FAX: (505) 846-0417
66	Tribou, John Initials	DOE/AL-NESD PO Box 5400 Albuquerque NM 87185-5400	Com: (505) 845-6360 DSN: 245-6360 FAX: (505) 845-4209
67	Vail, Pat Initials	PL/WSM Kirtland AFB NM 87117-6008	Com: (505) DSN: FAX: (505) 846-0566
68	VanVeldhuizen, Dave Initials	PL/WST Kirtland AFB NM 87117-6008	Com: (505) 846-9902 DSN: 246-9902 FAX: (505) 846-9900
69	Walker, Frank T. Initials 168	FCDNA/FCFA ~~1680~~ Texas St SE Kirtland AFB NM 87117-5669	Com: (505) 846-8883 DSN: 246-8883 FAX: (505) 846-4244
70	Walton, William Initials	PL/WSM Kirtland AFB NM 87117-6008	Com: (505) 846-4823 DSN: 246-4823 FAX: (505) 846-7836
71	Weitekamp, Mark Initials	HQDNA/RAEE 6801 Telegraph Rd Washington DC 22310	Com: (703) 325-6622 DSN: 221-6622 FAX: (703) 325-2959

5

72	Wendel, Arthur Initials_____	HQDNA/NOSA 6801 Telegraph Rd Washington DC 22310	Com: (703) 325-2004 DSN: 221-2004 FAX: (703) 325-4661
73	Whitted, Ed Initials EW	Los Alamos National Laboratory Mail Station 5000, MS-F602, PO Box 1663 Los Alamos NM 87545	Com: (505) 665-0038 DSN: FAX: (505) 665-2017 email: ewhitted@bailman.lanl.gov
74	Wojtowicz, Deborah Initials DW	Lawrence Livermore National Laboratory L-13, PO Box 808 Livermore CA 94550	Com: (510) 423-9000 DSN: FAX: (510) 423-0925
75	Wosoogh, Ben Initials BW	Strategic Systems Program 27221 Department of the Navy Washington DC 20376-5002	Com: (703) 607-1124 DSN: FAX: (703) 607-2189

1931 ~~Crystal Gateway~~
Jefferson Davis Hwy
Crystal Mall Bldg 7
Washington DC 20376-5362

Michael Schwab LLNL 510 422-6444
L-11

D. LYNN SHAEFFER LLNL (510) 422-2092
P.O. Box 808
L-84
LIVERMORE, CA 94550

Fredrick G. Trussell Sandia National Labs (505) 845-8111
P.O. Box 5800
Org. 334
Albuquerque, NM 87185

Bob Pfeffer Commander
U.S. Army Nuclear and Chemical Agency (703) 355-2238
ATTN: MCNA-NU (R. Pfeffer)
7500 Backlick Rd., Bldg 5073
Springfield, VA 22150

WRISLEY, KEN SANDIA NAT'L LAB, NM (505) 844-4800
DEPT 5161 244-4800
P.O. Box 5800 (505) 844-9225
ALBUQUERQUE, NM
87185-5800

BROZEK, JOHN Sandia Nat'l Labs NM (505) 844-8175
Dept 0324
P.O. Box 5800
Albuquerque NM 87185-5800

