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Report to the Congress; by Elmer B. Staats, Comptroller General.

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Congressional Relevance: Congress.
Authority: OMB Circular A-34.

A classification structure has been developed by GAO for the purpose of providing Congress with a method of viewing Federal research and development. The underlying concept is that Federal research and development can be associated with objectives that are defined in terms of solving national problems or accomplishing national goals. Reporting requirements include: each category in the structure is to be taken as exclusive of any other category; all organizational subdivisions that submit and testify regarding appropriations requests to the Congress should submit the required information; obligations in hundreds of thousands of dollars are to be provided for the prior fiscal year, the current fiscal year, and the budget fiscal year; a consolidated presentation will be prepared for the respective research and development activities; and the relationship with OMB reporting will be explained. Twelve subject areas are defined: education and training; energy development and conservation; environmental quality improvement; food, fiber, and other agricultural products; health; housing and community development; law enforcement and justice; mental health and substance abuse; military; natural resources; science and technology; space flight systems technology; transportation; and other, a catch all for community services, foreign policy, income assistance programs, manpower resources programs, assessment of regulatory activities, and occupational and consumer product safety programs. (Author/SS)

REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Need For A Government-wide Budget Classification Structure For Federal Research And Development Information-- Appendix IV

This appendix accompanies GAO report PAD-77-14. It contains the complete definition and instruction package for the unified classification structure for Federal research and development information developed by GAO.

PAD-77-14A

MARCH 3, 1977

Contents

PREFACE

This classification structure has been developed by GAO for the purpose of providing Congress with a method of viewing Federal research and development funding in a unified manner across the Federal Government. The concept underlying the structure is that Federal research and development can be associated with objectives that are defined in terms of solving national problems or accomplishing national goals.

This structure has been developed by GAO pursuant to its responsibilities under the Legislative Reorganization Act of 1970, as amended by Title VIII of the Congressional Budget Act of 1974.

The presentation is to provide dollar information in terms of obligations at each level of the structure for each agency and its subdivisions and in total (Government-wide) for the past, current and budget year.

This information requirement will supplement existing budget presentations. Accordingly, it is not intended to directly affect the method used by the agencies in presenting their basic budget requests.

This document includes general guidelines on how the departments and agencies are to fulfill the requirement, the unified Federal research and development classification structure, and detailed "Scope Notes" which define the content of each category or element of the structure.

GUIDELINES FOR PREPARATION OF PRESENTATION OF FEDERAL RESEARCH AND DEVELOPMENT FUNDING USING THE UNIFIED OBJECTIVE-ORIENTED STRUCTURE

PURPOSE

In order to provide the Congress with a unified presentation of Federal research and development funding, each agency performing or funding research and development is required to prepare this supplementary presentation of obligational data in accordance with the following guidelines. The presentation is intended to show research and development funds in a cross-cutting manner which identifies specific national objectives rather than agency missions. Accordingly, when preparing a response to this requirement, agencies must use the complete classification structure and accompanying definitions (Scope Notes) which begin on page 1.

BACKGROUND

This information requirement stems from congressional interest in determining and evaluating the Federal commitment to various national research and development objectives. The presentation will cut across agency lines, will facilitate evaluation and comparison of agencies' research and development activities and will improve analysis of resource allocation with respect to national priorities. The General Accounting Office has developed the Unified Objective-Oriented Classification Structure for Research and Development (Attachment A), and the complete set of categories and definitions--Scope Notes, which will be used as the basis for providing this information.

DEFINITIONS

Conduct of Research and Development includes all direct, indirect, incidental or related costs resulting from or necessary to the actual conduct of research and development funded by the Federal Government. For the purposes of this requirement, research and development includes scientific and technical information activities which encompass the dissemination of knowledge or data resulting from the conduct of research and development and which present the status, progress or results of research and development. In addition, research and development includes funds for technology utilization programs which encompass those activities devoted to direct interactions with State and local government and private organizations to assist in the application of Federally developed technology to the solution of their problems.

Operational activities such as the routine performance of mapping and surveying by traditional techniques, the collection of general purpose statistics and the training of scientific manpower should be excluded from this analysis. The following specific definitions and concepts are to be used in preparing a response to this requirement:

--Research is systematic, intensive study directed toward fuller scientific knowledge or understanding of the subject.

--Development is systematic use of knowledge and understanding gained from research, directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes. It excludes quality control, routine product testing and production.

--Research and development facilities consist of facilities and fixed equipment, such as reactors, wind tunnels, optical and radio telescopes, research radars, and the like. Includes acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land, for use in research and development activities at Federal and non-Federal installations.

Obligations, as defined in Office of Management and Budget Circular No. A-34, include amounts of orders placed, contracts awarded, services received and similar transactions during a given period that will require payments during the same or a future period. The data should include all obligations incurred against receipts, corporate income, or other sources, including funds appropriated to the President, that an agency received or expects to receive. For this requirement respondents should provide actual obligations for the prior year and estimated obligations for the current year and the budget year.

Each agency or subdivision thereof should include in its obligations the amounts allocated or otherwise made available or intended to be made available to other agencies or subdivisions for support of research and development. The receiving agencies or subdivisions are not to report funds allocated or made available to them.

The amount shown for each year should reflect obligations for that year regardless of when the funds were originally appropriated or received, and regardless of whether they were appropriated, received, or identified in the agency's budget

specifically for research, development, and research and development facilities. Obligations for work performed in foreign countries for an agency should include all funds available to the agency, including "special foreign currency program appropriations."

REPORTING REQUIREMENTS

a. Guidelines. Each category in the structure (whether the highest summary or lowest detailed level) is to be taken as exclusive of any other category. With the exceptions noted in the following paragraphs, a research project will be assigned only to the one category which represents the primary purpose for which the research is funded.

The intention here is to present a supplementary display of research and development from the perspective of total funding committed to certain national problem-solving objectives regardless of the performing agency's mission. For the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA), which have broad charters to conduct research and development to accomplish their missions, work that is conducted exclusively to further that mission will be separate from work that has clear potential to contribute directly to solving the national problems identified in the structure (all categories except Military, Science and Technology Base, and Space Flight Systems Technology).

DOD and NASA research and development that has a clear potential of directly contributing to national objectives will be included as part of the funding for those categories instead of being shown in Military and Space Flight Systems Technology. For example, DOD and NASA research to reduce aircraft noise will be included in Category III, Environmental Quality Improvement. Other examples are contained in the definitions of each objective found in the attached Scope Notes.

In cases where multiple objectives exist for a research project, amounts should be shown in the category that most clearly defines the primary purpose for support (except when choosing between mission and problem-solving objectives). In cases where the objective is to enhance understanding of a subject and there is not clear connection with any particular problem-solving objective, the obligations should be included in Category X, Science and Technology Base. Individual units of work may be allocated among two or more mutually exclusive categories within the structure if the agency believes that this provides a more accurate presentation. Explanatory notes should be used, as appropriate, to

clarify these allocations. In all cases, funding entered in one part of the structure may not be shown anywhere else. In this way the totals for all entries will add to 100 percent of an agency's research and development funding.

b. Submission level. All organizational subdivisions (units of a reporting agency, such as a bureau, division, office or service) that submit and testify regarding appropriation requests to the Congress should submit the required information. Each subdivision's information will be reported separately and in a consolidated total for the agency.

c. Data to be included. Obligations in hundreds of thousands of dollars are to be provided for the prior fiscal year, the current fiscal year and the budget fiscal year.

Amounts reported should include obligations to support operational research and development activities performed in Federal laboratories, research centers, and Federal facilities that are directly related to research and development, such as weapons test ranges, vehicle launch facilities, and telescopes. The amounts reported should include salaries of Federal employees performing and/or administering the programs and overhead costs up to and including the general management of agency research and development programs. If detailed cost accounting data is not available, overhead costs may be allocated to the activities on the basis of numbers of direct positions, direct costs, cost per launch, or by any other method judged appropriate by the agency. In each submission, the method selected should be described and the total amount allocated should be shown after the data presentation (see Attachment B).

Funding for research and development facilities construction or acquisition should be shown in a separate schedule following the research and development presentation. This schedule includes obligations which can be assigned directly to one entry in the structure and obligations which must be allocated to the lowest levels of the structure. Again, the responding agency would determine the best method for allocation and describe the method selected after the data presentation.

It is recognized that the agency's accounting and information systems may not be able to directly supply the data requested. The amounts used may therefore be estimated where they are not traceable to the agency's accounting system.

d. Preparation of materials. Each agency and its subdivisions will prepare a consolidated presentation for their respective research and development activities. Examples of the formats which could be used are displayed in Attachment C, Analysis of Federal Research and Development Activities and Attachment D, Analysis of Federal Research and Development Facilities Activities.

Obligations should be entered for all applicable numbered or lettered categories in the Scope Notes. NOTE: The Structure, Attachment A on page viii, is presented as a guide and includes only the top three levels of categories. The complete set of categories presented in the Scope Notes beginning on page 1 is to be used in providing this information. It is not necessary to list the categories and subcategories in the stub column for which there are no entries. For example:

II. ENERGY DEVELOPMENT AND CONSERVATION
    A. Petroluem and Natural Gas
        1. Improve Extraction and Processing

III. ENVIRONMENTAL QUALITY IMPROVEMENT
    C. Control and Abate Pollutants
        1. Air
        2. Noise

e. Relationship to OMB analysis. It is the intention of this requirement to obtain detail on the objectives of the research and development funding reported to the Office of Management and Budget under the requirements of Circular A-11 (July 1976, Sections 44.1-44.3) and additional research and development information discussed above. Since the total amount which an agency reports for this analysis will differ from the amount reported for the OMB report, the difference should be explained in a separate attachment to the submission.

RECOMMENDATIONS FOR STRUCTURAL REFINEMENTS

The objective-oriented structure supplied may not be altered for this year's submission. However, should any agency believe that the Scope notes supplied do not indicate appropriate inclusions and/or exclusions within an objective, the agency may suggest changes to the definitions and/or structure itself in a document which accompanies the required analysis. At its option, the agency may supply as a second analysis, its data in the revised structure it is suggesting.

ATTACHMENT A

UNIFIED CLASSIFICATION STRUCTURE FOR FEDERAL RESEARCH AND DEVELOPMENT

I. EDUCATION AND TRAINING

- A. The Learning Process
- B. The Relationship between Education/Training and Society
- C. Education Service Delivery
- D. Vocational Training

II. ENERGY DEVELOPMENT AND CONSERVATION

- A. Petroleum and Natural Gas
  - 1. Improve Resource Assessment
  - 2. Improve Extraction and Processing
- B. Oil Shale
  - 1. Improve Resource Assessment, Exploration and Extraction
  - 2. Improve Upgrading Methods
  - 3. Improve Transmission, Storage and Refining
- C. Coal
  - 1. Improve Resource Assessment
  - 2. Improve Extraction and Processing
  - 3. Convert Coal to Oil or Gas
- D. Nuclear Energy
  - 1. Improve Resource Assessment and Recovery
  - 2. Develop Liquid Metal Fast Breeder Reactor Technology
  - 3. Develop Light Water Breeder Reactor Technology
  - 4. Develop Alternative Breeder Technologies
  - 5. Develop Gas-Cooled Thermal Reactor Technology
  - 6. Improve Light Water Reactor Technology
  - 7. Nuclear Safety
  - 8. Develop Fusion Power
- E. Solar Energy
  - 1. Produce Solar Thermal and Solar Thermal Electrical Energy
  - 2. Develop Photovoltaic Electric Power Systems
- F. Geothermal Energy
  - 1. Improve Resource Assessment
  - 2. Improve Extraction and Processing
  - 3. Convert Geothermal Resources to Thermal and Electrical Energy
- G. Alternative Energy Resources
  - 1. Convert Wind Energy to Electricity
  - 2. Improve Fuel Generation from Bioconversion
  - 3. Improve Ocean Thermal Energy Conversion
  - 4. Other (must be specified and described)
- H. Energy Conservation
  - 1. Increase Electricity Generation Efficiency
  - 2. Improve Energy Storage
  - 3. Improve Electric Power Transmission
  - 4. Reduce Energy Consumption by End-Users
- I. Energy Systems Study and Analysis

ATTACHMENT A

III. ENVIRONMENTAL QUALITY IMPROVEMENT

A. Identify Pollutant Effects
   1. Air
   2. Water
   3. Solid Waste
   4. Pesticides
   5. Noise
   6. Radiation
B. Understand Pollution Processes
   1. Air
   2. Water
   3. Solid Waste
   4. Pesticides
   5. Noise
   6. Radiation
C. Control and Abate Pollutants
   1. Air
   2. Water
   3. Solid Waste
   4. Pesticides
   5. Noise
D. Understand, Describe, Predict and Affect Weather and Natural Hazards
   1. Regional Environmental Systems
   2. Climate and Weather Study
   3. Weather Modification
   4. Disaster and Natural Hazards Studies and Control

