ESL-TR-88-38

FY 88
TECHNICAL OBJECTIVE DOCUMENT (TOD)

JUNE 1988

ENGINEERING & SERVICES LABORATORY
AIR FORCE ENGINEERING & SERVICES CENTER
TYNDALL AIR FORCE BASE, FLORIDA 32403

NOTICE

PLEASE DO NOT REQUEST COPIES OF THIS REPORT FROM HQ AFESC/RD (ENGINEERING AND SERVICES LABORATORY). ADDITIONAL COPIES MAY BE PURCHASED FROM:

NATIONAL TECHNICAL INFORMATION SERVICE
5285 PORT ROYAL ROAD
SPRINGFIELD, VIRGINIA 22161

FEDERAL GOVERNMENT AGENCIES AND THEIR CONTRACTORS REGISTERED WITH DEFENSE TECHNICAL INFORMATION CENTER SHOULD DIRECT REQUESTS FOR COPIES OF THIS REPORT TO:

DEFENSE TECHNICAL INFORMATION CENTER
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for Public Release Distribution Unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) ESL-TR-88-38	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Engineering and Services Laboratory 6b. OFFICE SYMBOL (If applicable) HQ AFESC/RDXP	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Headquarters Air Force Engineering and Services Center (HQ AFESC) Tyndall AFB FL 32403-6001	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

FY88 Technical Objective Document (TOD)

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Annual	FROM _____ TO _____	June 1988	

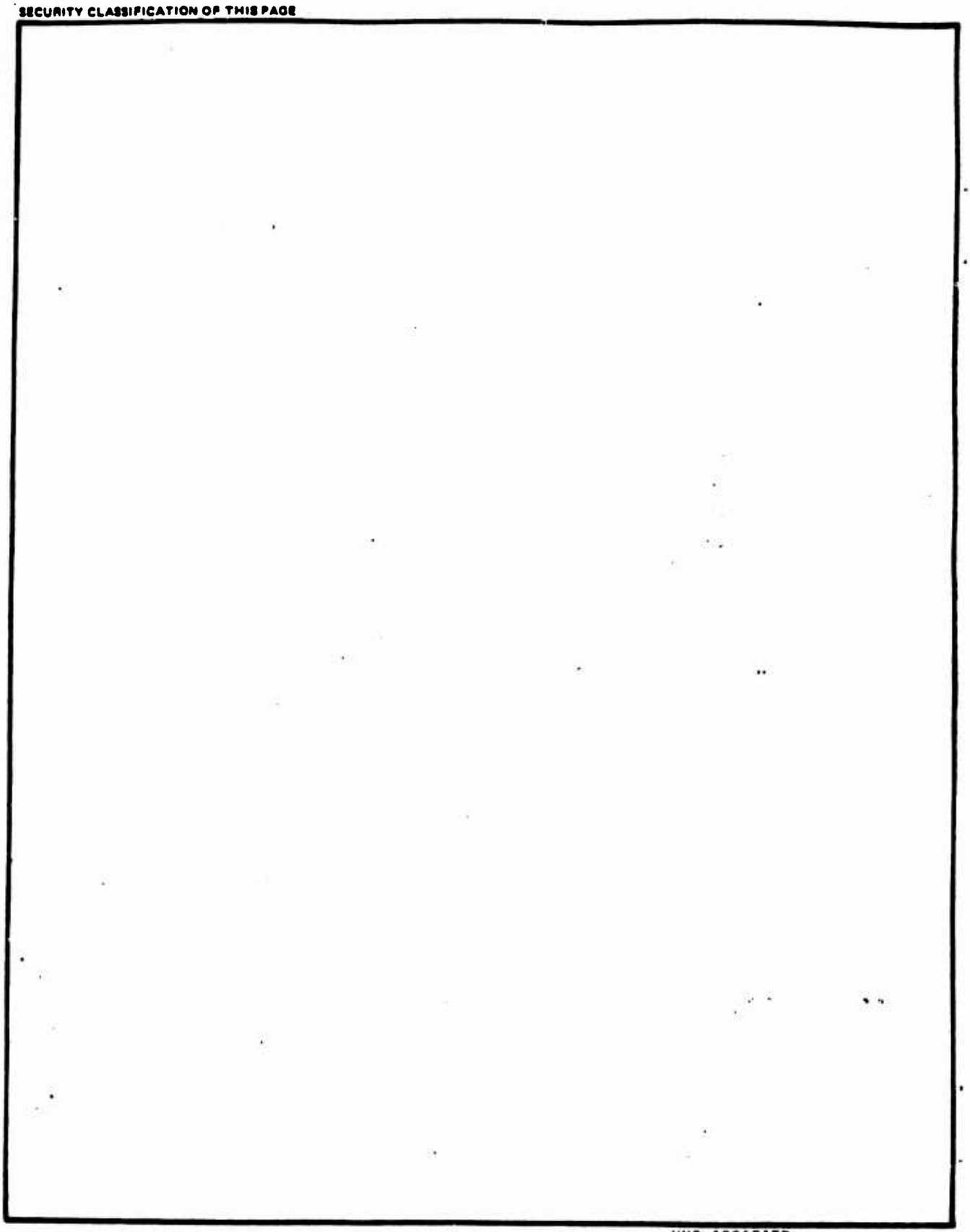
16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Aerospace Operating Surfaces; Fire Protection; Structures; Environmental Compliance; Utilities; Site Restoration.

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

This FY88 TOD details the Directorate of Engineering and Services Laboratory (HQ AFESC/RD) research and development program in civil engineering and environmental quality. The programs are directed toward expanding the technology base needed for developing state-of-the-art capabilities to support the wartime Engineering and Services' role in projection of aerospace power. These efforts encompass activities in the areas of aerospace operating surfaces, utilities, and fire protection technology. In addition, environmental research is pursued to assure that compliance with material environmental regulations will not impede Air Force operations.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Richard E. Brewer, Maj, USAF	22b. TELEPHONE (Include Area Code) (904) 283-6256 22c. OFFICE SYMBOL HQ AFESC/RDX



PREFACE

This technical report sets forth technical objectives for civil engineering (CE) and environmental engineering (EE) research and development (R&D) conducted by the Headquarters Air Force Engineering and Services Center, Engineering and Services Laboratory (HQ AFESC/RD), Tyndall Air Force Base, Florida 32403-6001. This information is designed to provide other laboratories, industry, and the academic community with preliminary necessary information on this Laboratory's planned technology programs. Project officer for these programs is Major Richard E. Brewer, HQ AFESC/RDXP.

This document is furnished for information and general guidance only; it is not to be construed as a request for proposal (RFP), or as a commitment by the United States Government to issue a contract, or as authority for the undersigned to incur expenses in anticipation of a Government contract; nor is it to be used as the basis of a claim against the Government. The furnishing of this document by the Government is not to be construed to obligate your company to furnish to the Government any experimental, developmental, research, or production articles, services or proposals, or comment with respect to such document, the Technical Objective Document (TOD) program, or any aspects of either.

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government, thereby, incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This document has been reviewed by the Public Affairs (PA) office and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nationals.

This document has been reviewed and is approved for publication.

LAWRENCE D. HOKANSON, Colonel, USAF
Director of Engineering and Services
Laboratory

(The reverse of this page is blank)

TABLE OF CONTENTS

(The reverse of this page is blank)

SECTION I

INTRODUCTION

The Air Force TOD program is an integral part of the process by which the Air Force plans and formulates a detailed technology program to support the development and acquisition of Air Force weapons systems. Each Air Force laboratory prepares an annual research and technology (R&T) plan in response to available guidance based on USAF requirements, the identification of scientific and technological opportunities, and the needs of present and projected systems. These plans include proposed efforts to achieve desired capabilities, to resolve known technical problems, and to capitalize on new technical opportunities. The proposed efforts undergo a lengthy program formulation and review process. Generally, the criteria applied during the formulation and review are responsiveness to stated objectives and known requirements, scientific content and merit, program balance, developmental and life cycle costs, and consideration of payoff versus risk.

It is fully recognized that the development and accomplishment of the Air Force technical program is a product of teamwork on the part of the Air Force laboratories and the industrial and academic research and development (R&D) community. The TOD program is designed to provide industry and the academic community with necessary information on the Air Force laboratories' planned technology programs. Each laboratory's TOD is extracted from its R&T plan.

Specific objectives are:

1. To provide planning information for independent R&D programs.

2. To improve the quality of the unsolicited proposals (UP) and R&D procurements.

3. To encourage face-to-face discussions between non-Government scientists and engineers (S&E) and their Air Force counterparts.

One or more TODs have been prepared by each Air Force laboratory that has responsibility for a portion of the Air Force's technical programs. Classified TODs are available from the Defense Documentation Center (DDC), and unclassified TODs are available from the National Technical Information Service (NTIS).

SECTION II

HOW TO USE THIS DOCUMENT

Unsolicited proposals (UPs) to conduct programs leading to the attainment of any of the objectives presented in this document may be submitted directly to an Air Force laboratory. However, before submitting a formal proposal, we encourage you to discuss your approach with the laboratory point of contact. After your discussion or correspondence with the laboratory personnel, you will be better prepared to write your proposal.

As stated in the "AFSC Guide for UPs" (copies of this informative guide on UPs are available by writing to Headquarters Air Force Systems Command (HQ AFSC/PPPR, Andrews AFB DC 20334), elaborate brochures or presentations are definitely not desired. The "ABCs" of successful proposals are accuracy, brevity, and clarity. It is extremely important that your letter be prepared to encourage its reading, to facilitate its understanding, and to impart an appreciation of the ideas you desire to convey. Specifically, your letter should include the following:

1. Name and address of your organization.

2. Type of organization (profit, nonprofit).

3. Concise title and abstract of the proposed research, and the statement indicating that the submission is a UP.

4. An outline and discussion of the purpose of the research, the method of attack, and the nature of the expected results.

5. Name and research experience of the principal investigator.

6. A suggestion as to the proposed starting and completion dates.

7. An outline of the proposed budget, including information on equipment, facility, and personnel requirements.

8. Names of any other Federal agencies receiving the proposal (this is extremely important).

9. Brief description of your facilities, particularly those which would be used in your proposed research effort.

10. Brief outline of your previous work and experience in the field.

11. If available, a descriptive brochure and a financial statement.

As you read through the pages that follow, you may see a field of endeavor where your organization can contribute to the achievement of a specific technical goal. If such is the case, you are invited to discuss the objective further with the S&E identified with that objective. Further, you may have new ideas not considered in this document which, if brought to the attention of the proper organization, can make a significant contribution to our military technology. We will always maintain an open mind in evaluating any new concepts which, when successfully pursued, would improve our future operational capability.

On behalf of the United States Air Force (USAF), you are invited to study the objectives listed in this document and to discuss them with the responsible Air Force personnel. Your ideas and proposals, whether in response to the TODs or not, are most welcome.

SECTION III

MANAGEMENT OVERVIEW

A. LABORATORY MISSION

1. The Air Force Engineering and Services Center Laboratory (AFESC/RD) mission is derived from the engineering and services (E&S) mission as well as that of the Headquarters Air Force Systems Command (HQ AFSC). The E&S mission is to provide the necessary assets and skilled manpower to prepare and sustain global installations as stationary and mobile platforms for projection of aerospace power in peace and war. The HQ AFSC mission is to advance aerospace technology and apply it to aerospace systems development/improvement, and to acquire superior, cost-effective, supportable aerospace systems and equipment.

2. RD must plan and execute USAF basic research, exploratory development, and advanced development programs to support E&S's operational missions in airbase performance and Air Force projection and employment of air power. RD is tasked with developing and providing the technology base for the tools and training of the military engineer which must be as much "state of the art" as the weapons systems he supports.

3. Principal elements of this mission include:

a. Achieving and maintaining superiority in R&D areas required to support the E&S operational mission.

b. Establishing and effectively applying laboratory capabilities to prevent technological surprises.

c. Identifying improvements that meet near- and/or long-term needs of the military engineer in support of aerospace forces.

d. Providing technical support to operational and logistics commands.

B. INVESTMENT STRATEGY

1. Our investment of R&D resources is guided by our goal of providing state-of-the-art capabilities to the E&S forces in the achievement of their wartime mission. The definition of technical requirements associated with that mission is continuing to evolve into a more structured and effective

process. Currently, our investment approach is motivated by statements of operational need (SONs), logistics needs (LNs), public law, and Air Force planning documents. In addition, our investment goals are reviewed and guided by the Engineering and Services Requirements Board (ESRB) composed of the director for E&S (HQ USAF/LEE) and major command deputy chiefs of staff for engineering and services (MAJCOM/DEs). In the future, E&S investment guidance will be supplemented by the results of an E&S requirements identification process. When fully institutionalized, this process will identify E&S required capability to support all Air Force operational missions against any threat worldwide. Once E&S required capability is identified, the process will allow the laboratory to compare E&S current and future capability to E&S required capability resulting in the identification of needs. Once these needs are identified, RD can develop the required tech base and selected engineering development programs to address these identified needs. The E&S requirements identification process will play a key role in the development of future investment strategies for this laboratory.

2. Current emphasis in the laboratory R&D program is placed on deriving the technologies to support advancements in the areas of airbase operability (ABO), including mission essential structures, launch and recovery platforms, survivable utilities, fire protection and recovery, environmental quality assessments, pollution control, and site restoration.

3. The potential operational utility to the Air Force are:

a. Serviceability, survivability, and recovery of aircraft operating surfaces.

b. Survivability and recovery of critical airbase structures.

c. Reliability, survivability, and recovery of utilities (electrical, POL, water).

d. Base recovery after attack.

e. Forward basing for force projection.

f. Compliance with applicable environmental standards.

g. Reduced cost to restore contaminated Air Force land and groundwater to acceptable levels.

C. DIRECTOR'S ASSESSMENT

1. Engineering and Services' role in the projection and employment of aerospace power is a crucial element of overall Air Force combat readiness. The military engineer's capability must be survivable, reliable, and as technologically advanced as the weapon system he supports. To keep airbase

support capabilities on a comparable basis with weapon systems, a strong R&D program is needed. The laboratory's ability to develop and sustain an adequate technology base to assure the effectiveness of E&S forces in the role of projecting and employing aerospace power will contribute to future Air Force operational capability.

2. The majority of our programs are designed to increase the warfighting capability of the Air Force. However, Air Force training and preparation for war occurs during peacetime. Society's increasing awareness of environmental problems and the mandated response by the Congress to these concerns demand that Air Force activities, programs, and operations that may impact on the environment comply with the spirit as well as the letter of the National Environmental Policy Act in addition to all other Federal environmental laws, executive orders, and regulations. Maintaining readiness in the face of accelerating high costs of environmental regulatory compliance requires that environmental factors associated with Air Force operations be identified, analyzed, and if necessary, corrected as early as possible in the life cycle of a weapon system.

3. Over the next 2-7 years, our program will have significant impact on E&S warfighting capability. Our resources will be directed toward building a strong technology base in the aerospace operating surfaces, structures, utilities, and fire protection/control areas. The Defense Environmental Restoration Program (DERP) will dominate the technological and engineering development activities of our environmental quality program over the upcoming 2-7 year period.

D. ORGANIZATION AND MANAGEMENT

1. The Engineering and Services Laboratory is part of the Headquarters Air Force Engineering and Services Center (HQ AFESC/RD) located at Tyndall AFB FL. The director of the laboratory reports directly to the Commander of AFESC, and is also responsible to the Deputy Chief of Staff for Technology and Plans at Headquarters Air Force Systems Command (HQ AFSC/XT), Andrews Air Force Base, Maryland 20334. Operations and maintenance funds are provided by the Air Staff through the Center, while R&D funds and program management direction are provided by HQ AFSC/XT.

2. This Laboratory has been organized to respond to the Air Force E&S' needs. The organization is structured to implement basic research, exploratory development, and advanced development in the areas of fire protection, structures, utilities, aerospace operating surfaces, environmental compliance, and site restoration.

E. FUNDS

The laboratory manages approximately $20 million in R&D funds annually. All R&D funds are used to obtain the expertise and capabilities of universities, industry, and other Government agencies in the development of Civil Engineering and Environmental Quality technology. These funds support basic research, exploratory development, and advanced development, and include funds provided by other Government agencies desiring support in these areas.

F. MANPOWER

The laboratory consists of approximately 150 assigned military and civilian scientific, engineering, administrative, and support personnel with approximately 70 percent in the S&E category covering the full range of disciplines relevant to E&S. The high level of educational attainment of professionals is reflected by over 15 percent with doctorate degrees and 50 percent with masters degrees. In addition to these, we have approximately 23 scientific, engineering, and support personnel who support the laboratory primarily in the areas of plans, programs, and financial management.

G. FACILITIES

1. The Engineering and Services Laboratory is co-located with the HQ AFESC. Our Engineering Research Division is located in the same building as the Center. Our Environics Division is located in a 33,000-square foot facility adjacent to the main AFESC building. This facility allows our scientists involved in environmental quality research to work in a specially designed laboratory that also incorporates space and capabilities for structural tests and evaluations, and provides the facilities and equipment needed for food service and mortuary laboratory activities. This means that the "services" portion of our laboratory designation is now a reality.

2. Improvements and streamlining of our operations support facility in building 9706 and the various test areas have enhanced our RDT&E capabilities in airbase operability, soil testing, shelters and structures, fire protection research, pavement stress, small crater repair, and other civil engineering projects. The recent installation of a small centrifuge allows gravity and time dependent events to be accomplished at a very small scale, and compress years of effects into only a few hours. In dynamic events, stress factors of explosions can be obtained without the usual dangers and expense of present large-scale demolition methods.

H. SUMMARY

The following sections project the direction of our R&D activities for the next 2-7 years. Major thrusts, tech areas, development areas and operational utility are presented in Section IV and Section V. The projections are based on needs identified in Air Force requirements and guidance documents, as well as on technology deficiencies projected by the scientific community. For this reason, they are under constant review and revision to assure optimization of R&D resources. Roadmaps for each major thrust are provided in Appendices A through F.

SECTION IV

CIVIL ENGINEERING TECHNOLOGY PROGRAM

A. PROGRAM STRUCTURE

1. The Civil Engineering technology program is structured to respond to Air Force civil engineering needs, support future system concepts in the Air Base Operability (ABO) Mission Area Plan (MAP), and respond to requirements identified by the Engineering and Services Requirements Board (ESRB). The individual programs are structured to implement exploratory (6.2) and advanced (6.3) development in the major thrust areas of Aerospace Operating Surfaces, Structures, Utilities, and Fire Protection and address a wide range of technical deficiencies and opportunities.

2. TECHNICAL DEFICIENCIES

a. Blast and temperature resistant surfaces

b. Asphalt pavement rutting

c. Electrical power quality and reliability

d. Long-range firefighting agent delivery

e. Flame retardant materials

f. Airfield damage assessment

g. Airfield damage debris clearance

h. Airfield damage repair methods and materials

i. Damage assessment of utilities/structures

j. Postattack repair of utilities/structures

k. Antipenetration structural design technology

l. Enhanced blast structural design technology

m. All terrain firefighting capability

n. POL tank fire protection

o. Contingency site soil evaluation

p. Air mobile survivable structures

q. Expedient airfield deployment

3. TECHNICAL OPPORTUNITIES

a. Pavement response prediction

b. Advanced construction and repair material

c. Advanced construction and repair methods

d. Robotics applications for base recovery

e. Halon replacement firefighting agent

f. Fuel neutralizing additives

g. Flame recognition detectors

h. Combined physical/chemical protection

i. Environmentally safe fire training facilities

j. Trans/postattack training simulators

k. Advanced air mobile facilities

B. AEROSPACE OPERATING SURFACES

The overall objective of this Major Thrust is to provide new technology for advanced development of methods, materials, and equipment for rapid assessment and repair of aircraft launch and recovery surfaces damaged by the full range of nonnuclear weapons, the development of alternate surfaces (runways/taxiways) that will permit limited aircraft operations, development of rapid low-cost construction of contingency aircraft operating surfaces, and maintaining readiness and the airfield structure. Tech areas include:

1. Evaluation and Performance Prediction - Develop methods to determine and predict pavement condition and capacity incorporating load, age, FOD, roughness, and environmental effects.

a. Long-term Performance Prediction

b. Contingency Airfield Performance Prediction

2. Mechanistic Design - Develop universal mechanistic pavement design procedures incorporating reliability issues.

a. Base Material Response

b. Surface Material Response

c. Heat/Fuel Resistance

3. Construction, Maintenance and Repair Material - Develop methods, materials, and equipment to construct, maintain, and repair aerospace operating surfaces.

a. Alternate Surface Material

b. Sealers

c. Geosynthetics

d. Contingency Operations

4. Construction, Maintenance and Repair Equipment - Develop methods, materials, and equipment to construct, maintain, and repair aerospace operating surfaces.

a. Crater Repair

b. Equipment Hardening

c. Launch/Recovery System

d. Expedient Construction

e. Readiness Enhancements

C. STRUCTURES

The overall objective of this Major Thrust is to provide new technology for survivability of critical airbase structures in situations of enemy attack with nonnuclear weapons, survivable, lightweight, air mobile shelters, chemical/biological protection, and rapid postattack damage assessment and recovery of structures. Tech areas include:

1. Survivable Structures - Provide technology to economically harden critical Air Force structures against existing and future nonnuclear weapon threats.

a. Material Development

b. Material Characterization

c. Testing Techniques

d. Design Methods

e. Weapons Effects

f. Antipenetration

g. Equipment Response

2. Structure Recovery - Provide technology to assess and repair damage to critical airbase structures in a postattack environment.

a. Damage Assessment

b. Expedient Repair

3. Mobility Shelters - Develop technology to improve air mobile structures for forward basing.

a. Air Mobile Structures

b. Forward Basing Architecture

D. UTILITIES

The overall objective of this Major Thrust is to provide technology for survivable and reliable fixed and mobile utility systems and alternate mobile energy sources. Tech areas include:

1. Energy Conversion - Provide technologies for reliable and efficient, mobile and fixed-site electrical power.

a. Generation Technologies

b. Conversion Efficiency

c. Consumption Efficiency

d. Distribution

2. Survivable Utilities - Provide the technology for survivable power, POL, water, and waste systems

a. Hardened Design Criteria

b. Damage Assessment

c. Expedient Repair

E. FIRE PROTECTION

The overall objective of this Major Thrust is to provide new technology for advancing the state of the art in fire prevention, detection, and suppression to include rescue from aircraft and structural facilities. Tech areas include:

1. Agent Development - Develop clean, nontoxic, environmentally benign agents effective against three-dimensional fires.

a. Halon Replacement

b. Aircraft Materials

c. Deliverability

d. Fuel Neutralizing Additive

e. Aqueous Film-Forming Foam

2. Physics of Fire - Develop the technology for understanding the mechanisms of combustion physics.

a. Fire Modeling

b. Material Combustion Products

c. Extinguishing Mechanisms

3. Advanced Equipment/Vehicles - Develop firefighting systems which improve ability to survive and function in a wartime environment.

a. Personnel Fire/CW Protection

b. Vehicles

c. Active Fire Suppression

d. Passive Fire Suppression

e. Training

4. Fire Assessment - Develop technology for assessing optimum fire prevention/protection of airbases in peacetime and wartime.

a. Postattack Assessment Simulation

b. Firefighter Certification

c. Facility Design Assessment

d. Atmospheric Testing

e. JP-8 Ignitability

F. OPERATIONAL UTILITY

1. Serviceability, survivability, and recovery of aircraft operating surfaces.

2. Survivability and recovery of critical airbase structures.

3. Reliability, survivability, and recovery of utilities (electrical, POL, water).

4. Base recovery after attack.

5. Forward basing for force projection.

SECTION V

ENVIRONMENTAL QUALITY TECHNOLOGY PROGRAM

A. PROGRAM STRUCTURE

1. The Environmental Quality technology program is structured to develop the tech base to allow the Air Force to comply with Federal, state, and local environmental laws and regulations by eliminating or reducing the generation of pollutants and hazardous waste and restoring contaminated land and water in support of the Defense Installation Restoration Program (IRP). The individual programs are structured to implement exploratory (6.2) and advanced (6.3) development in the major thrust areas of Environmental Compliance and Site Restoration and address a wide range of technical deficiencies and opportunities.

2. TECHNICAL DEFICIENCIES

   a. Control of air pollutant emissions

   b. Control and disposal of rocket propellants

   c. Control technology for aircraft engine exhaust

   d. High cost of environmental compliance

   e. Cleanup of contaminated soil and groundwater

3. TECHNICAL OPPORTUNITIES

   a. Hazardous waste reduction/reuse

   b. Response capability for toxic chemical release

   c. Restoration of hazardous waste sites

   d. Reclamation of contaminated groundwater

B. ENVIRONMENTAL COMPLIANCE

The objective of this Major Thrust is to develop, test, and evaluate pollution control procedures allowing the Air Force to conduct war fighting preparation in peacetime without delay from environmental litigation and operate weapon systems without environmental degradation. Included under each Tech Area are the development areas characterization, fate, and control. Tech areas include:

1. VOC & Solvents - Develop technologies to measure the magnitude of the environmental impact of VOCs and solvents from USAF operations and minimize this impact.

2. Rocket Propellants - Characterize the environmental fate and effects of rocket propellants and develop technologies to minimize their environmental impact.

3. Aircraft Fuels & Emissions - Characterize the environmental fate and effects of aircraft fuels and their combustion products and develop control technologies to minimize their environmental impact.

4. Weapon System Materials - Characterize the environmental fate and effects of new USAF materials and develop control technologies to minimize their environmental impact.

5. Industrial Systems - Develop treatment technologies and process modifications to minimize hazardous waste generated by USAF operations.

C. SITE RESTORATION

The objective of this Major Thrust is to restore contaminated Air Force lands and groundwater to acceptable levels. Tech areas include:

1. Remedial Action Technologies - Develop and demonstrate efficient, cost-effective technologies to restore contaminated land and groundwater.

a. Onsite Bioremediation

b. In Situ Bioremediation

c. Physical/Chemical Treatment

2. Contaminant Fate and Transport - Understand contaminant fate and transport to develop underlying principles of cleanup technologies.

a. Metals

b. Organic Chemicals

3. Site Characterization/Investigation - Develop and demonstrate efficient, cost-effective technologies to investigate, characterize, and monitor contaminated land and groundwater.

a. Long-term monitoring

D. OPERATIONAL UTILITY

1. Compliance with applicable environmental standards.

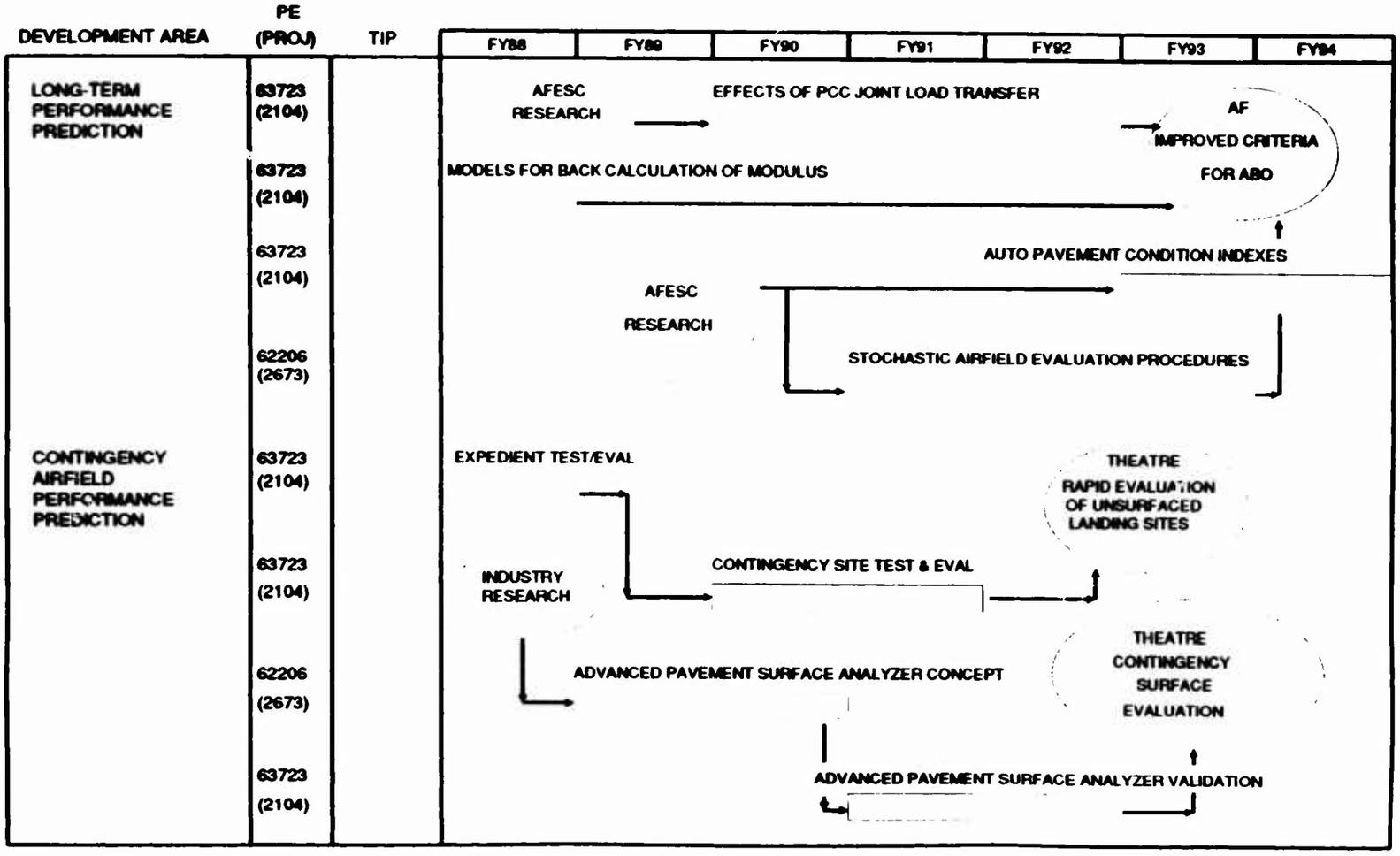
2. Reduced cost to restore contaminated Air Force land and groundwater to acceptable levels.

AEROSPACE OPERATING SURFACES

PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: EVALUATION AND PERFORMANCE PREDICTION

GOAL: DEVELOP METHODS TO DETERMINE AND PREDICT PAVEMENT CONDITION/CAPACITY.