HUIE, DONALD U.S. ARMY ARDEC 201-724-2720
SMCAR-FSN-N, B354 DSN 880-2720
PICATINNY ARSENAL, NJ 07806-5000 UFAX -5461

Lt Col David J Perella	FCDNA/FCFA 1680 Texas St SE Kirtland AFB NM 87117-5669	505 846-8885 505 846-4249 (FAX)
Gregory F. Simonsen	L-84 Lawrence Livermore National Laboratory Livermore, CA 94550	(510) 422 5374
David A. Goerz	L-153 PO Box 808 Lawrence Livermore Nat'l Lab Livermore, CA 94550	510 422-0193
Richard Zacharias	L-153 POB 809 LLNL Livermore, CA 94550	510-423-0714
Roland A. Polimadei	Army Research Lab Survivability/Lethality Analysis Directorate ATTN: AMSRL-SL-NN 2800 Powder Mill Road Adelphi, MD 20852-1145	(301) 394 5450 DSN 290
Gabriel Palomino	U.S. Army Research Laboratory Survivability/Lethality Analysis Directorate ATTN: AMSRL-SL-ES White Sands Missile Range, NM 88002-5513	(505) 678-9[illegible] FAX: 678-9045 DSN: 258-
Steven J. Patenaude	LLNL PO Box 808 L-84 Livermore CA 94550	Ph (510) 422-6698 FAX (510) 423-0703
KENNETH W. BUCK	SANDIA NATIONAL LABORATORIES ORGANIZATION 5371 P.O. BOX 969 LIVERMORE, CALIF. 94551	PH. (510) 294-1324 FAX (510) 294-1015
Larry M Moore	Sandia National Laboratories Organization 5712 P.O. Box 5800 Albuquerque NM 87185	ph 505-294-56[illegible]

Graham, Mark L
ORION International Technologies
6501 Americas Parkway #200
Albuquerque, NM 87110-5372
Comm
(505) 881-2500
Fax
(505) 881-5060

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APPENDIX C

(U) SURETY WORKING GROUP

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SURETY WORKING GROUP

The surety working group, in previous meetings, decided to limit its efforts to the evaluation of Nuclear Safety and Use Control aspects of surety, but not physical security since the systems being considered do not have new or unusual physical security requirements.

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Use control is included because DOE requires it for weapons in its custody. Also implementation of the Farr study recommendations may make it required for DOD as well. The committee is deferring action on use control until these requirements are defined by DOE and DOD. The approach to evaluating the Phase 2 Study candidates will be to use QFD.

The implementation of QFD began on February 22 and 23 when all the members of the SWG and their alternates received QFD training. The group met on February 24 at which time the requirements and requirements definitions were identified.

On March 16 and 17, the SWG met to define the measures by which the achievement of the requirements are judged. It was found that the requirements and definitions require some additional work. Difficulty was encountered in defining measures which apply equally to different safety subsystem implementations (eg. DOI vs Dual Stronglinks). The details of measurement are not the same for both and may even be incompatible. An approach which appears promising is to evaluate different systems using a " broad brush" in an initial evaluation, then in subsequent iterations add details as required. A meeting of the SWG is planned prior to the next general meeting to condinue work on defining the measures.

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DOE

United States Government Department of Energy

memorandum

DATE: April 19, 1990

ATTN OF: DP-20.1

SUBJECT: Transmittal of Department of Energy (DOE) Use Control Policy

TO: Distribution:

The Department of Energy Use Control Policy has been approved by the Principal Deputy Assistant Secretary for Defense Programs. It is transmitted herewith for your information and action as appropriate. Further distribution within your organizations is authorized and encouraged.

Note the requirement for an annual Assistant Secretary for Defense Programs review of the effectiveness of the DOE system for protecting both nuclear weapons and nuclear explosive devices against deliberate unauthorized use. The Deputy Assistant Secretary for Military Application chartered Nuclear Command and Control Steering Group will coordinate this annual review with assistance and input from Operations Offices, National Laboratories, and the Use Control Effectiveness Committee.

D L McCaughan

for James M. Turner
Associate Director for
for Weapon Safety
Office of the Deputy Assistant Secretary
for Military Application
Defense Programs

Attachment

Distribution:

B. Twining, Manager, Albuquerque Operations Office, ALO
N. Acquilina, Manager, Nevada Operations Office
D. Pearman, Jr., Manager, San Francisco Operations Office
A. Narath, President, Sandia National Laboratories (SNL)
J. Nuckolls, Director, Lawrence Livermore National Laboratory (LLNL)
S. Hecker, Director, Los Alamos National Laboratory (LANL)
Deputy Assistant Secretary for Military Application, DP-20, DOE
Director, DP-22
Director, DP-23
Director, DP-24
Director, DP-25
Acting Assistant Secretary for Security Affairs, DP-30, DOE
Chairman, Use Control Effectiveness Committee
Nuclear Command and Control Steering Group Members
James M. Turner, DP-20.1
Captain David McConagha
Colonel Denis Garcia, USAF, DP-23
Denny Krenz, ALO
Jerry Grayson, ALO
Ray Reynolds, SNL
Ben Bader, SNL
Jim Wright, SNL
John Marion, SNL
Tom Seitz, LANL
Dennis Roeder, LANL
Bill Scanlin, LLNL
Joe Keller, LLNL
Mark Bleck, NSS
Jeff Everett, SNL