IV. FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS

A. Identify and Develop New or Underdeveloped Food and Feed Sources
B. Improve Production
   1. Improve Crop Production for Food
   2. Improve Animal Production for Food
   3. Improve Production of Marine Food Sources
   4. Improve Production of Non-Food Items
   5. Improve Use of Land, Water, Fertilization, Equipment and Methods
C. Improve Storage and Processing
   1. Improve Storage and Processing of Food Products
   2. Improve Storage and Processing of Non-Food Products
D. Improve Distribution and Marketing
   1. Improve Distribution and Marketing of Food Products
   2. Improve Distribution and Marketing of Non-Food Products
   3. Improve Consumption
E. Improve Safety

ATTACHMENT A

V. HEALTH

A. Diseases and Injuries
   1. The Aging Process--Diseases and Related Conditions
   2. Arthritis and Rheumatism
   3. Blood Diseases and Disorders
   4. Cancer
   5. Dental Diseases and Disorders
   6. Diabetes and Other Endocrine Disorders
   7. Digestive Diseases
   8. Environmentally-Caused Health Disorders
   9. Eye and Visual System Disorders
   10. Genitourinary System Disorders (including Kidney Disease)
   11. Heart and Vascular Diseases (including Stroke)
   12. Infectious and Parasitic Diseases (including Allergies not elsewhere classified)
   13. Injuries Not Related to Diseases
   14. Lung and Respiratory Diseases and Disorders
   15. Maternal and Child Health (including Genetics not elsewhere classified, Fertility Regulation and Mental Retardation)
   16. Metabolic Disorders
   17. Musculoskeletal System and Connective Tissue Disorders
   18. Neurological and Communicative Disorders
   19. Nutritional Disorders
   20. Skin and Subcutaneous Tissue Diseases and Disorders
   21. Disease and Injury Base

B. Mental Health
   1. Mental Illness and Behavior Disorders
   2. Mental Health Aspects of Social Problems
   3. Mental Health Base

C. Substance Abuse
   1. Alcoholism
   2. Drug Abuse
   3. Abuse of Other Substances

D. Health Services Delivery
   1. Improve Quality
   2. Control and Reduce Cost
   3. Improve Accessibility

VI. HOUSING AND COMMUNITY DEVELOPMENT

A. Housing
   1. Increase Opportunities
   2. Improving Safety and Standards
   3. Improving Construction, Delivery and Costs
   4. Improving Housing Management
   5. Improving Housing Maintenance

B. Community Development
   1. Preserve and Revitalize Neighborhoods
   2. Community Development and Growth

ATTACHMENT A

VII. LAW ENFORCEMENT AND JUSTICE

A. Prevention of Crime (includes a total for drug trafficking)
B. Law Enforcement (includes a total for drug trafficking)
C. Adjudication
D. Corrections
E. Juvenile Justice
F. Understanding of Crime
G. Justice Technology

VIII. MILITARY

A. Deter Attack
   1. Land-based Missiles
   2. Sea-based Missiles
   3. Aircraft
   4. Deterrent Weapons Development and Protection
   5. Command and Control Elements of Nuclear Deterrence
   6. Nuclear Deterrence -- General
B. Defend Continental United States Against Attack
   1. Ballistic Missile Warning
   2. Ballistic Missile Defense
   3. Air Defense
   4. Defend Continental United States -- General
C. Combat Capability
   1. Land Warfare
   2. Air Warfare
   3. Ocean Control
   4. Combat Capability -- General
   5. Theater Nuclear Forces
D. Defensewide Applications
   1. Intelligence Systems
   2. Communications, Command and Control
   3. Area Navigation Systems
   4. Military Personnel Management and Utilization
   5. Biomedicine with Exclusive Military Applications
   6. Nuclear Weapons Effects
   7. Chemical/Biological Weapons
   8. Weather Modifications

IX. NATURAL RESOURCES

A. Forests
B. Land
C. Minerals
   1. Improve Means of Locating and Assessing Mineral Sources
   2. Improve Mineral Extraction and Recovery Techniques
   3. Improve Mineral Processing Techniques
   4. Improve Techniques for Reusing and Recycling Materials or Products Made from Minerals
   5. Improve Mineral Supply/Demand Analysis

ATTACHMENT A

D. Recreation
E. Water
F. Wildlife

X. SCIENCE AND TECHNOLOGY BASE

A. Astronomy
B. Atmospheric Sciences
C. Biology
D. Chemistry
E. Computers
F. Engineering
G. Geological Sciences
H. Materials
I. Mathematical Sciences
J. Measurement and Standards Technology
K. Oceanographic Sciences
L. Physics
M. Psychology
N. Science Information Technology
O. Science Policy, Management Technology and Other Special Programs
P. Social Sciences
Q. Surveying, Mapping, Charting and Geodesy
R. Telecommunications

XI. SPACE FLIGHT SYSTEMS TECHNOLOGY

A. Space Transportation Systems
   1. Space Shuttle
   2. Spacelab
   3. Interim Upper Stage/Tug
   4. Other Space Transportation Systems
B. Space Flight Equipment Engineering
   1. Energy Systems
   2. Human Operations in Space
   3. Information and Communication Systems
   4. Materials Used in Space Vehicles
   5. Propulsion Systems
   6. Space Vehicle Aerothermodynamics
   7. Systems and Design Studies
   8. Vehicle and Satellite Structures
   9. Vehicle Guidance and Control

XII. TRANSPORTATION

A. Air
   1. Improve Vehicles
   2. Improve Aviation Operational Environment and Effectiveness
   3. Improve Aviation Safety

ATTACHMENT A

B. Rail
   1. Improve Rail Vehicles
   2. Improve Operational Environment and Effectiveness
   3. Improve Rail Safety
C. Highway
   1. Improve Vehicles
   2. Improve Operational Environment and Effectiveness
   3. Improve Highway Safety
D. Marine
   1. Improve Marine Vehicles
   2. Improve Marine Operational Environment and Effectiveness
   3. Improve Marine Safety
E. Pipeline
   1. Improve Pipeline Equipment and Operational Effectiveness
   2. Improve Pipeline Safety
F. Multi- and Inter-modal

XIII. OTHER

A. Community Services
B. Foreign Affairs
   1. Foreign Aid
   2. International Agreements and Foreign Policy
C. Income Assistance
D. Manpower
E. Regulatory Activities
F. Safety
   1. Occupational Safety and Health
   2. Consumer Products Safety

ATTACHMENT B

ILLUSTRATION OF OVERHEAD ALLOCATION

For Bureau A of the Department of Research, administrative and management expenses which cannot be assigned directly to a research category are allocated on the basis of number of direct positions. These allocated amounts are added to the lowest level categories in which the Bureau conducts research.

The total amount of administrative and management expenses assigned directly or indirectly through this allocation method are:

$412 for FY 1976

115 for the three-month transition period

420 for FY 1977

470 for FY 1978

Agency/Subdivision _____

ATTACHMENT C

FEDERAL RESEARCH AND DEVELOPMENT ACTIVITIES
(Obligations in Hundreds of Thousands of dollars)

	FY 1976	3 mo. Trans	FY 1977	FY 1978
I. EDUCATION AND TRAINING				
A. The Learning Process				
B. The Relationship between Education/ Training and Society				
C. Education Service Delivery				
1. Quality of Instruction				
2. Accessibility				
3. Cost Reduction and Control				
4. Organization and Administration				
D. Vocational Training				
II. ENERGY CONSERVATION AND DEVELOPMENT				
A. Petroleum and Natural Gas				
1. Improve Resource Assessment				
2. Improve Extraction and Processing				
B. Oil Shale				
1. Improve Resource Assessment				
2. Improve Upgrading Methods				
C. Coal				
1. Improve Resource Assessment				
2. Improve Extraction and Precessing				
3. Convert Coal to Oil and Gas				

CONTINUE WITH THIS PRESENTATION THROUGHOUT THE STRUCTURE AS DEFINED IN THE SCOPE NOTES

ATTACHMENT C

Agency/Subdivision _____

ATTACHMENT D

FEDERAL RESEARCH AND DEVELOPMENT FACILITIES ACTIVITIES
(Obligations in hundreds of thousands of dollars)

	FY 1976	3 mo. Trans	FY 1977	FY 1978
I. EDUCATION AND TRAINING				
A. The Learning Process				
B. The Relationship between Education/ Training and Society				
C. Education Service Delivery				
1. Quality of Instruction				
2. Accessibility				
3. Cost Reduction and Control				
4. Organization and Administration				
D. Vocational Training				
II. ENERGY CONSERVATION AND DEVELOPMENT				
A. Petroleum and Natural Gas				
1. Improve Resource Assessment				
2. Improve Extraction and Processing				
B. Oil Shale				
1. Improve Resource Assessment				
2. Improve Upgrading Methods				
C. Coal				
1. Improve Resource Assessment				
2. Improve Extraction and Processing				
3. Convert Coal to Oil and Gas				

CONTINUE WITH THIS PRESENTATION THROUGHOUT THE STRUCTURE AS DEFINED IN THE SCOPE NOTES

ATTACHMENT D

I. EDUCATION AND TRAINING

EDUCATION AND TRAINING

I. EDUCATION AND TRAINING

This section includes research to increase understanding of and to improve all acts and processes of systematic instruction, schooling and training. Also includes research to improve means of imparting skills and knowledge to people at all education levels--pre-school, elementary, secondary, and post-secondary; means of developing general powers of reasoning and perception; and methods of improving or learning new job-specific vocational skills.

Education research includes efforts to

--improve knowledge concerning the learning process;

--conduct studies of the influences of education on society and of society on education;

--improve the quality, accessibility, cost, and organization and administration of education services delivery; and

--improve vocational training.

Vocational training herein refers only to the skilled occupations, such as the construction trades, clerical functions, or computer programmers. Research to increase understanding of or improve the education and training processes associated with certain highly skilled professions, for which there exist special, post-baccalaureate schools (such as medical, dental, or law schools), will be shown in the first four sections, rather than under the vocational training entry.

It is recognized that some research may be directed toward the special educational and training problems encountered by various persons

because of their ethnic origin, limited ability or total lack of ability to speak or understand the English language, physical or mental handicaps, economic situation, living conditions, limited mental or emotional stability, or their gender. However, responses are to be rendered on the basis of educational processes, as described above, rather than on the basis of such a targeted approach.

A. THE LEARNING PROCESS

Includes research to increase understanding of the learning process and to determine why individuals learn at different rates and in different ways. This category will include research directed toward the fundamental cognitive process in reading, writing, and comprehension, and the relation of this process to learning and instruction. Also included are studies of the following factors and their effect on students' motivation, competence, performance, and attitude: non-school influences, such as family and community relations; variations in teaching methods and school environment, such as open classrooms, highly-structured classrooms, peer tutoring, or instruction outside the classroom; individual student characteristics, such as learning style and attention span; comprehension and reading problems; and sex roles or ethnic group membership.

Excludes research on psychological (see X. M., PSYCHOLOGY), mental health (see V. B., MENTAL HEALTH), or behavioral (see X. P., SOCIAL SCIENCES) processes which are not specifically related to understanding the learning process.

B. THE RELATIONSHIP BETWEEN EDUCATION/TRAINING AND SOCIETY

Includes research on the impact of education and training and changes in educational attainments or skill levels of individuals on society. Also includes research on the influence of societal changes on education and training techniques and systems.

Typical objectives of research in this category include the following: study the relationship between education and economic opportunity; improve knowledge concerning the capacity of formal education to influence an individual's social behavior and economic future; study the effect of training and education on motivation and morale in work situations; improve understanding

of the relationship between education and work, including studies of the interactions between work, school and community activities, the response of the education system to changing needs of the labor market (including the supply of and demand for differing skill types and educational level attainment) and the adequacy of educational preparation for job entry and progression; improve understanding of the contribution of education to career awareness, in order to make wise career choices and to prepare for and obtain jobs; study career choices among adults starting second careers, or those preparing for advanced positions; examine the responsiveness of education to the career-related needs of individuals; study the capacity of formal education to foster the social integration of human beings; improve understanding of the effects of recent court decisions on various aspects of education, including desegregation, equality of access, and the process of compliance with an externally-imposed order to change; and investigate the legal status of the student, including a student's rights and responsibilities concerning education and educational systems, the effect of deviant behavior in schools, and the process of involuntary expulsion from school.

C. EDUCATION SERVICE DELIVERY

Includes research to improve understanding of the problems confronting educators and others in delivering educational services. Also includes research to develop improved methods of delivering these services. Research in this section is directed toward the provision of high quality, accessible, low-cost, and effectively organized and administered education services.

Excludes the provision of vocational training and job-specific education services (see I. D., VOCATIONAL TRAINING).

