

FINESSE
PLAN FOR FY 1985

MOHAMED ABDOU
UCLA

FINESSE EXECUTIVE COMMITTEE MEETING
DECEMBER 13-14, 1985
UCLA

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DECEMBER 13-14, 1984
UCLA, ROOM 6275 BOELTER HALL

AGENDA

THURSDAY, DECEMBER 13

9:00 - 9:30	INTRODUCTION	ABDOU
9:30 - 11:00	TEST PLAN, SCENARIOS	BERWALD
11:00 - 12:30	NON-NEUTRON EXPERIMENTS	SZE/TILLACK
12:30 - 1:30	LUNCH	
1:30 - 2:30	FISSION REACTORS	GROVER
2:30 - 3:00	POINT NEUTRON SOURCES	GROVER
3:00 - 4:00	FUSION DEVICES	GIERSZEWSKI
4:00 - 4:30	MIRRORS	DOGGETT
4:30 - 5:00	PLASMA-INTERACTIVE COMPONENTS	MCGRATH
5:00 - 5:30	DISCUSSION	

FRIDAY, DECEMBER 14

8:30 - 9:00	TRITIUM	BARTLIT
9:00 - 9:30	COST APPROACH/METHODOLOGY	CARPENTER
9:30 - 10:15	AGENDA FOR FY 1985	ABDOU
10:15 - 11:30	MARCH WORKSHOP STATUS/PLANS	ABDOU

FINESSE EXECUTIVE COMMITTEE MEETING
DECEMBER 13-14, 1984

PURPOSE OF MEETING

- FINALIZE SCOPE OF WORK AND RESPONSIBILITIES FOR FY84

OTHER ITEMS

- AGENDA FOR THE INTERNATIONAL MARCH WORK
- PREPARATION OF PRESENTATIONS AND RESPONSIBILITIES FOR THE WORKSHOP
- SCHEDULE FOR FY85

THANKS AND WELCOME

- THANKS FOR AN EXCELLENT EFFORT IN FY84
- THANKS FOR CONTINUING YOUR EFFORT INTO FY85
- WELCOME TO NEW PARTICIPANTS (OR INCREASED EFFORT) IN FINESSE

SANDIA:	MCGRATH, ET AL
MDAC:	G. D. MORGAN
LANL:	J. BARTLIT, ET AL
GRUMMAN:	T. CARPENTER, ET AL
KFK:	RHEIMAN
JAERI:	NAKAGAWA

FINESSE PRINCIPAL TECHNICAL TASKS

- I. IDENTIFICATION OF ISSUES
- II. QUANTIFYING TEST REQUIREMENTS
 - A. SURVEY OF TESTING NEEDS
 - B. QUANTIFYING TEST REQUIREMENTS
- III. EVALUATION OF EXPERIENCE FROM OTHER TECHNOLOGIES
 - A. FISSION
 - B. AEROSPACE
- IV. SURVEY AND EVALUATION OF TEST FACILITIES
 - A. NON-FUSION DEVICES
 - B. FUSION DEVICES
- V. COMPARATIVE EVALUATION OF TEST FACILITIES, SCENARIOS
- VI. RECOMMENDATIONS ON FUSION NUCLEAR TECHNOLOGY DEVELOPMENT STRATEGY

NOTE

- THESE TASKS CONTINUE TO BE THE FRAMEWORK OF FINESSE
- HOWEVER, BECAUSE OF THE NATURE OF THE SECOND YEAR'S EFFORT, IT IS MORE CONVENIENT TO DEFINE THE 1985 TASKS UNDER DIFFERENT BREAKDOWN STRUCTURE, IN ORDER TO MAKE NEW ITEMS MORE VISIBLE.