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SUBJECT: DEPARTMENT OF ENERGY (DOE) USE CONTROL POLICY--PROTECTION OF NUCLEAR WEAPONS AND NUCLEAR EXPLOSIVE DEVICES AGAINST DELIBERATE UNAUTHORIZED USE

References:
1. National Security Decision Directive (NSDD), United States Nuclear Weapons Command and Control (TS), August 21, 1987
2. NSDD, Nuclear Weapons Safety, Security and Control, (C), June 27, 1988
3. Memorandum of Understanding, Department of Defense (DOD)/DOE Objectives and Responsibilities for Joint Nuclear Weapon Activities, January 17, 1983

1. PURPOSE. The purpose of this document is twofold:

   a. To establish the DOE policy regarding protection against the deliberate unauthorized use of nuclear weapons and nuclear explosive devices (NEDs) while in DOE's custody.

   b. Consistent with the joint agency responsibilities specified in the references, it is the DOE's purpose to strengthen dual-agency, high-level oversight and attention to the control of nuclear weapons.

2. SCOPE. The provisions of this policy apply to all Departmental elements and all contractors and subcontractors performing work for or as a part of the Department's Defense Programs.

3. POLICY.

   a. An integrated system of positive measures shall be developed, implemented, and maintained to protect all nuclear weapons and NEDs in the custody of the DOE against deliberate unauthorized use. This system will include:

      (1) Physical security measures to preclude unauthorized access to nuclear weapons or NEDs.

      (2) Personnel assurance programs to assure the reliability of those DOE and contractor employees requiring authorized access to nuclear weapons or NEDs.

      (3) Use control measures to deter or delay unauthorized acts by anyone who gains access to nuclear weapons. To the maximum extent possible, use control measures shall include positive design features. These positive design features should be incorporated at the earliest feasible point in the assembly of a nuclear weapon and be removed at the latest feasible point in the disassembly of a nuclear weapon.

(4) Methods to assure the timely recapture or recovery of nuclear weapons or NEDs in the event physical control is lost.

b. The DOE shall conduct research and development on a broad range of security and control methods and devices for nuclear weapons.

c. Pursuant to the responsibilities identified in the references, the DOE will assist and coordinate with the DOD and other Federal agencies to provide protection against deliberate unauthorized use for all United States nuclear weapons throughout their life cycle.

d. The DOE shall assist the DOD in designating critical nuclear command and control equipment and components and ensuring that these items are developed to meet the criteria designated in the reference directives.

4. APPLICABILITY. This policy applies to all Defense Programs nuclear weapon developments and modifications unless there are compelling reasons to the contrary which are approved by the Assistant Secretary for Defense Programs.

5. TERMS EXPLAINED.

a. Access. Close physical proximity to a nuclear explosive in such a manner as to allow the opportunity to tamper with or damage a nuclear explosive.

b. Nuclear Explosive Device. Any assembly or subassembly containing fissionable or fissionable and fusionable material and high explosives capable of producing a nuclear yield.

c. Nuclear Weapon. A nuclear explosive that is configured for operational use as part of the war reserve stockpile.

d. Use Control Measures. Systems, devices, removable components, and procedures which allow timely authorized use of a nuclear weapon while precluding or delaying unauthorized nuclear detonation. These measures are in addition to physical access controls which always apply to nuclear weapons.

6. OBJECTIVES.

a. Positive measures to protect against deliberate unauthorized use:

(1) must be operable throughout the entire life cycle (production, transport, storage, deployment, maintenance, and retirement) of the nuclear weapon.

(2) should assist in providing to the principal nuclear command and control decision makers a secure, flexible nuclear response capability throughout the entire spectrum of peacetime, exercise and training, crisis, conventional and nuclear war, transition,

termination, and postwar periods.

(3) should allow timely authorized use of nuclear weapons by the nuclear forces when and as directed by the President.

b. Positive measures to protect against deliberate unauthorized use must not significantly adversely affect the safety, security, operational reliability, survivability, or availability of nuclear weapons.

