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High Power Radio Frequency (HPRF) Phase 2 Study

Meeting #3 Minutes (U)

11 December 1992

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NAME: Tom Tomasi
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AUTHORITY: ADD
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Captain William A. Lamb

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JERRY G. COLYER
Technical Director

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(U) ACKNOWLEDGMENTS

(U) I would like to take this opportunity to thank Dr. Jerry Cuderman of Sandia National Laboratories, New Mexico, who hosted the third meeting of the HPRF phase 2 Study. His efforts prior to and during the meeting helped immensely and were greatly appreciated.

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(U) INTRODUCTION

(U) The Nuclear Weapons Concept Division of the Office of Aerospace Studies (OAS/XRN) conducted meeting #3 for the High Power Radio Frequency (HPRF) Phase 2 Study on 9-11 December 1992. The meeting was held at Sandia National Laboratory, Albuquerque. 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 #3 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 funding aspects of phase 2 work, responsibilities of test directors, requirements for the warhead design, requirements for the engineering work, and the participation level of the Navy. The study director requested that each working group chair provide a funding shortfall statement. The test program plan from the Vulnerability Working Group (VWG) will outline the responsibilities for the test directors. The warhead design work will continue, with the final design decision coming after more information becomes available with option tradeoffs. The options for engineering will continue until the configuration of the warhead and its employment are decided The Navy's representative to the study stated that they will participate in an observer role.

(U) CLASSIFICATION AND SECURITY

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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information provided on the employment of such a device can also carry other caveats such as Not Releasable to Foreign Nationals (NOFORN) and Warning Notice - Intelligence Sources and Methods Involved (WNINTEL). Additionally, information concerning the nuclear design of the HPRF device most likely contains Critical Nuclear Weapon Design Information (CNWDI). It is imperative that all information that is classified be afforded the proper classification security protection. If there is any doubt as to the classification of any information, please take the time to investigate the classification guides or ask the proper knowledgeable individual. A request for information about classified material requires a need-to-know before access to the information can be provided. Make sure you have properly identified

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an individual's need to know. In regards to unclassified material associated with this program, please handle the information with care. Proper operation security (OPSEC) requires that the unclassified material not be released that can give uncleared individuals the required information to piece together classified information.

(U) SURETY WORKING GROUP

described how the Quality Function Deployment (QFD) process will be used within the SWG and emphasized the need to have participants attend a QFD orientation class. The presentation slides are included as appendix C. Further information will be provided as it becomes available within the SWG. The SWG met with the Warhead Design Working Group (WDWG) and the System Engineering Working Group (SEWG) during the working group meetings. Information from both working groups is important to the SWG as the information will be used to direct the surety themes. The external action items from the SWG are included in the action item section of this report.

(U) SYSTEM ENGINEERING WORKING GROUP

These inputs are provided as appendix D. As stated in the previous paragraph, the SEWG met with the SWG during the working group session. During the SEWG meeting, working group members reviewed the nuclear safety theme and discussed SEWG requirements including the major issues for their group and interactions with other working groups. Some important engineering constraints need to be identified as soon as possible. The SEWG will investigate the engineering options until the engineering constraints are defined. Once decisions are made concerning the engineering constraints, work in these areas will become more defined. The goal of the SEWG is to provide transparency to the Air Force with whatever design is chosen. The external SEWG action items are included in the action item section of this report.

(U) REQUIREMENTS WORKING GROUP

(S) The Requirements Working Group (RWG) met during the first day of the working group meetings. This presentation slides are included as appendix E. The working group reviewed the action items from their previous meeting and reviewed a draft Stockpile to Target Sequence

(STS) document. The draft STS document is based on the ICBM Replacement Warhead Phase 1 study and will be modified to reflect the employment of the HPRF device and the possible environments involved. The review of the draft STS brought about action items for members of the working group.

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Responsibility for LLCE will be investigated prior to the next meeting. The external action items from the RWG are included in the action item section of this report.

(U) WARHEAD DESIGN WORKING GROUP

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His slides are provided in appendix F. Three issues were identified for the WDWG.

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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

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 to identify a deficiency in the capability to complete an Air Force mission.

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

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(U) Action items external to the MAWG are provided in the action item section this report.