REFLECTIONS ON FY 84 EFFORT EMPHASIZING
AREAS REMAINING FOR FY 85

- WE ALL DID VERY WELL.
WE MUST KEEP THE MOMENTUM IN FY 85.
- IDENTIFIED ISSUES AND SURVEYED EXPERIMENTAL NEEDS
 - BUT, CHARACTERIZATION OF ISSUES IS NOT COMPLETE
 - EXPERIMENTAL NEEDS WERE BROAD BUT NOT DEEP
 - STILL NEEDS SHARPENING OF GOALS, CONCEPT VERIFICATION (WHAT, WHEN, HOW), AND FAILURE MODES
- EVALUATED CAPABILITIES AND LIMITATIONS OF POINT NEUTRON SOURCES AND FISSION REACTORS
 - BUT, WE DID NOT INVESTIGATE THE DETAILS OF FISSION REACTOR UTILIZATION/EXPERIMENTS
- VERY BRIEF LOOK AT NON-NEUTRON TEST STANDS
 - NEED A LOT MORE
- INVESTIGATED ENGINEERING SCALING FOR FUSION TEST DEVICE
 - WE NEED SIMILAR EFFORT FOR NON-FUSION DEVICES
- EVALUATED NEED FOR A FUSION DEVICE
 - CONCLUSION: DEFINITELY NEED A FUSION DEVICE (THIS IS NOT AN ISSUE)
 - THE ISSUES ARE:

WHEN?

(ANSWER DEPENDS ON GOAL)

TYPE OF DEVICE?

COMBINE WITH PHYSICS?

REFLECTIONS ON FY 84 EFFORT EMPHASIZING
AREAS REMAINING FOR FY 85, CONT'D

- EXPLORED SOME CONCEPTS FOR DEDICATED FUSION DEVICE
 - TMR (TDF, MFTF-B α + T)
 - RFP
 - BEAN TOKAMAK
 - COSTS, BENEFITS, RISKS VARY AND ARE HARD TO EVALUATE
 - SUBSTANTIAL IMPROVEMENTS CAN HELP
- R&D SCENARIOS WERE EXAMINED IN TERMS OF FUSION DEVICES
 - CONCLUSION: COMBINING PHYSICS AND TECHNOLOGY TESTING IN A SINGLE DEVICE WITH > 100 MW HAS ALARMING PROBLEMS (E.G. PARADOX OF BLANKET R&D)
- EVALUATED EXPERIENCE FROM FISSION AND AEROSPACE (NO FURTHER WORK IS NEEDED?)
- MADE A PRELIMINARY TEST MATRIX
 - WE DID NOT PRIORITIZE
 - WE HAVE NOT ATTEMPTED A TEST PLAN
 - WE DID NOT ATTEMPT ANY COSTING

GENERAL GOALS FOR FY85

1. CLEAR UNDERSTANDING OF:

TECHNICAL (COMPONENT) ISSUES
R&D PROBLEMS (ISSUES OF FACILITIES, COST
TIMING, ETC.)

2. IDENTIFICATION AND CHARACTERIZATION OF MERITORIOUS
PATHWAYS FOR R&D OF VARIOUS NUCLEAR SUBSYSTEMS

- A. PATHWAYS OF NON-FUSION FACILITIES
- B. PATHWAYS OF FUSION FACILITIES

GOAL: QUANTITATIVE COMPARISON OF ADVANTAGES AND
DISADVANTAGES OF OPTIONS

3. CLEAR DEFINITION OF NEAR-TERM FACILITIES/EXPERIMENTS

- ENOUGH INFORMATION TO SHOW THAT SOMETHING
MEANINGFUL CAN BE DONE NOW IF WORLD FUSION
PROGRAMS ARE TO START INITIATIVE IN FUSION
NUCLEAR TECHNOLOGY

4. APPROXIMATE COSTS OF INDIVIDUAL STEPS AND OVERALL
PROGRAM

RESPONSIBILITIES

MANAGER: OVERALL MANAGEMENT RESPONSIBILITY

DEPUTY MANAGER: SHARES MANAGEMENT RESPONSIBILITY, AND DAY-TO-DAY
PROJECT-WIDE COORDINATION

EXECUTIVE COMMITTEE

- RESPONSIBLE FOR TECHNICAL AND PROGRAMMATIC DIRECTION
- CONSISTS OF TASK LEADERS WHO HAVE OVERALL RESPONSIBILITIES FOR EXECUTION OF TASKS