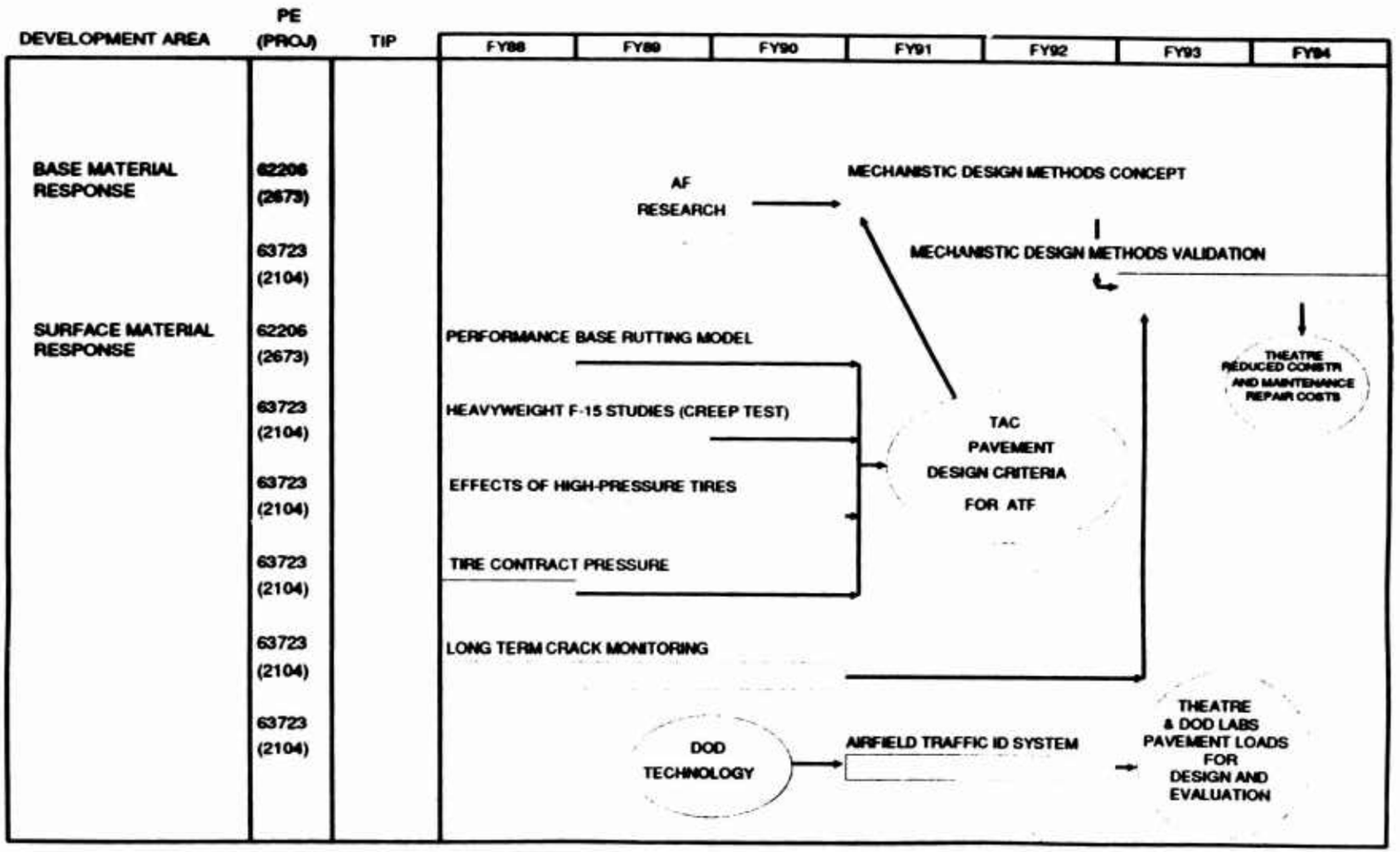
DATE: 15 JUN 1988
ROADMAP: RDCP8801
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: MECHANISTIC DESIGN

GOAL: DEVELOP A UNIVERSAL MECHANISTIC PAVEMENT DESIGN PROCEDURE INCORPORATING RELIABILITY ISSUES

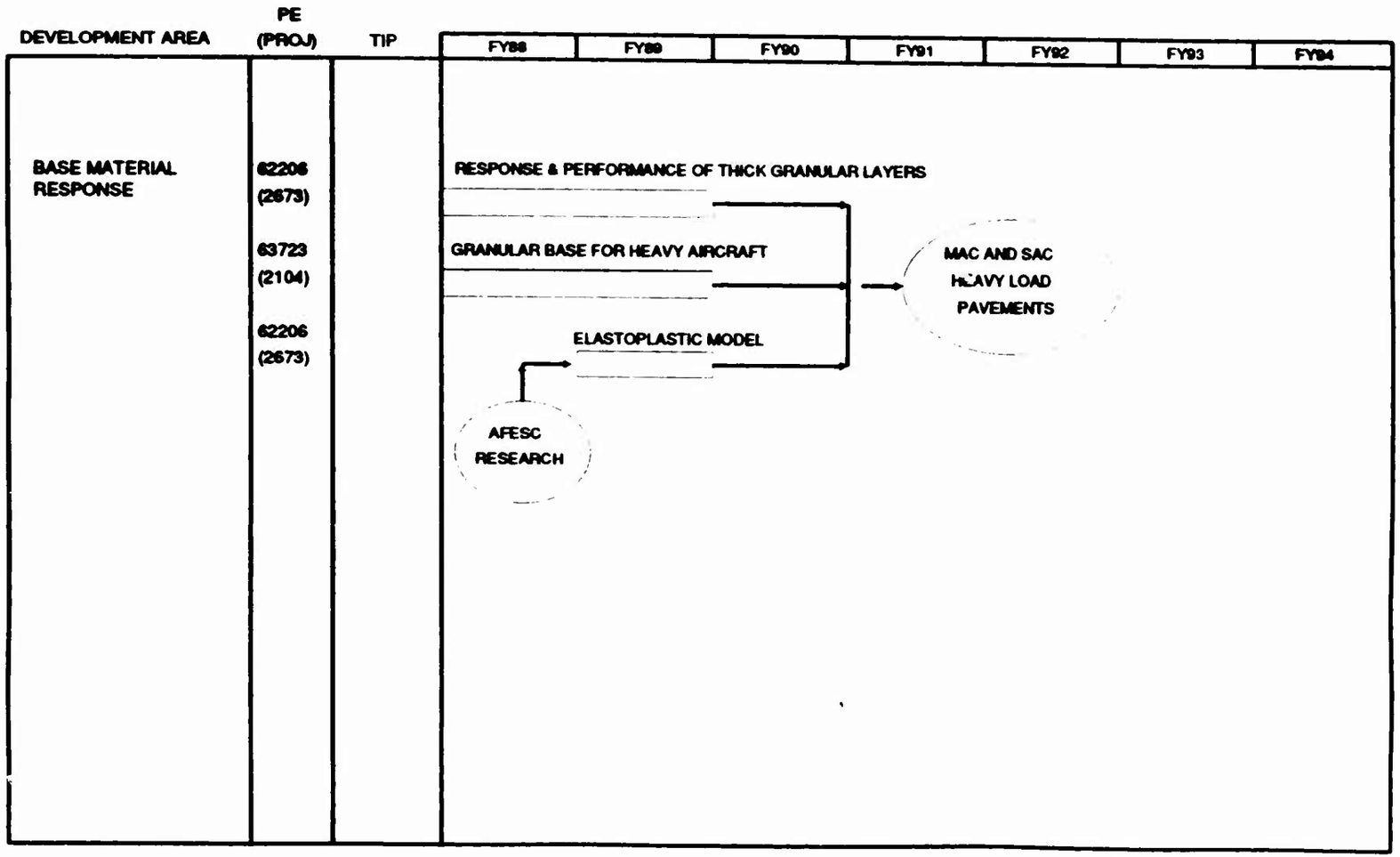
DATE: 15 JUN 1988
ROADMAP: RDCP8802
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: MECHANISTIC DESIGN

GOAL: DEVELOP A UNIVERSAL MECHANISTIC PAVEMENT DESIGN PROCEDURE INCORPORATING RELIABILITY ISSUES

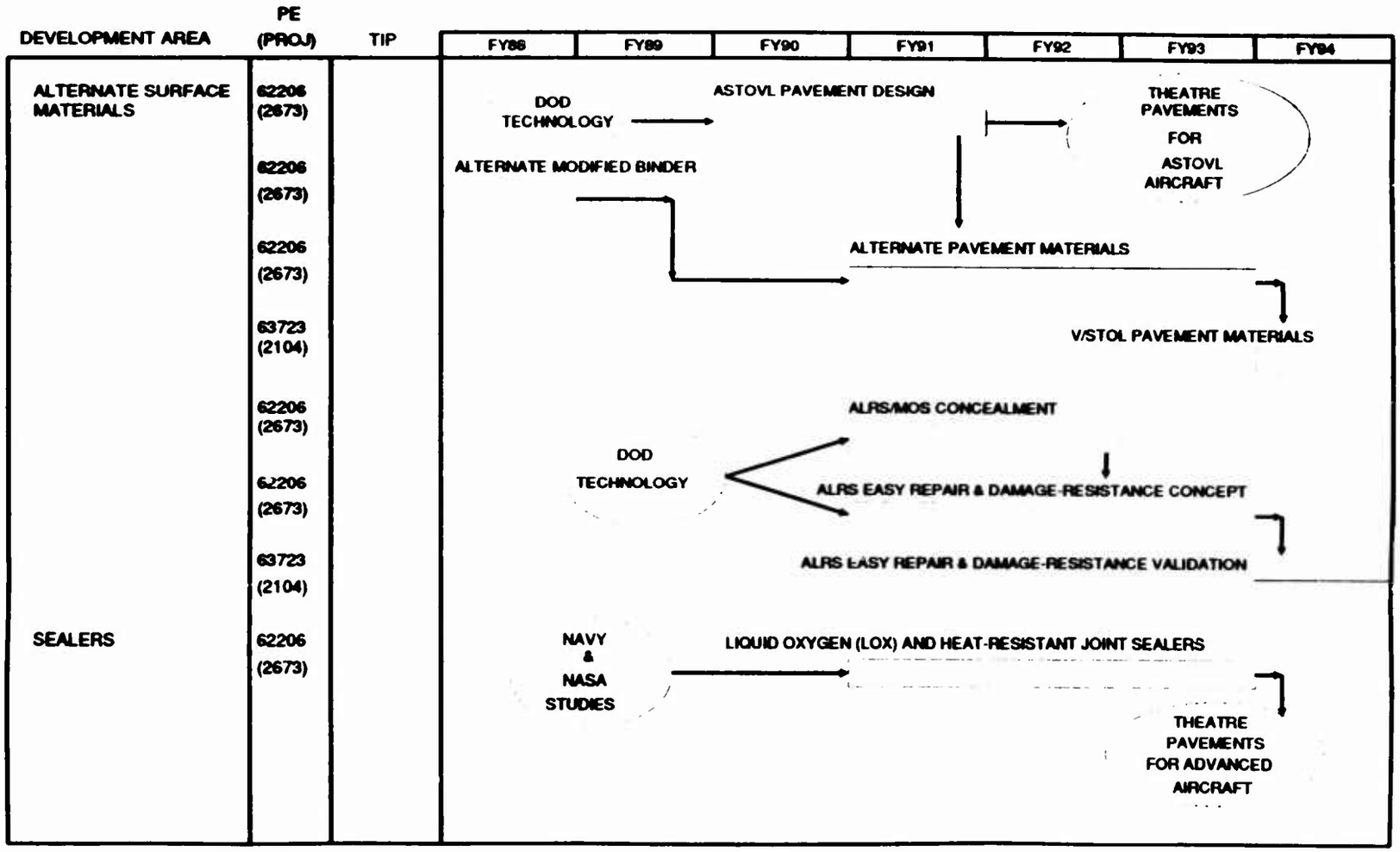
DATE: 15 JUN 1988
ROADMAP: RDCP8803
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: CONSTRUCTION, MAINTENANCE, AND REPAIR: MATERIALS

GOAL: DEVELOP METHODS, MATERIALS, AND EQUIPMENT TO CONSTRUCT, MAINTAIN, AND REPAIR AEROSPACE OPERATING SURFACES

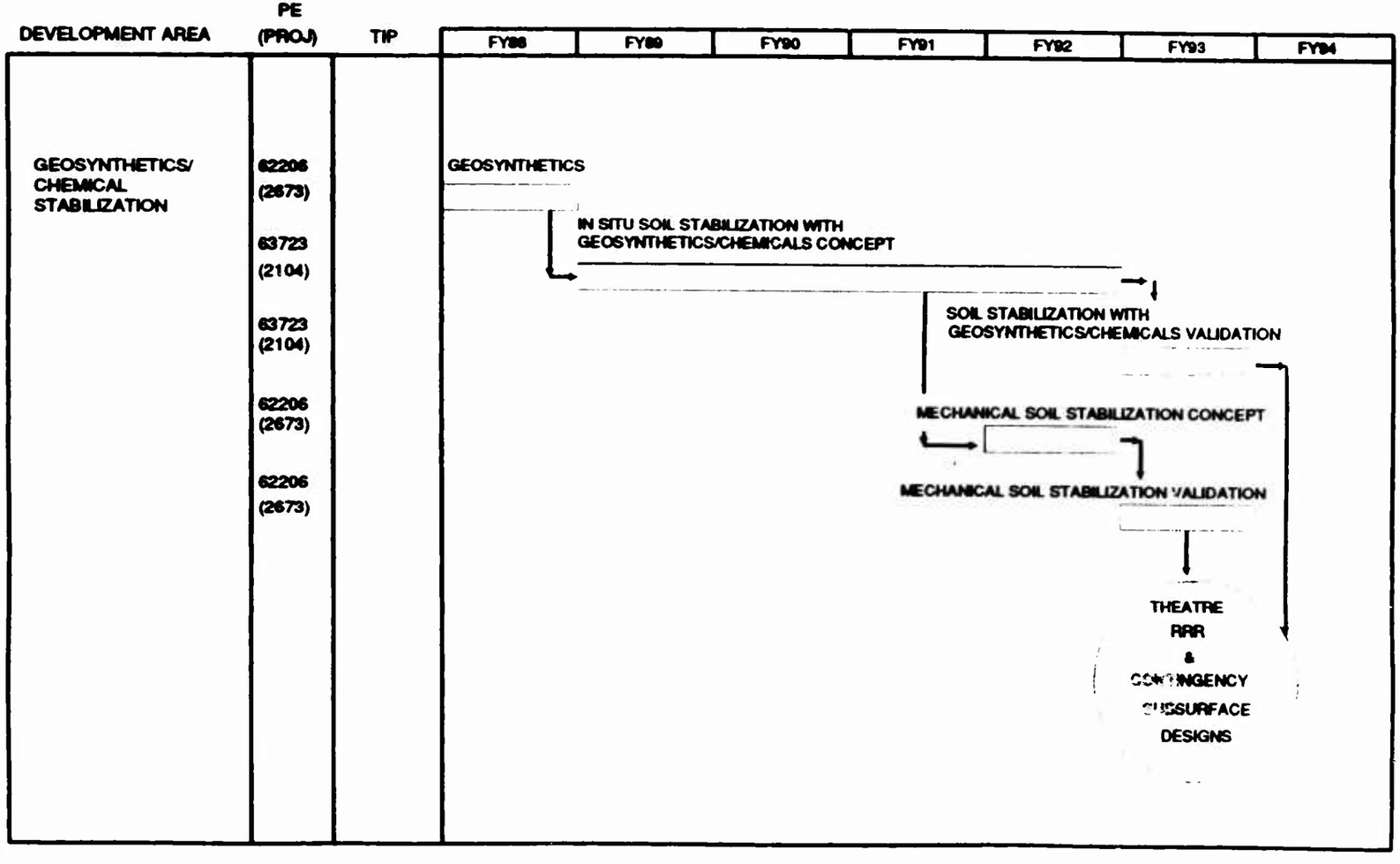
DATE: 15 JUN 1988
ROADMAP: RDCP8804
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: CONSTRUCTION, MAINTENANCE, AND REPAIR: MATERIALS

GOAL: DEVELOP METHODS, MATERIALS, AND EQUIPMENT TO CONSTRUCT, MAINTAIN, AND REPAIR AEROSPACE OPERATING SURFACES

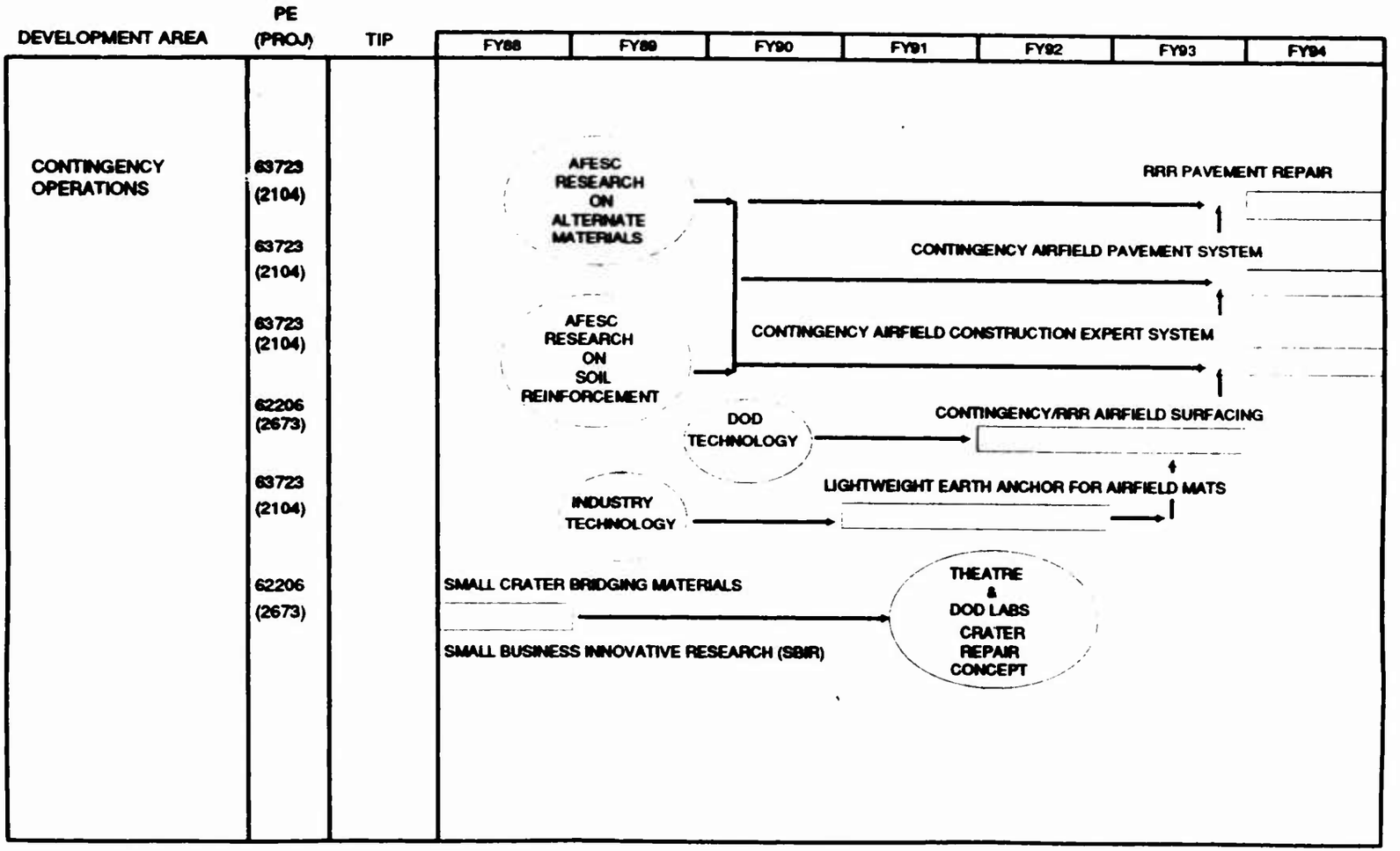
DATE: 15 JUN 1988
ROADMAP: RDCP8805
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: CONSTRUCTION, MAINTENANCE, AND REPAIR: MATERIALS

GOAL: DEVELOP METHODS, MATERIALS, AND EQUIPMENT TO CONSTRUCT, MAINTAIN, AND REPAIR AEROSPACE OPERATING SURFACES

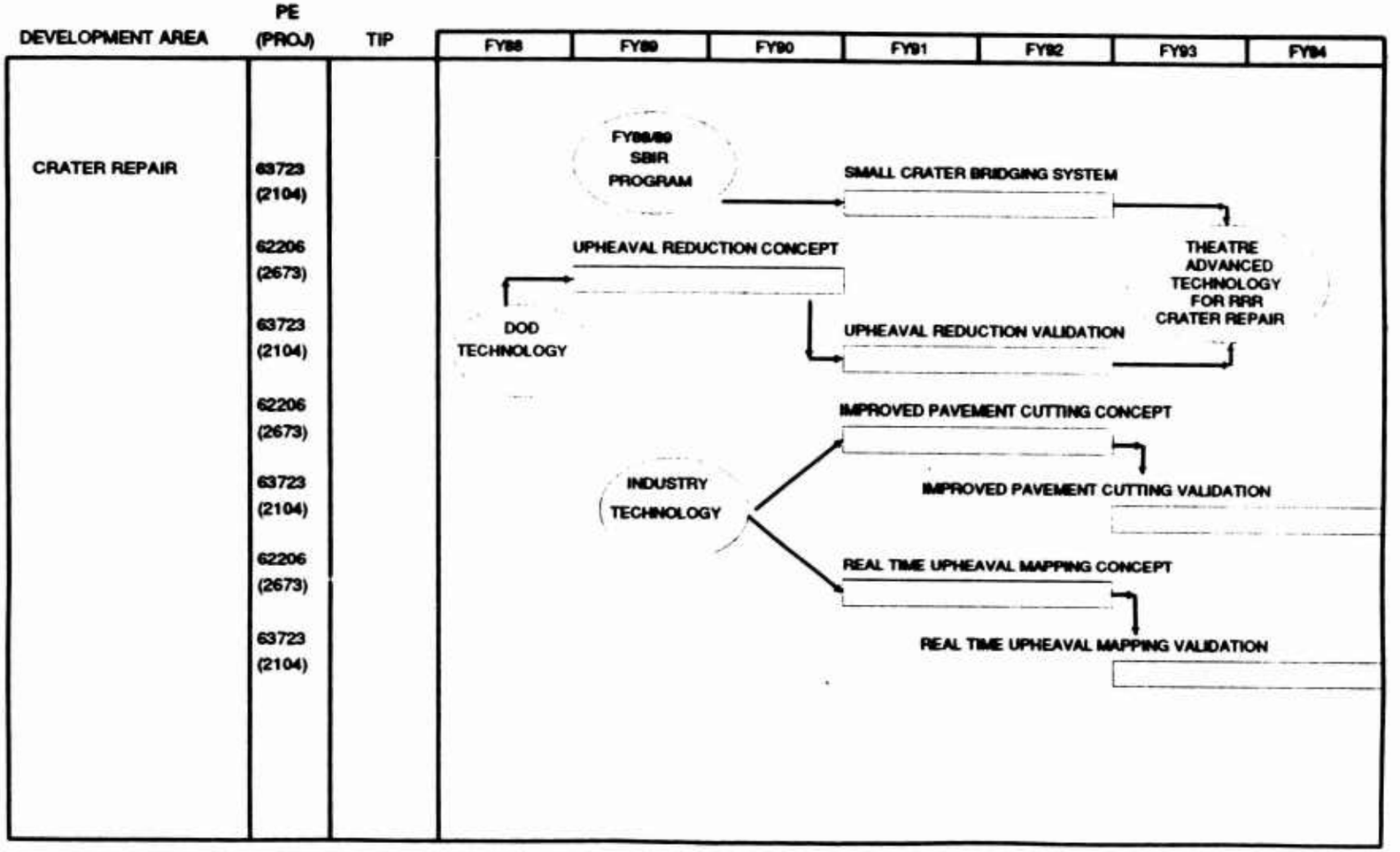
DATE: 15 JUN 1988
ROADMAP: RDCP8806
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: CONSTRUCTION, MAINTENANCE, AND REPAIR: EQUIPMENT

GOAL: DEVELOP METHODS, MATERIALS, AND EQUIPMENT TO CONSTRUCT, MAINTAIN, AND REPAIR AEROSPACE OPERATING SURFACES

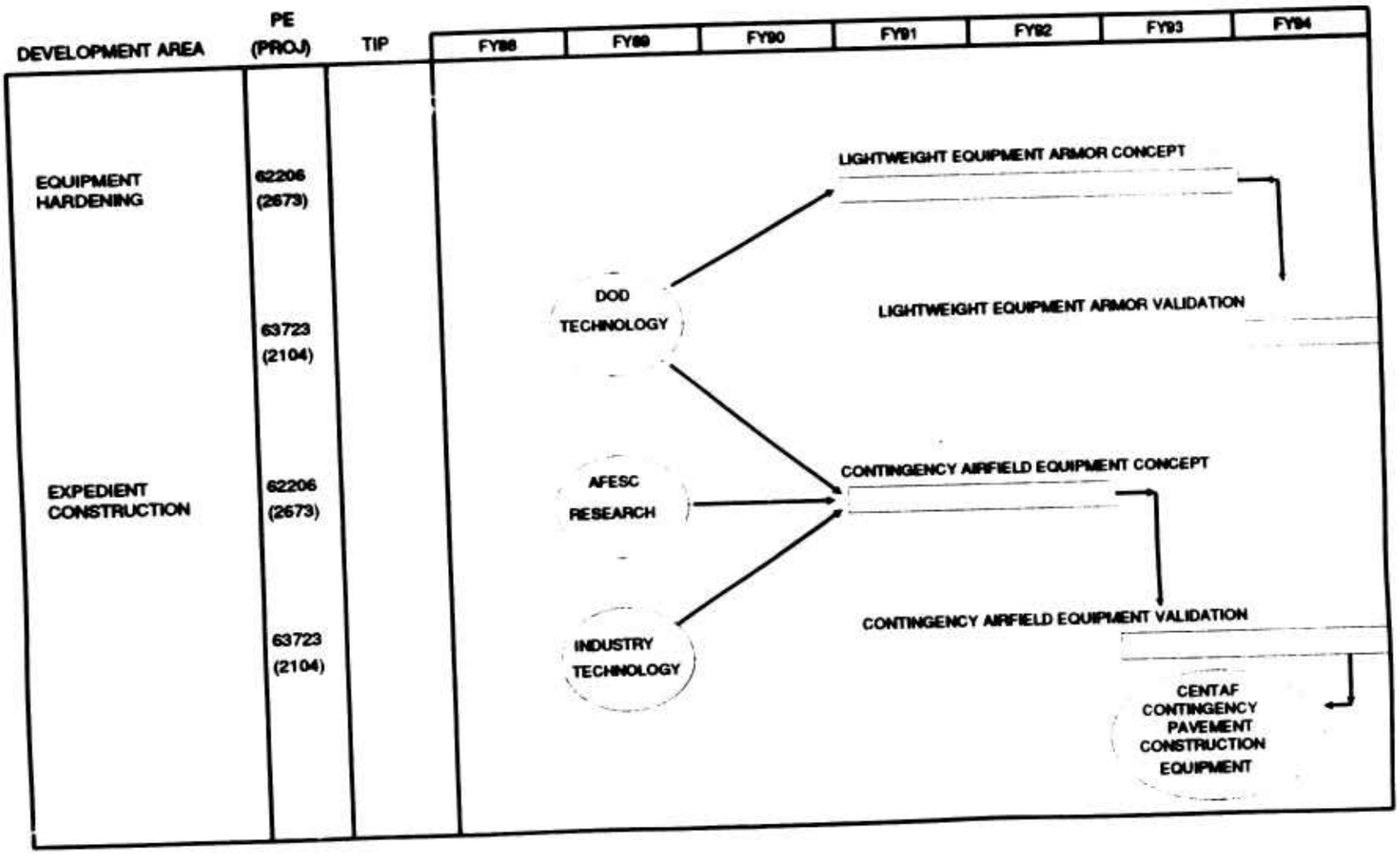
DATE: 15 JUN 1988
ROADMAP: RDCP8807
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: CONSTRUCTION, MAINTENANCE, AND REPAIR: EQUIPMENT

GOAL: DEVELOP METHODS, MATERIALS, AND EQUIPMENT TO CONSTRUCT, MAINTAIN, AND REPAIR AEROSPACE OPERATING SURFACES

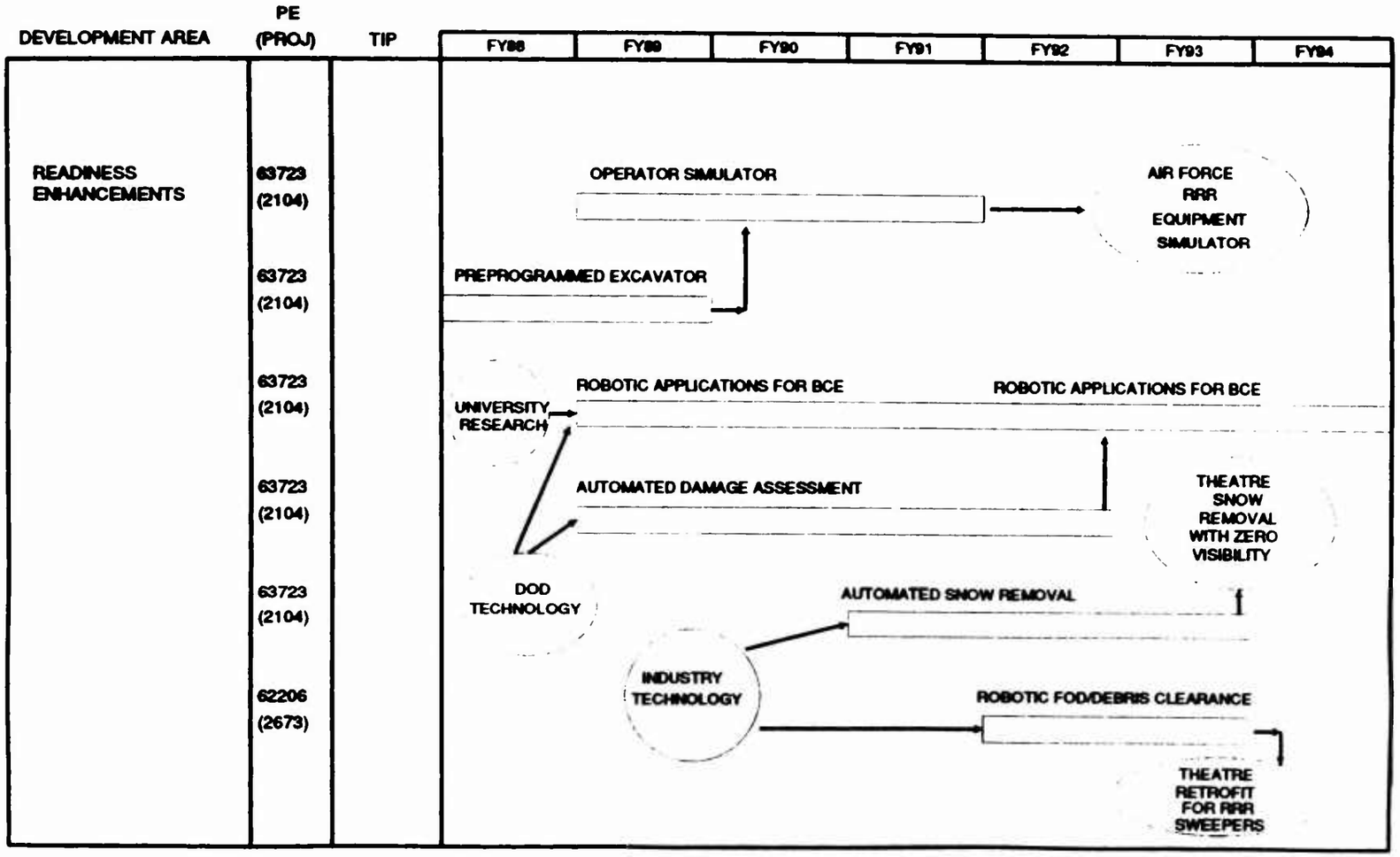
DATE: 15 JUN 1988
ROADMAP: RDCP8808
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: AEROSPACE OPS SURFACES
TECH: CONSTRUCTION, MAINTENANCE, AND REPAIR: EQUIPMENT