7. REVIEW. The Assistant Secretary for Defense Programs will annually review the DOE integrated system for protecting nuclear weapons and NEDs against deliberate unauthorized use to assure their effectiveness against current and emerging threats.

Victor Stello, Jr.
Principal Deputy
Assistant Secretary
for Defense Programs

April 16, 1990
Date

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APPENDIX D

(U) SYSTEM ENGINEERING WORKING GROUP

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System Engineering Working Group Meeting

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Classified by D.R. Henson Org. 5371
Title Manager Date 3/18/93

16 March 1993
LLNL
Livermore, CA

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SEWG will use the "customer-supplier" model for identifying technical issues. (U)

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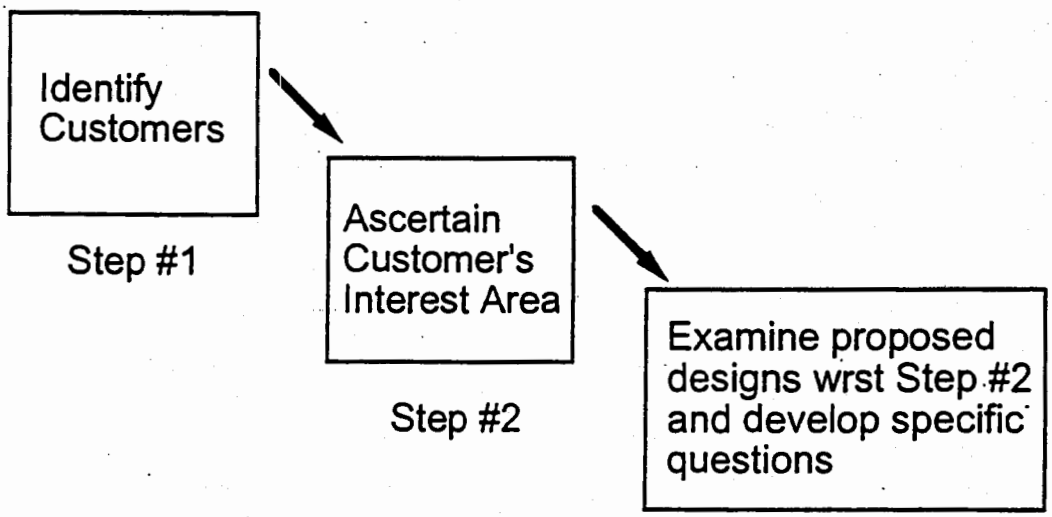

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HPRF Phase 2 Meeting #4 Issues/Action Items

RV Issues	Assumption	Design Impact	A.I. Owner
A. RV aeroshell. Is Mk 12A the only practical RV available?	Mk 12A is available. Mk 21 is not.	Mk 12A fit is tighter, so meeting it will be acceptable to the Mk 21.	
B. MGC Algorithm. Is it compatible with HPRF needs?	No. It is compatible only with the Mk 12A or 21 for single to multiple WH's. If partially yes, quantify acceptable limits.	Severe constraints on new RV design to meet old mass properties, shape, flight dynamics, and static margin.	

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HPRF Phase 2 Meeting #4 Issues/Action Items

Nuclear Safety Issues	Assumption	Design Impact	A.I. Owner
A. Level of Safety	Current modern safety theme, independent of Mk 12A or 21. Politically unacceptable to SNL otherwise. DOI not required.	Major impact. Exclusive region redefinition, intent, and trajectory inputs required.	
B. Intent Safety Subsystem	Controller in missile launch ctrl system commands WH via hard lines in msl that does not now exist. Assume will be available.		
C. Trajectory Safety Subsystem	MGC replaces ESSG to provide required USG signal to programmer during 3 stages of flight. Assume lines will be available, which do not now exist.		

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HPRF Phase 2 Meeting #4 Issues/Action Items

Use Control Issues	Assumption	Design Impact	A.I. Owner
A. What catagory is acceptable?	Cat. D is acceptable. F not required. E is OK. Lines are available in missile from ground controller in missile launch electronics.		