ADVISORY COMMITTEE

- PROVIDE ADVICE AND CRITIQUE ON VARIOUS TECHNICAL AND PROGRAMMATIC ASPECTS
- MECHANISM FOR INVOLVING THE OVERALL FUSION COMMUNITY (MEMBERS REPRESENT PRACTICALLY ALL IMPORTANT AREAS OF FUSION)

FINESSE EXECUTIVE COMMITTEE

M. ABDOU, UCLA
J. BARTLIT, LANL
D. BERWALD, TRW
T. CARPENTER, GRUMMAN
R. CONN, UCLA
J. DOGGETT, LLNL
P. GIERSZEWSKI, UCLA
J. GROVER, HEDL
R. McGRATH, SNL-A
G. D. MORGAN, MDAC
D. K. SZE, ANL
M. TILLACK, UCLA

FINESSE ADVISORY COMMITTEE

C. BAKER, ANL
E. BLOOM, ORNL
J. DAVIS, MDAC
R. KRAKOWSKI, LANL
J. MANISCALCO, TRW
J. SCHMIDT, PPPL
K. SCHULTZ, GA
T. SHANNON, FEDC
J. STRAALSUND, HEDL
K. THOMASSEN, LLNL

UCLA GROUP

M. ABDU	PRINCIPAL INVESTIGATOR
M. TILLACK	LIQUID METALS, NON-NEUTRON TEST STANDS
P. GIERSZEWSKI	SOLID BREEDERS, FUSION DEVICES
R. CONN	PLASMA ENGINEERING
N. GHONIEM	MATERIALS
K. TAGHAVI	THERMAL HYDRAULICS
J. REIMANN	THERMAL HYDRAULICS
H. MADARAME	LIQUID METAL MHD
M. NAKAGAWA	NEUTRONICS, SHIELDING
Y. OYAMA	NEUTRONICS
K. SHIN	NEUTRONICS
K. SNIDER	LIQUID METAL MHD
M. SONG	FUSION DEVICES
G. BELL	CORROSION
A. MAJID	NEUTRONICS

SCHEDULE OF FINESSE MEETINGS FOR FY 1985

DECEMBER 13-14, 1984	EXECUTIVE COMMITTEE MEETING	UCLA, BOELTER HALL, ROOM 6275
FEBRUARY 14-15, 1985	PROJECT MEETING	UCLA FACULTY CENTER, PLAYA ROOM
MARCH 11-13, 1985	INTERNATIONAL WORKSHOP*	UCLA FACULTY CENTER, HACIENDA ROOM
APRIL 23-24, 1985	PROJECT MEETING	UCLA FACULTY CENTER HACIENDA ROOM
JUNE 13-14, 1985	PROJECT MEETING*	UCLA FACULTY CENTER, PLAYA ROOM
LATE JULY/EARLY AUGUST (EXACT DATES TBD)	PROJECT MEETING	TBD
OCTOBER 23-24, 1985	WORKSHOP*	UCLA FACULTY CENTER, CALIFORNIA ROOM

*ADVISORY COMMITTEE ATTENDS.

PROJECT TASKS

PROJECT TASKS RELATE DIRECTLY TO THE OVERALL OUTPUT OF THE STUDY.

- LOOK AT THE OVERALL PICTURE AND DEFINE THE TYPES OF INFORMATION NEEDED FROM VARIOUS SUBTASKS (MECHANISM FOR EARLY DETECTION OF GAPS/DEFICIENCIES IN OUR DISTRIBUTION OF EFFORT.
- TRANSLATE OUTPUT FROM VARIOUS SUBTASKS INTO AN OVERALL PICTURE/OUTPUT DIRECTLY USABLE BY DECISION MAKERS.
- THESE TASKS ARE MANAGEMENT TASKS. THEY NEED TO BE WORKED VERY CLOSELY WITH THE PROJECT MANAGEMENT.