GOAL: DEVELOP METHODS, MATERIALS, AND EQUIPMENT TO CONSTRUCT, MAINTAIN, AND REPAIR AEROSPACE OPERATING SURFACES

DATE: 15 JUN 1988
ROADMAP: RDCP8809
OPR: AFESC/RD

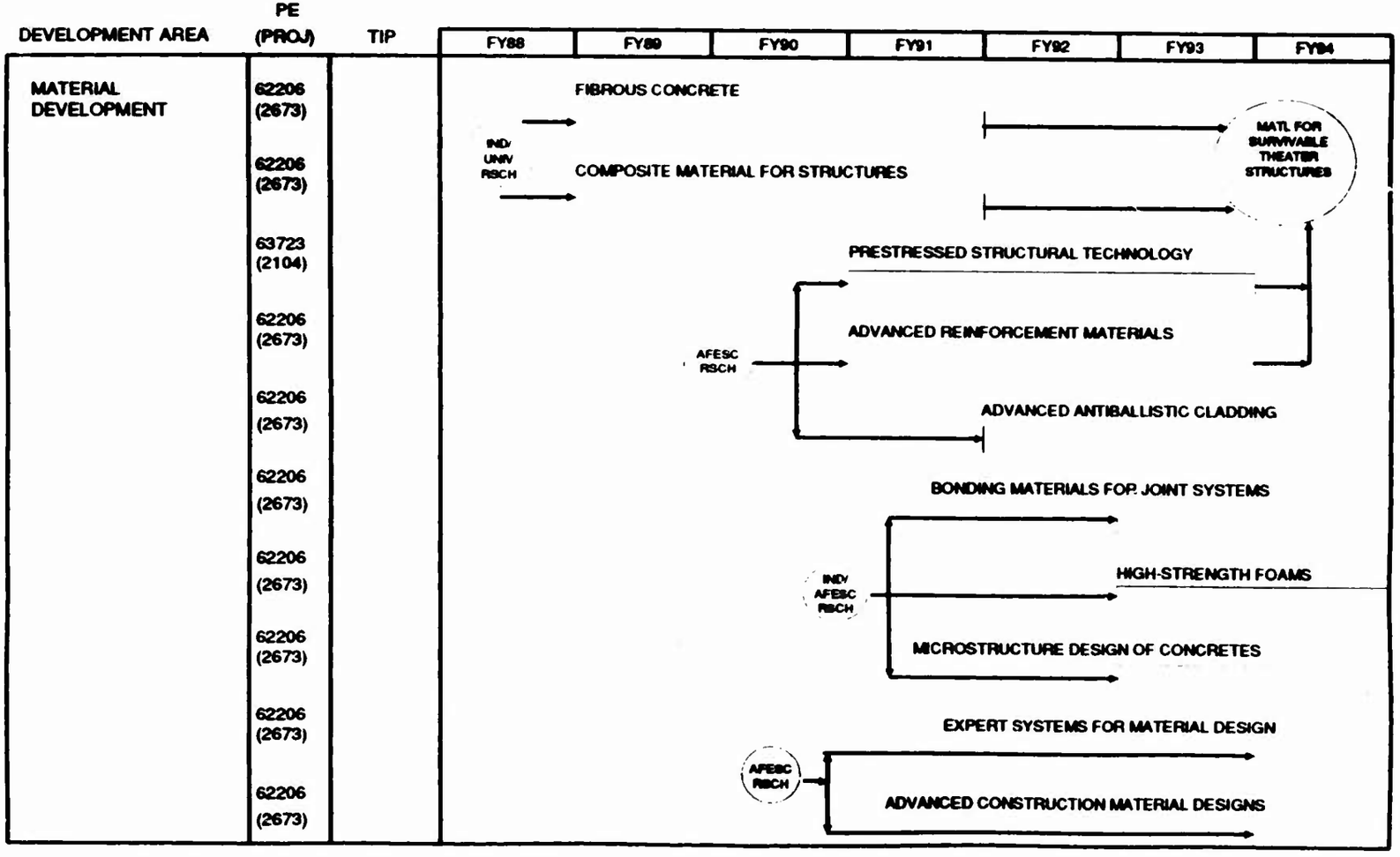


STRUCTURES

PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: SURVIVABLE STRUCTURES

GOAL: PROVIDE TECHNOLOGY TO ECONOMICALLY HARDEN CRITICAL AIR FORCE STRUCTURES AGAINST EXISTING AND FUTURE NONNUCLEAR WEAPON THREATS.

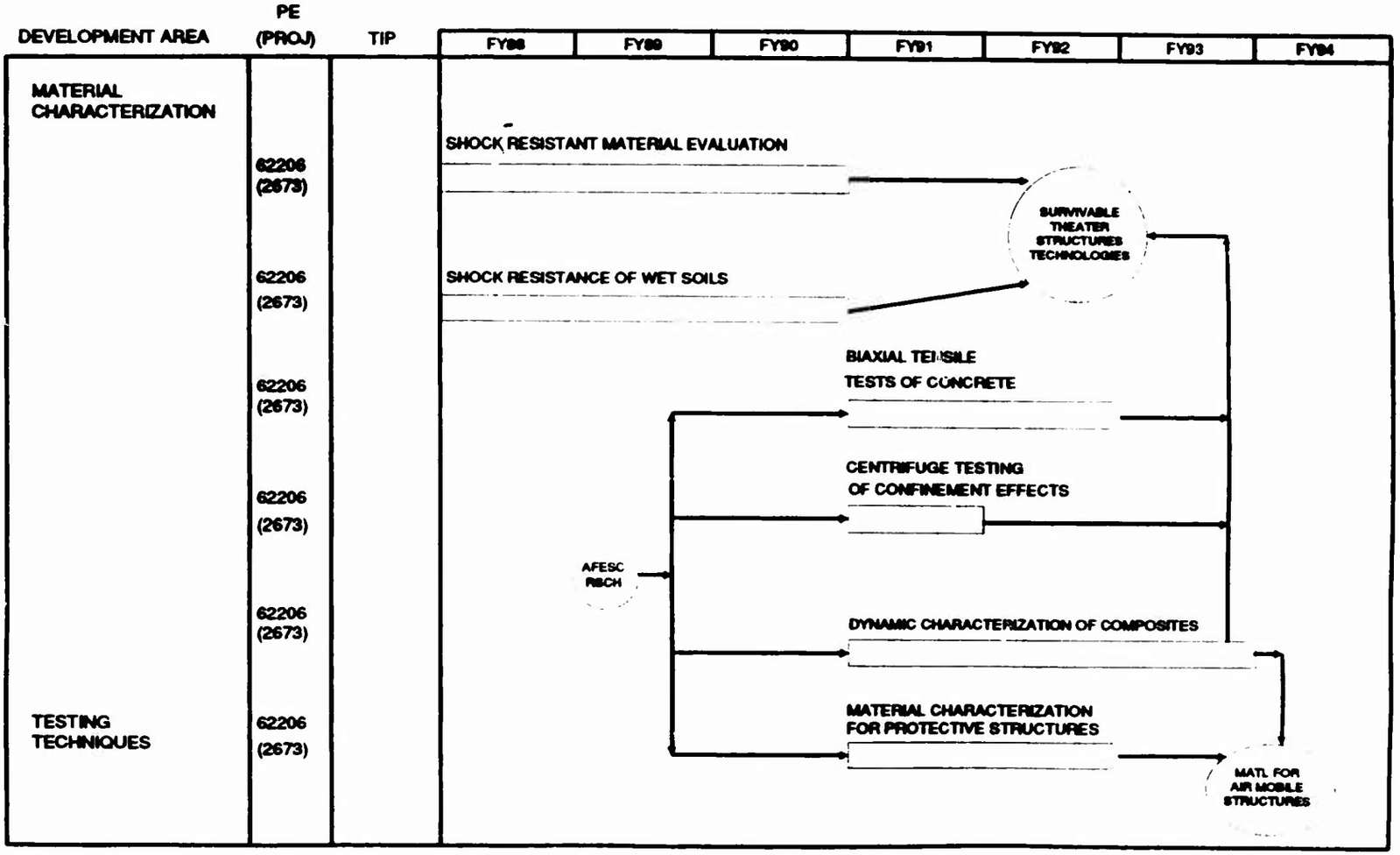
DATE: 15 JUN 1988
ROADMAP: RDCS8801
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: SURVIVABLE STRUCTURES

GOAL: PROVIDE TECHNOLOGY TO ECONOMICALLY HARDEN CRITICAL AIR FORCE STRUCTURES AGAINST EXISTING AND FUTURE NONNUCLEAR WEAPON THREATS.

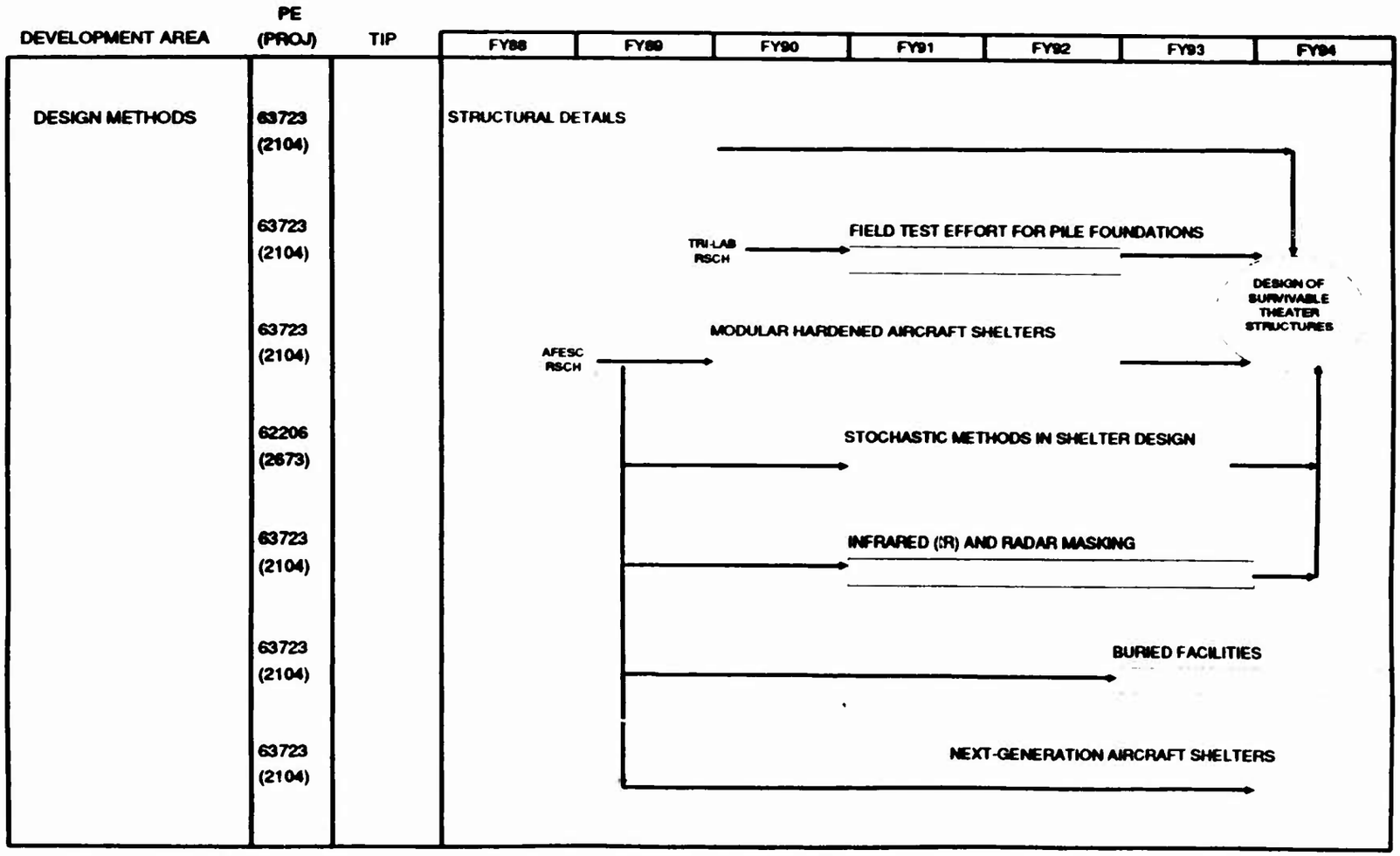
DATE: 15 JUN 1988
ROADMAP: RDCS8802
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: SURVIVABLE STRUCTURES

GOAL: PROVIDE TECHNOLOGY TO ECONOMICALLY HARDEN CRITICAL AIR FORCE STRUCTURES AGAINST EXISTING AND FUTURE NONNUCLEAR WEAPON THREATS.

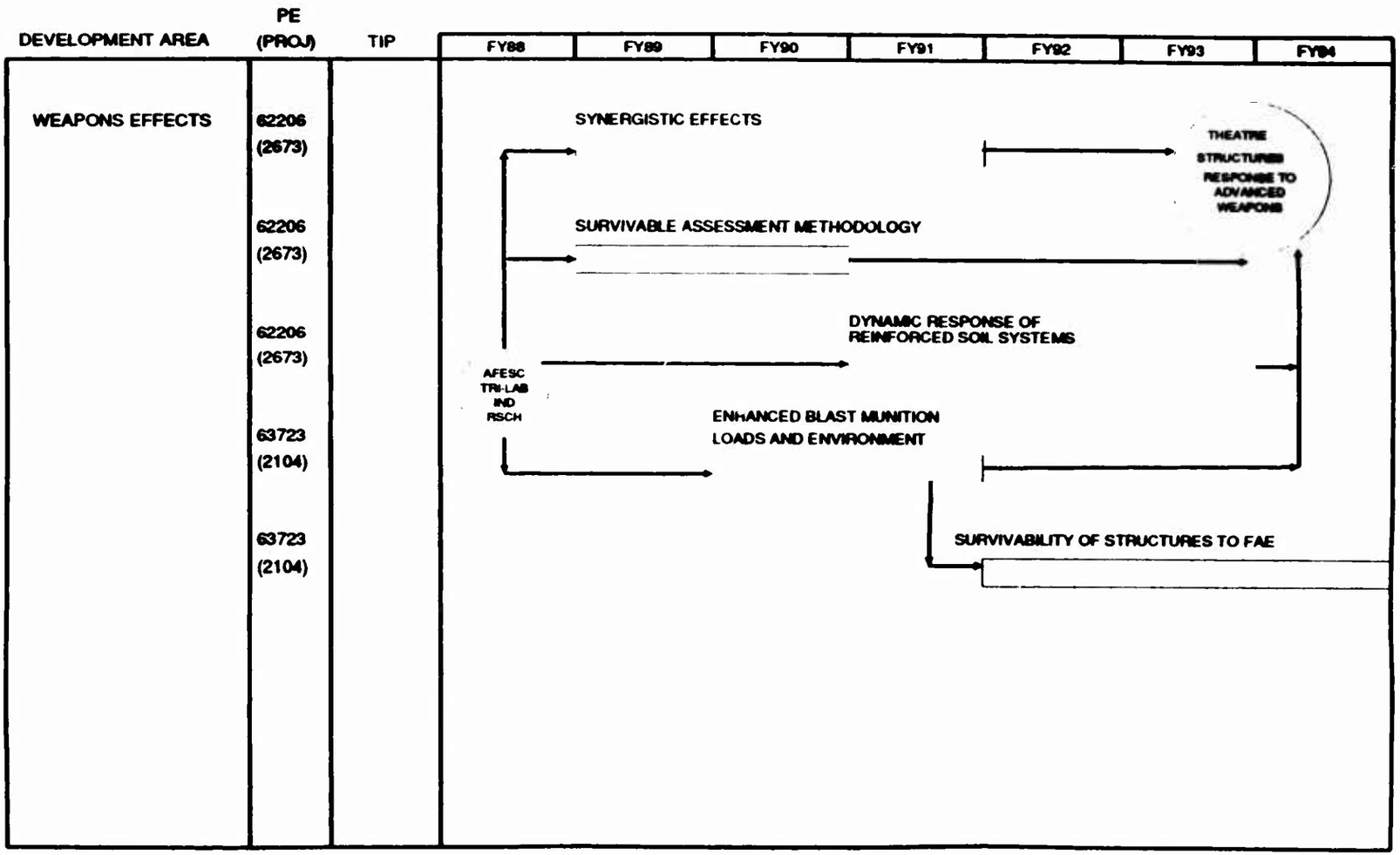
DATE: 15 JUN 1988
ROADMAP: RDCS8803
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: SURVIVABLE STRUCTURES

GOAL: PROVIDE TECHNOLOGY TO ECONOMICALLY HARDEN CRITICAL AIR FORCE STRUCTURES AGAINST EXISTING AND FUTURE NONNUCLEAR WEAPON THREATS.

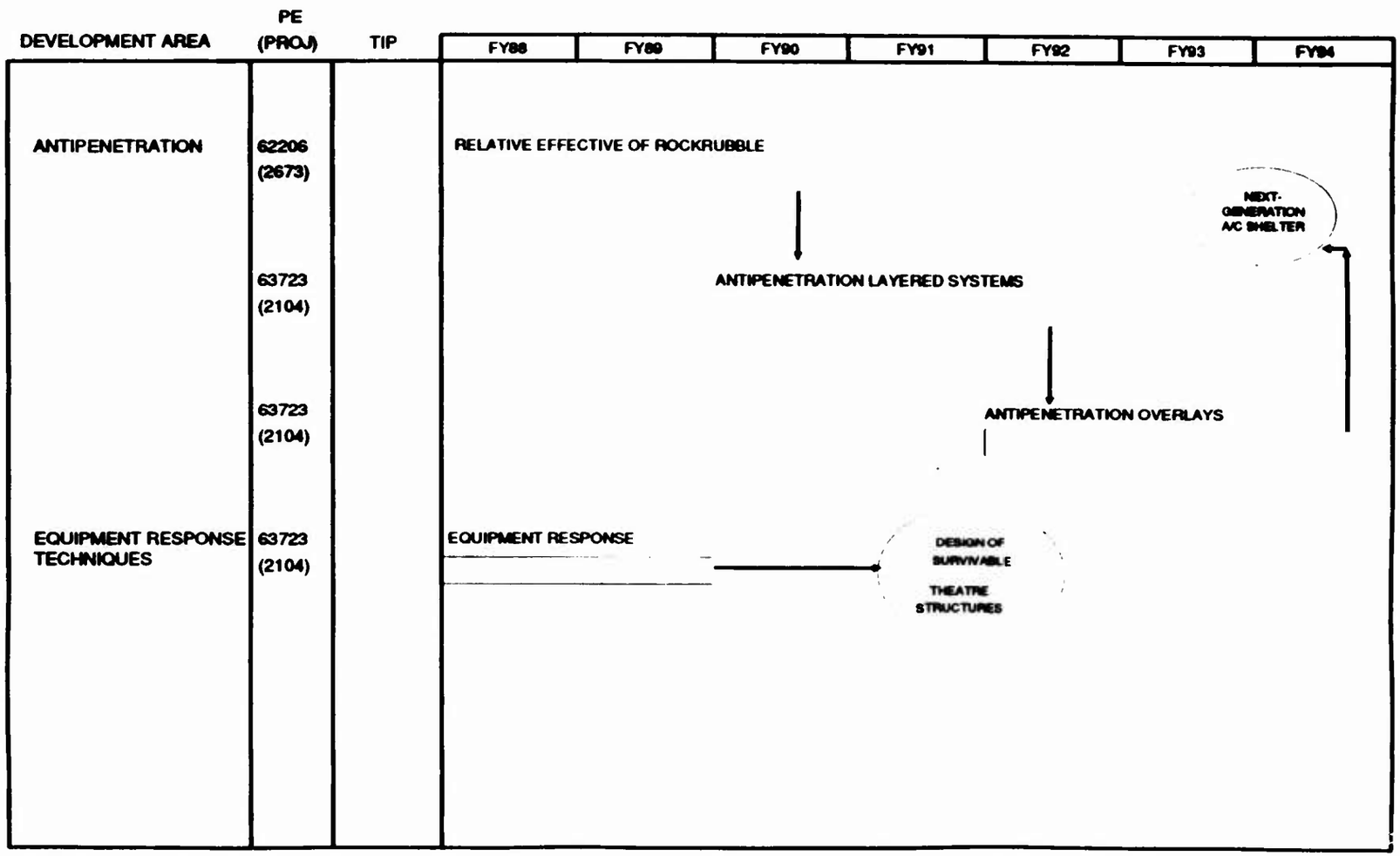
DATE: 15 JUN 1988
ROADMAP: RDCS8804
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: SURVIVABLE STRUCTURES

GOAL: PROVIDE TECHNOLOGY TO ECONOMICALLY HARDEN CRITICAL AIR FORCE STRUCTURES AGAINST EXISTING AND FUTURE NONNUCLEAR WEAPON THREATS.

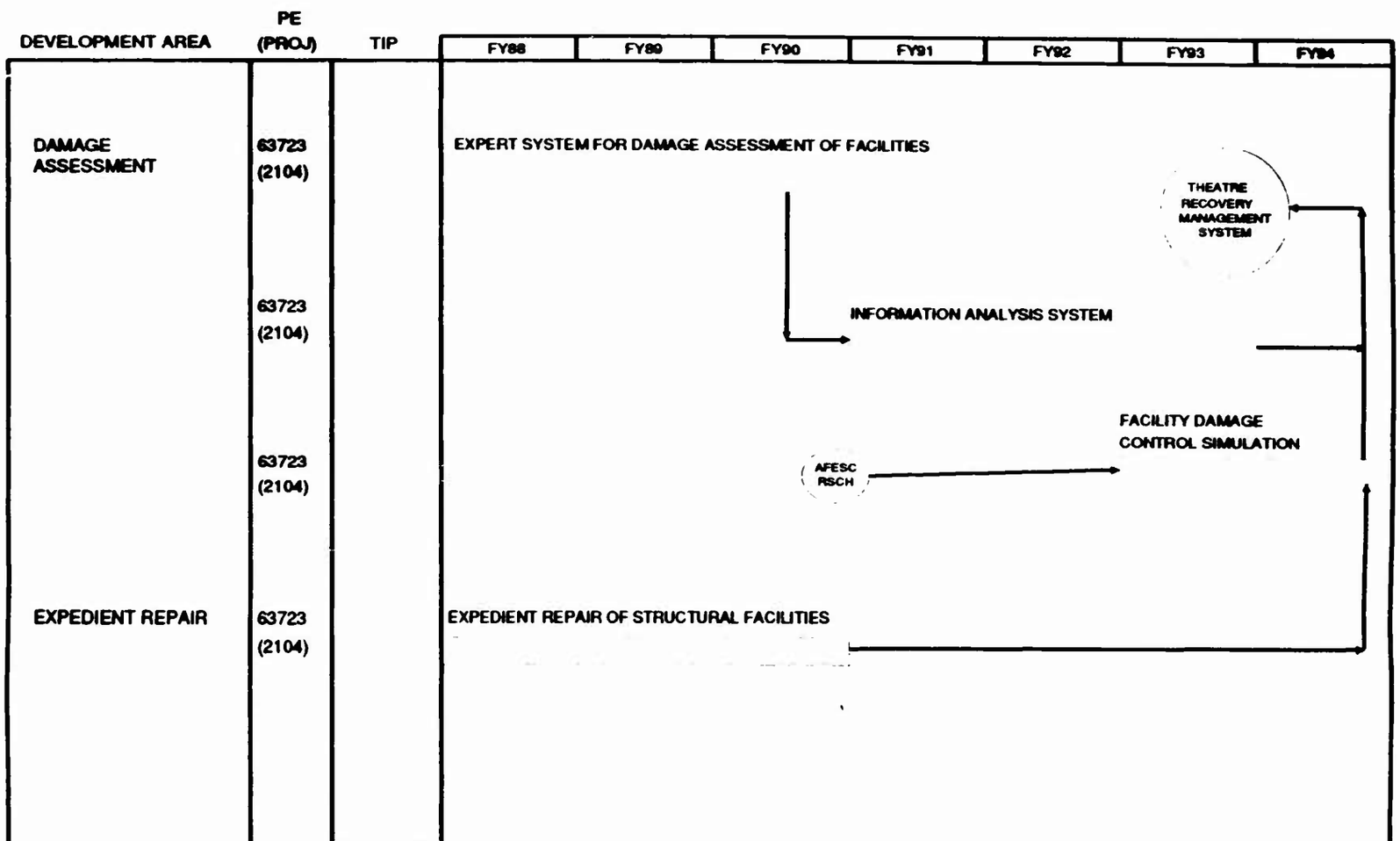
DATE: 15 JUN 1988
ROADMAP: RDCS8805
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: STRUCTURE RECOVERY

GOAL: PROVIDE TECHNOLOGY TO ASSESS AND REPAIR DAMAGE TO CRITICAL AIRBASE STRUCTURES IN A POSTATTACK ENVIRONMENT.

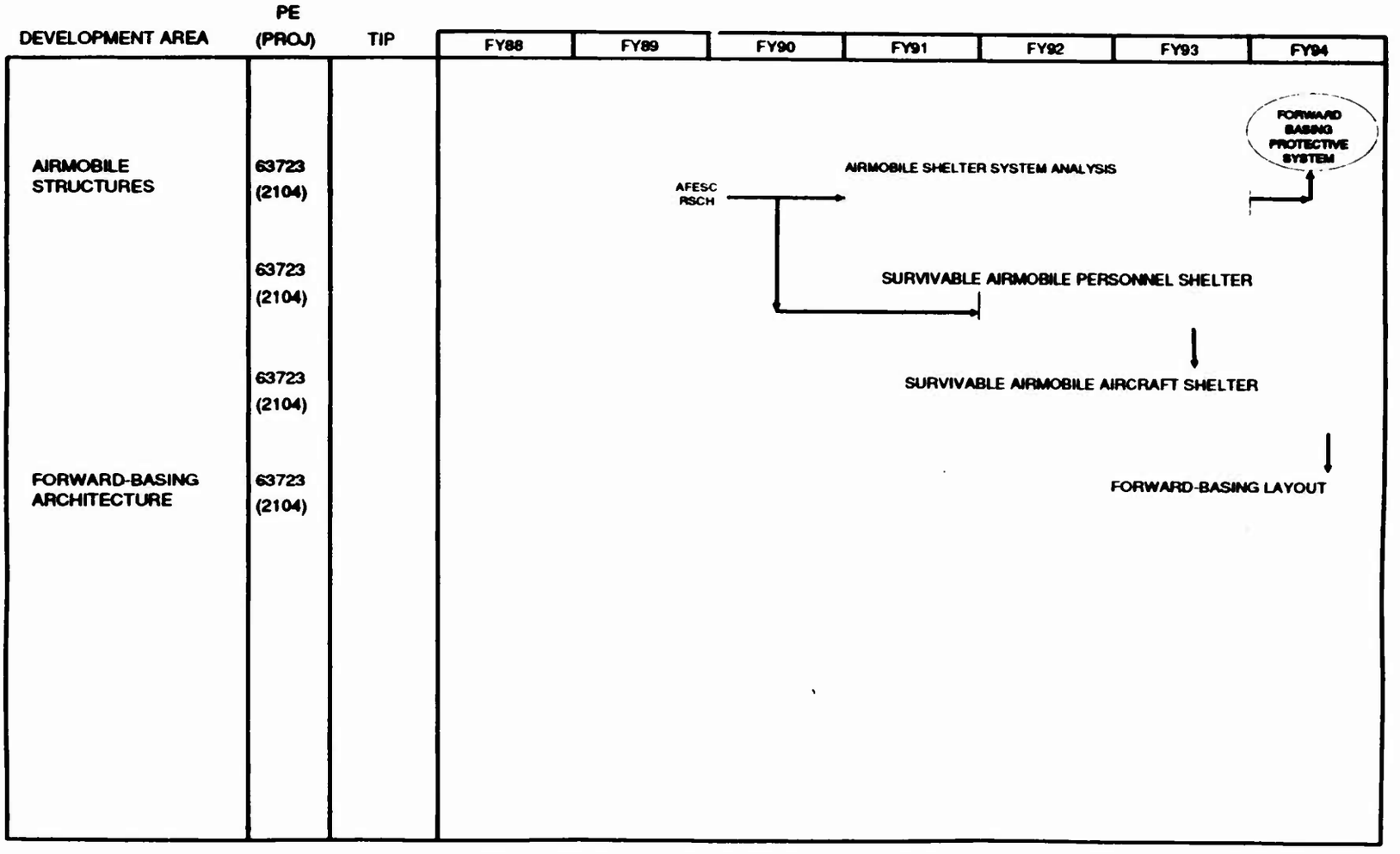
DATE: 15 JUN 1988
ROADMAP: RDCS8806
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: STRUCTURES
TECH: MOBILE SHELTERS

GOAL: PROVIDE TECHNOLOGY TO IMPROVE AIR MOBILE STRUCTURES FOR FORWARD BASING.