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HPRF Phase II Study

Warhead Layouts

Charles T. S. Chow
Lawrence Livermore National Lab
Livermore, CA

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Warhead Layouts

Manuel Martinez
Los Alamos National Lab
Los Alamos, NM

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HIGH POWER RADIO FREQUENCY

16 March 93

Bill Replogle (510) 294-2140

Sandia National Laboratories

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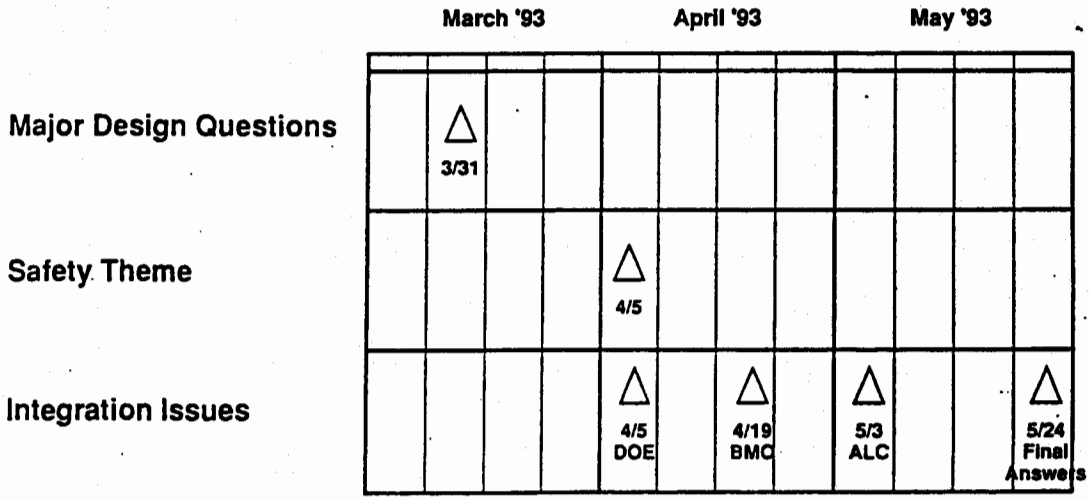
Project Plan for SEWG



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HPRF SEWG Meeting - 3/16/93

Jim Hogan	SNLL/CA, 5171	(510) 294-2853
Bob Okagawa	LANL/WX-S	(505) 667-3545
Mike Morgan	HQ ACC/DONM	(804) 764-6403
Manuel Martinez	LANL/WX-1	(505) 667-2019
Jim Schulze	SNL/NM, 5161	(505) 844-4706
Cliff DeJong	Kaman	(719) 599-1932
Doug Henson	SNL/CA, 5371	(510) 294-2729
Ken Buck	SNL/CA, 5371	(510) 294-1324
Bill Replogle	SNL/CA, 8446	(510) 294-2140
Brent Haroldsen	SNL/CA, 8446	(510) 294-2590
Lt Col Dave Perella	FCDNA/FCFA	(505) 846-8885
Stan Gooch	USSTRATCOM/J541	(402) 294-2580
Kaz Oish	SNL/NM, 5161	(505) 844-0159
Karl Rueb	DOE/AL	(505) 845-5189
LCDR Ed Ade	FCDNA/FCPRW	(505) 846-8575
Jerry Adams	SNL/NM, 2883	(505) 844-6120
Capt Dave Sanders	BMO/CYRR	(909) 382-2231
Don Shover	TRW	(909) 382-6461
David Ericksen	OO-ALC/LMEW	(801) 479-0959
Charles T. S. Chow	LLNL	(510) 422-4639

APPENDIX E

(U) REQUIREMENTS WORKING GROUP

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No slides were presented during the presentation.