(U) VULNERABILITY WORKING GROUP

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→ USAF

A major discussion of the VWG centered around the responsibilities of the test director for each test object. The test director has the responsibility for the testing and analysis of the data from the test. The information for that test object then must be provided to the MAWG in a format that is compatible or useful for MAWG analysis of mission effectiveness. To insure that the information flow to the MAWG is proper, a representative from the MAWG will attend the VWG meetings.

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The plan was to be completed by the following Wednesday, December 16, 1992, and faxed to the test directors from each participating organization. They would have a chance to review it prior to meeting on December 18, 1992,. The completed test plan would show each organization's level of effort and level of participation during the study period. The plan would give the community an overview of the work levels each organization expects to perform.

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

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(U) ADDITIONAL PRESENTATIONS

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(U) ACTION ITEMS

(U) Table 1 provides the list of action items assigned during meeting #3. The action items assigned during previous meeting are listed in table 2. Figure 1 shows a timeline for the study.

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→ USAF

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High Power Radio Frequency
Phase II Study Schedule

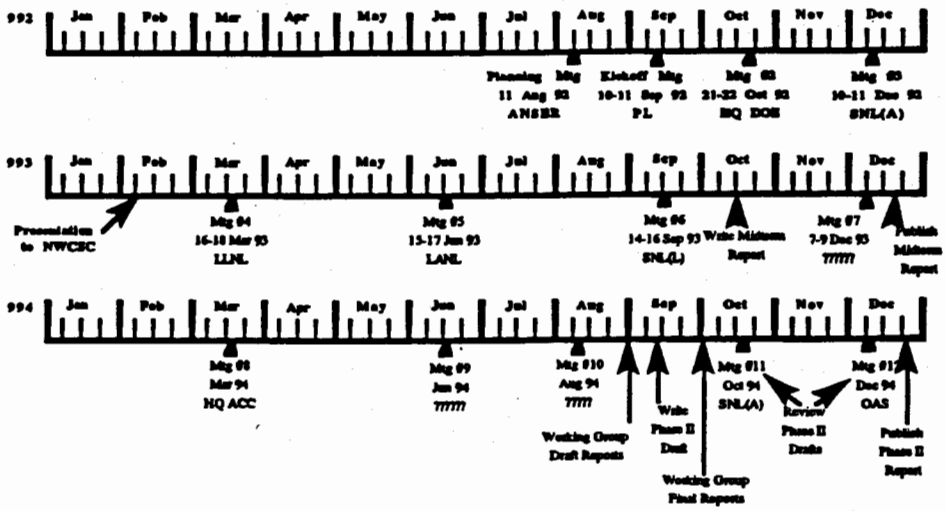

Figure 1. (U) HPRF phase 2 study schedule.

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APPENDIX A

(U) MEETING AGENDA

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APPENDIX B

(U) MEETING ATTENDANCE LIST

High Power Radio Frequency Phase 2 Study
Meeting #3, 11 December 1992
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APPENDIX C

(U) SURETY WORKING GROUP

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SURETY WORKING GROUP MEETING
December 10, 1992

The Surety Working Group met jointly with the Systems Engineering Working Group. The attendance list for the joint meeting is attached as is the agenda and viewgraphs from the SWG portion of the meeting

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Subsequent discussion addressed how we ought to approach surety analysis in the Phase 2 study. It was suggested that both a QFD and a limited PRA be conducted as well as a conventional evaluation of candidate warheads. Action items for the group included feedback from the SWG members on the proposed approach to surety, comments on the proposed schedule, and candidates for the QFD class.

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SURETY/SYSTEMS ENGINEERING WORKING GROUP MEETING
HPRF Meeting #3
December 10, 1992

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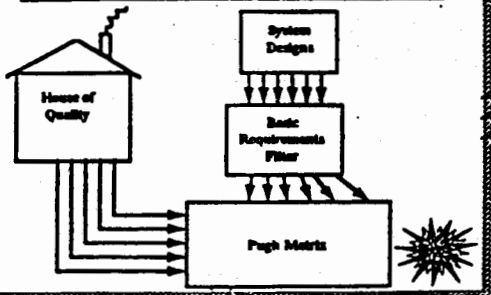
WG* PLEASE INDICATE SWG, SEWG, OR OBS.