DATE: 15 JUN 1988
ROADMAP: RDCS8807
OPR: AFESC/RD

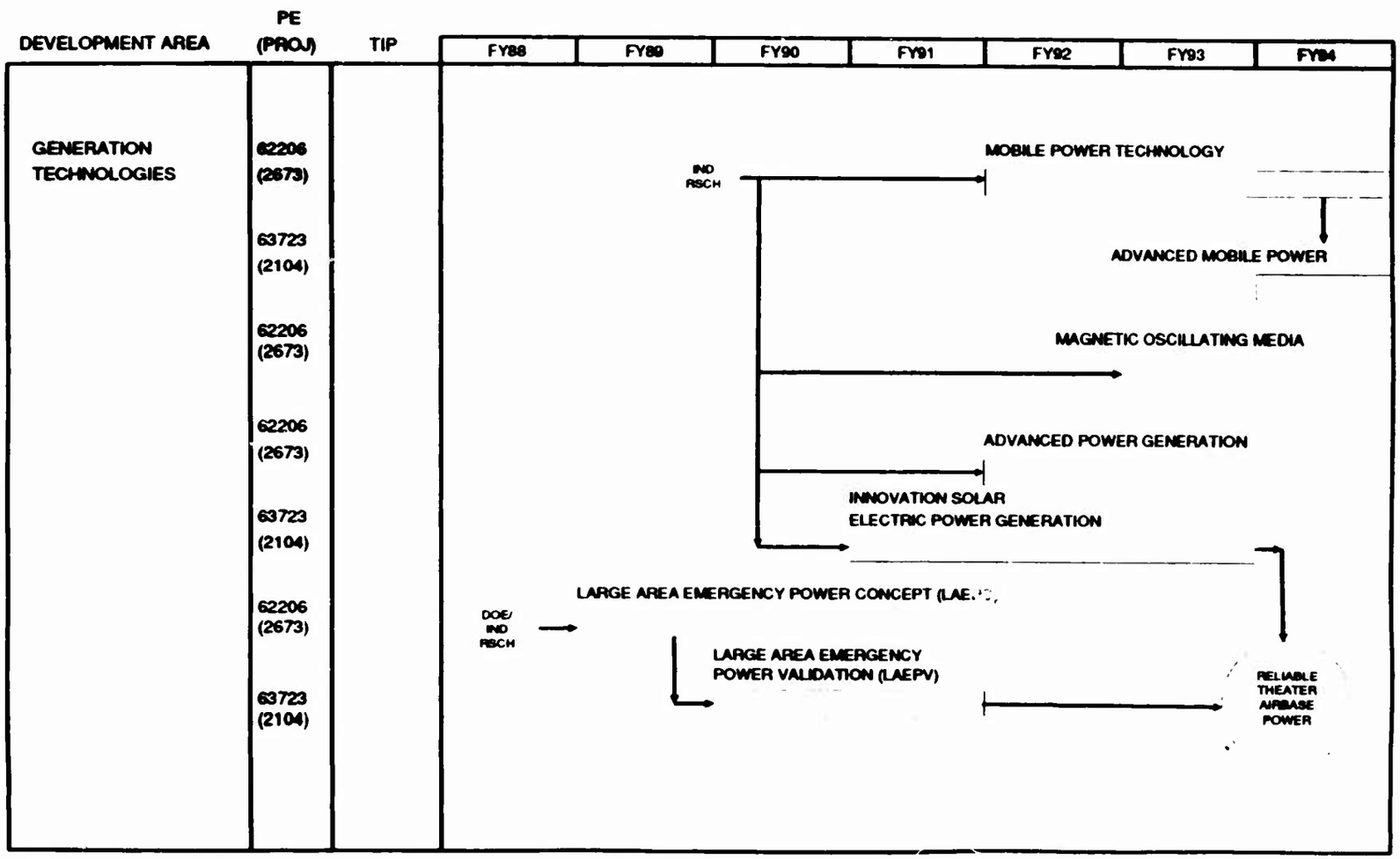


UTILITIES

PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: UTILITIES
TECH: ENERGY CONVERSION

GOAL: PROVIDE THE TECHNOLOGIES FOR RELIABLE AND EFFICIENT MOBILE AND FIXED-SITE ELECTRICAL POWER.

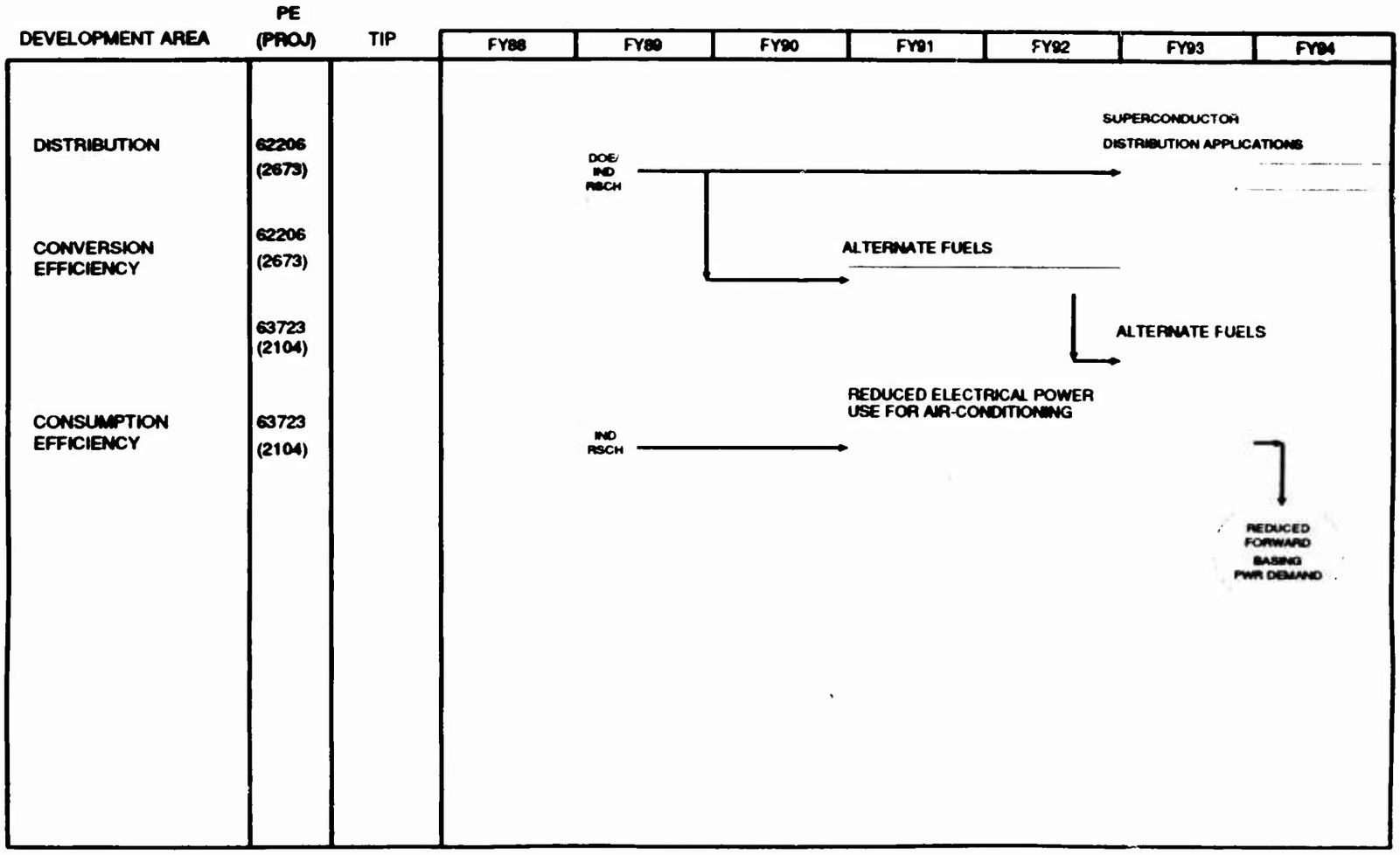
DATE: 15 JUN 1988
ROADMAP: RDCU8808
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: UTILITIES
TECH: ENERGY CONVERSION

GOAL: PROVIDE THE TECHNOLOGIES FOR RELIABLE AND EFFICIENT MOBILE AND FIXED-SITE ELECTRICAL POWER.

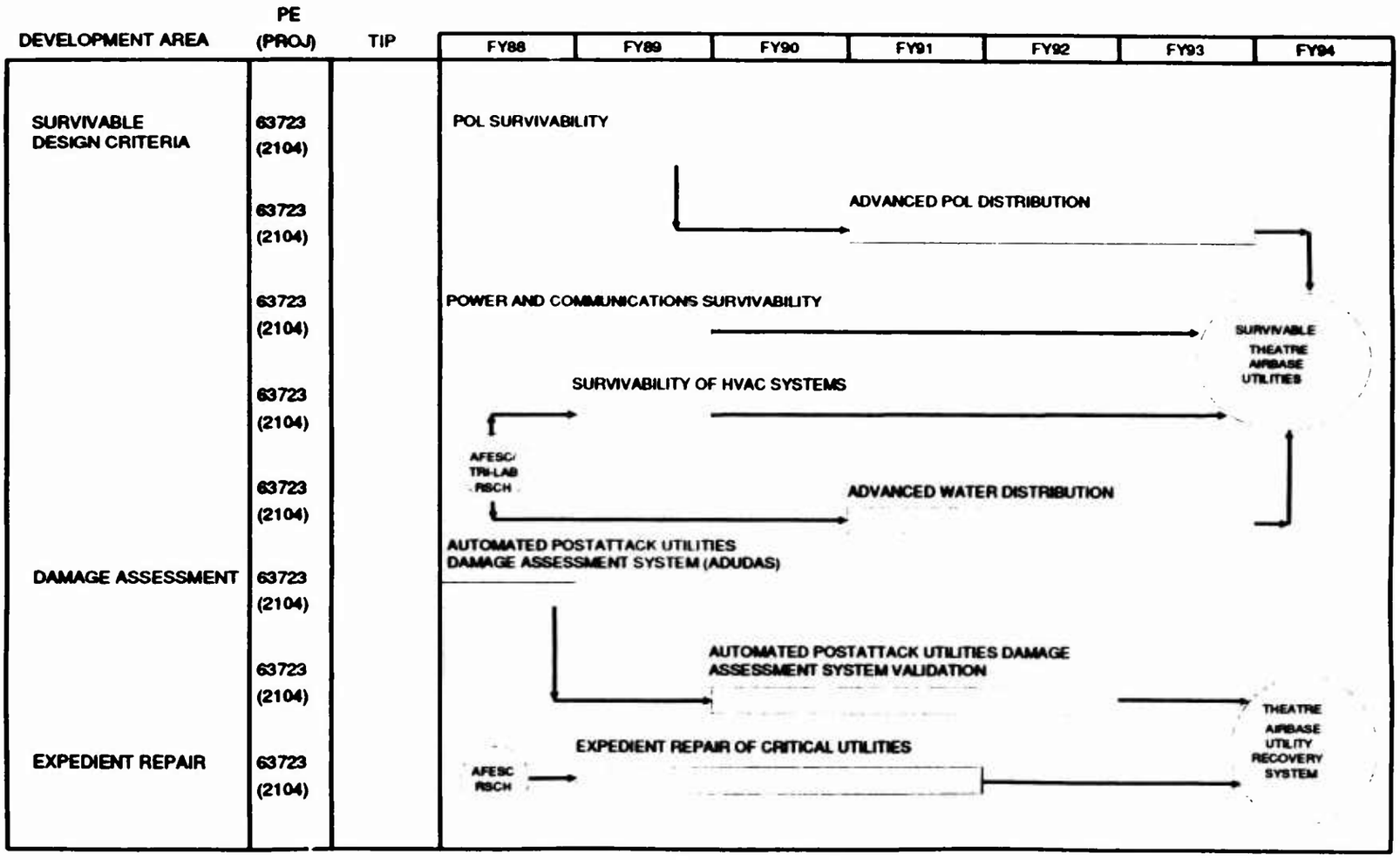
DATE: 15 JUN 1988
ROADMAP: RDCU8809
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: UTILITIES
TECH: SURVIVABLE UTILITIES

GOAL: PROVIDE TECHNOLOGIES FOR SURVIVABLE POWER, POL, WATER, AND WASTE SYSTEMS

DATE: 15 JUN 1988
ROADMAP: RDCU8810
OPR: AFESC/RD

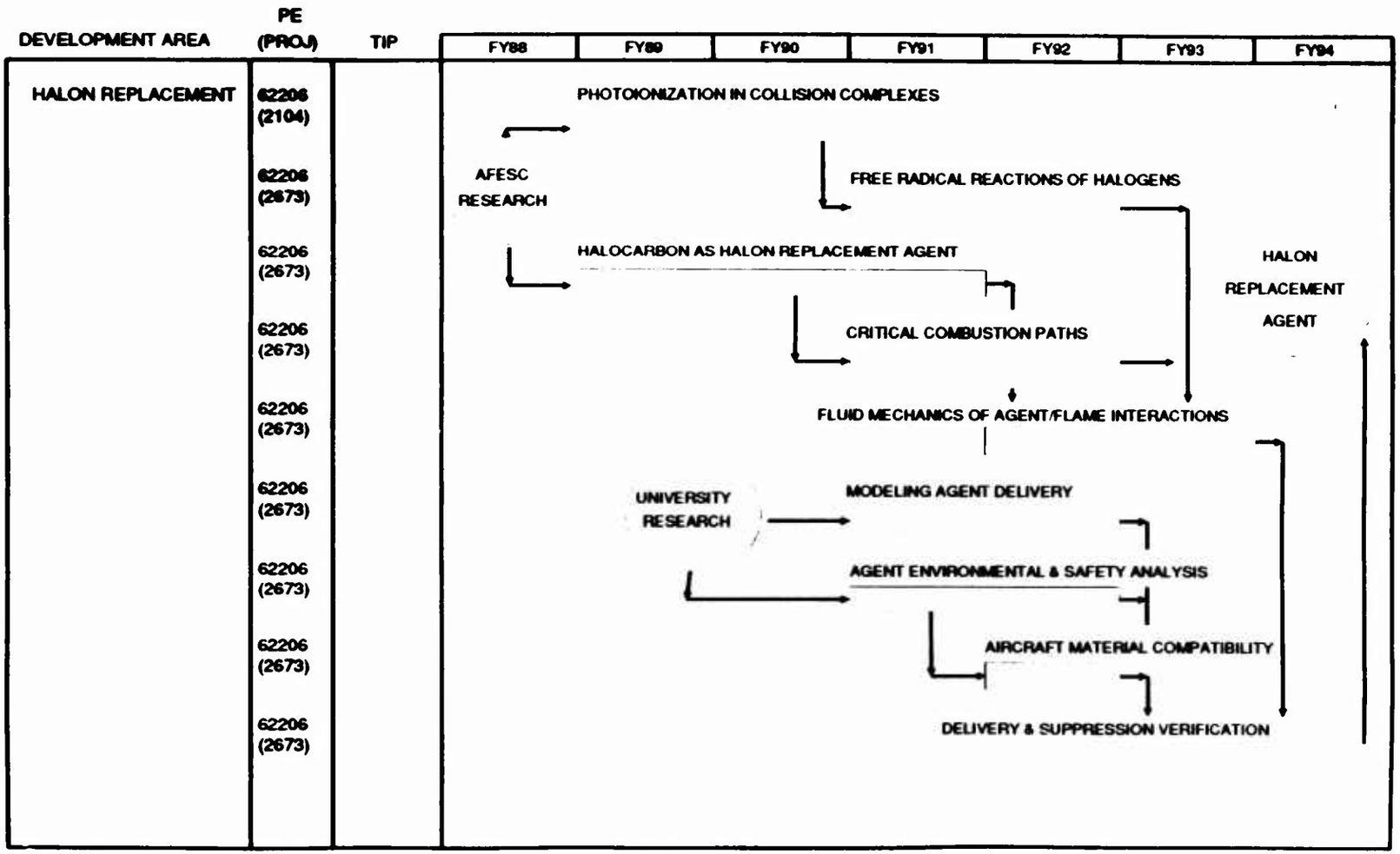


FIRE PROTECTION

PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: AGENT DEVELOPMENT

GOAL: DEVELOP CLEAN, NONTOXIC ENVIRONMENTALLY BEGIN AGENTS EFFECTIVE AGAINST THREE DIMENSIONAL FIRES.

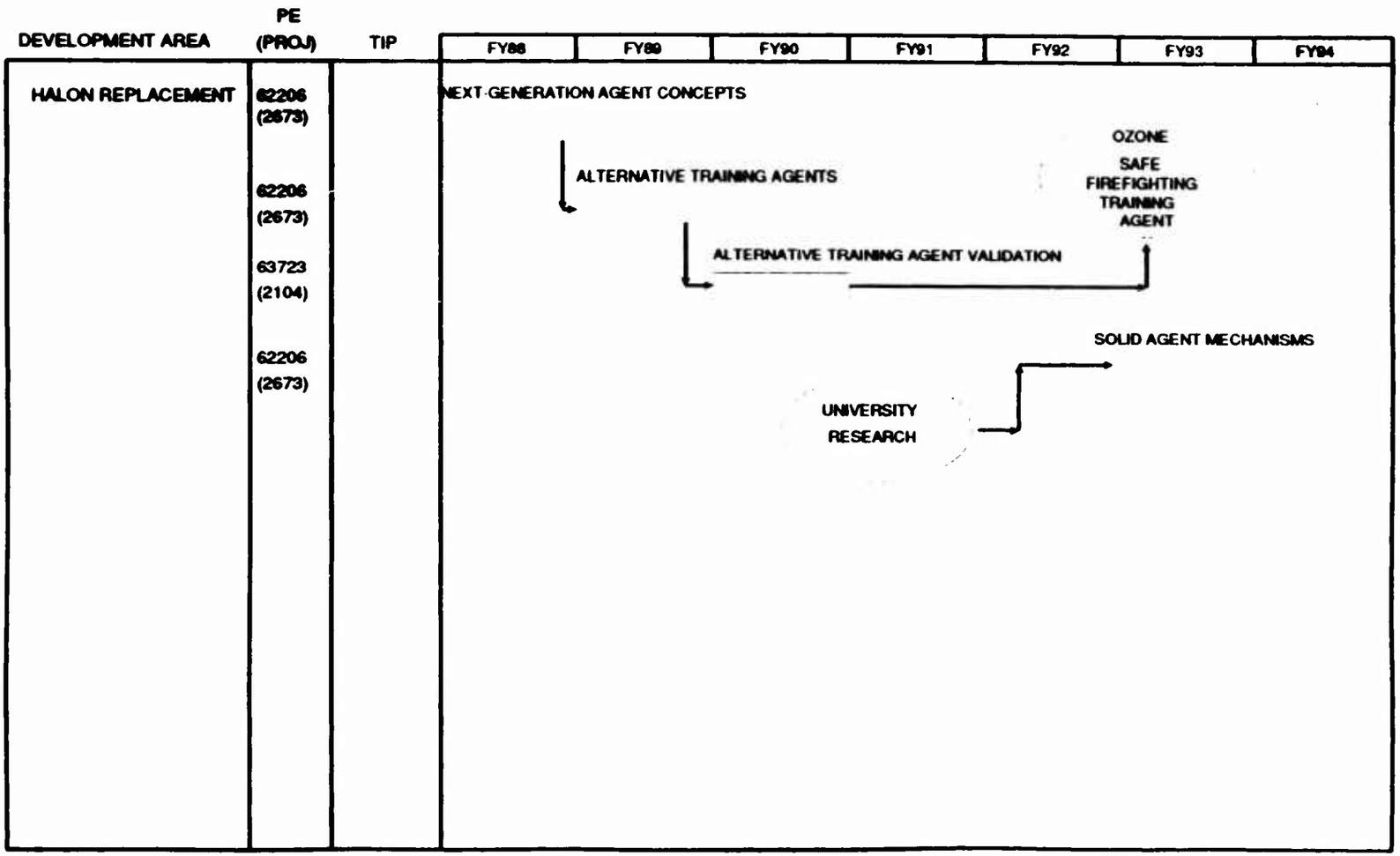
DATE: 15 JUN 1988
ROADMAP: RDCF8801
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: AGENT DEVELOPMENT

GOAL: DEVELOP CLEAN, NONTOXIC ENVIRONMENTALLY BEGIN AGENTS EFFECTIVE AGAINST THREE DIMENSIONAL FIRES.

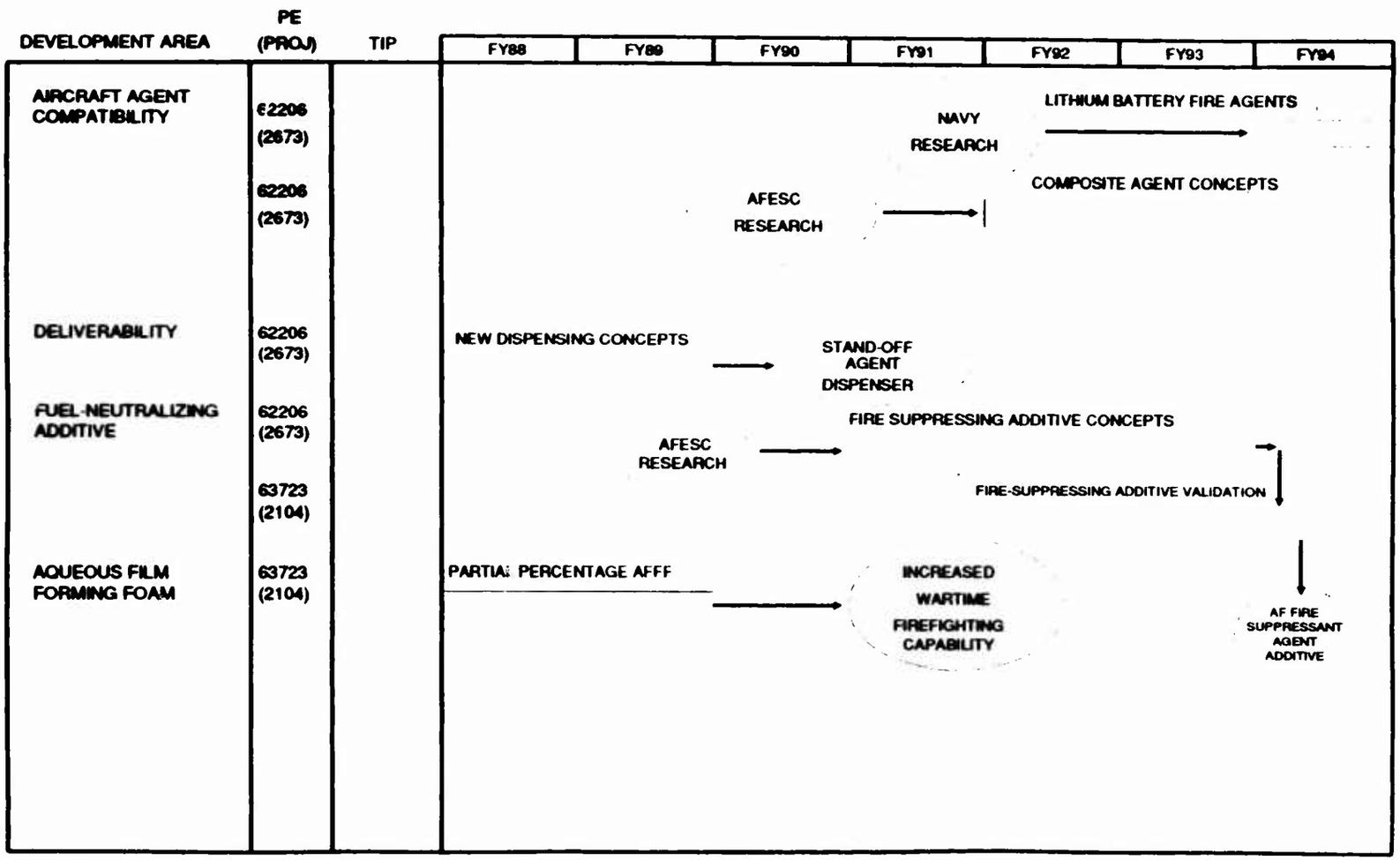
DATE: 15 JUN 1988
ROADMAP: RDCF8802
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: AGENT DEVELOPMENT

GOAL: DEVELOP CLEAN, NONTOXIC ENVIRONMENTALLY BEGIN AGENTS EFFECTIVE AGAINST THREE DIMENSIONAL FIRES.

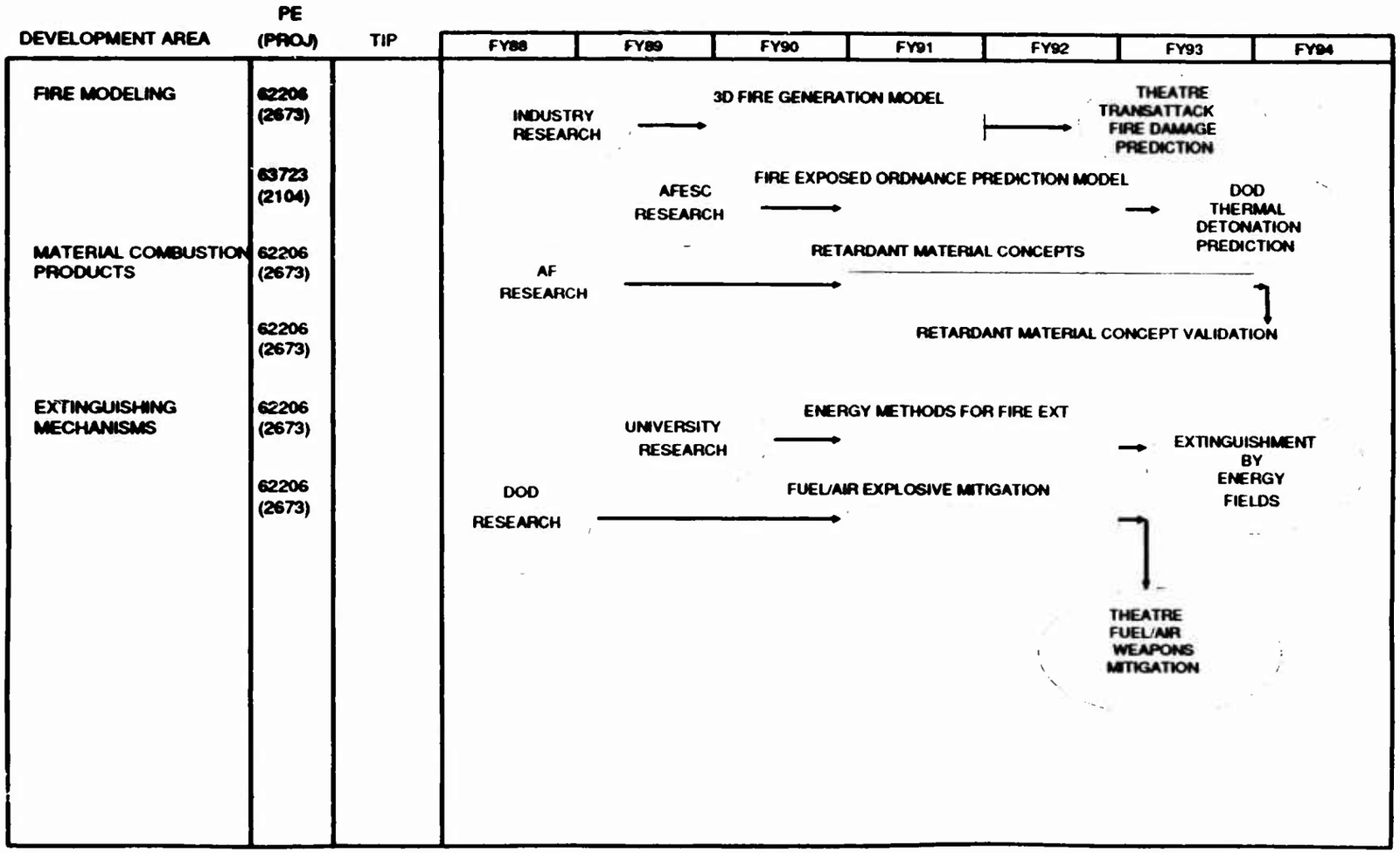
DATE: 15 JUN 1988
ROADMAP: RDCF8803
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: PHYSICS OF FIRE

GOAL: DEVELOP THE TECHNOLOGY FOR UNDERSTANDING THE MECHANISMS OF COMBUSTION PHYSICS

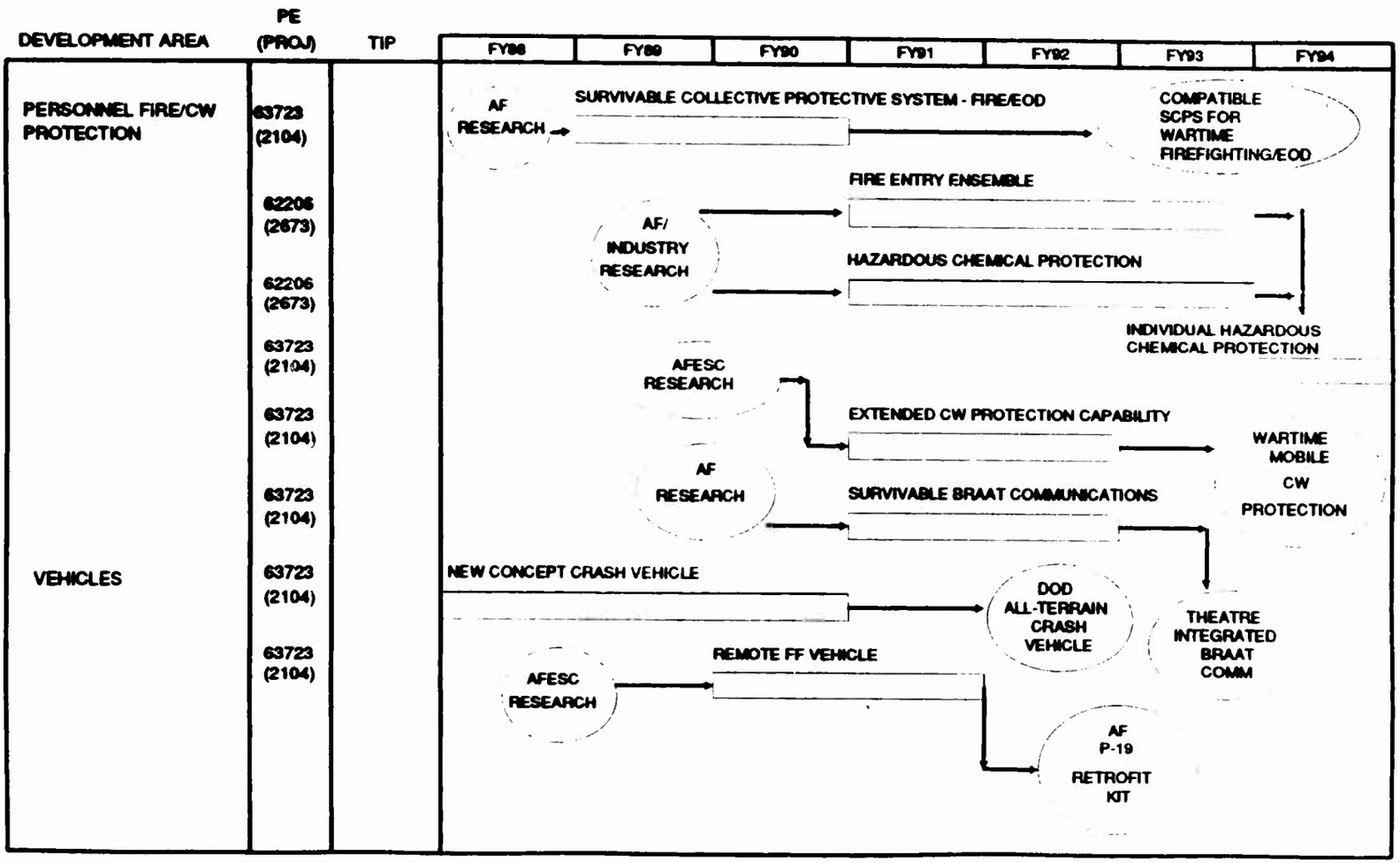
DATE: 15 JUN 1988
ROADMAP: RDCF8804
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: ADVANCED EQUIPMENT/VEHICLES