1. QUALITY OF INSTRUCTION

Includes research to increase the quality of educational instruction through improvements in curricula, subject matter, and instructional techniques. Research on curricula improvement is directed toward the selection and sequencing of course packages presented to students. This research also addresses the need for increased understanding of and improvements in the subject matter studied in each course of instruction and, efforts to improve the effectiveness of instructional and teaching techniques.

Research in this category is exemplified by the following objectives: develop the means to match curricula and subjects taught with the constantly changing needs of society; design curricula which, at a minimum, will provide individuals with fundamental verbal, mathematical, and social abilities (including the skills of reading, writing, comprehension, the use of language, and basic analytical abilities); develop curricula and subject areas which are more responsive to unique educational settings or individual needs of students; improve teacher skills in implementing new curricula and subject areas; develop better performance criteria to guide administrators in teacher selection; evaluate the fairness and quality of teacher selection procedures; develop methods to close the gap between disparate educational system qualities from area to area; improve standards of measurement to assess the adequacy of educational instruction and student achievement; identify and study effective educational innovations which were developed through practice rather than as a result of formal research; and identify schools with relatively higher academic achievement, determine why this occurred, and develop ways of replicating this condition in other schools and school systems.

2. ACCESSIBILITY

Includes research on ways to enhance the opportunity of individuals to obtain educational instruction. Also includes research on new or better ways of financing education services.

The following objectives exemplify research efforts to be included in this section: develop methods of making education more available to the general populace, including the application of technology (television, computers, audio cassettes, video tapes, and films); study the problems of availability of education services to various socioeconomic groups and develop methods to alleviate these problems; and examine the present methods of financing education services and the effects of changing those methods.

Excludes research on improving the quality of educational curricula, subject matter, and instruction techniques (see I. C. 1., QUALITY OF INSTRUCTION).

3. COST REDUCTION AND CONTROL

Includes research on ways of providing the same quality and quantity of education services at lower cost or at the same cost level in the face of rising costs elsewhere. Also includes research to improve our understanding of and use of productivity concepts in education delivery.

The following objectives exemplify research efforts to be reported under this category: study the distribution of educational costs among households according to percentage of family income; improve understanding of the historical relationship between changes in educational costs and improvements in educational attainment; develop new concepts of efficiency in education delivery; examine alternative resources and resource mixes to deliver education services; and study the cost effects of increased or excessive use of private schools over public schools.

4. ORGANIZATION AND ADMINISTRATION

Includes research to improve understanding of current educational organization structures and administrative practices and procedures. Also includes research to develop viable alternative methods for organizing and administering education services delivery.

The following objectives are indicative of the research efforts to be reported under this category: study alternative structures of education which provide parents, teachers, and administrators more voice in determining the form, content, and style of education that is provided in a community or school district (such as the use of education vouchers for student placement); develop better understanding concerning the organization and practice of education, including studies of factors which affect change in education systems; develop better methods to obtain information and provide input to education policy decisions; and improve understanding of the current methods and develop better alternatives for school system organization and management (such as some of the present experimental schools employing open learning or relatively unstructured classroom situations).

D. VOCATIONAL TRAINING

Research in this category is directed toward improving methods of teaching individuals a marketable skill to enhance their

employability. It differs from the four previous subsections of I., EDUCATION AND TRAINING, in that this subsection covers skill- or job-specific instruction and learning, while the other sections include research on the more general processes of education.

Includes research to improve methods for providing the technical skills and associated general knowledge required in various vocations or occupations, which are primarily characterized by, but not limited to, the existence of labor unions or other specialized representative bodies corresponding to the trades or skills involved in these vocations or occupations (for example, the construction trades). Also includes occupations which, although not strictly organized, likewise require specific skills and education (such as computer programmers or operators).

Efforts to be reported under this section are exemplified by the following objectives: develop new or improve existing occupational fields and associated training methods; develop or improve methods of meeting specialized occupational needs; develop ways to create shortcuts for experience as a method of learning or developing job-related skills; improve understanding of the job preparation needs of various groups of people and develop ways to meet these needs; and improve existing or develop new occupational guidance, counseling, and placement services.

II. ENERGY DEVELOPMENT AND CONSERVATION

ENERGY DEVELOPMENT AND CONSERVATION

II. ENERGY DEVELOPMENT AND CONSERVATION

Encompasses research on methods and technologies to increase the domestic supply of energy and energy resources and to promote their efficient utilization. More specifically includes research to:

--Develop technologies to increase oil and gas resources recovery.

--Develop techniques and systems to increase coal production and to convert coal to oil and gas.

--Develop economical systems and techniques to convert solar radiation into thermal and electrical power.

--Develop economical systems and techniques to convert geothermal resources into electrical and thermal energy.

--Develop techniques and systems to develop and convert alternative energy resources such as wind and plant biomass into energy.

--Develop the capability to produce energy with all types of nuclear reactors.

--Develop new methods and technologies to conserve energy.

--Conduct studies and analyses for planning and management of energy systems.

These objectives of ENERGY DEVELOPMENT AND CONSERVATION are subject to environmental constraints. Exclude research directed towards such constraints' interface with ENERGY DEVELOPMENT AND CONSERVATION objectives. For example, exclude work to improve sulfur removal from coal before combustion in order to control environmental pollution. (See III. C. 1., AIR)

A. PETROLEUM AND NATURAL GAS

Research to develop technologies which will increase oil and gas resources recovery is shown here. Includes research to assess the inventory of and to improve the extraction and processing of oil and gas.

Exclude research to liquefy or gasify coal (See III C. 1., AIR if the primary purpose of the work is to reduce environmental impact. All other coal liquifaction and gasification research is shown in II. C. 3., CONVERT COAL TO OIL OR GAS).

1. IMPROVE RESOURCE ASSESSMENT

Research to assess the nation's oil and gas resources in terms of quantity, quality, distribution, and recoverability is shown here. Includes research to develop an information base on distribution and quality of oil and gas deposits and improve ability to assess potential oil and gas recovery from off shore sites.

Exclude research to assess the inventory of oil shale resources. (See II. B. 1., IMPROVE RESOURCE ASSESSMENT).

2. IMPROVE EXTRACTION AND PROCESSING

Research to improve recovery techniques for gas and oil and increase efficiency in the processing of oil and gas products is shown here. Includes research to develop secondary and tertiary recovery methods and to develop methods to stimulate flow in low permeability areas.

Exclude research to improve the extraction and processing of oil shale. (See II. B. 2., DEVELOP IN SITU PROCESSING TECHNIQUES.)

B. OIL SHALE

Encompasses research to maximize oil shale's potential as an energy resource. Includes research to develop or improve

efficient methods of exploration, mining, processing, transmission, storage, and refining of oil shale.

Exclude research to insure the safety of oil shale mines and facilities. (See XIII. F. 1., OCCUPATIONAL SAFETY AND HEALTH.)

1. IMPROVE RESOURCE ASSESSMENT, EXPLORATION AND EXTRACTION

Encompasses research to assess oil shale resources in terms of quantity, quality, distribution, recoverability, composition, and characterization and to improve extraction methods.

2. IMPROVE UPGRADING METHODS

Encompasses research to develop or improve efficient methods of upgrading oil shale; in other words, converting oil shale into a more useable and more easily refined form. This work is divided into in situ processing and off-site (above ground) processing.

a. IMPROVE IN SITU PROCESSING METHODS

Includes research to improve in situ techniques of upgrading oil shale.

b. IMPROVE ABOVE GROUND PROCESSING METHODS

Includes research to improve the techniques used to upgrade oil shale above ground.

3. IMPROVE TRANSMISSION, STORAGE AND REFINING

Encompasses research to improve the techniques involved in transmitting oil shale, storing it and refining it into a higher quality energy resource.

C. COAL

Encompasses research to assess coal resources, improve the extraction and processing of coal, and to improve coal liquefaction and gasification.

Exclude research on coal extraction, processing, and utilization whose primary purpose is to minimize the environmental impact. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT). For example, exclude research to enhance cleaner coal combustion such as sulfur removal from coal. (See III. C. 1., AIR).

Exclude research to improve electricity generation efficiency with coal such as magnetohydrodynamics, fuel cells, and advanced [illegible] systems. (See II. H. 1., INCREASE ELECTRICITY GENERATION EFFICIENCY).

1. IMPROVE RESOURCE ASSESSMENT

   Includes research to assess the nation's coal resources in terms of quality, quantity, regional distribution and recoverability.

2. IMPROVE EXTRACTION AND PROCESSING

   Includes research to improve the productivity of coal mining and processing systems.

   Exclude mining technology research performed to minimize its environmental impact. (See ENVIRONMENTAL QUALITY IMPROVEMENT).

3. CONVERT COAL TO OIL AND GAS

   Encompasses research to improve systems and technologies for converting coal to oil and gas. Includes the liquefaction systems of direct hydrogenation, solvent extraction, pyrolysis, and indirect liquefaction. Includes research on processes to perform high-BTU gasification, low-BTU gasification, and in situ gasification.

   Exclude [illegible]ion and gasification research conducted primarily to [illegible]ize the environmental impact. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

D. NUCLEAR ENERGY

Research to develop the engineering base, qualify materials, develop components and subsystems, and conduct studies to produce energy with all types of nuclear reactors is shown here. Includes research to assess nuclear energy resources. Also includes research performed to insure worker and nuclear reactor safety in nuclear power plants and research to improve the management and disposal of radioactive materials and wastes. This involves research which improves the capability to determine the effects on workers due to radiation exposure which enables the formulation of threshold levels for the workplace. Also involves all research to prevent, control, or abate the escape of radioactive pollutants into the power plant itself or into the general environment.

Exclude research on the effects and processes of human exposure to ionizing and nonionizing radiation in the general environment which enables radiation exposure standards for the general

environment to be set. (See III. A. 6., RADIATION for research on radiation effects and III. B. 6., RADIATION for research on radiation processes.)

1. IMPROVE RESOURCE ASSESSMENT AND RECOVERY

Research to evaluate and analyze U.S. uranium ore reserves, potential resources, and production capability; and research on the geology of uranium and thorium and on improved techniques to assess, discover, recover, and produce these resources is shown here. Only that work which fits this structure's definition of research and development is shown here. For example, exclude processes to produce reactor products, U-235, feed materials, and procurement of reactor products from this structure unless such material is used in research activities.

2. DEVELOP LIQUID METAL FAST BREEDER REACTOR TECHNOLOGY

Encompasses research to develop, demonstrate and improve systems, components, and technologies to support the establishment of a commercially viable Liquid Metal Fast Breeder Reactor (LMFBR).

Exclude research on the safety of the Liquid Metal Fast Breeder Reactor. (See II. D. 7., NUCLEAR SAFETY).

3. DEVELOP LIGHT WATER BREEDER REACTOR TECHNOLOGY

Encompasses research to design, develop, and improve systems, components, and technologies necessary to develop the Light Water Breeder Reactor. Includes research to advance the design, operation and maintenance of pressurized water reactors and reactor plants.

Exclude research on the safety of the Light Water Breeder Reactor. (See II. D. 7., NUCLEAR SAFETY).

4. DEVELOP ALTERNATIVE BREEDER TECHNOLOGIES

Encompasses research to design, develop and improve systems, components and technologies to develop breeder reactors other than those mentioned previously. More specifically includes research to develop the Gas Cooled Fast Breeder Reactors and the Molten Salt Breeder Reactors.

Exclude research on the safety of these breeder reactors. (See II. D. 7., NUCLEAR SAFETY).

5. DEVELOP GAS COOLED THERMAL REACTOR TECHNOLOGY

Encompasses research to develop and advance the technology of gas cooled thermal reactors so as to achieve higher reactor coolant outlet temperature, high thermal efficiency, and reliable operation. Includes research to develop very high temperature reactors and a direct cycle program, and research to develop spent fuel recycling technology for the High Temperature Gas Reactor (HTGR).

Exclude research on the safety of gas cooled thermal reactors and the safety of spent fuel recycling processes for the HTGR. (See II. D. 7., NUCLEAR SAFETY).

6. LIGHT WATER REACTOR TECHNOLOGY

Includes research to improve the reliability, availability, and capacity of Light Water Reactors (LWR). Also includes research to develop commercially applicable processes, equipment, and systems to recover and recycle plutonium and uranium from spent LWR fuels.

Exclude research on the safety of LWR's and the safety of spent fuel recovery and recycling processes for the LWR. (See II. D. 7., NUCLEAR SAFETY).

7. NUCLEAR SAFETY

Encompasses research performed to insure worker and nuclear power plant (including reactor) safety and research to improve the management and disposal of radioactive materials and wastes. Includes research to improve the determination of effects on workers due to radiation exposure which enables the formulation of standards for the work place. Also includes research to prevent, control, or abate the escape of radioactive pollutants into the power plant itself or into the general environment.