QFD PROCESS FOR PHASE 1 STUDIES

ADDITIONAL VALUES

- FOCUSES EFFORT ON THE "REAL" ISSUES
- DEVELOPS A "CONSENSUS" OF THE ISSUES
  - What's important
  - What's not important
  - What's being addressed in the study
- DEVELOPS "CONSENSUS" DEFINITIONS
- DEVELOPS "TEAMWORK" ATMOSPHERE
- VALUABLE COMMUNICATIONS TOOL
- RAISES IMPORTANT ISSUES

QFD PROCESS FOR PHASE 1 STUDIES



QFD PROCESS FOR PHASE 1 STUDIES

MISCONCEPTIONS

- WHAT IS A "HOW"?
  - How we're going to do it?
  - How we'll know that we did it?
- IS QFD AN END IN ITSELF OR A MEANS?
- HOW MUCH IS ENOUGH?
- IS MORE REALLY BETTER?

QFD PROCESS FOR PHASE 1 STUDIES

RECOMMENDATIONS

- LIMIT EFFORT TO HOQ AND PUGH MATRIX
- TAKE THE QFD CLASS
- TRUST THE METHOD
- RESIST THE TEMPTATION TO SECOND GUESS THE PROCESS
- CONSISTENT PARTICIPANTS
- KEEP THE GROUP SMALL

QFD PROCESS FOR PHASE 1 STUDIES

CONCLUSIONS

- WHEN DONE "RIGHT" QFD IS A VALUABLE PROCESS
- WHEN DONE IMPROPERLY QFD IS A FRUSTRATING AND TIME CONSUMING PROCESS, HOWEVER, IT'S STILL VALUABLE

QFD PROCESS FOR PHASE 1 STUDIES

RECENT QFD EXPERIENCES

FRANK F. DEAN, 5161

QFD PROCESS FOR PHASE 1 STUDIES

OVERVIEW

- QFD DEFINITION
- QFD BENEFITS
- CUSTOMER REQUIREMENTS
- HOW THE QFD PROCESS WORKS
- ADAPTATION TO SYSTEM STUDIES
- EXAMPLE OF A QFD
- MISCONCEPTIONS AND RECOMMENDATIONS
- ADVANTAGES
- CONCLUSIONS

QFD PROCESS FOR PHASE 1 STUDIES

WHAT IS QFD?