APPENDIX F

(U) WARHEAD DESIGN WORKING GROUP

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Warhead Design Working Group

March 18, 1993

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Warhead Design Working Group: LLNL Activities Status Report

by
Deborah Wojtowicz, LLNL A-Division

High Power Radio Frequency Phase 2
Meeting # 4

Lawrence Livermore National Laboratory
March 16-18, 1993

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WDWG March 17, 1993

Name	Affiliation	Address	Phone
Ronald W McFarlane	LANL	Los Alamos, NM 87545	505 667-1682
Joyce A. Guzik	LANL	X-2 MS B220 LANL, Los Alamos, NM	667-8927
Deborah Whitewicz	LLNL	PO Box 808 Livermore CA	510 423-9000
Kazuo Oishi	SNL	PO Box 5800, Albuq NM 87185	505-844-0159
Jerry Adams	SNL	" " "	(505) 899-6120
Jerry Cuderman	SNL/NM	PO Box 5800 ABQ NM 87185	(505) 844-8063
Carolyn Mangeng	LANL	MS F630, Los Alamos, NM 87545	505-667-3460
Bill Tedeschi	SNL/NM	Org. 5161, Albuquerque, NM 87185	(505) 845-9851
John Brozek	SNL/NM	Org 0324, Albuquerque, NM 87185	(505) 844-8175
Ken Buck	SNL/CA	Org 5371 Livermore, CA 94551	(510) 294-1324
GCol Dave Perella	FCDNA/FCFA	1680 Texas St SE, Albuquerque NM 87117-5669	(505) 846-8895
David Ericksen	OOALC/LMEW	6054 Dogwood St.	801 479 0959
LCDR ED ADE	FCDNA/FCPRW	Hill AFB, UT 84056-5811	(505) 846 8575
Michael Bernardin	LANL	X-5 MS B259 Los Alamos, NM 87545	505 667-1439
Fred Trussell	SNL	PO Box 5800, Albuq, NM 334	(505) 845-8111
Joe Sefcik	LLNL/A	P.O. Box 808 Livermore CA 94550	(510) 4230671
Bill Lamb	OAS/XRR	2350 Maxwell St, Kirtland AFB, 87117-6008	(505) 846-8330
Manuel Martinez	LANL/WX-1	MSC936 Los Alamos NM 87545	(505) 667-2019
Jim Schulze	SNL/5761		505-844-4706
Jim Hogan	SNL/5371		(510) 294-2853
Cliff Dejong	KAMAN	PO Box 7463 Colo Scgs Co 80933	(719) 599-1932

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The following slides are from the December HPRF Meeting.

High Power Radio Frequency Phase 2 Study
Warhead Design Working Group (U)

Device Certification Issues

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THERMONUCLEAR APPLICATIONS (X-2)

Los Alamos National Laboratory

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WARHEAD DESIGN/SURETY WG ATTENDANCE

NAME	ORG	PHONE
LtCol ROGER KROPF	OAS	(505) 846-7996
LTC RODNEY M GRAYSON	FCDNA/FCPRW	505 846 8584
Joyce A. Gurk	X-2, LANL	(505) 667-8927
KARL B. RUEB	DOE/AL/WPD	(505) 845-5189
Joseph J. GazdA	DOE/HQ/DP-251	(301) 903-2984
DAVID SANDERS	BMO/CYRR	(714) 382-2231
DON SHOVER	TRW	714-382-6461
LCDR ED ADE	FCDNA/FCPRW	(505) 846-8575
MICHAEL HAERTLING	LANL/WX-1	(505) 667-0592
RICHARD C. KEYSER	LANL/WX-5	(505) 667-7809
MANUEL D. MARTINEZ	LANL/WX-1	(505) 667-2019
ROBERT K. OKAGAWA	LANL/WX-5	(505) 667-3545
JAMES R. HOGAN	SANDIA	(510) 294-2853
Linn Derickson	Sandia, 8445	(510) 294-2117
Deborah Wojtowicz	LLNL/ADV	(510) 423-9000
JOSEPH A. SEFCIK	LLNL/A	(510) 423 0671
JAMES MERCER-SMITH	LANL/X-2	505-667-9635
JERRY F. CUDERMAN	SNL/NM 5161	505-844-8063
Stanfield R. Eccles	USSTRATCOM/JS41	402-294-2580

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APPENDIX G

(U) MISSION ANALYSIS WORKING GROUP

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APPENDIX H

(U) VULNERABILITY WORKING GROUP

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STRATCOM has Supplied Information for a Cruise Missile Penetration Model

- Launch 5000' altitude
- Cruise at 2000' for most of flight
- Turn 20° or more every 60 miles
- 440 knots
- 1 missile per target