Exclude research that is conducted to set radiation standards in the general environment by identifying and measuring the human effects of ionizing and nonionizing radiation and to understand radiation pollution processes. (See III. A. 6., RADIATION for research on effects and see III. B. 6., RADIATION for research on processes).

8. DEVELOP FUSION POWER

Research to develop the engineering base, qualify materials, develop components, and conduct engineering studies for the design, construction, and operation of prototype, demonstration, and commercial fusion power reactors is shown here.

Includes research to investigate, develop and establish the feasibility of laser fusion as a basis for commercial power production. Examples of work shown here include research to:

Develop and demonstrate methods to heat and contain high temperature plasmas; and
Develop technology base for larger confinement systems.

E. SOLAR ENERGY

Research to design, develop, and prove practical, reliable, economical systems to convert solar radiation into thermal and electrical power is shown here. Includes research to develop and demonstrate the practicality and desirability of solar heating and cooling systems for buildings and facilities, to provide technology for solar thermal energy production and solar thermal electric power plants, and to develop photovoltaic electric power systems.

1. PRODUCE SOLAR THERMAL AND SOLAR THERMAL ELECTRICAL ENERGY

Research developing the technology to produce thermal and thermal electric power from solar radiation is shown here. Includes research to develop solar thermal electric power plants as efficient, economical sources of electricity and research to evaluate solar total energy systems to produce both thermal and electrical energy. Also includes research to support the demonstration of solar heating and cooling systems to achieve widespread use of such systems for all purposes that are economically, socially, and environmentally acceptable. Examples of work shown here include research to:

Analyze performance and operational data of solar heating and cooling systems;
Perform feasibility determinations and system designs;
Reduce technical and financial risk;
Document design, construction, and operational experience;
Prove the viability and reliability of new concepts and system designs;
Develop the central receiver concept for solar thermal electric plants;
Develop facilities to test components and subsystems of solar thermal electric plants; and
Evaluate solar total energy systems for urban complexes, rural communities, industrial parks, and Federal installations.

2. DEVELOP PHOTOVOLTAIC ELECTRIC POWER SYSTEMS

Research to develop efficient, economical photovoltaic electric power systems is shown here. Includes research to:

Develop low cost, practical photovoltaic arrays;

Characterize all subsystems and components of the photovoltaic electric power systems;
Develop processes to fabricate these systems; and
Insure continued involvement of potential users.

Exclude research to assess the environmental impact of photovoltaic systems. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

F. GEOTHERMAL ENERGY

Encompasses research to develop and prove practical, reliable, technologically feasible and economical methods of producing electrical and thermal energy from geothermal resources. Includes research to explore and assess geothermal resources, to improve extraction and processing, to make mining materials and equipment more durable and to improve the conversion of geothermal resources to energy. Also includes the design, construction, and operation of facilities needed to test and solve problems of geothermal energy utilization.

1. IMPROVE RESOURCE ASSESSMENT

Encompasses research to assess geothermal resources in terms of quantity, quality, distribution, and recoverability.

2. IMPROVE EXTRACTION AND PROCESSING

Encompasses research to improve the extraction and processing of geothermal energy resources. Includes research into drilling technology, reservoir engineering and management, and extraction technology. Includes research to design, construct, and operate facilities needed to test these geothermal resource production systems. More specifically includes research to:

Develop high temperature drill bits, downhole replaceable bits, explosive and spark drilling, and water jet drilling;
Define expected life of a reservoir;
Develop models of two-phase flow in geothermal reservoirs;
Determine chemical reactions in a producing reservoir;
Improve downhole temperature logging tools; and
Develop downhole pumps and alternatives to pumping.

3. CONVERT GEOTHERMAL RESOURCES TO THERMAL AND ELECTRICAL ENERGY

Encompasses research to develop, test, and evaluate systems and components for generating electric power and for other purposes such as space heating and cooling with geothermal resources. Work to design, construct and operate facilities to test and demonstrate these systems and components is shown here. Includes research on such power conversion

systems as the single and multiple stage flash, organic and inorganic binary cycles, hybrid cycles, and total flow devices such as the impulse turbine and the helical screw expander.

G. ALTERNATIVE ENERGY RESOURCES

1. CONVERT WIND ENERGY TO ELECTRICITY

Research to develop efficient and economical methods to convert wind energy to electricity is shown here. Includes research to determine user requirements, wind potential, and cost and system performance.

2. IMPROVE FUEL GENERATION FROM BIOCONVERSION

Research to establish the commercial applicability of producing plant biomass and converting this biomass (and other wastes) to liquid, gaseous, and solid fuels as well as thermal and electrical energy is shown here. Includes research to improve large-scale plant biomass conversions, to improve waste organic matter utilization such as urban solid wastes, and develop large-scale terrestrial and marine energy farming systems.

3. IMPROVE OCEAN THERMAL ENERGY CONVERSION

Develop and demonstrate large-scale floating power plants to convert ocean thermal energy into electricity. Includes research to establish design and criteria for components and subsystems, examine economic feasibility of various ocean thermal concepts, and explore energy conversion and delivery systems.

4. OTHER (Must Be Specified and Described)

Research which cannot be shown under the former three objectives of ALTERNATIVE ENERGY RESOURCES is shown here. Each research project shown here must be specified and the project's primary objective must be explained.

H. ENERGY CONSERVATION

Encompasses research on methods and technologies to conserve energy by improving the efficiency of electricity generation, developing new energy storage systems, increasing energy transmission efficiency, and by reducing end-user's energy consumption.

1. INCREASE ELECTRICITY GENERATION EFFICIENCY

Encompasses research to develop higher efficiency technologies for generating electricity, especially with coal. Includes

research on advanced power systems such as magnetohydrodynamics, fuel cells, and higher temperature and pressure turbine systems which generate more electricity from the same amount of coal.

Exclude research whose primary purpose is to lessen the environmental impact of converting coal to energy. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

2. IMPROVE ENERGY STORAGE

Research to develop energy storage systems for electrical utility application; to develop storage systems to be used at residential, commercial, and industrial sites; to develop energy storage systems for automotive propulsion systems; and to develop storage systems related to new energy production means (such as solar and geothermal) is shown here. Includes research in such systems as batteries, hydrogen storage, thermal storage, flywheels, compressed air storage, and magnetic energy storage.

3. IMPROVE ELECTRIC POWER TRANSMISSION

Research to develop an increased capacity in ac and dc overhead transmission systems, to develop underground transmission systems capable of matching future overhead systems, to develop security and control systems for the generation, transmission and distribution of electricity, to identify desirable growth options, and to develop more efficient distribution systems is shown here.

4. REDUCE ENERGY CONSUMPTION BY END-USERS

Research to reduce energy utilization by end-users is shown here. Includes research to cut down use in the commercial and residential sectors. For example, research on energy conserving office buildings and more efficient home appliances is shown here. Also includes research to improve energy consumption efficiency for existing propulsion systems for autos, ships, and airplanes, develop more efficient heat engines that use fossil fuels, and to develop systems to use alternative fuel substitutes for crude oil fuels.

I. ENERGY SYSTEMS STUDY AND ANALYSIS

Research to provide an understanding of the interrelationships among energy supply and demand options; energy systems analysis and technological assessment; input-output analysis of the energy sectors; develop models to forecast impact of various energy research efforts; and otherwise assist in the planning and management of energy systems is shown here.

III. ENVIRONMENTAL QUALITY IMPROVEMENT

ENVIRONMENTAL QUALITY IMPROVEMENT

III. ENVIRONMENTAL QUALITY IMPROVEMENT

Encompasses research to identify pollutant effects in order to establish standards for regulating them, excluding research to improve treatment and cure of illnesses which result from pollutants; to improve means of identifying and measuring pollution processes; to control and abate all pollutants which adversely affect air, water, land and living things; and to improve the ability to understand, predict and affect weather and natural hazards.

Research shown here includes all efforts conducted primarily to protect or improve environmental quality. Therefore, research to remove sulfur from coal before it is converted to electricity, and thereby reduce sulfur dioxide emissions, would be shown here as would work to reduce emissions from automobiles or airplanes.

A. IDENTIFY POLLUTANT EFFECTS

Encompasses research to determine the ecological, social, and health effects of environmental pollutants on man, animals (including marine animals), inorganic materials, and plants (including marine plant life) and research to determine the exposure levels at which these pollutants and their effects become dangerous to the various elements of the environment. Research in this category is generally directed toward isolating pollutants which cause adverse effects, in order to establish standards or tolerance levels for regulatory purposes. Furthermore, it usually precedes efforts to improve technological or operational means of controlling and abating pollution or otherwise meeting the above-mentioned standards or tolerance levels. Research on the effects of pesticides and of radiation is also shown here.

Exclude research on identifying and measuring pollutants which is conducted to treat or cure an illness or disease that is caused by a pollutant or to develop a personal preventive device (see V. A., DISEASES AND INJURIES). Exclude research

on understanding pollution processes or technological or operational methods to control pollutants which are shown elsewhere in III., ENVIRONMENTAL QUALITY IMPROVEMENT. Exclude research on food safety thresholds and standards (see IV., FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS). Also exclude research on occupational safety and health and consumer product safety (see XIII. F., SAFETY).

1. AIR

Includes research on the effects of pollutants carried in the air, such as hydrocarbons. Excludes the effects on air from noise, pesticides and radiation and also excludes air pollution resulting from solid wastes (see the following pertinent categories in this section). Work to be shown here is exemplified by research to study epidemiological and toxicological health effects of air pollutants on man and animals and investigate long-term low-level effects of fossil fuel pollutants during energy conversion.

2. WATER

Includes research on the effects of pollutants, including thermal pollution, found in fresh and salt water excluding pesticides, radiation and pollution resulting from solid waste. Work to be shown here is exemplified by research to:
Study relationship between water quality and disease;
Study subsequent generation effects of tritiated ingestion;
Study birth defects caused by heavy metals;
Determine effects of asbestos on aquatic life;
Determine methyl mercury effects on central nervous system of animals; and
Assess ecosystem costs of thermal shock from power plant waste heat release and cooling tower blow-down.

3. SOLID WASTE

Includes research on the effects of solid waste handling and disposal. Solid waste includes, but is not limited to, animal wastes, crop residues, and municipal solid wastes. This entry specifically includes the effects of solid waste handling which results in air or water pollution. Work to be shown here is exemplified by research to:
Assess public health impact of toxic and pathogenic products of solid waste, waste incineration, landfill and ocean dumping operations;

Determine the environmental effect of coal, oil, oil shale, uranium and geothermal energy extraction techniques; and
Assess environmental effects of hydrocarbon and other fuel transport, storage or waste releases during waste disposal.

4. PESTICIDES

Includes all research conducted to determine the adverse effects of pesticide use. Work to be shown here is exemplified by research to determine pesticidal effects on particular organs, metabolic reactions, reproduction and behavioral responses and on freshwater and saltwater life.

Exclude research to improve treatment for a health problem caused by pesticide use (see V., HEALTH) and research on food safety that relates to pesticides (see IV. E., IMPROVE SAFETY).

5. NOISE

Includes all research conducted to determine the effects of noise on man, plants and animals. Work to be shown here is exemplified by research to improve health effects data for noise emissions standards and determine the effect of noise on man's ability to concentrate on a task.

Research to determine the effects of aircraft noise should be reported both as a separate item and as a part of the total for this entry.

6. RADIATION

Includes research conducted to determine the effects of exposure to radiation in the general environment from any source. More specifically, this includes work to:
Measure health effects of ionizing and nonionizing radiation exposure;
Investigate long-term low-level effects of radioactive pollutants; and
Assess environmental effects of radionuclide transport, storage and waste disposal.

Exclude research on effects from radiation exposure within nuclear power plants (see II. D. 7., NUCLEAR SAFETY).

B. UNDERSTAND POLLUTION PROCESSES

Encompasses research to improve the understanding of pollution processes such as transportation and dispersion and to improve the means of identifying, measuring and sampling pollutants. Pollutants resulting from energy conversion and transportation sources are specifically included where appropriate in this entry. This research is an important step leading to the control or abatement of pollution at its source.

1. AIR

Includes research to study air pollution processes like dispersion and improve sampling or analytical methods and technology to measure and identify air pollutants. The following work exemplifies research to be shown here:

Identify combustion products of fuels, fuel additives and catalytic reactor emissions;
Standardize air measurement technologies;
Study chemical and physical processes of atmospheric pollutants;
Measure and predict dispersion and transportation of air pollutants from fossil energy production; and
Characterize and identify emissions (SO, NO, hydrocarbons) from extraction and conversion processes.

Exclude research related to air pollution processes of and to means of identifying, measuring and sampling solid waste, pesticide, noise, and radiation pollution. (See below in this entry.)