GOAL: DEVELOP FIREFIGHTING SYSTEMS WHICH ENHANCE ABILITY TO SURVIVE AND FUNCTION IN WARTIME ENVIRONMENT

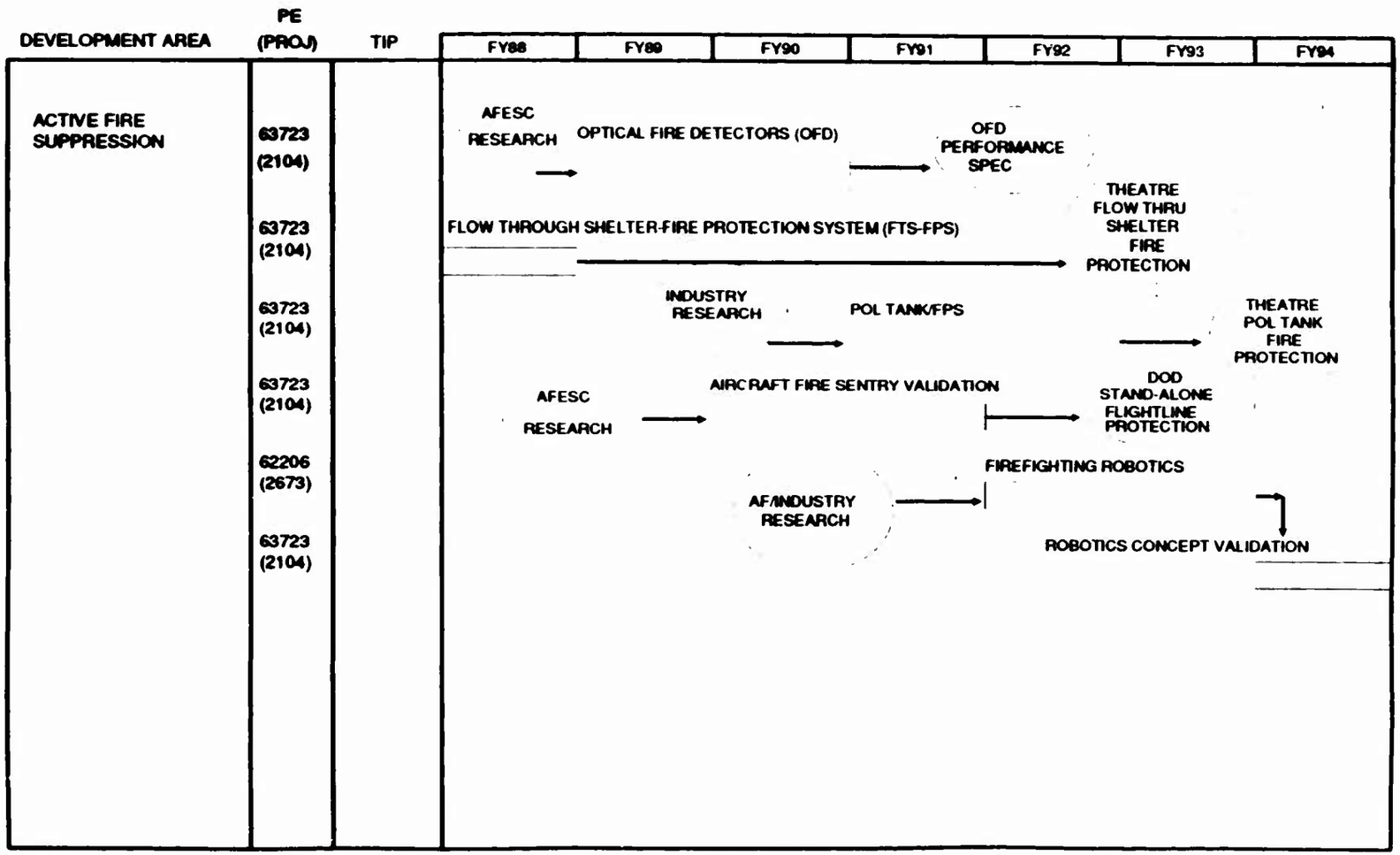
DATE: 15 JUN 1988
ROADMAP: RDCF8805
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: ADVANCED EQUIPMENT/VEHICLES

GOAL: DEVELOP FIREFIGHTING SYSTEMS WHICH ENHANCE ABILITY TO SURVIVE AND FUNCTION IN WARTIME ENVIRONMENT

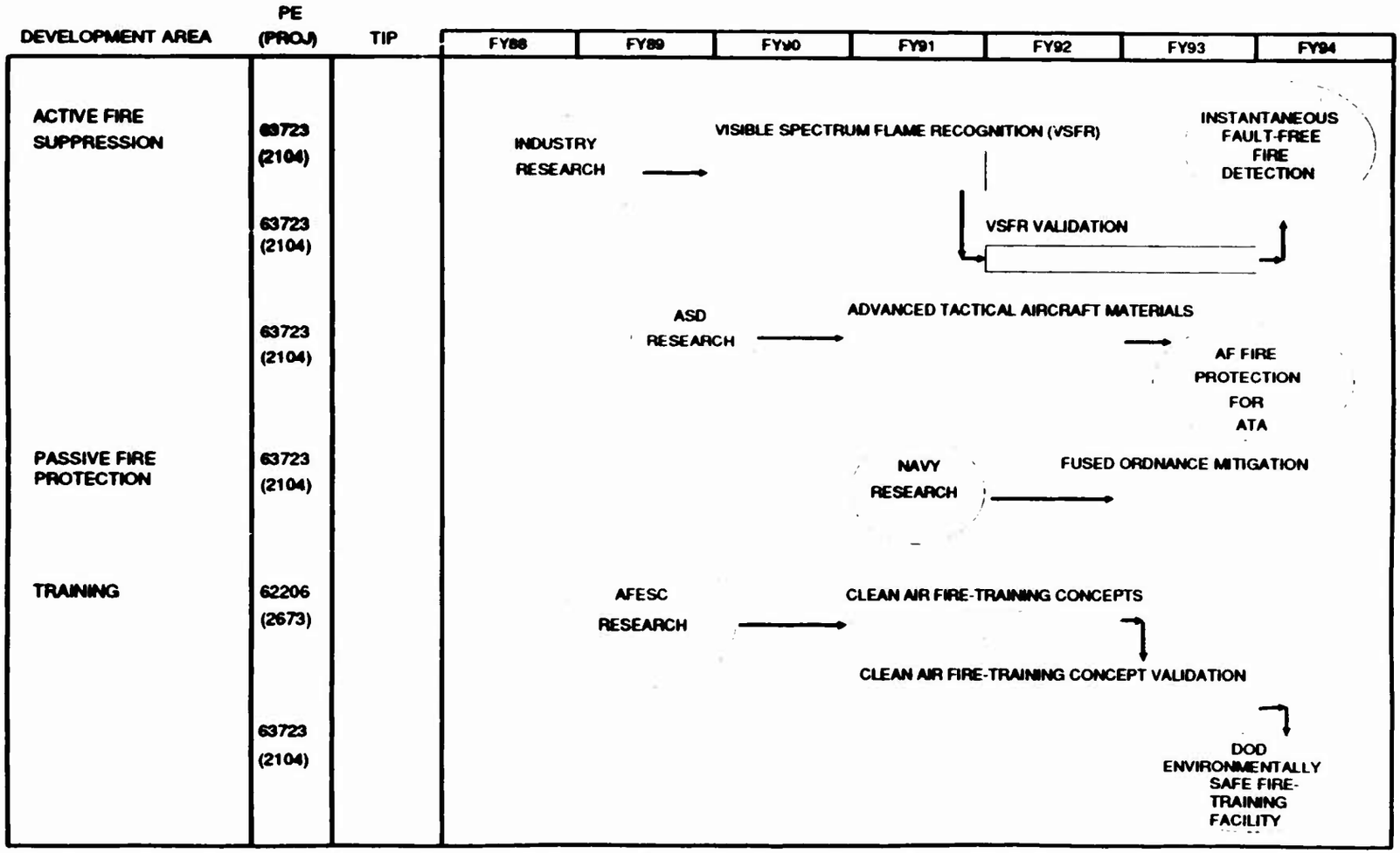
DATE: 15 JUN 1988
ROADMAP: RDCF8806
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: ADVANCED EQUIPMENT/VEHICLES

GOAL: DEVELOP FIREFIGHTING SYSTEMS WHICH ENHANCE ABILITY TO SURVIVE AND FUNCTION IN WARTIME ENVIRONMENT

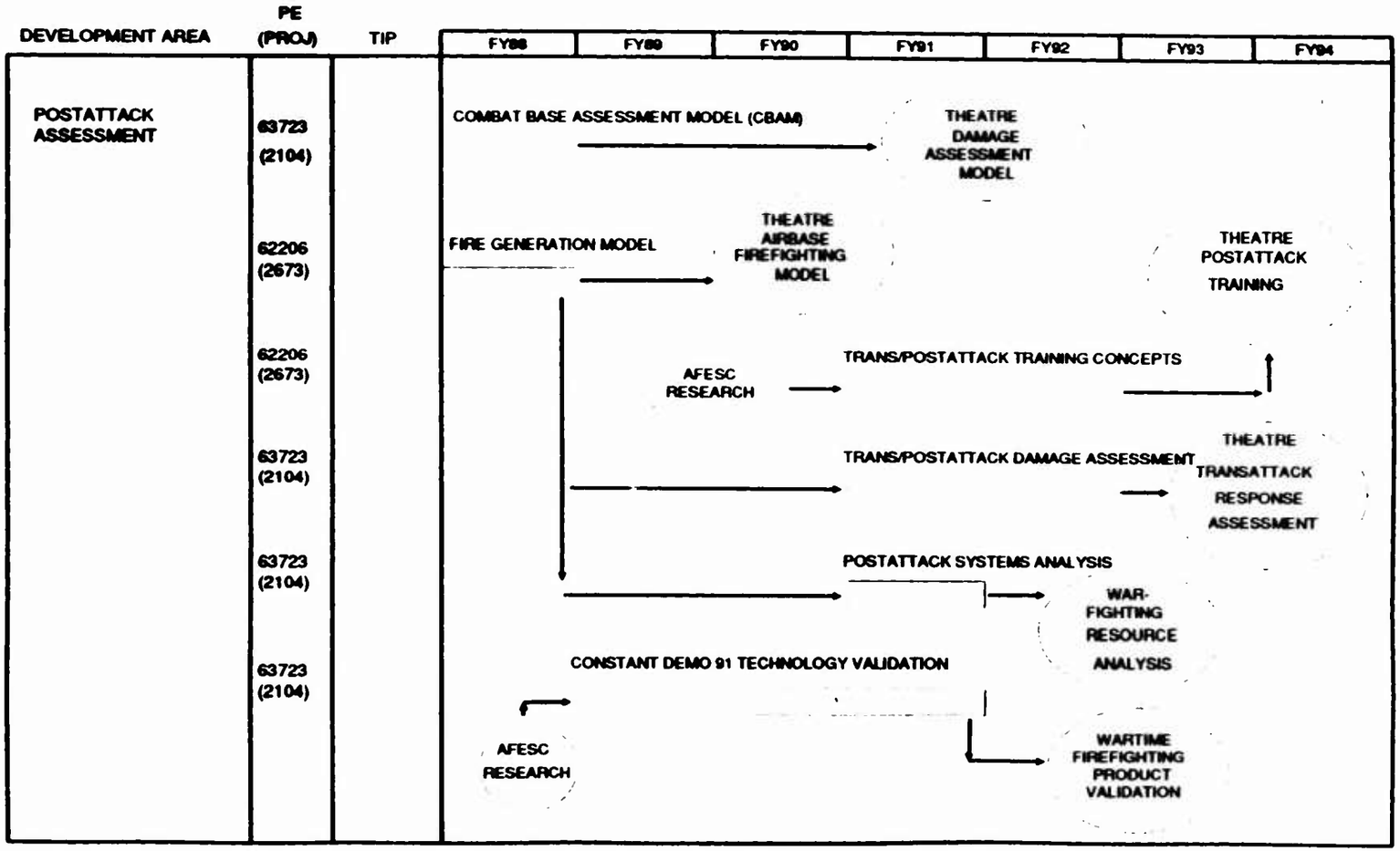
DATE: 15 JUN 1988
ROADMAP: RDCF8807
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: FIRE ASSESSMENT

GOAL: DEVELOP TECHNOLOGY FOR ASSESSING OPTIMAL FIRE PREVENTION PROTECTION OF AIRBASE DURING WAR AND PEACE

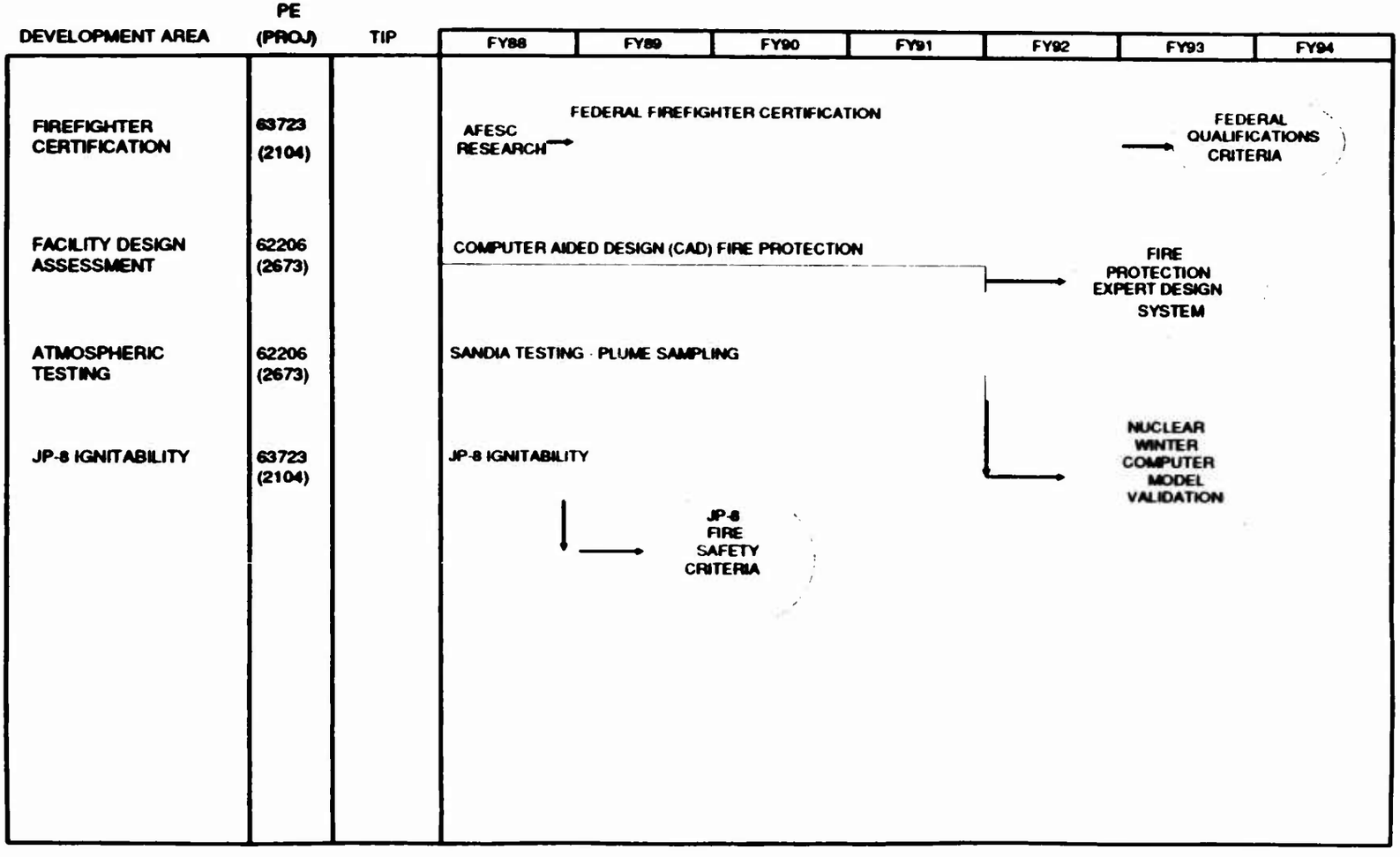
DATE: 15 JUN 1988
ROADMAP: RDCF8808
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: FIRE
TECH: FIRE ASSESSMENT

GOAL: DEVELOP TECHNOLOGY FOR ASSESSING OPTIMAL FIRE PREVENTION PROTECTION OF AIR BASE DURING WAR AND PEACE

DATE: 15 JUN 1988
ROADMAP: RDCF8809
OPR: AFESC/RD

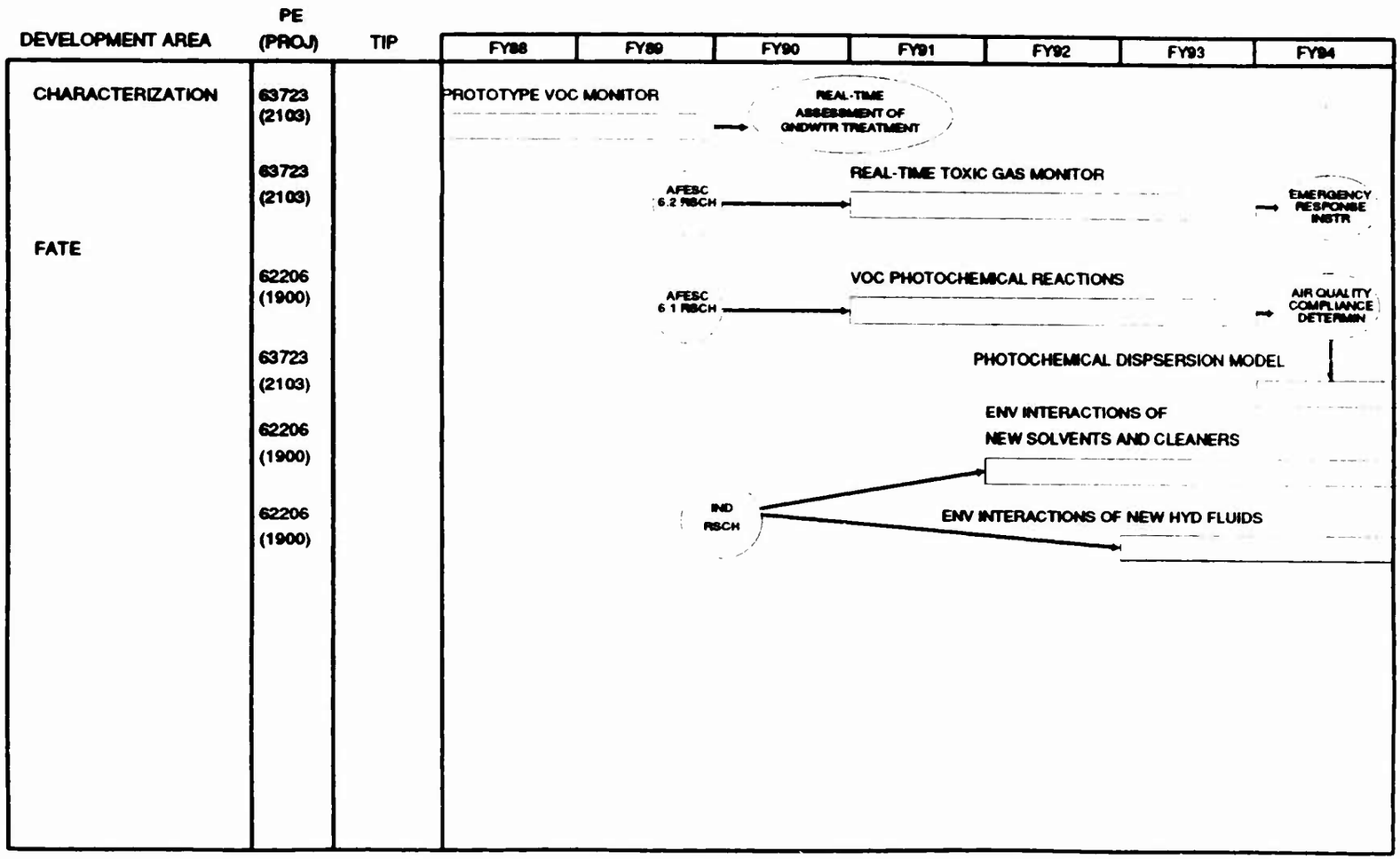


ENVIRONMENTAL COMPLIANCE

PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: VOC & SOLVENTS

GOAL: DEVELOP TECHNOLOGY TO MEASURE THE MAGNITUDE OF THE ENVIRONMENTAL IMPACT OF VOCs AND SOLVENTS FROM USAF OPERATIONS AND TO MINIMIZE THIS IMPACT.

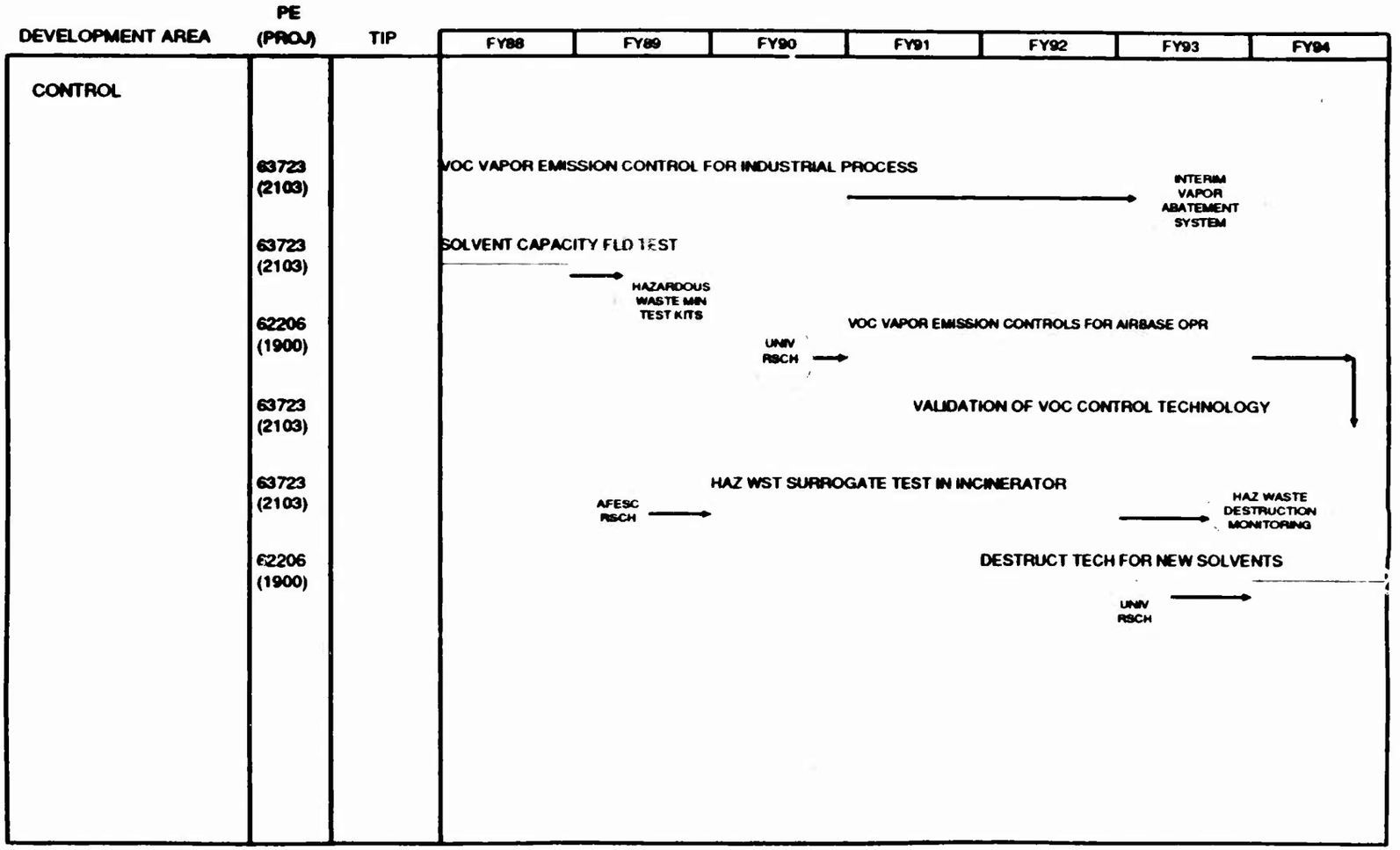
DATE: 15 JUN 1988
ROADMAP: EC01
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: VOC & SOLVENTS

GOAL: DEVELOP TECHNOLOGY TO MEASURE THE MAGNITUDE OF THE ENVIRONMENTAL IMPACT OF VOCs AND SOLVENTS FROM USAF OPERATIONS AND TO MINIMIZE THIS IMPACT

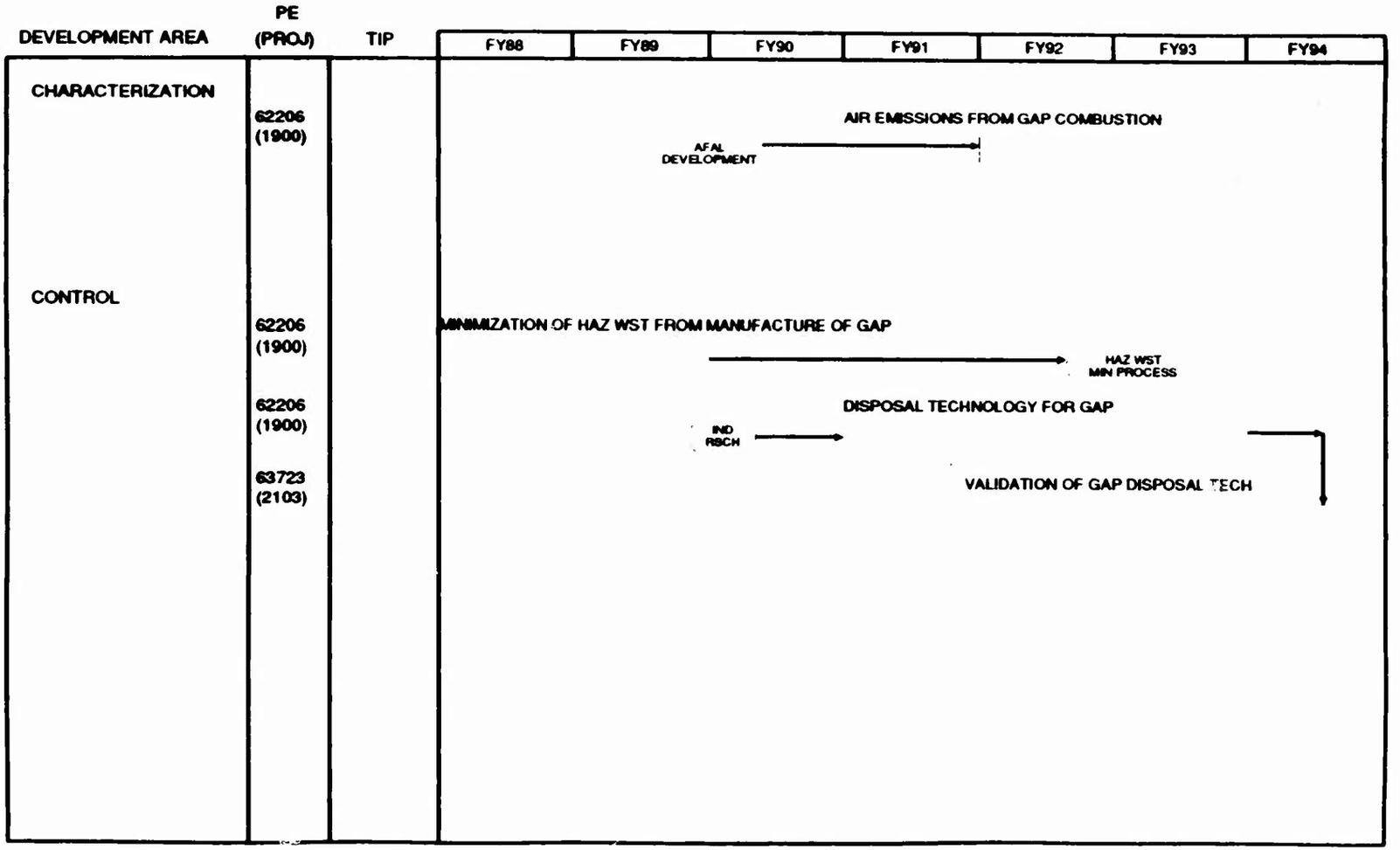
DATE: 15 JUN 1988
ROADMAP: EC02
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: ROCKET PROPELLANTS -
GLYCIDYL AZIDE POLYMER (GAP)

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF ROCKET PROPELLANTS AND TO DEVELOP TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