Flight path determined by

- Target Location
- Availability of Terran Maps
- Air defenses
- Options

Typically there will be about five cruise missiles on the same course for some distance

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3 US Army ARDEC
Attn: Mr Donald Huie
SMCAR-FSN-N B354
Picatinny Arsenal NJ 07806-5000

4 ATSD(AE)
Attn: Lt Col Mike Crawford
The Pentagon Room 3C124
Washington DC 20301-5000

5 BMO/CYRR
Attn: Capt Dave Sanders

Norton AFB CA 92409-6468

6 DOE/AL-WPD
Attn: Mr Karl Rueb
PO Box 5400
Albuquerque NM 87185-5400

7 DOE/AL-NESD
Attn: Mr John Tribou
PO Box 5400
Albuquerque NM 87185-5400

8 DOE/HQ, DP-251
Attn: Mr Joe Gazda
PO Box A
Germantown MD 20874

9 FASTC/TASC
Attn: Lt Tom Tingley
4115 Hebble Creek Rd Suite 25
Wright-Patterson AFB OH 45433-5629

10 FCDNA/FCFA
Attn: LCDR Tom Walker
1680 Texas St SE
Kirtland AFB NM 87115-5616

11 FCDNA/FCPRA
Attn: Lt Col Walt Atchison
1680 Texas St SE
Kirtland AFB NM 87115-5616

12 FCDNA/FCSAC
Attn: LCDR Ed Ade
1680 Texas St SE
Kirtland AFB NM 87115-5616

13 HQ ACC/DONM
Attn: Maj Chris Powell
205 Dodd Blvd, Suite 101
Langley AFB VA 23665

14 HQ ACC/DRNB
Attn: Capt Mike Macagnone
204 Dodd Blvd, Suite 226
Langley AFB VA 23665

15 HQ ACC/DONB
Attn: Maj Charles Kinkead
205 Dodd Blvd, Suite 101
Langley AFB VA 23665

16 HQDNA/NOSA
Attn: Maj Art Wendel
6801 Telegraph Rd
Washington DC 22310

17 HQDNA/RAEE
Attn: Dr George Baker
6801 Telegraph Rd
Washington DC 22310

18 HQDNA/RAEE
Attn: CPT Mark Weitekamp
6801 Telegraph Rd
Washington DC 22310

19 Kaman Sciences
Attn: Mr Cliff De Jong
PO Box 7463
Colorado Springs CO 80933-7463

20 Lawrence Livermore National Laboratory
Attn: Mr Mike Bland
L-13 PO Box 808
Livermore CA 94550

21 Lawrence Livermore National Laboratory
Attn: Dr Hriar Cabayan
L-13 PO Box 808
Livermore CA 94550

22 Lawrence Livermore National Laboratory
Attn: Dr Charles Chow
L-125 PO Box 808
Livermore CA 94550

23 Lawrence Livermore National Laboratory
Attn: Dr Al Kaufman
L-85 PO Box 808
Livermore CA 94550

24 Lawrence Livermore National Laboratory
Attn: Dr Mike Ong
L-153 PO Box 808
Livermore CA 94550

25 Lawrence Livermore National Laboratory
Attn: Dr Joe Sefcik
L-13 PO Box 808
Livermore CA 94550

26 Lawrence Livermore National Laboratory
Attn: Ms Deborah Wojtowicz
L-13 PO Box 808
Livermore CA 94550

27 Logicon/RDA
Attn: Mr Phil Castillo
PO Box 9377
Albuquerque NM 87119

28 Logicon/RDA
Attn: Dr Charles Mo
6053 W Century Blvd PO Box 92500
Los Angeles CA 90009

29 Los Alamos National Laboratory
Attn: Dr Michael Bernardin
X-5, MS B259 PO Box 1663
Los Alamos NM 87545

30 Los Alamos National Laboratory
Attn: Dr Ken Calahan
Mail Station 5000, AT-9, MS H818 PO Box 1663
Los Alamos NM 87545

31 Los Alamos National Laboratory
Attn: Mr Michael Heartling
Mail Station 5000, WX-1, MS C936 PO Box 1663
Los Alamos NM 87545