2. WATER

Includes research on the movement, transformation and fate of water pollutants and research to improve the sampling, analytical methods and instrumentation measuring water quality and effluents. Pollutants which result from energy conversion and transportation sources and which adversely affect water are included here. The following work exemplifies research to be shown here:

Improve measurement and tracing of ocean dumping of pollutants;
Analyze, predict and assess sources and magnitude of water pollution such as mining and agriculture; and
Assess groundwater pollution.

Exclude research related to pollution processes of and identifying, measuring and sampling solid waste, pesticides and radiation pollution. (See below in this entry.)

3. SOLID WASTE

Includes research to study pollution processes related to solid wastes and to improve the means of identifying and measuring toxic and pathogenic products of solid waste incineration, landfilling and recycling operations. The following work exemplifies the research to be shown here:

Increase understanding of soil transport mechanisms;
Determine the fate of heavy metals and other hazardous materials from sludge; and
Improve the means of tracing toxic and pathogenic products of solid waste.

4. PESTICIDES

Includes research to improve methods of identifying and measuring exposure to pesticides and the transportation of pesticides through the environment. All such work on pesticides is shown here regardless of whether the pesticides utimately pollute air or water. This entry is exemplified by research to understand how pesticides move through soil and into the water supply.

5. NOISE

Includes research to identify major sources of noise and assess the state-of-the-art of noise technology. Exclude research to determine the effects of noise pollution or to reduce noise pollution (see III. A. 5., for effects research and III. C. 5., for control technology).

Research to improve means of identifying and measuring aircraft noise pollution and to increase understanding of its processes should be reported both as a separate item and as a part of the total for this entry.

6. RADIATION

Includes research to improve methods of identifying and measuring ionizing and nonionizing radiation that affects the general environment. For example, it includes research to improve radiation measurement and monitoring from nuclear power plant releases. However, exclude research to improve

measuring and monitoring radiation in the work environment such as within a nuclear reactor and show that work in II. D. 7., NUCLEAR SAFETY.

C. CONTROL AND ABATE POLLUTANTS

Encompasses research to improve the means of preventing, controlling or abating pollution. This entry includes efforts to prevent pollution by treating the outputs of processes such as emissions or by changing the form of the inputs of a process such as coal cleaning processes for the purpose of reducing sulfur dioxide emissions.

Exclude research to understand pollution processes; identify, measure or sample pollutants; or to identify pollutant effects (see the two subobjectives above).

Exclude research to prevent or control accidents in nuclear power plants, especially in nuclear reactors, which would cause radiation to contaminate the reactor or plant area and would emit radiation into the general environment (see II. D. 7., NUCLEAR SAFETY).

1. AIR

Includes research to improve means of controlling or abating air pollution which results from all sources excluding pollution from solid waste, pesticides, noise and radiation. The following work exemplifies research to be shown here:

Refine, purify and clean fuels;
Develop methods for clean combustion of fuels such as coal gasification or liquefaction research which is conducted primarily to reduce or eliminate emissions;
Develop fine particulate collection and control devices; and
Develop propulsion systems or auxiliary pollution control devices which reduce emissions from means of transportation.

2. WATER

Includes research to improve wastewater pollution treatment, control and abatement methods excluding that water pollution caused by solid wastes, pesticides and radiation. This entry focuses on efforts to protect and sustain the quality of water and accordingly includes efforts to control effluents at the source or to purify water which has already been polluted. The following work exemplifies research to be

shown here:
Control thermal pollution from power plants;
Treat and control urban and industrial wastewater; and
Remove asbestos from drinking water.

Exclude research conducted to increase the water supply (see IX. E., WATER).

3. SOLID WASTE

Includes research to control the toxic and pathogenic products of solid wastes incineration and landfilling and develop control techniques and technology for safe disposal of toxic and hazardous solid wastes. The following work exemplifies the research to be shown here:
Control the toxic and pathogenic products of solid wastes.

Exclude research to improve means of recycling materials in solid waste (see IX. C., MINERALS).

4. PESTICIDES

Includes research to control the adverse effects of pesticide use by controlling the harmful agents in the pesticide and by minimizing certain pesticide usage through alternative methods of pest control.

5. NOISE

Includes research to improve the technology to control or reduce the impact of major sources of noise. Research shown here pertains to all major sources of noise.

In addition, research to reduce aircraft noise should be reported both as a separate item and as a part of the total for this entry.

D. UNDERSTAND, DESCRIBE, PREDICT AND AFFECT WEATHER AND NATURAL HAZARDS

Includes research to identify and analyze regional environmental problems and to encourage the development of solutions to those problems; to understand and modify severe and destructive weather and to predict natural hazards and reduce the damage they cause.

1. REGIONAL ENVIRONMENTAL SYSTEMS

Includes research to improve means of planning and managing regional environments with maximum environmental benefits and minimal environmental damage. This work is exemplified by research to define environmental problems unique to a geographic region and study the Arctic and Antarctic environmental systems.

2. CLIMATE AND WEATHER STUDY

Includes research to increase understanding of the natural processes which result in climate and weather, to improve means of evaluating the impacts of climate and weather, and to develop improved predictive techniques.

More specifically, this research is exemplified by efforts to:

Improve fundamental understanding of weather and climatic conditions;
Develop increased knowledge concerning the natural hazards of extreme wind (such as hurricanes or tornadoes), floods, hail, and lightning;
Delineate the extent and mechanisms of metropolitan area weather changes;
Improve long-term weather prediction;
Improve measurement of atmospheric vertical temperature and moisture profiles;
Improve the means of collecting global weather data;
Study global data on atmospheric circulation models;
Gather data on chemical constituents and meteorological parameters of upper atmosphere; and
Conduct studies on precipitation processes, turbulence, diffusion and atmospheric surface interactions which will improve means of understanding, observing, describing, or predicting weather and climatic conditions.

Weather and climatic condition research generally applies to many objectives in the overall structure; however, all weather research, excluding that on weather modification (see the following entry), will be shown in this category.

Excludes that research which is conducted to resist weather problems or threats such as making crops or aircraft more resistant to hail storms or other severe weather (see IV. B. 1., IMPROVE CROP PRODUCTION FOR FOOD, or XII. A., AIR TRANSPORTATION).

Also excludes research to study the effects of pollutants on the weather and atmosphere, such as resultant temperature changes (see III. A., IDENTIFY POLLUTANT EFFECTS.).

3. WEATHER MODIFICATION

Includes research to improve methods of modifying or altering weather and climatic conditions to mitigate the undesirable effects of weather or to increase its desirable effects. Also includes research to identify and correct unanticipated or inadvertent effects of weather modification, as well as studies of the social and economic effects of these changes in the natural environment.

Excludes research on weather modifications which have exclusive applications as destructive forces in support of military objectives (see VIII. D. 8., DEFENSEWIDE APPLICATIONS/WEATHER MODIFICATION).

4. DISASTERS AND NATURAL HAZARDS STUDIES AND CONTROL

Includes research to improve understanding of and to develop improved methods for evaluating and understanding fires and earthquakes and methods for reducing resulting losses in life and property. Also includes research on the social impact of natural hazards and disasters.

Excludes research on improved or new methods of weather modification (see WEATHER MODIFICATION above).

Also excludes research on the fundamental process which results in weather and climatic conditions and improved ways of predicting and measuring these changes (see CLIMATE AND WEATHER STUDY above).

a. EARTHQUAKES

Includes, but is not limited to, research to improve earthquake prediction capability, research to improve design and construction methods for earthquake resistant structures, and research on better ways of integrating seismic risk information with land use policies.

b. FIRE

Includes, but is not limited to, research on fires which occur naturally, primarily forest fires and range fires, in order to improve the means of measuring and controlling them.

IV. FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS

FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS

IV. FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS

This objective encompasses research primarily directed toward identifying and developing new and underdeveloped food sources; improving the productivity of existing food sources, including efforts to improve breeding, feeding, managing and protecting these sources; improving the productivity of non-food agricultural products; improving the processing, marketing and distribution of food and non-food products; and reducing the hazards of food and non-food agricultural products to man.

Research which is primarily directed toward improving the productivity, utilization and preservation of non-food producing trees is excluded from this objective (See IX. A., FORESTS). Also, research conducted primarily to determine the adverse effects of pesticide use, to improve methods of identifying and measuring exposure to pesticides and the transportation of pesticides through the environment, and to control the adverse effects of pesticide use is excluded (See III., ENVIRONMENTAL QUALITY IMPROVEMENT). Research directed toward the treatment and nature of nutritional diseases and the general understanding of nutrition and its effect on human health and well-being is excluded (See V. A. 19., NUTRITIONAL DISORDERS). Research to isolate pollutants which cause adverse effects upon livestock, crops and plants in order to establish standards or tolerance levels for regulatory purposes is excluded (See III. A., IDENTIFY POLLUTANT EFFECTS). Research to

improve the understanding of pollution processes such as transportation and dispersion, including improving the means of identifying, measuring and sampling pollutants is excluded (See III. B., UNDERSTAND POLLUTION PROCESS). Research to increase the knowledge and understanding of climate and weather; to improve means of evaluating the impacts of climate and weather; and to improve predictive and measurement systems and tools and techniques to perform weather modification is excluded (See III. D. 2., CLIMATE AND WEATHER STUDY; and III. D. 3., WEATHER MODIFICATION).

A. IDENTIFY AND DEVELOP NEW OR UNDERDEVELOPED FOOD AND FEED SOURCES

This encompasses all research primarily directed toward identifying new and developing previously underdeveloped sources of food for humans including research into the use of oilseeds as sources of food; the use of waste foodstuffs such as carrot tops, pea and potato vines, and plant vines as food sources; the development of improved methods of processing vegetable and non-animal protein into edible foods and feeds; improved methods for processing, distributing and marketing new food products or food products which are now underutilized; and identifying new food from marine sources.

B. IMPROVE PRODUCTION

Encompasses all research directed toward increasing the production of food and non-food products whether agricultural, livestock or marine. This includes, but is not limited to, research toward improving breeding, feeding, livestock management, crop management, disease and pest control; improving nutritional quality; developing new varieties of crops; and developing improved feeds, forages, fertilizers, and fertilization and irrigation practices.

1. IMPROVE CROP PRODUCTION FOR FOOD

Encompasses all research primarily directed toward increasing

the production and quality of crops such as food cereals, grains, fruits, vegetables, edible nuts, sugar crops as well as the honey production of bees and existing oilseed food sources. This includes, but is not limited to, research to develop new crop varieties; improve the nutritional value and palatability of crops; make crops more weather, disease, pollution and insect resistant; improve methods of fertilization, including new and improved fertilizers; improve various types and uses of pesticides; develop new and improved methods of weed and disease control; improve the understanding of microbiotics, physiology and genetics of food cereals and grains; develop hybrids; improve irrigation and water management practices as they apply to food crops; improve crop and land management; improve equipment, technology and methodology for planting, maintaining and harvesting crops; increase the photosynthetic efficiency of plants to increase yield; improve pollination; and develop crop varieties which are adaptable to mechanized processing. Research to increase the production and quality of grain sorghums as food is included here.

Excludes research into feed cereals and grains (See IV. 2., IMPROVE ANIMAL PRODUCTION FOR FOOD below).

2. IMPROVE ANIMAL PRODUCTION FOR FOOD

Encompasses research primarily directed toward improving production and quality of beef cattle, swine, lambs, poultry (including eggs), dairy cattle and milk. This includes, but is not limited to, research to improve breeding methods, including reproductive efficiency and cross breeding; improve managing herds and flocks; control disease, parasites and insects; improve animal resistance to disease, pollution and natural hazards; improve means to control predators and protect livestock and poultry from predators; increase the understanding of nutritional needs of livestock, dairy cattle and poultry; increase understanding of factors controlling protein synthesis and the production of more meat and less fat; increase understanding of fat metabolism, physiology and genetics of livestock, dairy cattle and poultry; improve the quality and wholesomeness of meat; and improve dairy management. This category also includes research to increase yields and forage quality from pastures, forages and ranges; improve the use of soil and water resources in forage production; increase the resistance of forages to pests, weather, disease and weeds; improve methods to

control pest, weed and disease; improve pasture and range management; improve feeds and feeding practices; and improve the production and quality of livestock, dairy cattle and poultry feed.

Exclude research into new or underdeveloped feed sources such as industrial and agricultural waste (See IDENTIFY AND DEVELOP NEW OR UNDERDEVELOPED FOOD AND FEED SOURCES, above).

3. IMPROVE PRODUCTION OF MARINE FOOD SOURCES

Encompasses research primarily directed toward improving the production and quality of fresh and salt water fish, shellfish and edible vegetation. This includes, but is not limited to, research into breeding, including hatcheries and fisheries; harvesting practices and regulation; developing new varieties; and improving the nutritional value of fish, shellfish and vegetation.