- A TOOL TO HELP DEFINE AND RANK THE CUSTOMER'S NEEDS
- A TOOL TO MEASURE HOW WELL WE SATISFY THE CUSTOMER'S NEEDS

QFD PROCESS FOR PHASE 1 STUDIES

QUALITY FUNCTION DEPLOYMENT

QFD PROCESS FOR PHASE 1 STUDIES

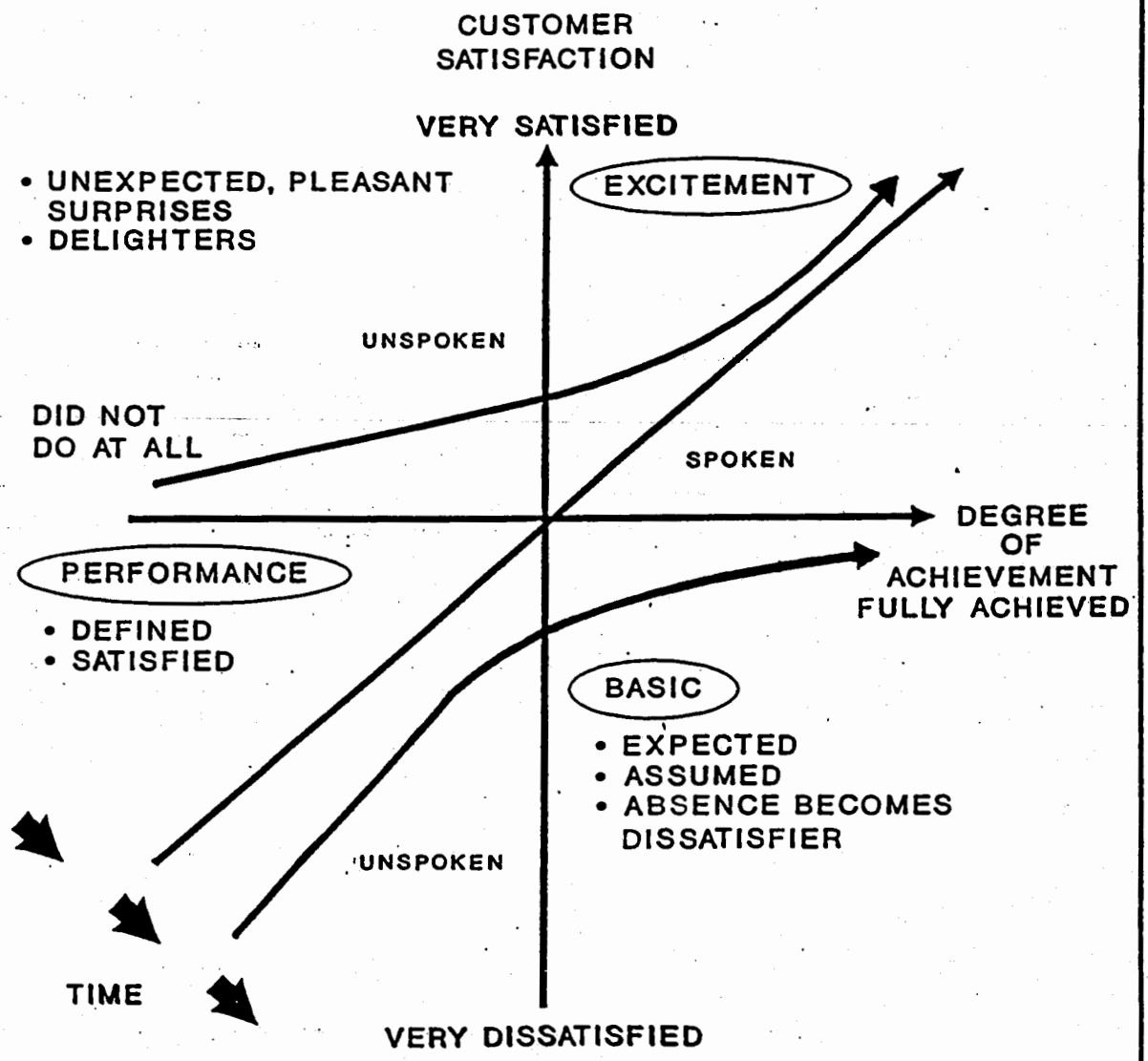
ARE WE MEETING OUR CUSTOMERS REQUIREMENTS?

QFD PROCESS FOR PHASE 1 STUDIES

BENEFITS OF THE QFD PROCESS

- CUSTOMER FEEDBACK UP FRONT
  - What's important
  - Relative ranking of the issues
- CUSTOMER PERCEPTION OF CURRENT PERFORMANCE
- FORMAL PROCESS FOR WHAT WE'VE DONE "HIT OR MISS" IN THE PAST
- CORRELATION MATRIX

KANO MODEL OF CUSTOMER SATISFACTION



QFD5.TAR

What is QFD?

Definition:

"... a discipline for product planning and development in which key customer wants and needs are deployed throughout an organization."

Dr. Yoji Akao

Problems with Customer Requirements

- Incomplete
- Vague
- Subject to misinterpretation
- Constantly changing
- Conflicting
- Emotional
- Changing personnel & organizations
- Complex communication lines

The QFD Approach

Customer Requirements

↓ (I)

Satisfaction Measures

↓ (II)