TEST PLAN

- DEFINE CLEARLY AND QUANTITATIVELY THE "END GOAL" FOR WHICH FINESSE R&D PATHWAYS ARE DEVELOPED.
- FORMULATE SCENARIOS FOR OVERALL FUSION DEVELOPMENT.
- COMPARE (AS QUANTITATIVELY AS POSSIBLY) PATHWAYS AND SCENARIOS.
- PREPARE OUTPUT IN A FORMAT USABLE BY THE COMMUNITY AT LARGE.
- NOTE: WE WILL COMPARE AND ELIMINATE THE OBVIOUSLY POOR OPTIONS. WE WILL AVOID, WITHIN THE CONTEXT OF FINESSE, STRONG ENDORSEMENT OF ONLY ONE OPTION.

COST

- HELP VARIOUS SUBTASKS IN PRELIMINARY COSTING TO PERMIT PERFORMING TRADEOFFS WITHIN EACH SUBTASK.
INTERACTION: WITH SUBGROUPS
- DEVELOP COSTING INFORMATION NECESSARY FOR EVALUATION OF PRIMARY PATHWAYS AND SCENARIOS DEFINED IN THE TEST PLAN.
INTERACTION: WITH TEST PLAN MANAGER/GROUP

CONCEPT DEFINITION

- THE SCOPE OF THIS TASK IS STILL IN THE FORMULATION STAGE.
- THE PURPOSE OF THIS IS TO SOLVE A GENERAL PROBLEM THAT HAS BEEN A SOURCE OF CONFUSION IN COMMUNICATING WITH PEOPLE OUTSIDE FINESSE.
- DESCRIPTION OF PROBLEM
 - BASED ON R&D HISTORY FROM OTHER TECHNOLOGY (AND ON OUR OWN ANALYSIS) R&D HAS FOUR DISTINCT, ALBEIT OVERLAPPING, AREAS:
 1. BASIC PROPERTIES
 2. PHENOMENA EXPLORATION
 3. CONCEPT ENGINEERING FEASIBILITY VERIFICATION
 4. COMMERCIAL FEASIBILITY DEMONSTRATION
 - THE FOUR AREAS OCCUR ROUGHLY IN THE SAME CHRONOLOGICAL ORDER (1,2,3,4) BUT WITH CONSIDERABLE OVERLAP (1-2,2-3).
 - CONCEPT ENGINEERING FEASIBILITY VERIFICATION IS NORMALLY BASED ON INTEGRATED TESTS OF THE COMPONENT/SUBSYSTEM NOT THE SYSTEM. WE HAVE EXAMINED THE NEED FOR INTEGRATED TESTS (COMPONENT ONLY AND UNDER SCALED DOWN ENVIRONMENTAL CONDITIONS) FOR ENGINEERING FEASIBILITY. WE CANNOT PROVE IN DEFINITIVE QUANTITATIVE TERMS (NEED THE EXPERIMENTAL DATA) THAT WE WILL EVENTUALLY NEED THEM. SINCE DESIGN WINDOW IS NARROW AND FAILURE MODES ARE UNKNOWN, IT IS PRUDENT TO ASSUME FUSION R&D WILL FOLLOW HISTORICAL TRENDS IN OTHER FIELDS.
 - PEOPLE SEEM TO BE EITHER QUESTIONING THE NEED FOR INTEGRATED TESTING (OR IT MAY BE WE MERELY CONFUSED THEM ABOUT TIME FRAME, ETC.).

CONCEPT DEFINITION

(CONTD.)

- ACTION

MORGAN DEVELOPS A TASK SCOPE AND SELECTS GROUP TO ADDRESS THE PROBLEM.

- WHAT DOES IT TAKE FOR CONCEPT ENGINEERING FEASIBILITY VERIFICATION? (INTERACT WITH TEST PLAN GROUP.)
- DO WE HAVE A SERIOUS FLAW IN OUR LOGIC OR DO WE MERELY HAVE A NOMENCLATURE PROBLEM?

SPECIAL TASKS

- SPECIAL TASKS COVERS AREAS THAT:
 1. ARE LOGICALLY BEING CARRIED OUT UNDER OTHER TASKS BUT THERE IS A RISK OF BEING FORGOTTEN; OR
 2. DO NOT FIT LOGICALLY INTO OTHER TASKS AND NEED TO BE EXPLICITLY DEFINED.