Exclude research into the use of fish, shellfish and vegetation as feeds and for fertilizer which should be shown in IMPROVE ANIMAL PRODUCTION FOR FOOD and IMPROVE CROP PRODUCTION FOR FOOD. Also exclude research into the sport and recreational aspects of marine life (See IX. F., WILDLIFE).

4. IMPROVE PRODUCTION OF NON-FOOD ITEMS

Encompasses research primarily directed toward improving the production and processing of non-food agricultural products. This includes, but is not limited to, research into cotton, flax, ornamental plants, flowers, turf, shrubs, decorative trees and tobacco. Research into the uses of such products, for example, cottonseeds, as feeds or fertilizers is excluded and should be shown in IMPROVE ANIMAL PRODUCTION FOR FOOD and IMPROVE CROP PRODUCTION FOR FOOD above. Also, research to improve the means and methods of increasing the production of forest resources and products other than fruit and edible-nut-producing trees is excluded (See IX. A., FORESTS).

5. IMPROVE USE OF LAND, WATER, FERTILIZATION, EQUIPMENT AND METHODS

Encompasses research on land, water, fertilization, equipment and methods that are specifically directed toward production of food and non-food agriculture but which cannot

be assigned to a specific production category in IMPROVE PRODUCTION.

More specifically, this includes research which is otherwise unassignable to improve water management and use practices; improve means and methods of managing, using and preserving agricultural and forage lands, including methods for reclaiming lands for agricultural use; create new fertilizers; improve existing fertilizers and the use and application of fertilizers; and improve the production and quality of food and non-food agricultural products through new or improved equipment, methods and management techniques for planting, maintaining and harvesting crops or breeding and feeding livestock and poultry.

Exclude research to improve the development, planning, use and conservation of fresh water which is not primarily directed toward improving food and non-food agricultural production. (See IX. E., WATER).

Exclude research to protect and manage land which is not primarily directed toward improving food and non-food agricultural production. (See IX. B., LAND).

C. IMPROVE STORAGE AND PROCESSING

Encompasses research primarily directed toward improving the methods for storing food and non-food items both prior to and after processing, toward improving the transportation of food and non-food items from the producer to processing and from processing to marketing, and toward improving the processing of livestock, sea and raw agricultural products into consumable products.

1. IMPROVE STORAGE AND PROCESSING OF FOOD PRODUCTS

Encompasses research primarily directed toward improving the methods for storing food products or inputs to food processing prior to and after processing, but prior to transfer to the marketing and distribution system; improving the transporting of food products from the producer to the processor and from the processor to the distributor; and the processing of livestock, sea products and raw agricultrual crops into consumable food products. This includes, but is not limited to, research into methods for maintaining quality during transportation, storage and processing; methods for eliminating

livestock and poultry death losses during transportation; size, number and location of storage facilities; improved methods for handling farm output; methods for reducing or preventing insect damage during storage; methods for using or disposing of waste products from food processing; ways of reducing condemnation losses of livestock and poultry during slaughter; improved methods of packing; and improved processing equipment and technology.

Exclude research primarily directed toward reducing or preventing the transfer of agents harmful to man through food (See IMPROVE SAFETY, below).

Exclude research directed toward the improvement of transportation systems, vehicles and safety (See XII., TRANSPORTATION). Exclude research directed toward pollution abatement. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

2. IMPROVE STORAGE AND PROCESSING OF NON-FOOD PRODUCTS

Encompasses research primarily directed toward improving the methods for storing non-food agricultural, sea products and non-food livestock, sea and agricultural by-products (including feeds) prior to and after processing; improving the transportation of non-food products from producer to processor and from processor to distributor; and improving the processing of agricultural and sea products, and livestock, sea and agricultural by-products into usable non-food products.

Exclude research primarily directed toward reducing or preventing the hazards to man of non-food products (See IMPROVE SAFETY, below). Exclude research primarily directed toward the improvement of transportation systems, vehicles and safety (See XII., TRANSPORTATION). Exclude research directed toward pollution abatement. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

D. IMPROVE DISTRIBUTION AND MARKETING

Encompasses research primarily directed toward improving the distribution, marketing and consumption of food and non-food products, including studies of markets, consumption patterns, and distribution systems. Export markets are included in these studies. Exclude research primarily directed toward improving the marketability of a specific item (See IMPROVE PRODUCTION, above).

1. IMPROVE DISTRIBUTION AND MARKETING OF FOOD PRODUCTS

Encompasses research primarily directed toward improving the distribution and marketing of livestock, sea and agricultural food products. This includes, but is not limited to, research to improve the understanding of the organization and performance of major commodity markets; improve the understanding of the impact of foreign policy and world trade on agricultural distribution; improve the understanding of export markets; improve the operation and management of commodity markets; improve merchandising methods and techniques; develop new or improved retailing systems; develop methods for reducing marketing costs; improve methods for efficient and equitable food distribution; improve methods for identifying and developing new markets for foods; and improve methods for increasing consumer acceptance of new food products.

2. IMPROVE DISTRIBUTION AND MARKETING OF NON-FOOD PRODUCTS

Encompasses research primarily directed toward improving the distribution and marketing of agricultural and sea non-food products and non-food livestock, sea and agricultural by-products (these include feeds). This includes, but is not limited to, research into improving distribution systems; improving methods for identifying and developing new markets; increasing the understanding of export markets; improving methods for reducing marketing costs; improving merchandizing methods and techniques; and developing new or improved retailing systems.

3. IMPROVE CONSUMPTION

Encompasses research primarily directed toward improving the understanding of consumer needs (nutritional and otherwise), consumption patterns and ways to improve consumption of food and non-food products. This includes, but is not limited to, research into improving the understanding of nutritional requirements, the nutritional composition and value of food used and needed by consumers; methods for improving consumption patterns to improve nutrition received while lowering costs; and improving the understanding of consumption patterns and trends.

Exclude research primarily directed toward improving the treatment of nutritional disorders, understanding the

nature of nutritional disorders, and the general understanding of nutrition and its effect upon human health (See V. A. 19., NUTRITIONAL DISORDERS).

E. IMPROVE SAFETY

Encompasses research primarily directed toward improving the safety of food and non-food (developed from agricultural, sea or livestock sources) products to man. This includes, but is not limited to, research into improved methods for preventing the transmission of animal disease and parasites to man; improved methods for preventing pesticides from contaminating foods; improved methods for hazard-free processing; and improved methods for preventing potentially harmful products from being distributed.

Exclude research primarily directed toward determining the adverse effects of pesticide use, improving methods for identifying and measuring exposure to pesticides, understanding the transportation processes of pesticides through the environment, and improving the control of the adverse effects of pesticide use (See III., ENVIRONMENTAL QUALITY IMPROVEMENT). Research into improving the safety of non-food products which are not derived from agricultural, sea or livestock sources is excluded (See XIII. F. 2., CONSUMER PRODUCTS SAFETY).

V. HEALTH

V. HEALTH

Includes research to reduce the incidence and adverse human health effects of diseases, injuries, mental illnesses, and social disorders; and encompasses all research for which the primary purpose is the maintenance of human health.

The health objective is divided into four components, each of which is further divided into more specific subcomponents. The four major elements are:

--Diseases and Injuries,

--Mental Health,

--Substance Abuse, and

--Health Services Delivery.

The arrangement of these components is indicative of the logic to be followed in reporting research and development funding. All health research should first be viewed from the standpoint of its primary purpose. If the primary purpose of the research is related clearly to the categories under V. A., DISEASES AND INJURIES, then it should be reported there. Thus, studies of the mental and social aspects of cancer, research into health care or service for cancer victims, and the resources needed to conduct cancer research should be reported under V. A. 4., CANCER. The same logic applies to those projects which cannot be placed under the disease and injury category. All research relating specifically to mental health and associated social disorders and to substance abuse should be reported under the appropriate category under V. B., MENTAL

HEALTH, and V. C., SUBSTANCE ABUSE, respectively. Research into health care, service and delivery which cannot be assigned to specific items under the previous three categories should be placed under the appropriate categories of V. D., HEALTH SERVICES DELIVERY.

A. DISEASES AND INJURIES

Encompasses the primarily physical human health problems (diseases and injuries) and related conditions or activities. Research and development objectives which are included in this section are exemplified by the following statements:

Improve understanding of a specific disease's entire process in humans, including advancing the scientific disciplines necessary to facilitate that understanding;
Improve knowledge concerning the causes and complications of specific diseases and injuries; and
Develop improved methods of diagnosing, treating, curing and preventing diseases.

The diseases, injuries, and related conditions or activities listed here are defined in terms of the classifications in the International Classification of Diseases, Adapted (ICDA). While the ICDA was not designed specifically to categorize health-related research, it is a useful guide for identifying the diseases, injuries, and related conditions contained in the categories listed in this structure. It is recognized that there may be initial inconsistencies in attempts to classify health-related research according to the ICDA. Therefore, respondents are requested to identify and explain any problems that are encountered in reporting in accordance with this structure.

All research to be reported under this subobjective should first be viewed from the standpoint of its primary purpose. If the primary purpose is related to one of the specific diseases or special problems, then all research funding associated with that disease or problem should be reported under the corresponding line item. Examples of these specific diseases and special problems, which cut across body systems, include cancer, arthritis and rheumatism, injuries, environmentally-caused health disorders, maternal and child health, and aging.

If the research cannot be attributed to one of the above categories, it then should be classified in terms of the body system

to which the research is primarily related. These body system classifications are aggregations of diseases and related conditions, according to generally accepted divisions of the human anatomy. If the primary purpose of the research is so general or multidisciplinary that it cannot be classified in terms of either diseases or body systems, it should then be shown under DISEASE AND INJURY BASE. Again, for any research which cannot be classified in accordance with the structure as presented, respondents should identify the problem and suggest a heading (not "Other") which would accommodate that effort.

Cross-cutting research on topics such as allergies or genetics, to the maximum extent possible, should be reported under the disease or body system to which it primarily applies. Research on allergies not elsewhere categorized will be shown under INFECTIOUS AND PARASITIC DISEASES. Genetic research not attributable to a specific disease or body system will be reported under MATERNAL AND CHILD HEALTH PROBLEMS.

The total research effort which is conducted primarily because of a disease, injury or other health-related problem listed herein should be shown under the corresponding category. This may include related mental health, social considerations and associated health services delivery.

In addition to the ICDA codes described above, each category under this subobjective also presents a number of "key words." These are short descriptors or subjects of typical research to be included in each category under this subobjective. The key words are not meant to be all-inclusive; rather, they are provided to facilitate respondents' identification of the most appropriate placement for research funding. Respondents are also encouraged to suggest additional key words for possible inclusion in future versions of the structure, if such words would tend to clarify, rather than complicate, the instructions.

1. THE AGING PROCESS--DISEASES AND RELATED CONDITIONS

   Includes research to improve understanding of the general process and results of aging, including senility, in terms of its biomedical, social and behavioral, and service delivery aspects. This includes improving understanding of the gradual changes in the structure of any organism that occur with the passage of time, that do not result from disease or gross accidents, and that eventually lead to the increased probability of death as the individual grows older. Excludes research to investigate diseases

and disorders which are generally associated with the aging process but which are not exclusively a result of aging. For example, the incidence of cancer, arteriosclerosis, and arthritis and rheumatism generally are more prevalent at advanced age, but they also affect individuals of other age groups and would therefore be reported under other corresponding disease groupings.

ICDA Codes

The specific ICDA code included is senility without mention of psychosis (794). This is extended toward any general research in the aging process.

Key Words

Aged	Aging	Maturation
Geriatrics	Elderly	Nursing Homes
Gerontology	Senescence	Senility

2. ARTHRITIS AND RHEUMATISM

Includes research concerning all disorders marked by inflammation, degeneration, or metabolic derangement of the connective tissues of the body. Excludes research on rheumatoid and arthritic conditions which result from other diseases or disorders, such as a rheumatoid condition resulting from tuberculosis. Research on these arthritic or rheumatoid effects will be shown under the disease and injury line item corresponding to the [illegible]erating condition.

ICDA Codes

The ICDA codes included under this category are:
Arthritis and Rheumatism, except Rheumatic Fever (710-718)

Key Words

Arthritis	Marie-Strumpell's Disease	Rheumatism
Dermatomyositis	Myalgia	Still's Disease
Duplay's Syndrome	Osteoarthritis	Spondylitis
Felty's Syndrome	Periarthritis	Torticollis
Fibrositis	Polyarthritis	Traumatic Arthritis
Frozen Shoulder	Pyarthrosis	von Bechterew's Disease
Kummell's Disease	Polymyositis	Wry Neck
Lumbago		

3. BLOOD DISEASES AND DISORDERS

Includes all research on diseases and disorders of the blood and blood-forming organs, such as anemias, hemophilia, and purpura. Excludes cancers of the blood, such as leukemia, and heart and vascular system disorders, both of which are included in other categories under V. A., DISEASES AND INJURIES.