Parts Characteristics

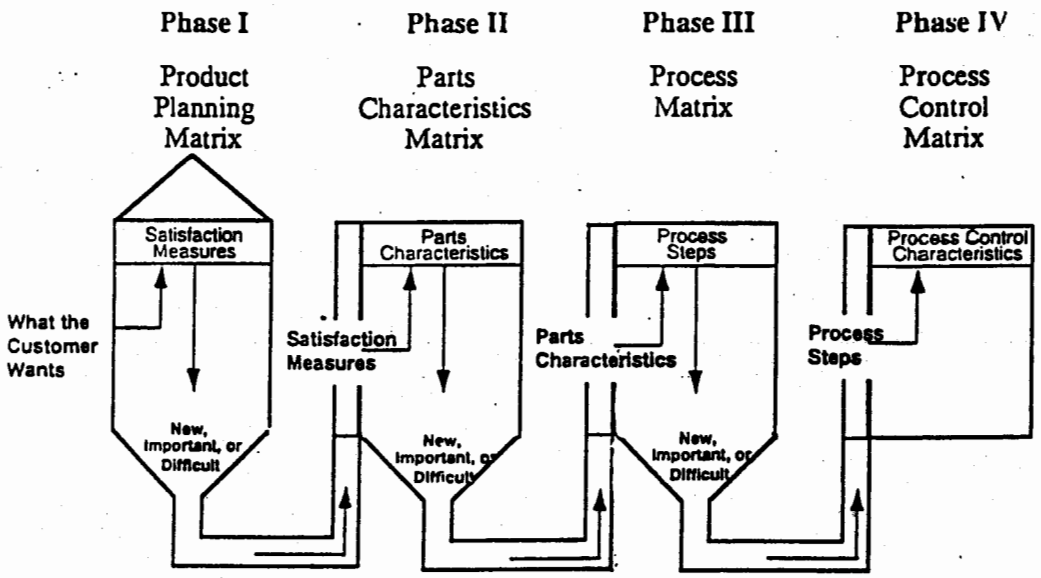
↓ (III)

Manufacturing Process Characteristics

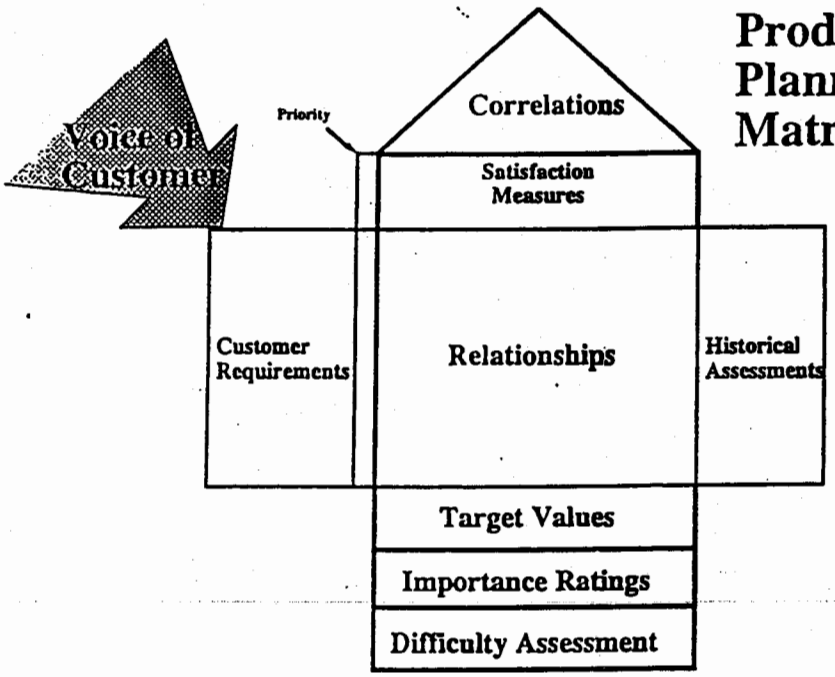
↓ (IV)

Manufacturing Process Control

Four Phase Analysis



How QFD Works



Advantages

- Provides a Method for Structured Requirements Planning
- Increases Responsiveness to Customer Needs
- Reduces Cycle Time and Cost of New Designs
- Documents Product Planning Process
- Provides for a Common Understanding & Common Language throughout Organization

QFD Process (Phase I)