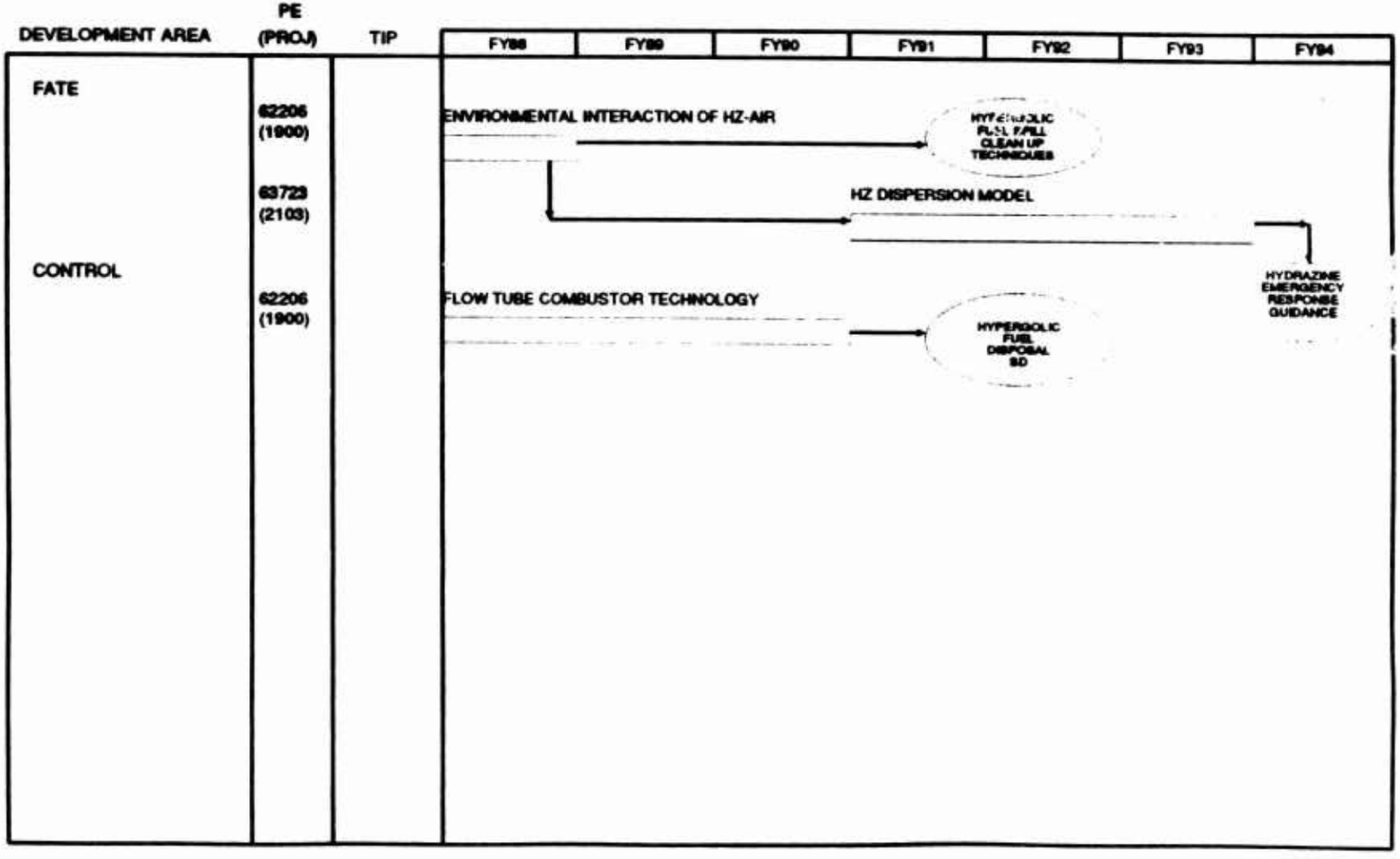
DATE: 15 JUN 1988
ROADMAP: EC03
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: ROCKET PROPELLANTS - HYDRAZINE (Hz)

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF ROCKET PROPELLANTS AND TO DEVELOP TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

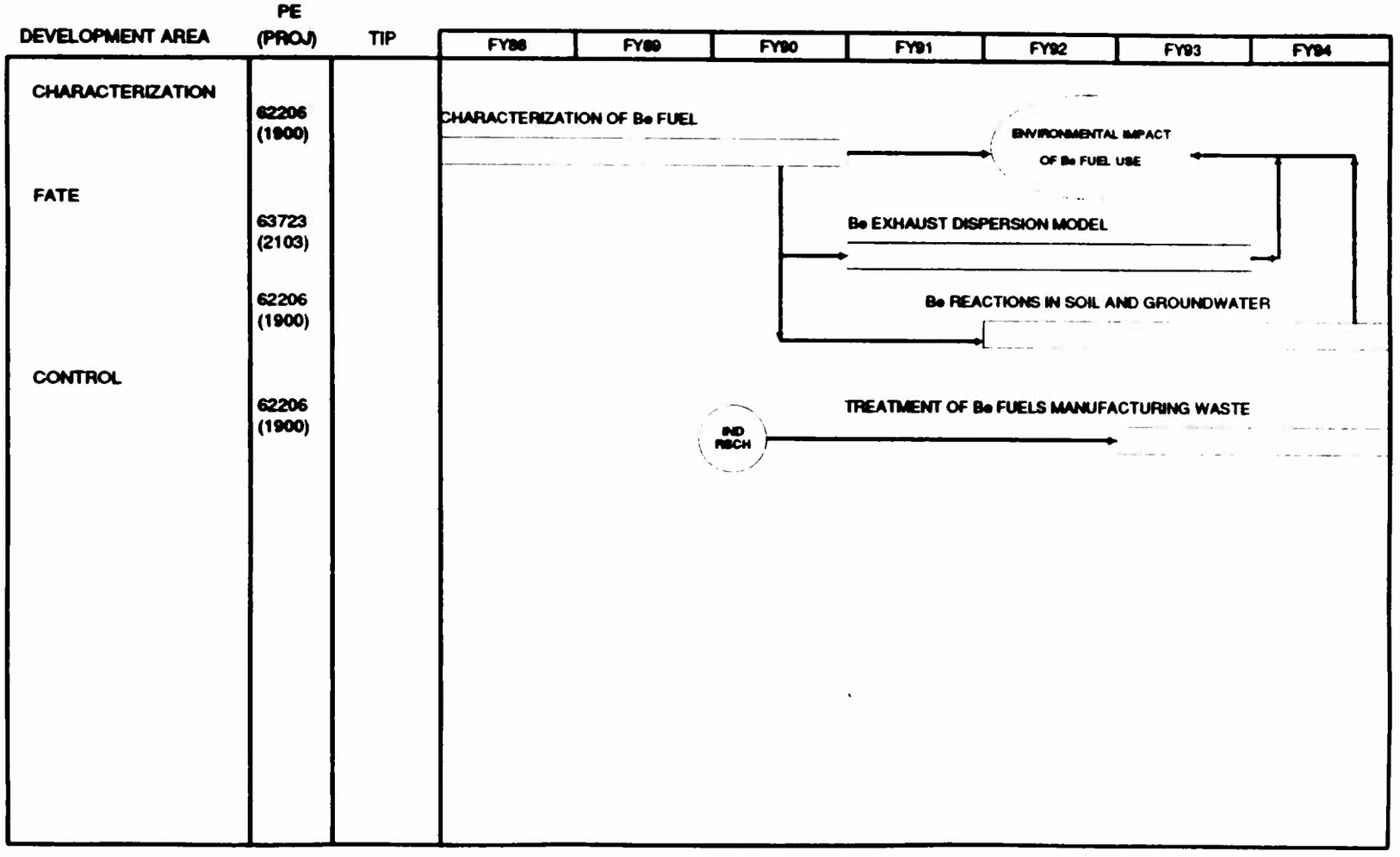
DATE: 15 JUN 1988
ROADMAP: EC04
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: ROCKET PROPELLANTS -
BERYLLIUM (Be)

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF ROCKET PROPELLANTS AND TO DEVELOP TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

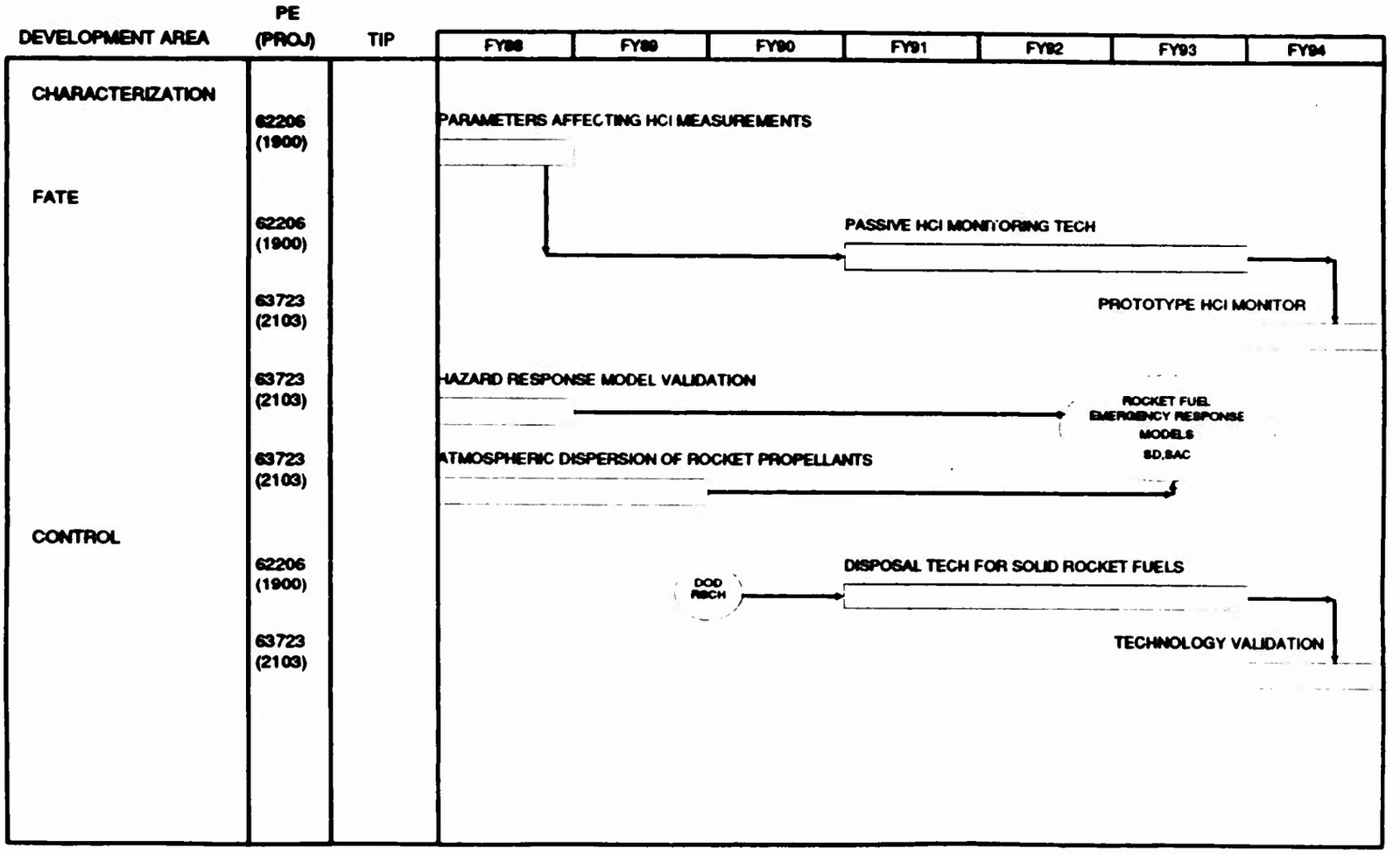
DATE: 15 JUN 1988
ROADMAP: EC05
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: ROCKET PROPELLANTS -
AMMONIUM PERCHLORATE/HCI

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF ROCKET PROPELLANTS AND TO DEVELOP TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

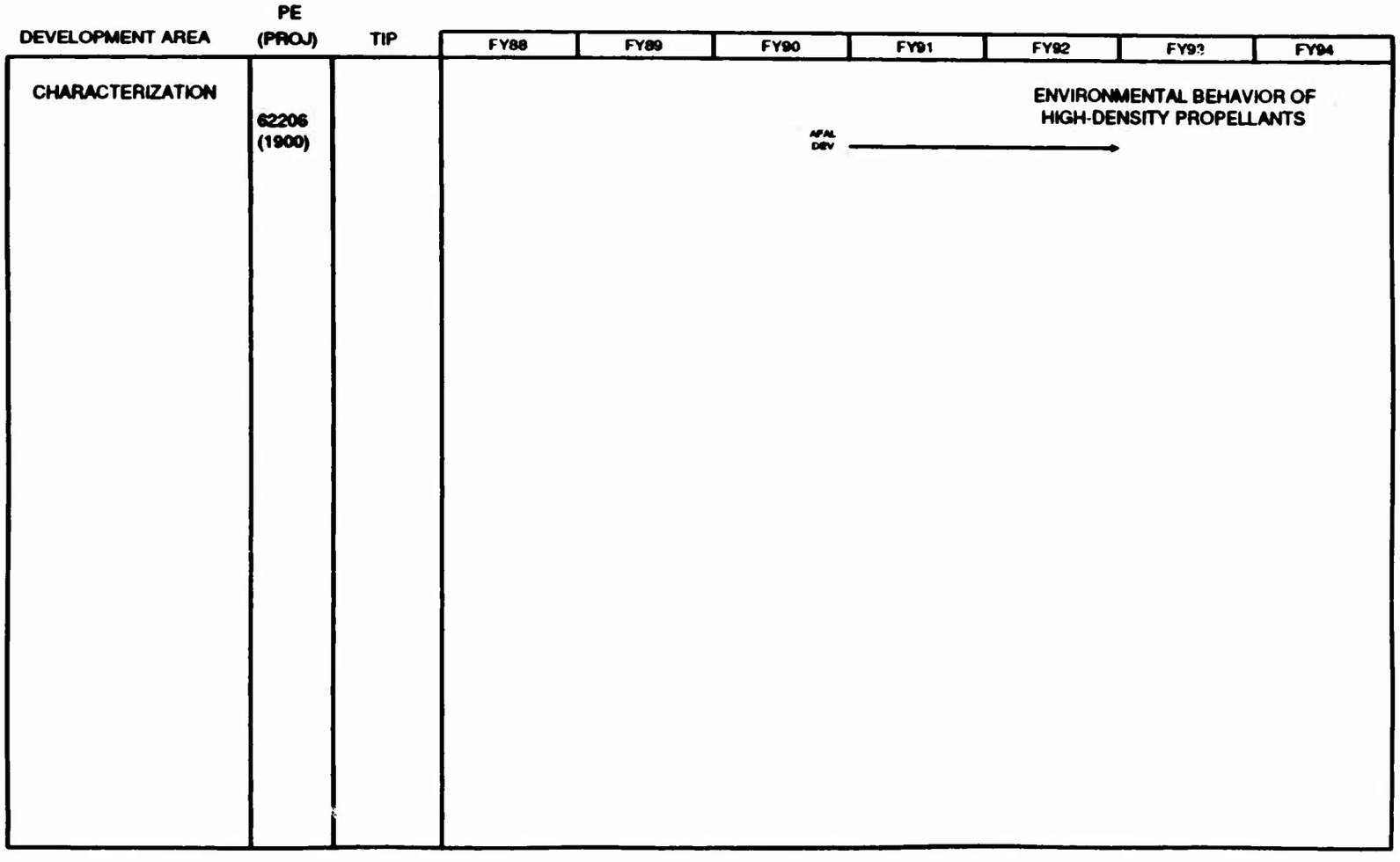
DATE: 15 JUN 1988
ROADMAP: EC06
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: ROCKET PROPELLANTS -
NEW FUELS

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF ROCKET PROPELLANTS AND TO DEVELOP TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

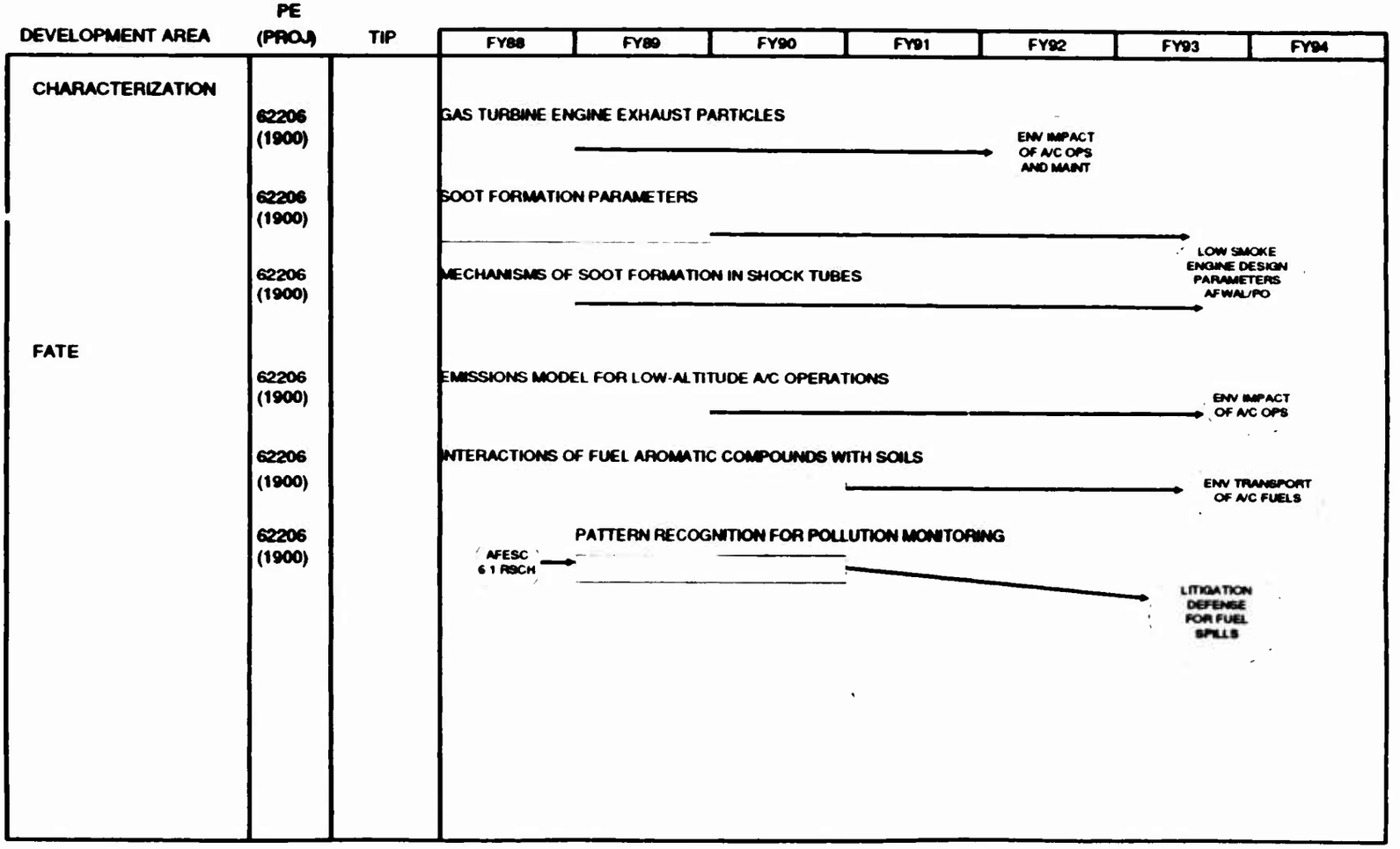
DATE: 15 JUN 1988
ROADMAP: EC07
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: AIRCRAFT FUELS & EMISSIONS

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF AIRCRAFT FUELS AND THEIR COMBUSTION PRODUCTS AND DEVELOP CONTROL TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

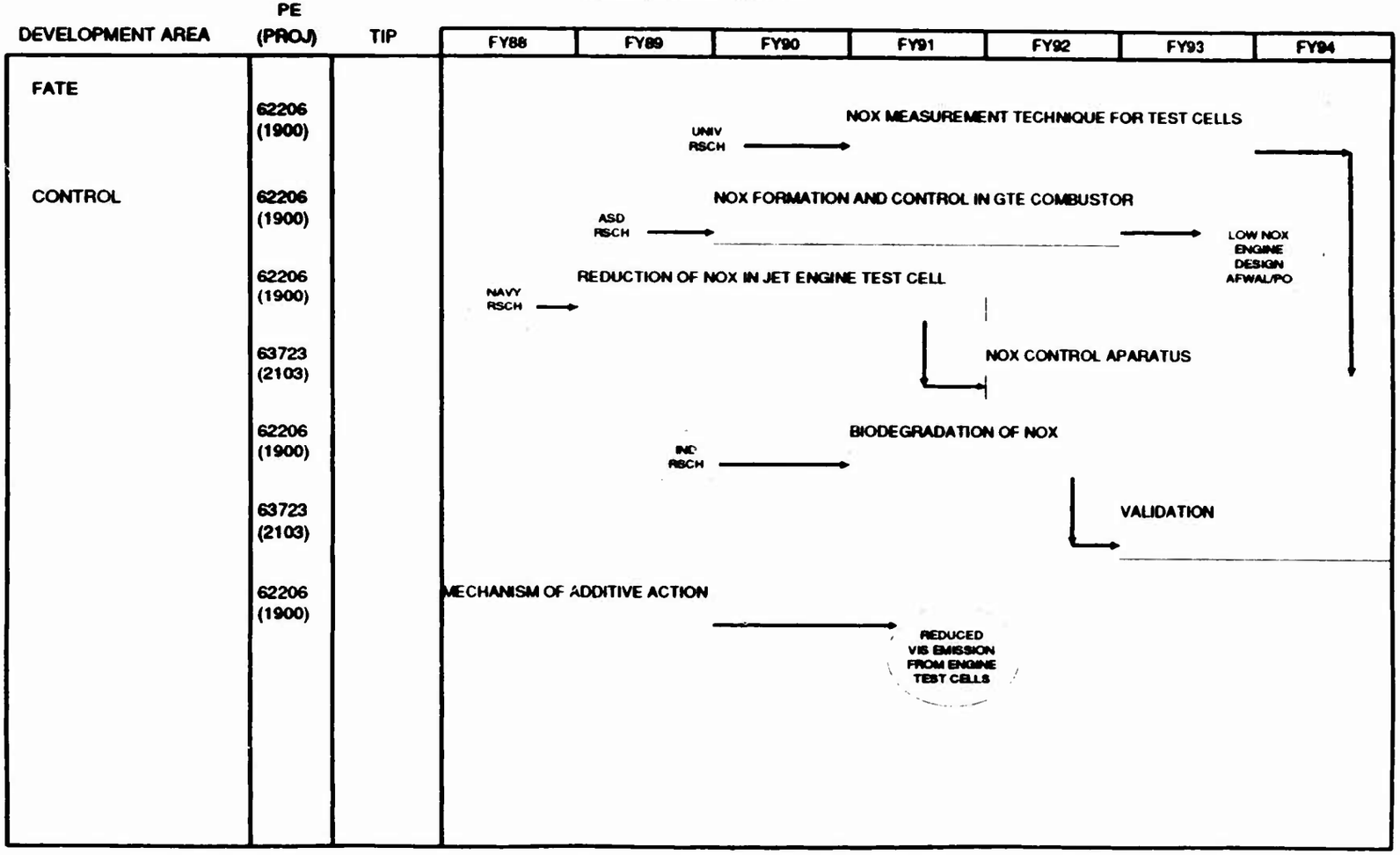
DATE: 15 JUN 1988
ROADMAP: EC08
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: AIRCRAFT FUELS & EMISSIONS

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF AIRCRAFT FUELS AND THEIR COMBUSTION PRODUCTS AND DEVELOP CONTROL TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

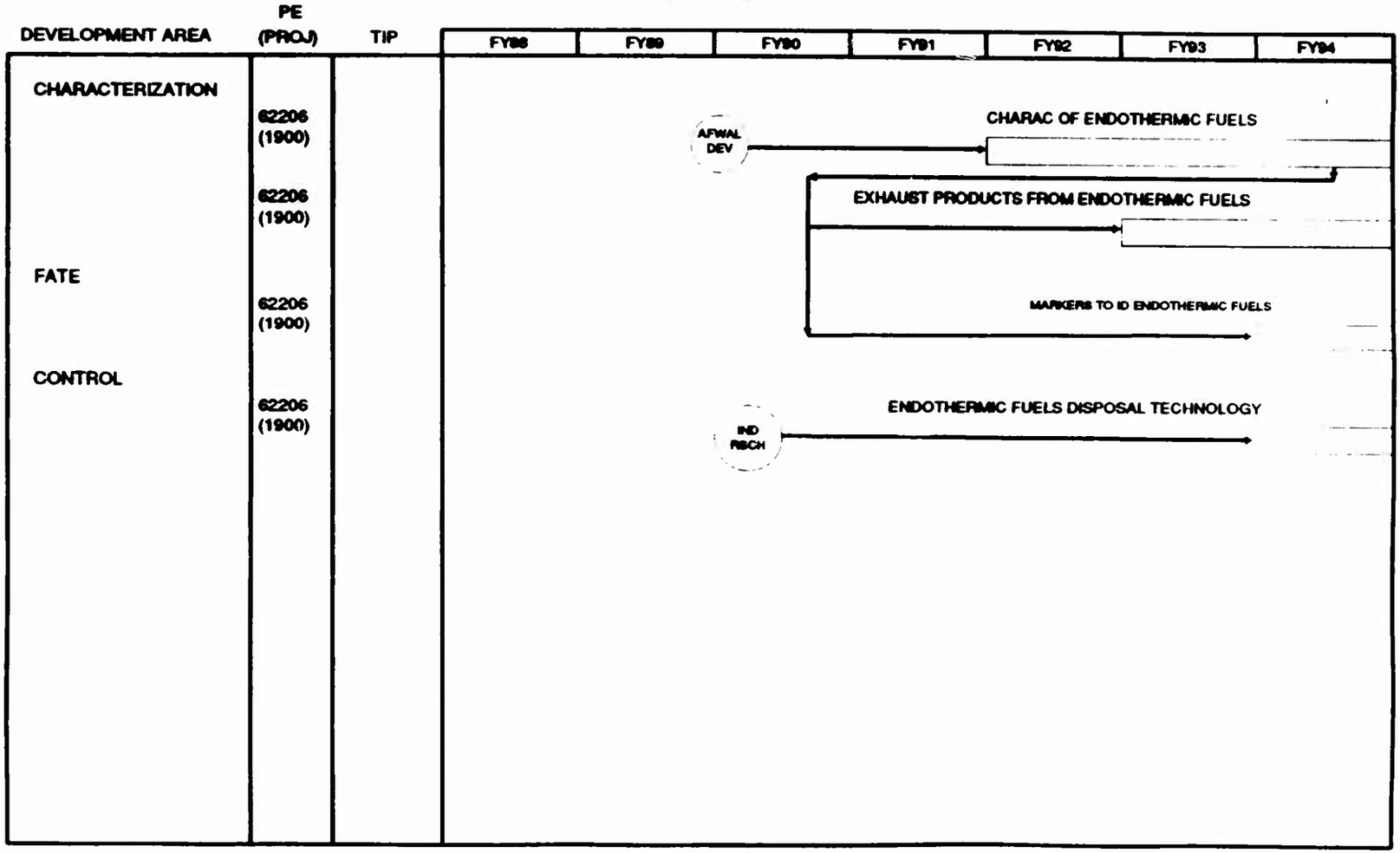
DATE: 15 JUN 1988
ROADMAP: EC09
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: AIRCRAFT FUELS & EMISSIONS - ADVANCED FUELS

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF AIRCRAFT FUELS AND THEIR COMBUSTION PRODUCTS AND DEVELOP CONTROL TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

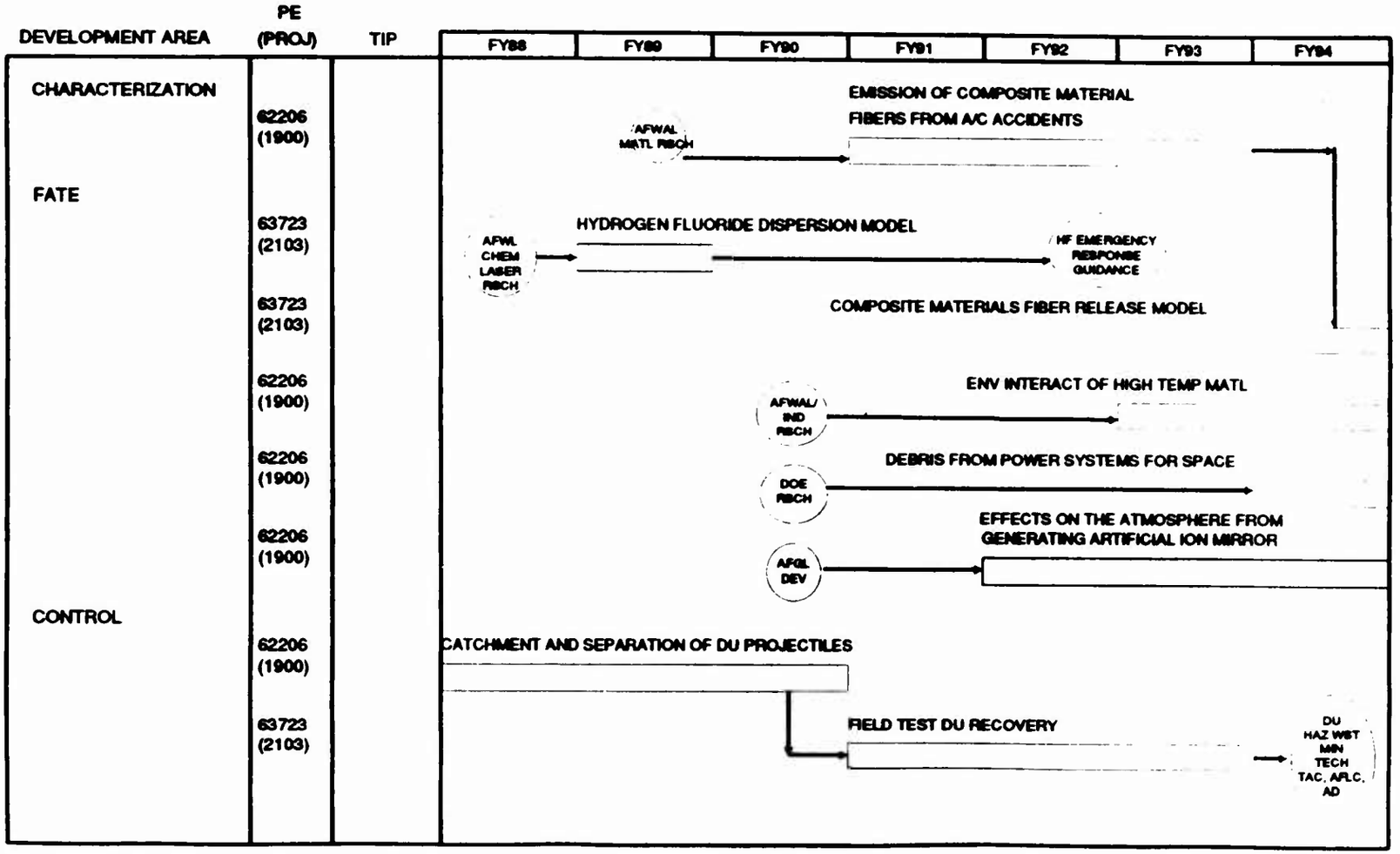
DATE: 15 JUN 1988
ROADMAP: EC10
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: WEAPON SYSTEM MATERIALS

GOAL: CHARACTERIZE THE ENVIRONMENTAL FATE AND EFFECTS OF NEW USAF MATERIALS AND DEVELOP TECHNOLOGIES TO MINIMIZE THEIR ENVIRONMENTAL IMPACT.