32 Los Alamos National Laboratory
Attn: Dr Joyce Guzik
X-2, Mail Stop B220 PO Box 1663
Los Alamos NM 87545

33 Los Alamos National Laboratory
Attn: Ms Carolyn Mangeng
Mail Station 5000, MS-F633 PO Box 1663
Los Alamos NM 87545

34 Los Alamos National Laboratory
Attn: Dr Manny Martinez
Mail Station 5000, MS C936 PO Box 1663
Los Alamos NM 87545

35 Los Alamos National Laboratory
Attn: Mr Ronald McFee
Mail Station 5000, MS-B220 PO Box 1663
Los Alamos NM 87545

36 Los Alamos National Laboratory
Attn: Dr J.A. Mercer-Smith
Mail Station 5000, MS-F634 PO Box 1663
Los Alamos NM 87545

37 Los Alamos National Laboratory
Attn: Mr Ed Whitted
Mail Station 5000, MS-F602 PO Box 1663
Los Alamos NM 87545

38 Navy
Attn: Mr Ben Wosoogh
SSP-27221
Washington DC 20376-5002

39 OL-NS/EN
Attn: Mr Todd Fattor
1651 First St SE
Kirtland AFB NM 87117-5617

40 OL-NS/ENN
Attn: Mr Ellsworth Rolfs
1651 First St SE
Kirtland AFB NM 87117-5617

41 OO-ALC/LMAA
Attn: Mr Jim Oldham
6014 Dogwood Ave
Hill AFB UT 84056-5816

42 PL/WSA
Attn: Capt Luke Lorang
3550 Aberdeen St SE
Kirtland AFB NM 87117-5776

43 PL/WSM
Attn: Mr Sam Gutierrez
3550 Aberdeen St SE
Kirtland AFB NM 87117-5776

44 PL/WSM
Attn: Mr William Walton
3550 Aberdeen St SE
Kirtland AFB NM 87117-5776

45 PL/WSR
Attn: Mr Bill Prather
3550 Aberdeen St SE
Kirtland AFB NM 87117-5776

46 PL/WST
Attn: Lt Dave VanVeldhuizen
3550 Aberdeen St SE
Kirtland AFB NM 87117-5776

47 SAIC
Attn: Dr Cordelia White
10260 Campus Point Drive
San Diego.CA 92121

48 SAF/AQQS(N)
Attn: Lt Col Armen Mardiguian
The Pentagon Room 4C258
Washington DC 20330-5040

49 SAF/AQQS(N)
Attn: Lt Col Charles Martin
The Pentagon Room 4C258
Washington DC 20330-5040

50 Sandia National Laboratories, NM
Attn: Mr John Andersen
Org 5161 PO Box 5800
Albuquerque NM 87185-5800

51 Sandia National Laboratories, NM
Attn: Dr Jerry Cuderman
Org 5161 PO Box 5800
Albuquerque NM 87185-5800

52 Sandia National Laboratories, NM
Attn: Dr Dave Fordham
Org 4113 PO Box 5800
Albuquerque NM 87185-5800

53 Sandia National Laboratories, NM
Attn: Dr Kazuo Oishi
Org 5161 PO Box 5800
Albuquerque NM 87185-5800

54 Sandia National Laboratories, NM
Attn: Dr Jim Solberg
Org 5161 PO Box 5800
Albuquerque NM 87185-5800

55 Sandia National Laboratories, NM
Attn: Dr William Tedeshi
Org 5161 PO Box 5800
Albuquerque NM 87185-5800

56 Sandia National Laboratories, CA
Attn: Mr Doug Henson
Org 5371 PO Box 969
Livermore CA 94550

57 Sandia National Laboratories, CA
Attn: Dr Jim Hogan
Org 5371 PO Box 969
Livermore CA 94550

58 TRW Defense System Group
Attn: Mr Don Shover
PO Box 1310
San Bernadino CA 92402-5000

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Attn: Maj Tim Lampe
901 SAC Blvd Suite L-118
Offutt AFB NE 68113-6500

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Attn: Mr Stan Gooch
901 SAC Blvd
Offutt AFB NE 68113-6500

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