Step 1	Planning	•Identify customers & their representatives •Identify suppliers & their representatives •Identify QFD core team •Define the methods to be used to gather customer requirements
Step 2	Gather Customer Requirements	•Gather customer requirements along with source •List common definitions for customer requirements •Have customer prioritize requirements •Perform historical/competitive assessment (optional)
Step 3	Determine Satisfaction Measures	•Determine satisfaction measures •List common definitions for satisfaction measures
Step 4	Determine Target Values	•Determine target values for satisfaction measures •Assess feasibility of obtaining each target value
Step 5	Determine Relationships & Correlations	•Determine relationships between customers requirements & satisfaction measures •Determine correlations among satisfaction measures (optional)
Step 6	Calculate Importance Ratings	•Calculate importance ratings for satisfaction measures •Calculate importance ratings for satisfaction measures weighted by feasibility assessment •Based on these ratings determine what satisfaction measures to carry on to next phase of QFD

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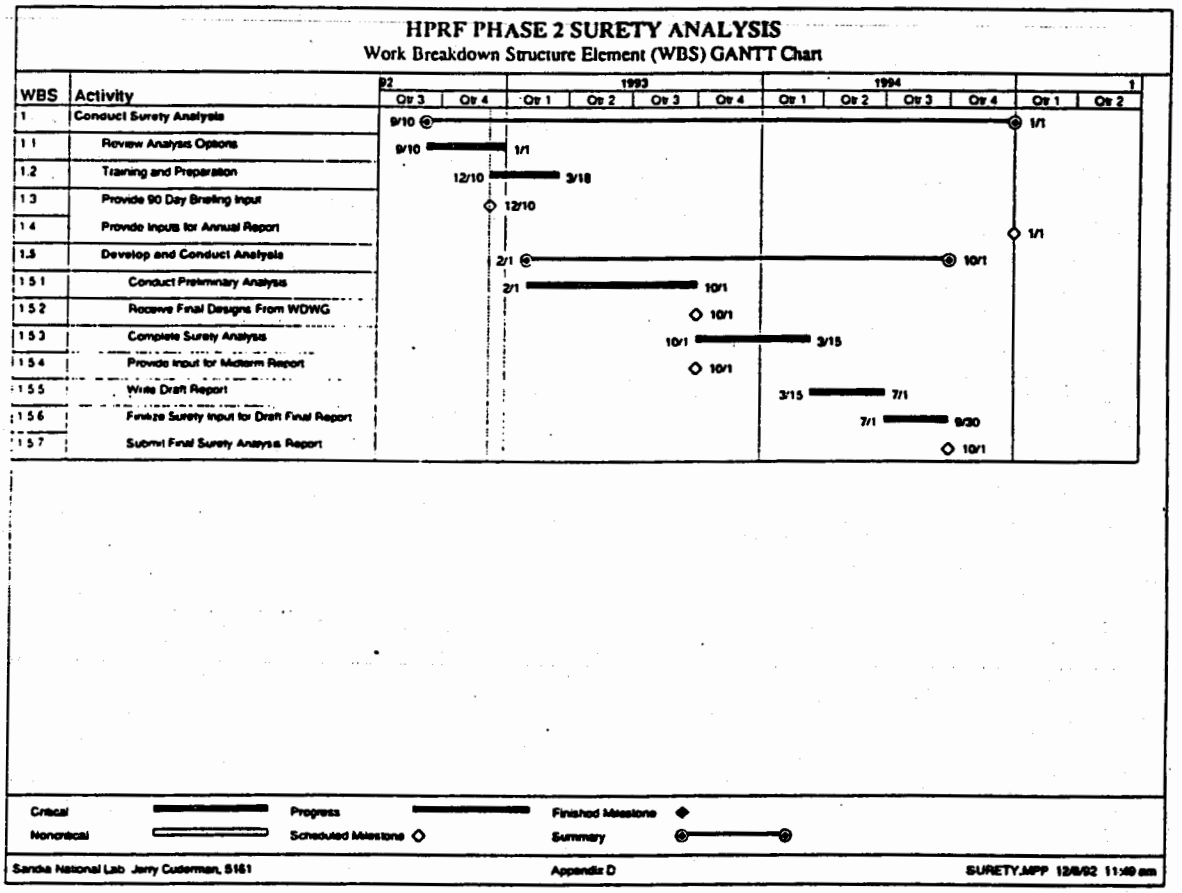
DISCUSSION