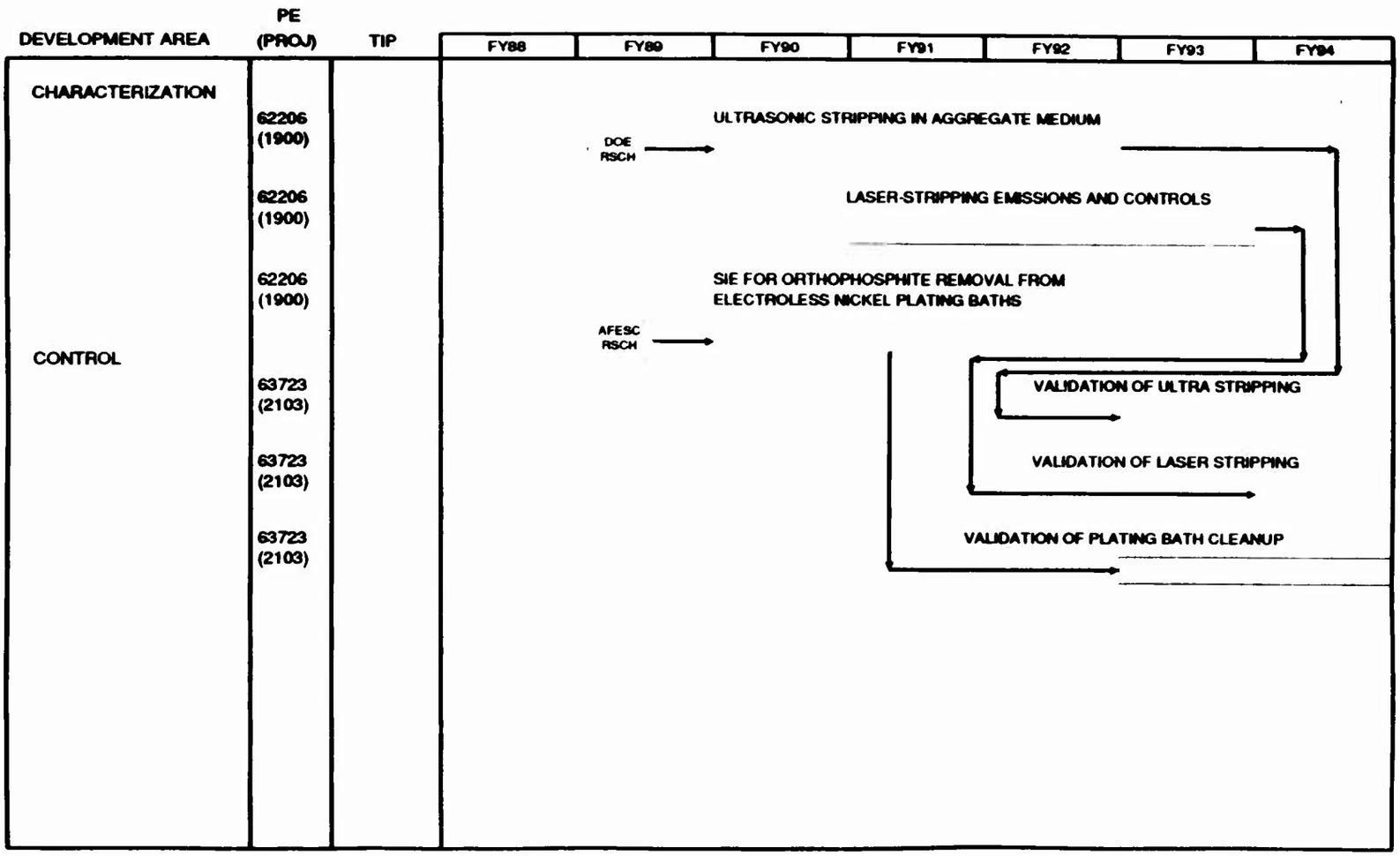
DATE: 15 JUN 1988
ROADMAP: EC11
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: INDUSTRIAL SYSTEMS - MAINTENANCE

GOAL: DEVELOP TREATMENT TECHNOLOGIES AND PROCESS MODIFICATIONS TO MINIMIZE HAZARDOUS WASTE GENERATED BY USAF OPERATIONS.

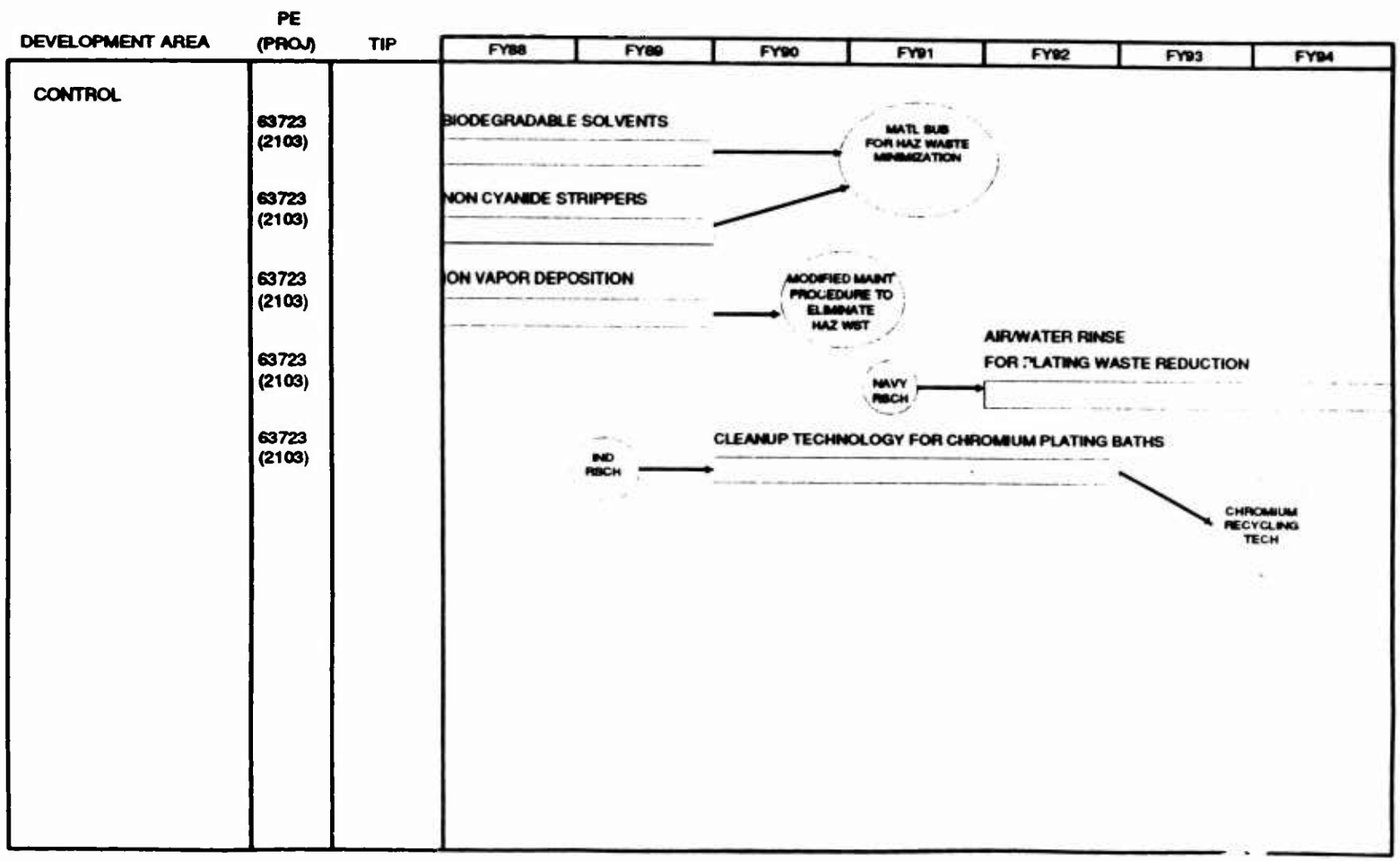
DATE: 15 JUN 1988
ROADMAP: EC12
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: INDUSTRIAL SYSTEMS - MAINTENANCE

GOAL: DEVELOP TREATMENT TECHNOLOGIES AND PROCESS MODIFICATIONS TO MINIMIZE HAZARDOUS WASTE GENERATED BY USAF OPERATIONS.

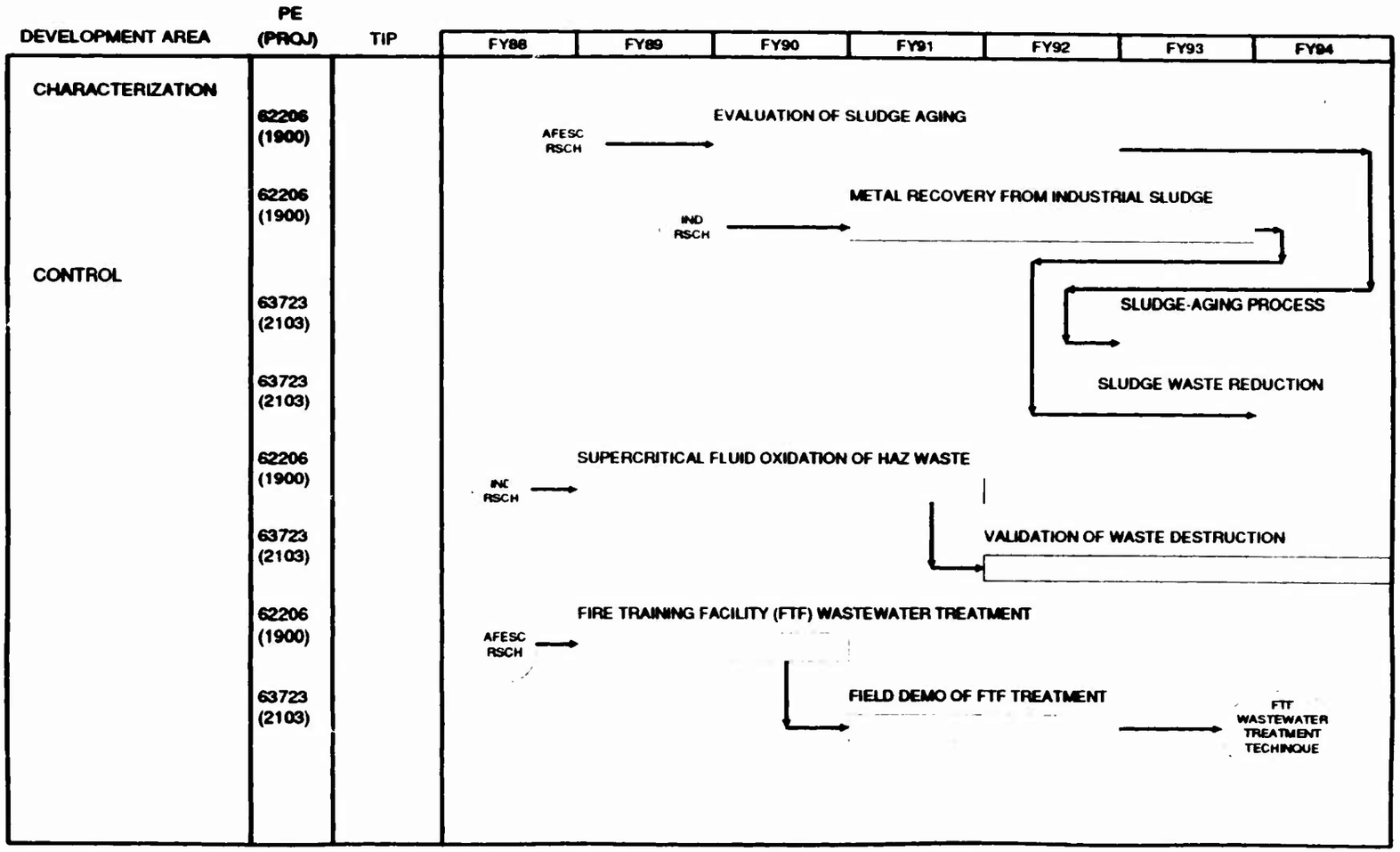
DATE: 15 JUN 1988
ROADMAP: EC13
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: INDUSTRIAL SYSTEMS - DISPOSAL

GOAL: DEVELOP TREATMENT TECHNOLOGIES AND PROCESS MODIFICATIONS TO MINIMIZE HAZARDOUS WASTE GENERATED BY USAF OPERATIONS.

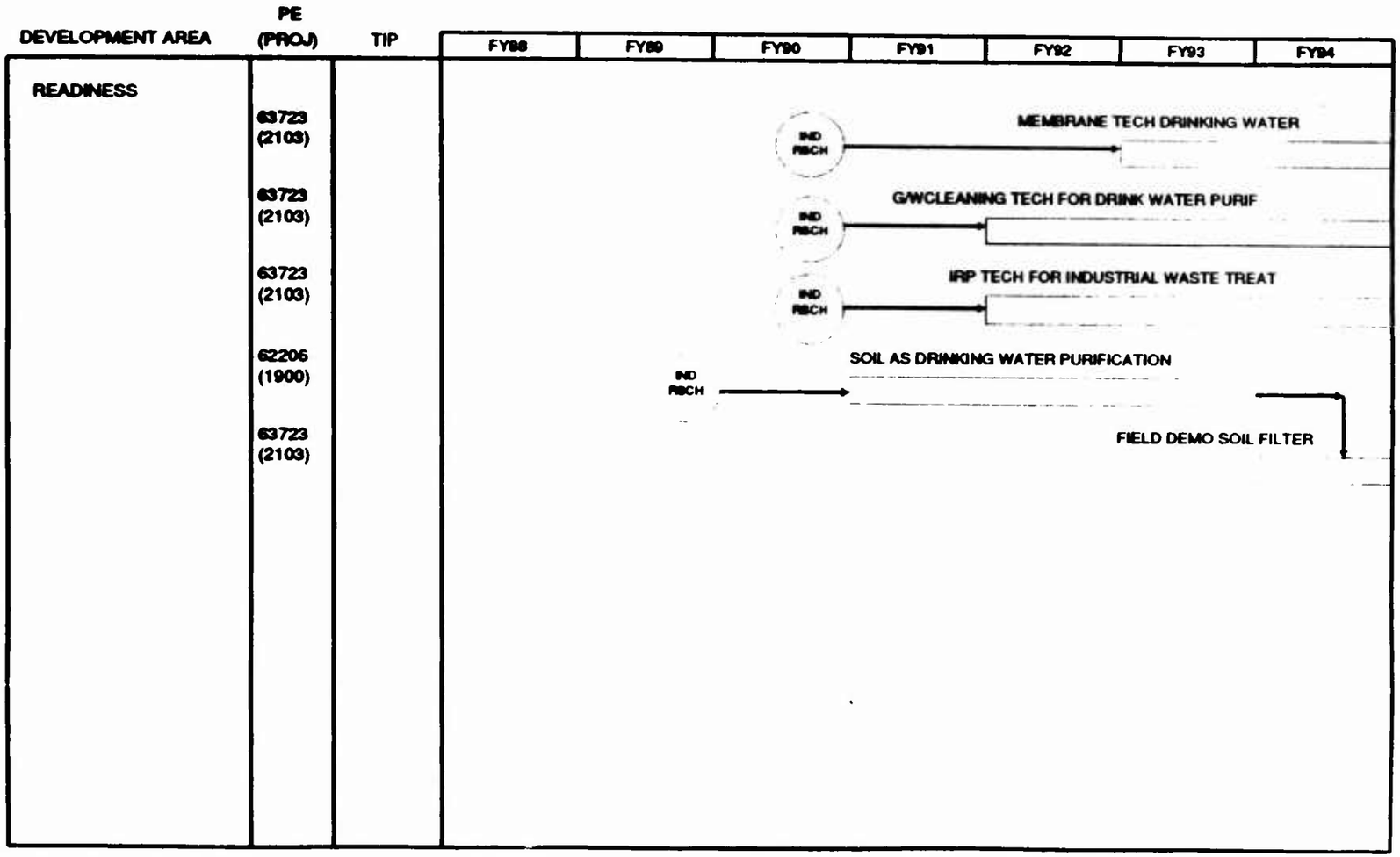
DATE: 15 JUN 1988
ROADMAP: EC14
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: ENVIRONMENTAL COMPLIANCE
TECH: INDUSTRIAL SYSTEMS - READINESS

GOAL: DEVELOP TREATMENT TECHNOLOGIES AND PROCESS MODIFICATIONS TO MINIMIZE HAZARDOUS WASTE GENERATED BY USAF OPERATIONS.

DATE: 15 JUN 1988
ROADMAP: EC15
OPR: AFESC/RD

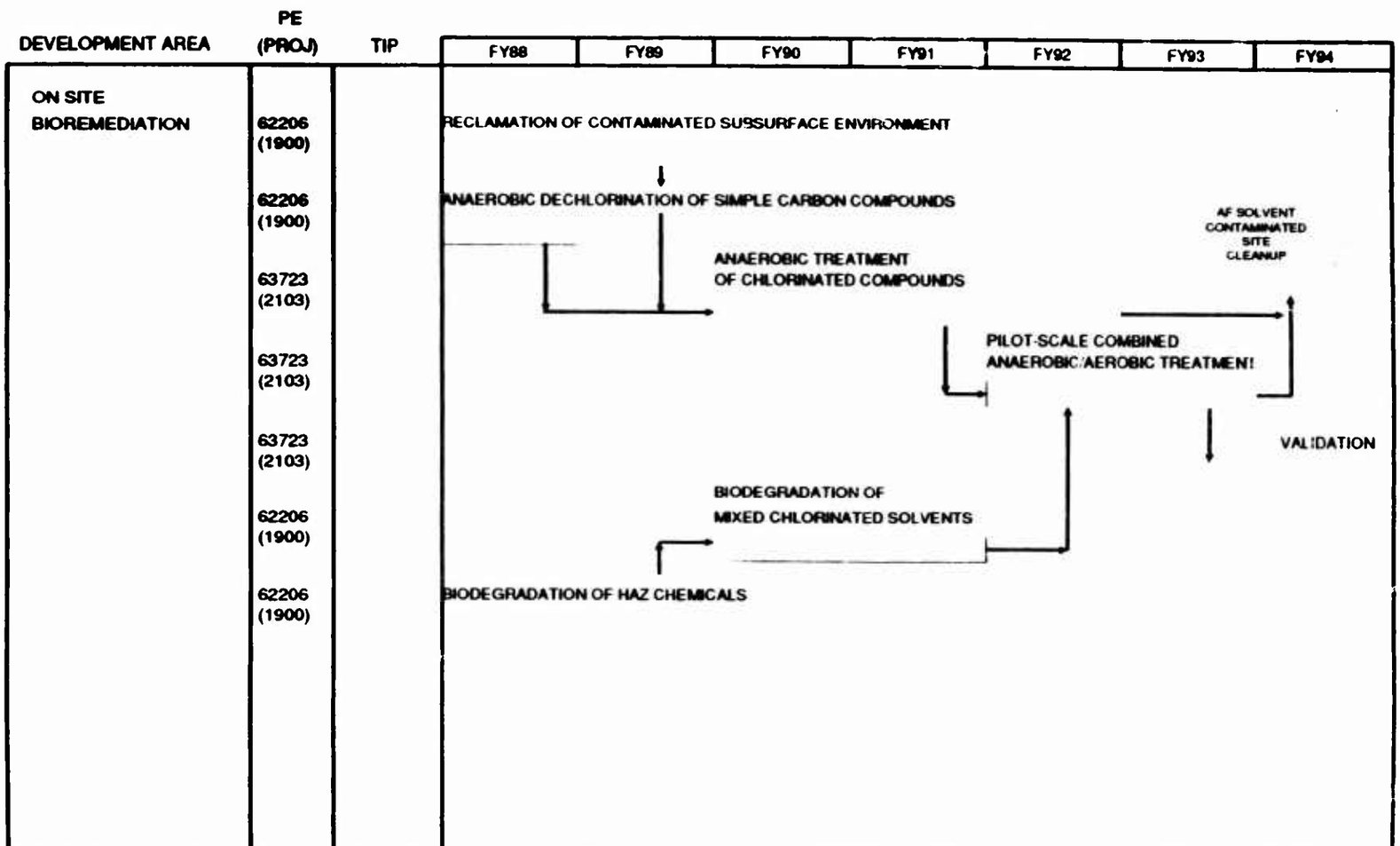


SITE RESTORATION

PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

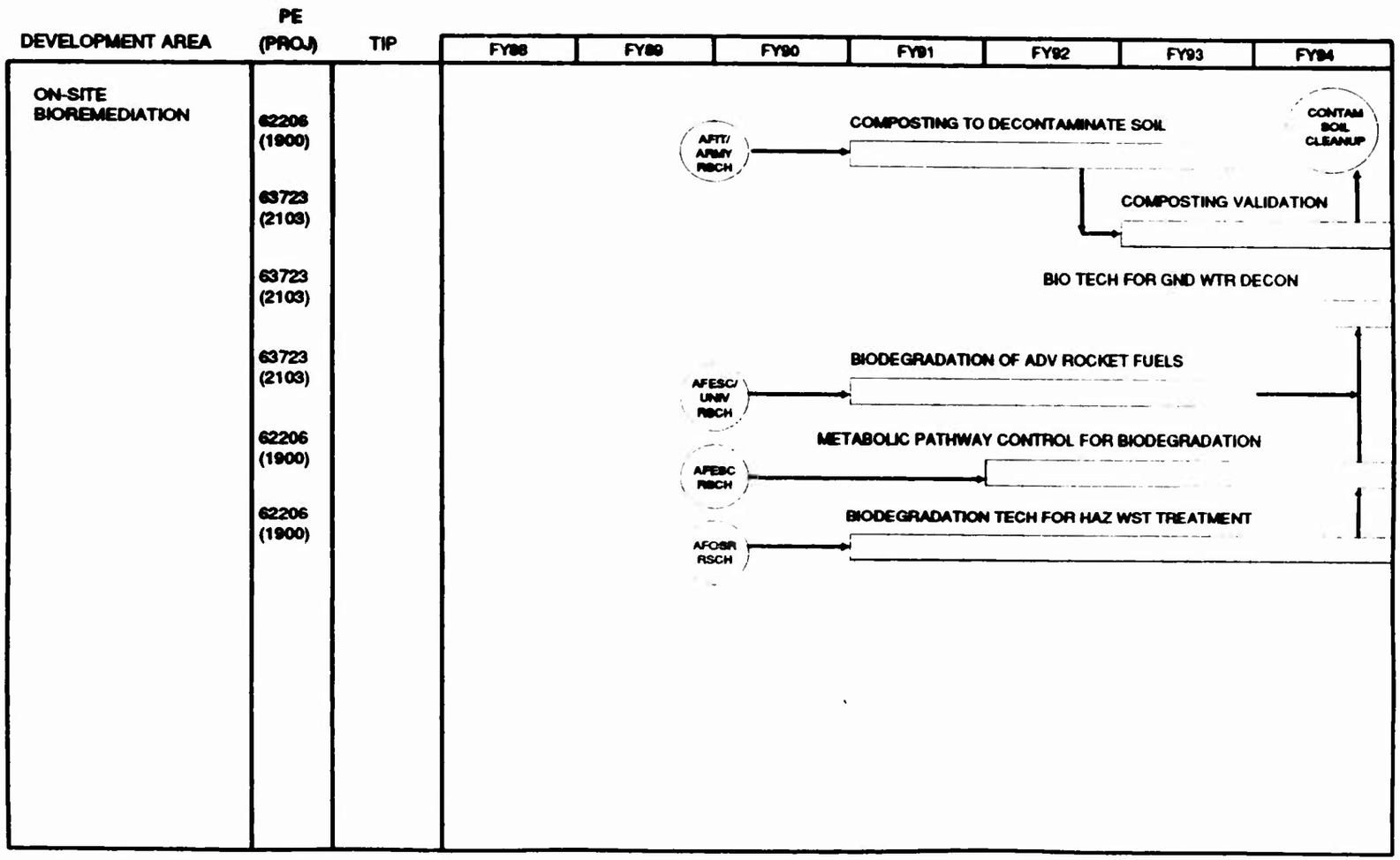
DATE: 15 JUN 1988
ROADMAP: SR01
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

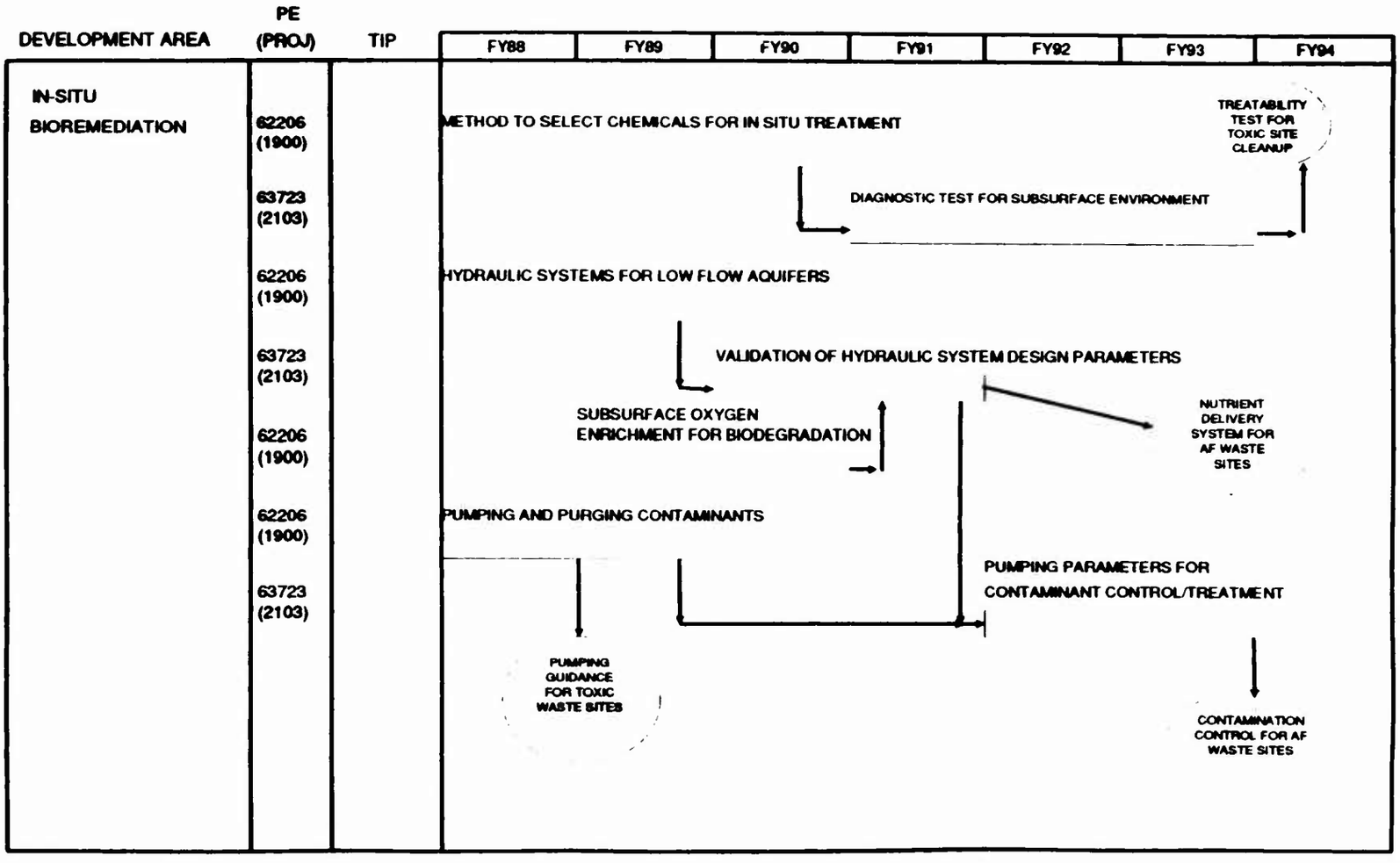
DATE: 15 JUN 1988
ROADMAP: SR02
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

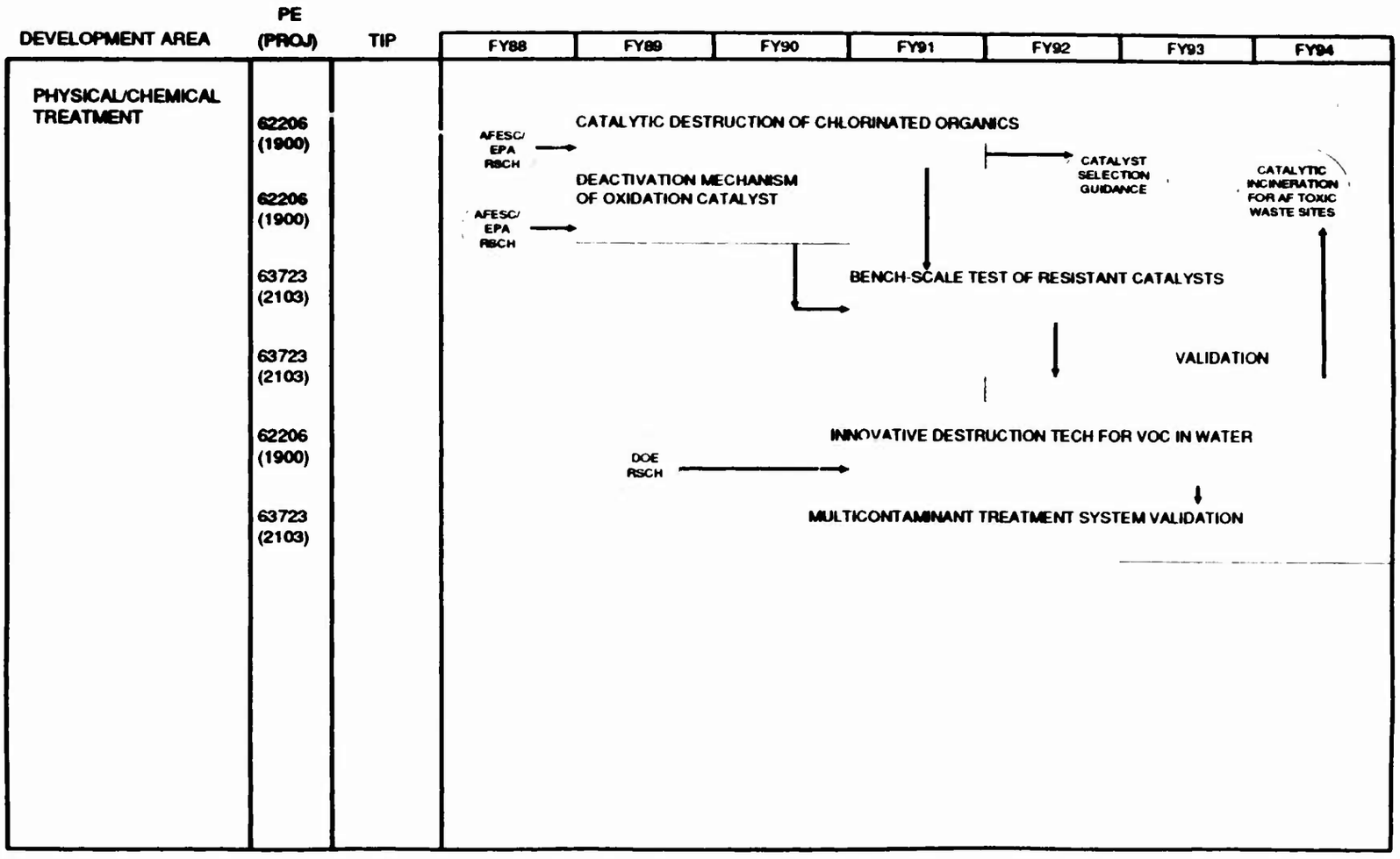
DATE: 15 JUN 1988
ROADMAP: SR03
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