Also includes research which concerns the provision of adequate blood resources to contribute to human health. An example of such research is the development of blood substitutes.

ICDA Codes

Diseases of the blood and blood-forming organs (280-289).

Key Words

Anemia	Christmas Disease	Hypersplenism
Blood disease	Diseases of spleen	Polyeythemia
Blood dyscrasia	Hemophilia	Purpura
		Thrombocytopenia

4. CANCER

Includes all research on the various cancers and non-malignant tumors, regardless of the body system or part of the body in which they are located. Also includes studies of the mental and social effects of cancer, the special problems in delivering health services to cancer patients, and the research resources needed for cancer studies. Cancer research included herein also concerns the effects of the disease on other parts of the body as it spreads from the original site.

ICDA Codes

Malignant neoplasms of specified sites (140-189);
Malignant neoplasms of other and unspecified sites (190-199);
Benign and related neoplasms of specified nature (200-228); and
Neoplasms of unspecified nature (230-239).

Key Words

Benign tumor	Malignant tumor	Neoplastic growth
Cancer	Melanoma	Neoplastic tumor
Hodgkin's disease	Myeloma	New growth
Leukemia	Neoplasms	Sarcoma
		Tumor

5. DENTAL DISEASES AND DISORDERS

Includes all research on tooth development, tooth decay, diseases of the salivary glands, and other disorders associated with the jaw; and research and development on new or improved dental prosthetics. Excludes the remainder of the digestive system (beginning with the pharynx), which is included as a separate category under V. A., DISEASES AND INJURIES.

ICDA Codes

Diseases of Oral Cavity (520-525, 528, 529);
Salivary Glands (527); and
Jaws (526).

Key Words

Dental Abcess	Diseases of the Salivary Clands
Dental Caries	Diseases of the Tongue
Dental Nerve	Malocclusion
Dental Prosthesis	Oral Surgery
Diseases of the Gums	Peridontal and Soft Tissue Diseases
Diseases of the Jaw	Tooth Decay

6. DIABETES AND OTHER ENDOCRINE DISORDERS

Includes all diseases of the thyroid, pituitary, and adrenal glands; diabetes; and a variety of endocrine diseases. Excludes diseases of a specifically nutritional cause or deficiency, such as avitaminoses, which are included under V. A. 19., NUTRITIONAL DISORDERS. Also excludes dysfunction of ovaries and testes, which are included under V. A. 10., GENITOURINARY SYSTEM DISORDERS.

Research conducted primarily to affect diabetes, in terms of studies of the disease itself, related mental and social disorders, health service delivery considerations, and associated research resources, should be reported both as a subtotal and as a part of the total for endocrine disorders.

ICDA Codes

Diseases of the Thyroid Gland (240-246); and
Diseases of other Endocrine Glands (250-258).

Key Words

Adrenal disease	Endocrine diseases	Pituitary disease
Cystic fibrosis	Goiter	Thymus disease
Diabetes	Obesity, endocrine	Thyroid disease

7. DIGESTIVE DISEASES

Includes all diseases of the pharynx, esophagus, stomach, duodenum, appendix, abdominal cavity, intestines, peritoneum, liver, gallbladder and pancreas. Specifically excludes any of the cancers associated with those organs (see V. A. 4., CANCER). Also excludes diseases of the oral cavity, salivary glands and jaws, which are to be included under V. A. 5., DENTAL DISEASES AND DISORDERS.

ICDA Codes

Diseases of esophagus, stomach, and duodenum (530-537);
Appendicitis (540-543);
Hernia of abdominal cavity (550-553);
Other diseases of intestine and peritoneum (560-569);
Diseases of liver, gallbladder and pancreas (570-577); and
Symptoms referable to upper and lower gastrointestinal tract and abdomen (784-785).

This categorization specifically excludes the ICDA categories under diseases of oral cavity, salivary glands, and jaws (520-529).

Key Words

Anorexia	Diseases of Intestines
Appendicitis	Diseases of Liver
Cirrhosis of Liver	Diseases of Pancreas
Diseases of Esophagus	Diseases of Peritoneum
Diseases of Gallbladder	Dysphagia
Flatulence	Indigestion
Heartburn	Jaundice
Hematemesis	Nausea
Hepatitis	Peptic Ulcer
Hepatomegaly	Pylorospasm

Hernia of Abdominal Cavity
Hiccough
Stomach Diseases
Stomach Ulcers
Vomiting

8. ENVIRONMENTALLY-CAUSED HEALTH DISORDERS

Includes research for which the primary purpose is to develop a treatment or cure for environmentally-caused health disorders, which result from both man-made and natural hazards. Examples of man-made hazards include air pollution, radiation exposure, poor water quality, and pesticides and chemicals. Two of the natural hazards included herein are exposure and effects of contact with lightning.

Specifically excludes research to improve methods of identifying and measuring the effects of pollutants on man, research to improve understanding of pollutant processes, and work to improve or develop new ways of controlling and abating pollutants (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

ICDA Codes

Toxic Effect of Substances Chiefly Nonmedicinal as to Source (980-989);
Effects of Radiation (990);
Effects of Reduced Temperature and Excessive Dampness (991);
Effects of Heat (992);
Effects of Air Pressures (993); and
Effects of Other External Causes (994):
- Drowning and Nonfatal Submersion
- Lightning
- Hunger, Thirst, Exposure, and Excessive Exertion
- Motion Sickness
- Asphyxiation and Strangulation
- Electrocution and Nonfatal Effects of Electric Current.

The research and development identified under these codes is extended to treating and curing general environmental health problems, both natural and man-made.

Key Words

The key words included under this category are the health effects of the following:

Air Pollution	Radiation exposure
Chemicals	Rat Control
Noise Pollution	Solid Waste Disposal
Pesticides	Toxic Chemicals
	Water hygiene

9. EYE AND VISUAL SYSTEM DISORDERS

Includes all research on diseases and conditions of the eye including conjunctivitis, cataracts, reflective errors, and diseases of the retina and optic nerves. Also includes research oriented to the overall condition of blindness; however, exclude blindness, as a secondary effect of a particular disease such as syphilis or diabetes (see V. A. 12., INFECTIOUS AND PARASITIC DISEASES, and V. A. 6., DIABETES AND OTHER ENDOCRINE DISORDERS, respectively).

ICDA Codes

Inflammatory diseases of the eye (360-369) and
Other diseases and conditions of the eye (370-379).

Key Words

Astigmatism	Conjunctivitis	Eye inflammation
Blindness	Corneal opacity	Glaucoma
Cataract	Corneoplasty	Hyperopia
Color blindness	Detached retina	Myopia
		Ophthalmia

10. GENITOURINARY SYSTEM DISORDERS (INCLUDING KIDNEY DISEASE)

Includes research on the diseases and disorders of the urinary system, male genital organs, and the female genital organs, including breast and ovaries. Specifically excludes any cancers of the various organs involved in this category and any infectious and parasitic diseases which affect this region of the body, such as venereal disease.

Research on kidney disease should be reported both as a separate item and as a part of the total for this category.

ICDA Codes

Nephritis and Nephrosis (580-584);
Other Diseases of the Urinary System (590-599);
Diseases of Male Genital Organs, (600-607);
Diseases of breast, ovary, fallopian tubes, parametrium, uterus, and other female genital organs (610-629);
Symptoms referable to genitourinary system (786); and
Abnormal urinary constituents of unspecified cause (789).

Key Words

Albuminuria
Diseases of Bladder
Diseases of Fallopian tubes
Diseases of Ovary
Diseases of Prostate
Diseases of Ureter
Disorders of Menstruation
Glycosuria
Hematuria
Hemoglobinuria
Diseases of Breast
Diseases of Cervix
Kidney Disease
Menopausal Symptoms
Micturition
Nephrosis
Nephritis
Priapism
Renal Colic
Sterility
Vaginismus

11. HEART AND VASCULAR DISEASES (INCLUDING STROKE)

Includes research on heart disease, cerebrovascular, disease (stroke), and various diseases of the arteries, veins, capillaries, and lymphatic system. Specifically excludes any cancers or other growths of organs or other body parts within the circulatory system.

Research on stroke or cerebrovascular disease, in terms of causes of the malady and in terms of its effects, should be reported both as a separate line item within this category and as a portion of the total for the category.

ICDA Codes

Active rheumatic fever (390-392);
Chronic rheumatic heart disease (393-398);

Hypertensive disease (400-404);
Other forms of heart disease (410-429);
Cerebrovascular disease (430-438);
Other diseases of circulatory system (440-458);
Symptoms referable to cardiovascular and lymphatic system (782); and
Cardiovascular and lymphatic disorders of presumably psychogenic origin (305.3-305.4).

Key Words

Aneurysm	Coronary disease	Hypertension
Angina pectoris	Dropsy	Palpitation
Arteriosclerosis	Embolism	Phlebitis
Cardiac Arrest	Fainting	Rheumatic fever
Cerebral hemorrhage	Gangrene	Tachycardia
Cerebrovascular disease	Heart disease	Thrombosis
Chorea	Hemorrhoids	Varicose Veins

12. INFECTIOUS AND PARASITIC DISEASES (INCLUDING ALLERGIES NOT ELSEWHERE CLASSIFIED)

Includes all diseases generally recognized as communicable or transmissable, except certain acute respiratory infections, influenza, and other localized infections which should be reported under V. A. 14., LUNG AND RESPIRATORY DISEASES AND DISORDERS. Among the diseases included in this category are tuberculosis, poliomyelitis, various venereal diseases, and bacterial diseases such as leprosy, diphtheria, tetanus, and scarlet fever.

Research on allergies and allergic reactions, to the maximum extent possible, should be reported under the specific body system disease groupings to which they apply. Any research on allergies not elsewhere classifiable should be reported under this category.

ICDA Codes

Intestinal infectious diseases (000-009);
Tuberculosis (010-019);
Bacterial diseases (020-039);
Poliomyelitis and other enterovirus diseases of central nervous system (040-046);
Viral diseases (050-079);
Rickettsiosis and other arthropod-borne diseases (080-089);
Syphilis, venereal diseases, and other spirochetal

diseases (100-104); and
Infective and parasitic diseases (110-136).

Key Words

Allergies (not elsewhere classified)
Bacterial food poisoning
Chickenpox
Cholera
Cowpox
Diptheria
Encephalitis
Hepatitis, infectious
Infective disease
Leprosy
Malaria
Measles
Meningitis, infective
Mumps
Mycosis
Parasitic disease
Plague
Poliomyelitis
Rabies
Rubella
Salmonella
Scarlet fever
Smallpox
Syphilis
Tetanus
Tuberculosis
Typhoid fever
Typhus
Venereal disease
Viral disease
Whooping cough
Yellow fever

13. INJURIES NOT RELATED TO DISEASES

Includes research on injuries and other deleterious conditions of human health, which are not caused by diseases or related problems, such as fractures, sprains, lacerations, puncture wounds, trauma, and the adverse effects of medical agents. Excludes certain health problems resulting from the impact of man-made or natural environmental conditions, which should be reported under V. A. 8., ENVIRONMENTALLY-CAUSED HEALTH DISORDERS. Also excludes self-afflicted abuse of drugs and similar agents, which is included as a separate category under V. C., SUBSTANCE ABUSE. Research concerning the causes of or circumstances surrounding the injuries included within this category should be reported under other major objectives instead of V., HEALTH. For example, research concerning the causes of wounds inflicted in combat situations are specifically excluded from this category (see VIII. C., COMBAT CAPABILITY), while research to improve diagnosis and treatment of such injuries are included herein.

ICDA Codes

Fractures, Dislocations, and Sprains (800-848);
Intracranial Injuries, exclusing skull fractures (850-854);
Internal Injuries (860-869);
Lacerations and Open Wounds (870-907);
Superficial Injury (910-918);
Contusion and Crushing with Intact Skin Surface (920-929);
Effects of Foreign Body, entering through Orifice (930-939);

Burns (940-949);
Spinal Cord and Nerve Injuries (950-959);
Adverse Effects of Medical Agents (960-979);
Certain Early Complications of Trauma (995);
Complications of Surgical Procedures and Medical Care (997-999); and
Other and Unspecified Injuries (996).

The following ICDA codes are specifically excluded from this category:
Toxic Effects of Substances Chiefly Nonmedicinal as to Source (980-989) and
Effects of Radiation (990).
These ICDA codes are included under ENVIRONMENTALLY-CAUSED HEALTH DISORDERS.