PROPOSED KEY TASKS FOR SWG

- Evaluate WH Candidates using QFD
  - Limit Participation to SWG Members
  - All Part icipants be QFD Trained
  - Limited Scope of Study
- Evaluate Final WH Candidates using Fault Tree Analysis (Limited PRA)
- Conventional Surety Evaluation



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ACTION ITEMS for SWG Members

- Return Comments on Gantt Chart
- Return Comments on Proposed Tasks
- Provide Name(s) for QFD Course
-
- Deadline for Action Items : 12-18-92

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APPENDIX D

(U) SYSTEM ENGINEERING WORKING GROUP

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JCE, USAF, DTRA

SEWG Status Report

High Power Radio Frequency Weapon Phase 2 Study

USAF
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9-11 December 1992
Sandia National Labs
Albuquerque, NM

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DOE, USAF, DTRA

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SEWG Briefing

AF Action Items

Don Shover
TRW
San Bernadino CA

9-11 December 1992
Sandia National Labs
Albuquerque, NM

BMO RESPONSE TO ACTION ITEMS

10 DEC 1992 DON SHOVER TRW

RWG A.I. 92-1-2

THE BALLISTIC MISSILE OFFICE NEEDS TO DETERMINE THE MAXIMUM ALLOWABLE WEIGHT FOR THE HPRF WARHEAD BASED ON THE LIMITS OF THE MM III PLATFORM

USAF
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HPRF PHASE 2
A.I. #20

PROVIDE PARAMETERS OF THE MM III AS A DELIVERY VEHICLE USING AN HPRF DEVICE TO THE SEWG/RWG.

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SEWG Briefing

Phase 1 Warhead Layouts

Charles T. S. Chow
Lawerence Livermore
National Lab

9-11 December 1992
Sandia National Labs
Albuquerque, NM

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SEWG Briefing

Paste Extrudable Explosive Booster Technology

Linn Derickson
Sandia National Labs
Livermore, CA

9-11 December 1992
Sandia National Labs
Albuquerque, NM

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PEX Booster Architecture Concept (U)

Motivation:
Increase nuclear detonation safety.

Methodology:
Move detonation safety system into the nuclear explosive package.

Advantages of the PEX Booster Architecture

1. Distributes fundamental safety dependence:
   separation, disruption, exclusion
   (multiple phenomena required for nuclear detonation)
2. Focuses critical safety volume on NEP
3. Reduces costly barrierization
4. Complicates circumvention scenario
5. Relaxes packaging constraints
6. Increases number of weak links/scenarios

PEX Booster Design Team Members

Member	Function
Don Breit, LLNL B Division	Physics Package Design
William Curtis, SNL 2361	Consultant
Charlie DeCarli, SNL 5313	Statistical Analysis
Linn Derickson, SNL 8445	Component Design, Meeting Facilitator
Steve Goods, SNL 8314	Materials
Bill Greenwood, SNL 2545	DSSL Design
Gene Kenderdine, SNL2545	Stronglink Design
Brad Meyer, SNL 8244	Analysis/Fluids Test Consultant
Dave Nagel, SNL 8272	Mechanical Design
Bob Phillips, SNL 8543	ES&H
Paul Spence, SNL 8245	Fluid Modeling
Greg Thomas, SNL 5375	System Management
Bruce Worden, SNL 5375	System Design

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University of California
Lawrence Livermore
National Laboratory

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DOE, USAF, JTRA

Attendance List
Joint Surety/Systems Engineering Working Group Meeting -- December 10, 1992

CDR Walker	FCDNA
D. Ericksen	OO-ALC
LCDR Ade	FCDNA
Capt Morgan	HQACC
C. Chow	LLNL
D. Shover	TRW
M. Haertling	LANL
J. Cuderman	SNL
M. Martinez	LANL
R. Okagawa	LANL
L. Derickson	SNL
R. Keyser	LANL
J. Mercer-Smith	LANL
J. Hogan	SNL
K. Oishi	SNL
J. Gazda	HQDOE
D. Wojotowicz	LLNL
F. Dean	SNL
D. Sanders	BMO
E. Rolfs	OL-NS
T. Fattor	OL-NS
D. Huie	ARDEC
LTC Kropf	OAS
K. Rueb	DOE/AL
C. Mangeng	LANL

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APPENDIX E

(U) REQUIREMENTS WORKING GROUP

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APPENDIX F

(U) WARHEAD DESIGN WORKING GROUP

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THE SLIDES FOR THIS SECTION WERE NOT AVAILABLE AT PRINT TIME.