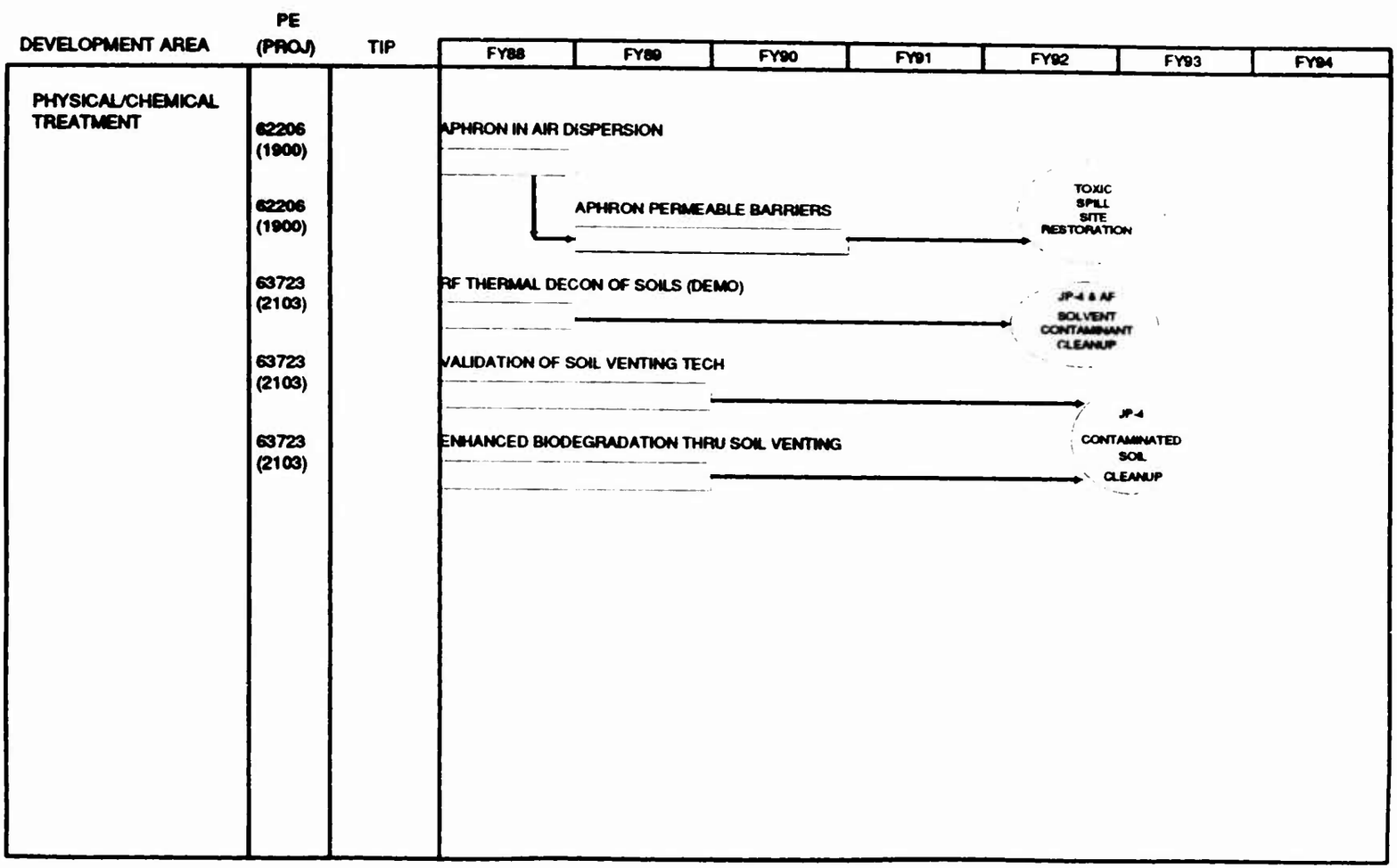
DATE: 15 JUN 1988
ROADMAP: SR04
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

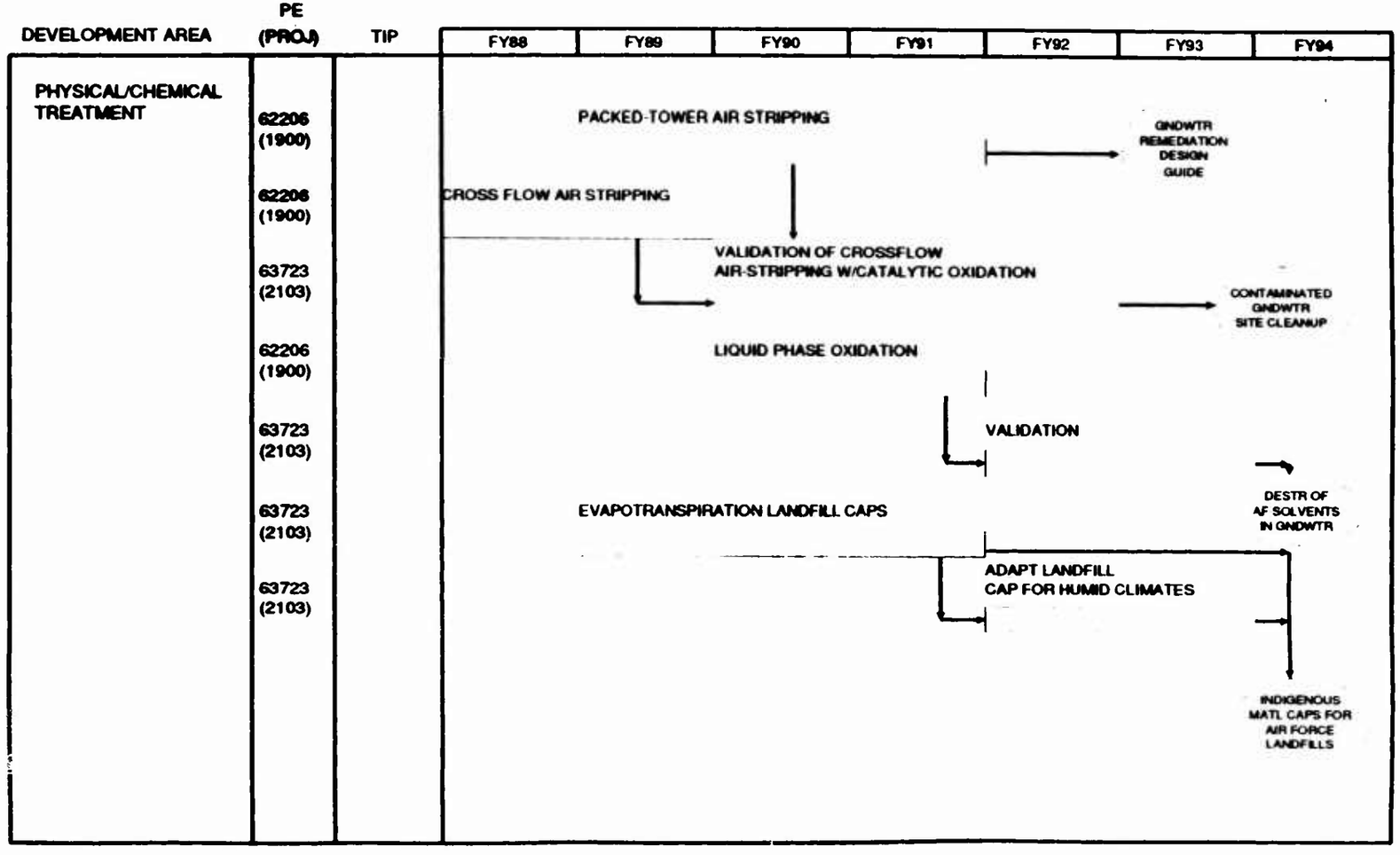
DATE: 15 JUN 1988
ROADMAP: SR05
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

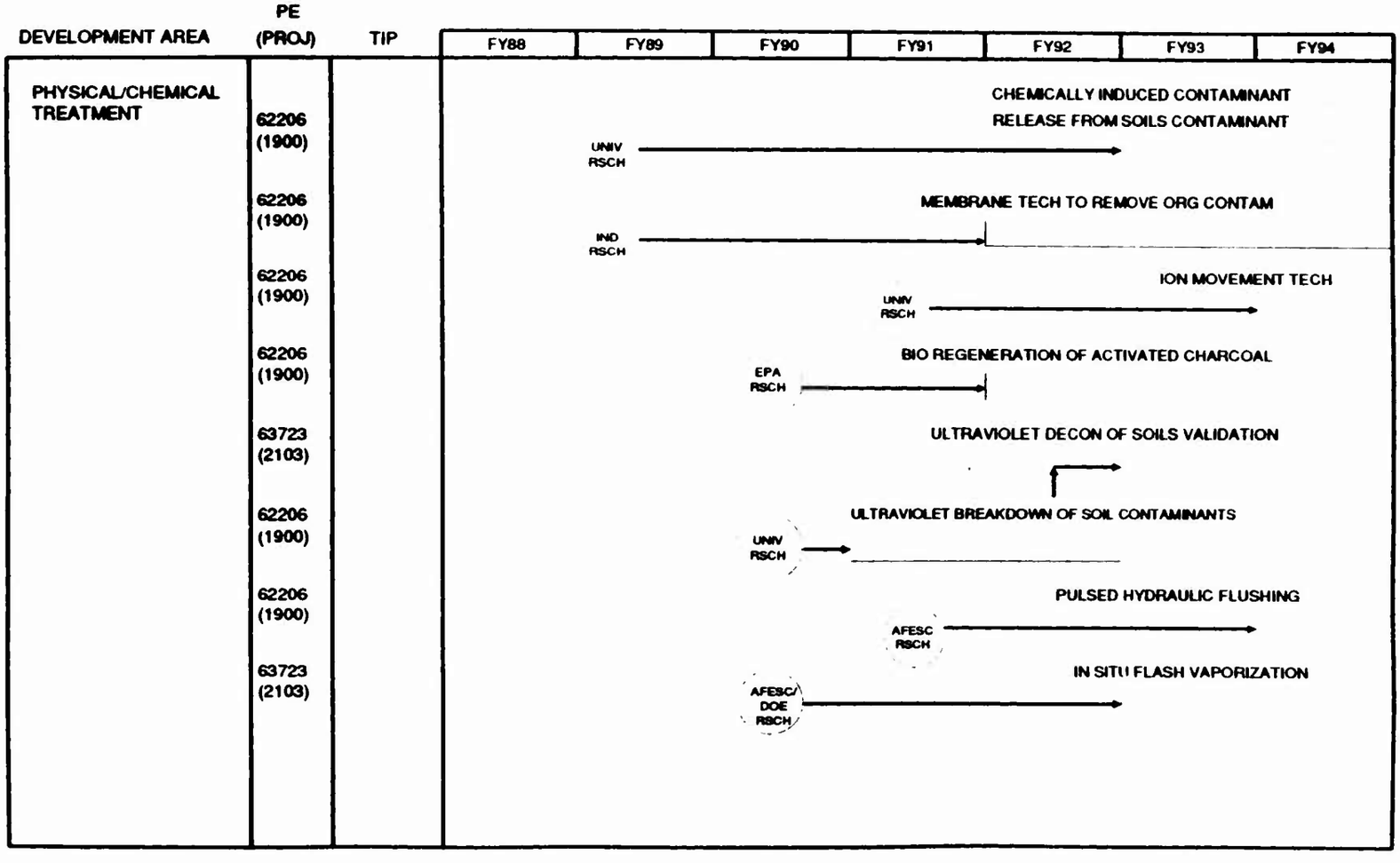
DATE: 15 JUN 1988
ROADMAP: SR06
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: REMEDIAL ACTION TECHNOLOGIES

GOAL: DEVELOP AND DEMONSTRATE EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO RESTORE CONTAMINATED LAND AND GROUNDWATER.

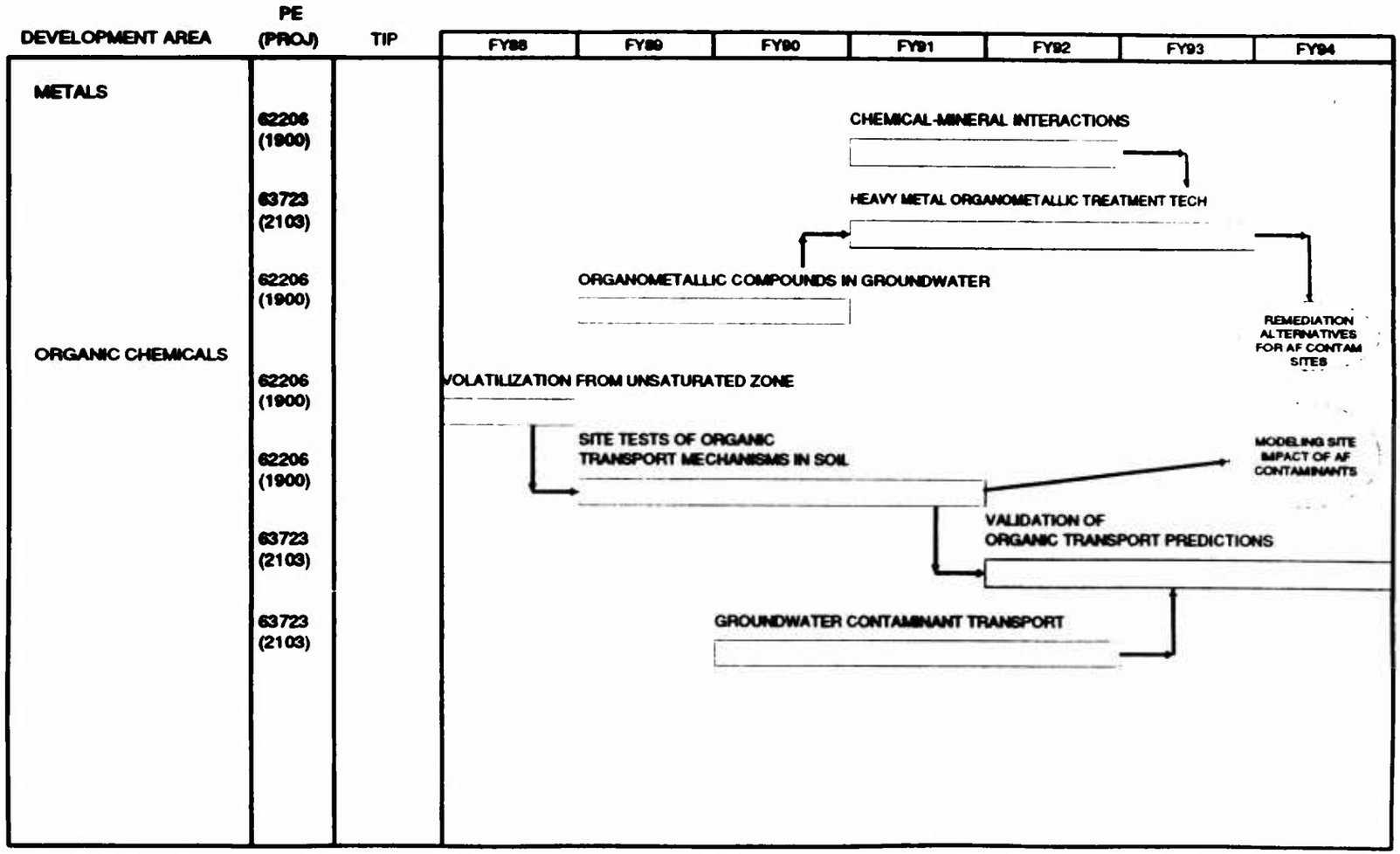
DATE: 15 JUN 1988
ROADMAP: SR07
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: CONTAMINANT FATE & TRANSPORT

GOAL: UNDERSTAND CONTAMINANT FATE AND TRANSPORT IN THE SUBSURFACE TO DEVELOP UNDERLYING PRINCIPLES OF CLEANUP TECH.

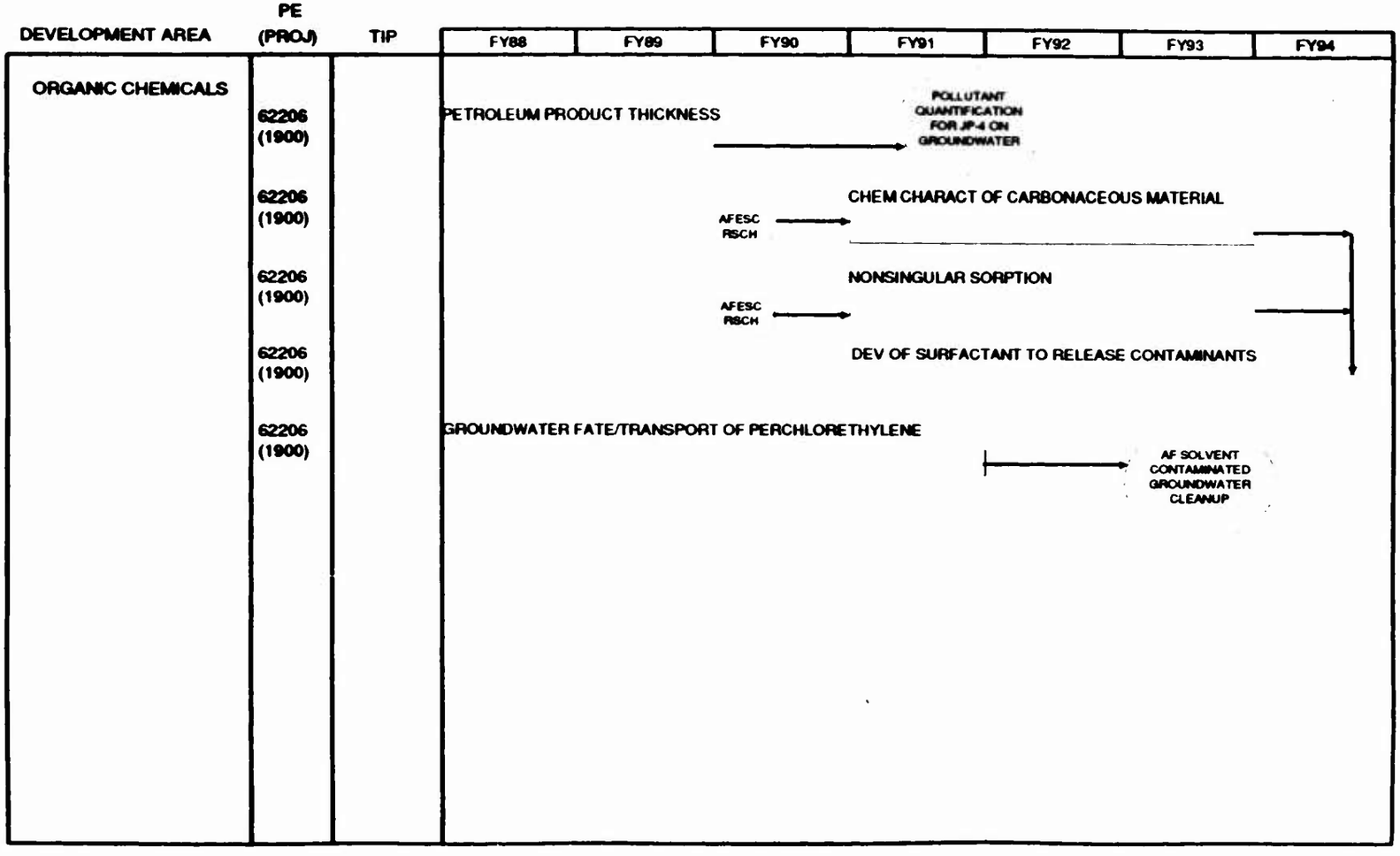
DATE: 15 JUN 1988
ROADMAP: SR08
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: CONTAMINANT FATE & TRANSPORT

GOAL: UNDERSTAND CONTAMINANT FATE AND TRANSPORT IN THE SUBSURFACE TO DEVELOP UNDERLYING PRINCIPLES OF CLEANUP TECH.

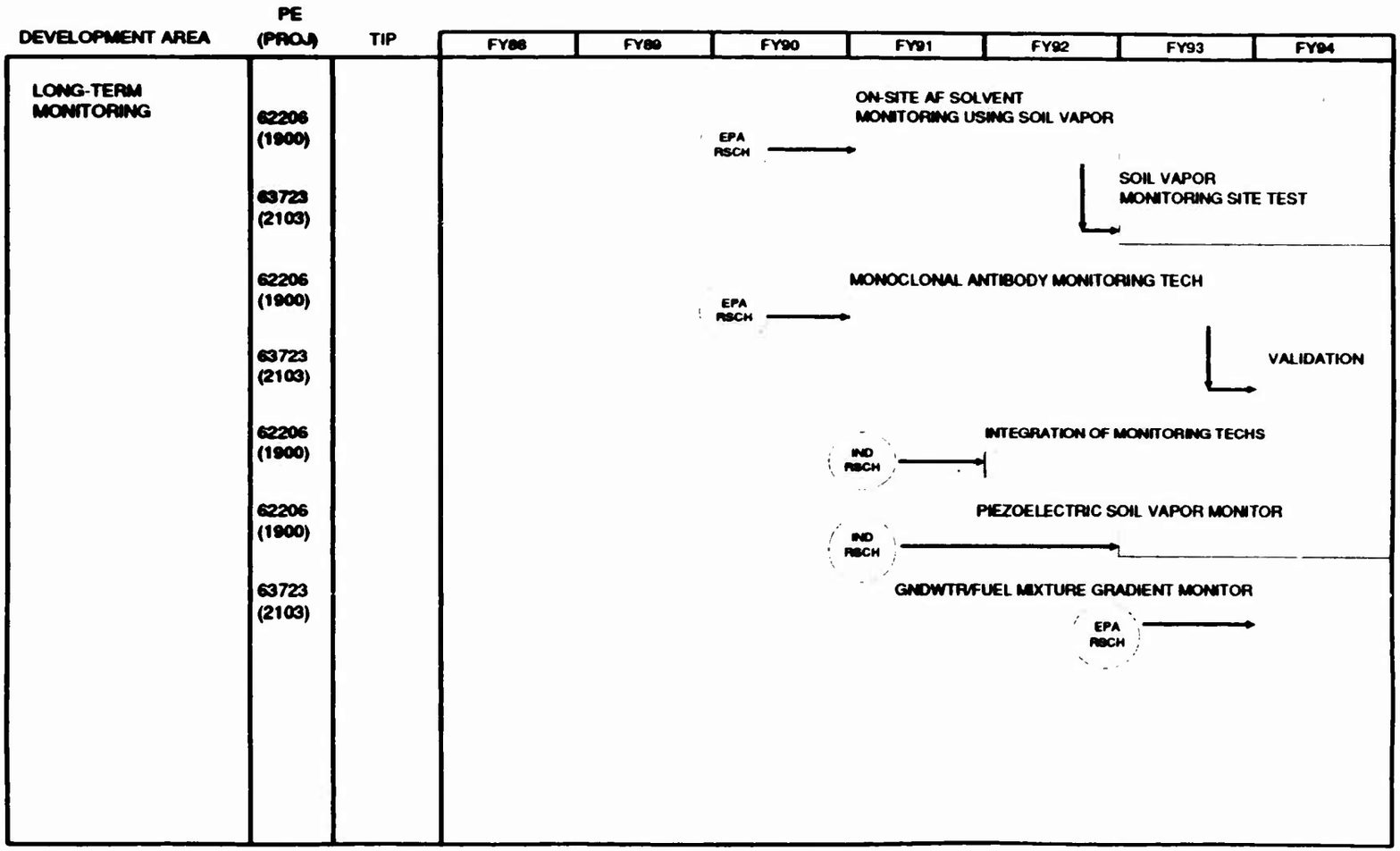
DATE: 15 JUN 1988
ROADMAP: SR09
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: SITE CHARACTERIZATION/ INVESTIGATION

GOAL: DEVELOP AND DEMO EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO INVESTIGATE, CHARACTERIZE, AND MONITOR CONTAMINATED LAND AND GROUNDWATER.

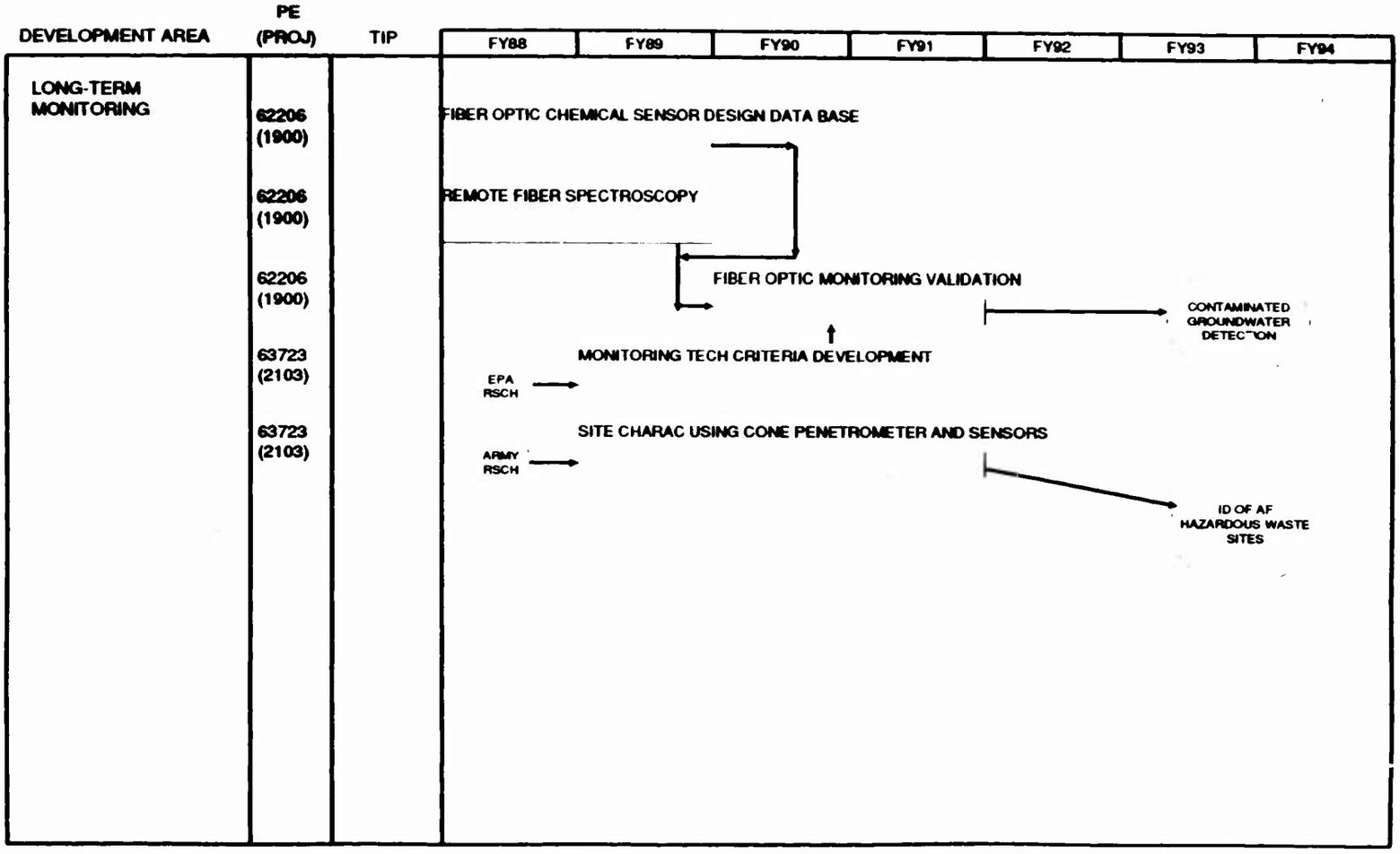
DATE: 15 JUN 1988
ROADMAP: SR10
OPR: AFESC/RD



PROGRAM: CIVIL/ENVIRONMENTAL ENG
THRUST: SITE RESTORATION
TECH: SITE CHARACTERIZATION/ INVESTIGATION

GOAL: DEVELOP AND DEMO EFFICIENT, COST-EFFECTIVE TECHNOLOGIES TO INVESTIGATE, CHARACTERIZE, AND MONITOR CONTAMINATED LAND AND GROUNDWATER.

DATE: 15 JUN 1988
ROADMAP: SR11
OPR: AFESC/RD



DISTRIBUTION LIST

	Number of Copies
HQ AFSC/XTXP/XTXB	2
SAF/AQ	1
Air Force Information for Industry Office 5001 Eisenhower Avenue Alexandria VA 22333	25
Air Force Information for Industry Office Air Force Wright Aeronautical Labs (AFWAL/TST) Wright-Patterson AFB OH 45433	25
Air Force Information for Industry Office 1030 East Greene Street Pasadena CA 91106	25
Defense Technical Information Center Cameron Station Alexandria VA 22314-6145	2

(The reverse of this page is blank.)