MATERIALS

- INSURE THAT OVERALL ASPECTS OF MATERIALS ARE ADEQUATELY ADDRESSED IN VARIOUS TASKS
- AUTHORITY AND SOURCE OF INFORMATION ON MATERIALS
- TASK LEADER: GROVER (SHOULD INVOLVE RAY CLIFF FROM ORNL BASED ON BLOOM'S APPROVAL)

I&C

- I&C R&D ISSUES AND NEEDS FOR THE "END GOAL"
- I&C R&D TO SUPPORT NEAR-TERM EXPERIMENTS

FAILURE MODES

- MDAC/EPRI PROGRAM
- CRITICAL AREA THAT NEEDS A LOT MORE ANALYSIS

CORE TASKS

- NUCLEAR SUBSYSTEMS
- NON-FUSION FACILITIES
- FUSION FACILITIES

- THIS IS THE MAIN EFFORT.
- THESE TASKS GENERATE THE TECHNICAL INFORMATION NECESSARY TO CARRY OUT THE PROJECT TASKS (TEST PLAN, COST, ETC.).
- REMEMBER, HOWEVER, THE TECHNICAL WORK PERFORMED IN THE CORE TASK IS IMPORTANT IN ITS OWN RIGHT:
 - UNDERSTANDING OF ISSUES,
 - PREDICTION OF NEW PHENOMENA,
 - UNDERSTANDING DEVELOPMENT QUESTIONS,
 - UNDERSTANDING EXPERIMENTAL CAPABILITIES, LIMITATIONS, NEEDS.
- INTERFACES
 - SUBSYSTEMS GROUPS (IN GENERAL): ASPECTS OF EXPERIMENTS
 - FACILITIES GROUPS: ASPECTS OF FACILITIES

NUCLEAR SUBSYSTEMS

- LM BLANKET, SB BLANKET, PIC, TRITIUM/VACUUM, SHIELD
- EACH NUCLEAR SUBSYSTEM GROUP IS RESPONSIBLE FOR:
 - SUBSYSTEM TECHNICAL ANALYSIS;
 - DEFINITION, CHARACTERIZATION OF ISSUES AND TESTING NEEDS;
 - QUANTIFYING TEST REQUIREMENTS.
- INTERACTIONS
 - NON-FUSION FACILITIES GROUPS TO JOINTLY DEVELOP EXPERIMENTAL OPTIONS FOR THE SUBSYSTEM R&D.
 - FUSION FACILITIES GROUP TO DEFINE EXPERIMENTS AND FACILITY REQUIREMENTS/UTILIZATION (SUBSYSTEM GROUPS RESPONSIBLE FOR THE EXPERIMENTS, RESPONSIBLE FOR FACILITIES).
- CRITICAL INTERACTIONS
 - LM BLANKET ↔ NON-NEUTRON BLANKET TEST STANDS
 - SB BLANKET ↔ FISSION REACTORS

NON-FUSION FACILITIES

A. POINT SOURCES

- UTILIZATION OF EXISTING FACILITIES
- OPTIONS FOR NEW FACILITIES

B. FISSION REACTORS

- ULTIMATE GOAL: DEFINE THE MAJOR EXPERIMENTS THAT CAN BE CARRIED OUT IN FISSION REACTORS OVER THE NEXT 10 TO 15 YEARS
- TASK CARRIED OUT JOINTLY

C. NON-NEUTRON TEST STANDS

- EVALUATE THE EXTENT TO WHICH EXISTING FACILITIES CAN BE USED (OVER NEXT 10-15 YEARS)
- DEFINE AND CHARACTERIZE MAJOR NEW FACILITIES NEEDED OVER THE NEXT 10-15 YEARS.

FUSION FACILITIES

- PRIMARY FINESSE TASK:
 - QUANTIFY TEST REQUIREMENTS
 - EVALUATE ISSUES OF UTILIZATION/MODIFICATIONS FOR NUCLEAR EXPERIMENTS IN CANDIDATE DEVICE OPTIONS.
 - COMPARE FACILITIES
- FACILITIES DEFINITION
 - RELY ON EFFORTS OF OTHER "ADVOCATE/EXPERTISE" GROUPS