WHEN THEY BECOME AVAILABLE WE WILL MAIL AN ADDENDUM TO THE MEETING MINUTES.

APPENDIX G

(U) MISSION ANALYSIS WORKING GROUP

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MISSION ANALYSIS WORKING GROUP

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OVERVIEW

- Activities Since Last Meeting
- Mission Need Statement
- Modeling Efforts
- Action Items

Activities Since Last Meeting

- CMT Workshop
- MNS Progress
- Modeling Progress

Mission Need Statement

- Validate Need
- Threat Analysis
- Mission Area Analysis
- Write MNS

Modeling Efforts

- Progress (Lt VanVeldhuizen Briefing)
- Funding

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HPRF PHASE II MAWG

FUNDING ISSUES

- MISSION MODELING MAY NOT BE ACCOMPLISHED FOR FREE!
- SIMULATION MODIFICATIONS MAY BE REQUIRED
  - THESE WILL PROBABLY COST MONEY!
- CURRENTLY IDENTIFIED FUNDING SOURCES
  - POSSIBLE FCDNA CONTRIBUTION
  - ANY VOLUNTEERS?
- W/O FUNDS, MODELING MAY NOT BE ACCOMPLISHED!

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HPRF PHASE II MAWG

MAWG MILESTONES

- 11 DEC 92 - APPROVE MODELING PRIORITIES
- 11 DEC 92 - APPROVE SPECIFIC SIMULATION FOR PENETRATION MISSION
- 1 FEB 93 - IDENTIFY FUNDING SOURCES
- 1 MAR 93 - IDENTIFY AGENCY(IES) TO PERFORM PENETRATION MODELING
- 1 APR 93 - BEGIN PENETRATION MODELING
- 1 APR 93 - IDENTIFY AND APPROVE SIMULATIONS FOR OTHER MISSIONS
- 1 MAY 93 - IDENTIFY AGENCY(IES) TO PERFORM OTHER MISSION MODELING
- 1 JUN 93 - BEGIN OTHER MISSION MODELING

Action Items

- Deconfliction Issue
- Design Preference
- Working Group Representatives
- MNS
- Test Objects Alignment With Modeling
- Modeling Function Efforts
- Notify Test Subgroup When Modeling Subgroup Meets

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APPENDIX H

(U) VULNERABILITY WORKING GROUP

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List of workshop participants

Philip Angelotti	ARDEC/SMCAR-FSS-E
LTC Walter L. Atchison	DNAFC/FCPRA
Captain Roy M. Bohnert	FASTC/TATD
Thomas M. Boyd	FASTC/TABS
Hriar S. Cabayan	LLNL/L-81
J. Philip Castillo	Logicon – RDA, Albuquerque
Elizabeth L. (Betsy) Doherty	FASTC/TABS
David M. Fordham	SNL, Albuquerque/Dept. 4113
James M. Hoffman	SNL, Albuquerque/Dept. 1208
James R. Hogan	SNL, Livermore/Dept. 5371
Lt. William D. Hopkins	FASTC/TABB
Lt.Col. Wayne M. Johnson	USSTRATCOM/J5232
Captain Christopher M. Kalivoda	FASTC/TABS
Major Charles C. Kinkead	HQ, ACC/DONB
Captain William A. Lamb	OAS/XRN
Captain Brian A. Larkin	FASTC/TABG
Clifton H. McAuley	FASTC/TABB
Lt. William L. McGraw	FASTC/TABS
Captain John C. (Chris) Powell	HQ, ACC/DONM
Major Kevin T. Reilly	HQ, ACC/DONB
Joseph A. Sefcik	LLNL/L-22
Fred A. Swanson	FASTC/TABG
Thomas F. Tingley	FASTC/TACS

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DOE, USAF

Review procedure

- Report faxed/mailed to
  - FASTC
  - USSTRATCOM
  - HQ ACC
  - Air Staff
  - PL
- Review meeting held at PL on December 9, 1992

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