Key Words

Accidents
Adverse Effects of Medical Agents
Burns
Concussion
Contusion
Dislocations
Extreme Air Pressure
Extreme Temperature
Foreign Bodies
Fractures
Injuries
Internal Injury
Intracranial Injury
Sprains
Strains

14. LUNG AND RESPIRATORY DISEASES AND DISORDERS

Includes research on diseases of the respiratory system including any of the acute respiratory infections such as influenza, pneumonia, and tonsillitis. Specifically excludes any of the cancers of the various organs involved.

ICDA Codes

Diseases of upper respiratory tract (460-508);
Other diseases of respiratory system (510-519);
Symptoms referable to respiratory system (783); and
Respiratory disorders of presumably psychogenic origin (305.2).

Key Words

Abscess of Lung
Asthma
Bronchitis
Emphysema
Epistaxsis
Hay Fever
Pneumonia
Pulmonary Congestion
Respiratory Infection

Bronchopneumonia	Hyperventilation	Shortness of Breath
Common Cold	Influenza	Sinusitis
Cough	Laryngitis	Stridor
Diseases of Lung	Pharyngitis	Tonsillitis
	Pleurisy	Tracheitis

15. MATERNAL AND CHILD HEALTH (INCLUDING GENETICS NOT ELSEWHERE CLASSIFIED, FERTILITY REGULATION, AND MENTAL RETARDATION)

Includes research on all conditions of the expectant mother and on other causes of perinatal morbidity and mortality, which is oriented towards the impact of such causes or the surrounding circumstances on the fetus or infant. Excludes research directed towards a specific disease in infant or fetus, which should be reported under the appropriate category for that disease. Also includes research on the complications in the mother of pregnancy, childbirth, and the puerperium which are not specifically related to diseases otherwise listed under HEALTH.

Encompasses research concerning population planning and control, including research into various fertility regulation techniques, such as contraception and sterilization, and the general organization of population planning and control organizations. Specifically excludes operational aspects, such as program implementation or provision of population planning and control services and devices.

Includes research into congenital anomalies such as hydrocephalus, spina bifida, and other physical abnormalities, in addition to Down's Syndrome and mongolism. Also includes research into developmental disorders, including the biomedical, social, behavioral, and service delivery considerations of mental retardation. Research on mental retardation should be reported both as a separate line item within this category and as a portion of the total for the category.

Includes all genetic research which is not oriented towards another specific disease or injury category. Excludes genetic research oriented toward a specific disease or injury, which should be reported under the corresponding categories in this structure.

Includes all research concerning abortion, regardless of the purpose for which the procedure would be performed.

ICDA Codes

Complications of Pregnancy (630-634);
Urinary infections and toxemias of pregnancy and the Puerperium (635-639);
Abortion (640-645);
Complications of the Puerperium (670-678);
Congential Anomalies (740-759);
Genetic Research not Otherwise Classified; and
Certain causes of perinatal morbidity and mortality (760-779).

No ICDA codes are specifically oriented towards population planning and control.

Key Words

Abortion
Anemia of Pregnancy
Anencephalus
Birth Injury
Childbirth
Cleft Lip
Cleft Palate
Club Foot
Congenital Anomaly
Contraception
Death in Utero
Delivery
Down's Syndrome
Eclampsia
Family Planning
Fertility Regulation
Fetal Death
Genetics (not elsewhere classified)
Hemolytic Disease of Newborn
Hydrocephalus
Intrauterine Devices
Labor, Difficult
Labor, False
Lactation
Mental Retardation
Mongolism
Population Planning and Control
Pregnancy, Complications of
Pregnancy, Ectopic
Premature Birth
Puerperium, Complications of the
Spina Bifida
Sterilization
Still-Birth
Toxemia
Vasectomy

16. METABOLIC DISORDERS

Includes research on all disorders of both anabolic and catabolic processes. Specifically excludes research whose primary purpose is in the area of nutritional disorders, a separate category in this structure. Also

excludes all research specifically attributable to the endocrine disorders objective.

ICDA Codes

Other Metabolic Diseases (270-279)

Key Words

Amino Acids	Gout
Cystic Fibrosis	Metabolism
Gargoylism	Metabolic Disorders

17. MUSCULOSKELETAL SYSTEM AND CONNECTIVE TISSUE DISORDERS

Includes research on diseases associated with the musculoskeletal system and connective tissues of the human body, such as osteomyelitis, bunion, and periostosis. Excludes arthritis and rheumatism, which constitute another disease category within this structure.

ICDA Codes

Osteomyelitis and other diseases of bone & joint (720-729); Other diseases of musculoskeletal system (730-738); Symptoms referable to limbs and joints (787); and Musculoskeletal disorders of presumably psychogenic origin (305.1).

Key Words

Arthralgia	Diseases of Joints
Bone deformaties	Diseases of Muscle
Bunion	Diseases of Tendons
Cramp	Osteomyelitis
Curvature of Spine	Periostosis
Disease of Connective Tissues	Prosthetic Devices for functions of bones and joints

18. NEUROLOGICAL AND COMMUNICATIVE DISORDERS

Includes the inflammatory diseases of the central nervous system, various hereditary nervous system diseases, and other such diseases including multiple sclerosis and epilepsy. Also includes all research on communicative disorders and on diseases of the ear and the mastoid, including deafness, and mastoiditis. Specifically

excludes diseases of the nervous system which are basically infective and parasitic in nature such as infective meningitis or encephalitis (see V. A. 12., INFECTIOUS AND PARASITIC DISEASES).

ICDA Codes

Inflammatory diseases of the central nervous system (320-324);
Hereditary and familial diseases of the nervous system (330-333);
Other diseases of the central nervous system (340-349);
Diseases of nerves and peripheral ganglia (350-358);
Diseases of the ear and mastoid process (380-389); and
Symptoms referable to nervous system and special senses (780-781).

It specifically excludes those portions of Category VI of the ICDA that refer to disorders of the eye and visual system (see V. A. 9., EYE AND VISUAL SYSTEM DISORDERS).

Key Words

Amnesia
Ataxia, Hereditary
Auditory vertigo
Central Nervous System, Diseases of the
Cerebral spastic
Coma
Convulsions
Deaf mutism
Deafness
Ear, Inflammation of the
Encephalopathy
Eustachian Tube, Disease of
Hallucinations
Hearing Impairment
Mastoiditis
Migraine
Multiple Sclerosis
Muscular Dystrophy
Myotonia Atrophica
Neuralgia
Neuritis
Oculomotor Disturbance
Otitis Externa
Paralysis
Paralysis, Facial
Paralysis, Infantile
Parkinson's Syndrome
Photophobia
Sciatica
Tympanum, Disease of
Vertigo

19. NUTRITIONAL DISORDERS

Includes all research oriented towards the treatment and nature of nutritional diseases and the general understanding of nutrition and its effect on human health and well being. Excludes diseases of the oral cavity (see V. A. 5., DENTAL DISEASES AND DISORDERS) and digestive disorders (see V. A. 7., DIGESTIVE DISEASES).

ICDA Codes

Avitaminosis and Other Nutritional Deficiencies (260-269).

Key Words

Avitaminosis	Nutrition
Dietary Research	Scurvy
Malnutrition	Vitamin Deficiency
Mirasmus	

20. SKIN AND SUBCUTANEOUS TISSUE DISEASES AND DISORDERS

Includes all infections and inflammatory conditions of the skin and subcutaneous tissue including any allergenic reactions. Specifically excludes all research oriented toward the environmental impact of various substances or natural hazards on skin tissues, which should be reported under V. A. 8., ENVIRONMENTALLY-CAUSED HEALTH DISORDERS. Also excludes research on skin tissues associated with problems of the mother and fetus during pregnancy and childbirth (see V. A. 15., MATERNAL AND CHILD HEALTH).

ICDA Codes

Diseases of the skin and subcutaneous tissue (680-709) and Skin disorders of presumably psychogenic origin (305.0).

Key Words

Acne	Dermatitis	Pruritus
Boils	Diseases of Hair	Psoriasis
Carbuncle	Diseases of Nails	Seborrhea
Cellulitis	Eczema	Skin Ulcer
Corns	Impetigo	Sunburn

21. DISEASE AND INJURY BASE

To the maximum extent practicable, disease and injury research should be classified under the disease, injury or related condition which it primarily addresses. If it does not apply to one of the above specific categories or is too multi-directional to be shown above, but is primarily disease and injury research, it should be reported under this category.

Exclude biology research which is not conducted primarily to understand or resolve problems of human diseases, injuries and other health conditions (see X. C., BIOLOGY).

ICDA Codes

With the exception of ICDA code 794 (Senility), which is included under V. A. 1., THE AGING PROCESS, any health-related problem that would otherwise be included under ICDA codes 790-796 (111-Defined Diseases) should be considered part of this grouping.

Codes 780-789 (Symptoms Referable to Systems or Organs) are excluded from this category and should be allocated to the specific disease or injury categories to which they apply.

Key Words

Key words generally do not apply to DISEASE AND INJURY BASE, which is characterized by multi-directional health research.

B. MENTAL HEALTH

Includes human mental disorders and diseases and related social and behavioral problems. Research included herein will have the following objectives: improve understanding of the causes and complications of mental disorders and diseases and related social problems; and develop improved methods of diagnosing, treating, curing, and preventing mental diseases and disorders.

This subobjective also includes research conducted primarily to increase our understanding of problem behavior which could result in or involves financial or physical harm or threats of harm against others or the commission of statute-defined crimes, and more specifically, includes studies of the individual behavior which may underlie the commission of a crime. Also included are multi-directional or cross-cutting studies of mental problems and related social disorders.

Exclude research on the development and improvement of methods to deter, prevent, or control crime (see VII., LAW ENFORCEMENT AND JUSTICE). Also exclude general psychological or behavioral research (See X. M., PSYCHOLOGY or X. P., SOCIAL SCIENCES, respectively).

1. MENTAL ILLNESS AND BEHAVIOR DISORDERS

This work focuses on individual behavior and mental problems. It involves the diagnosis, description, etiology, treatment and prevention of mental and psychiatric problems and the delivery of services to the mentally ill. These problems include mental, psychiatric, psychological, and behavioral disorders, and biological and psychosocial mechanisms related to them, irrespective of research subject. Such disorders include organic brain syndromes, particularly those associated with chronic or functional psychoses, depression, schizophrenia, suicide, neuroses, psychosomatic and psychophysiological disorders and character and personality disorders. Also included are major facets of psychopathology: anxiety, stress reactions, impulsive violence, hostility, and reactions to interpersonal adjustment and coping problems.

Explorations of related biological and psychosocial mechanisms include studies of both abnormal and normal functioning, in which the primary purpose is to delineate the relationships of such functioning to abnormal behavior, or to develop normal baseline data.

Also included are therapeutic interventions such as psychopharmacology, psychotherapy, behavioral intervention, and other forms of psychosocial treatment. Psychopharmacological studies cover such areas as the prediction of the individual's response to therapeutic drug treatment, the influence of patient or other characteristics on this response, the development of better psychotropic drugs, the development of improved drug screening methods, and improvement of our understanding of the mechanisms of pyschoactive drug actions on a physiological, biochemical, pharmacological, genetic, toxicologic, or behavioral level. (This excludes research directed primarily toward understanding, diagnosing, treating, curing and preventing drug abuse, which is included in this structure under Substance Abuse.) Psychotherapy includes developing and refining psychological treatment, examining the patient-clinician interactions, and assessing treatment outcome. Behavioral intervention encompasses primarily studies of non-surgical behavior modification, learning and training in problem situations, and biofeedback methods such as the development of individual self-control of hypertension. Other psychosocial treatments include group therapy, milieu therapy, mental

health crisis intervention, community programs for the mentally ill, and rehabilitation programs.

Also included are studies of mental health service delivery approaches. Included are studies of the organization, functioning and effectiveness of community mental health centers, the use of paraprofessionals in the delivery of mental health services, the financing of mental health services, the development and evaluation of special approaches such as mental health crisis intervention, and partial hospitalization programs.

Exclude mental disorders associated with the aging process (see V. A. 1. THE AGING PROCESS).

Exclude studies of mental retardation (see V. A. 15., MATERNAL AND CHILD HEALTH).

Exclude research directed primarily toward understanding, diagnosing, treating, curing and preventing the abuse of substances, including drugs and alcohol (see V. C., SUBSTANCE ABUSE).

2. MENTAL HEALTH ASPECTS OF SOCIAL PROBLEMS

Includes research on the effects of social problems, processes, and conditions beyond the control of the individual which impact on mental illnesses. Research in this area will focus on the contribution of these factors to individual mental disorders and diseases. Such social problems and conditions include individual violent behavior, antisocial behavior, sex-role development, minority group membership and ethnicity, institutional racism, urban problems including the impact of urban institutions and social structures on mental health, work and unemployment, technological change, and social and physical environments.

Examples of research topics included herein are the relation between mental problems and criminal, delinquent, and other deviant behavior; and law and mental health interactions, such as the issues of pretrial competency, exculpatory insanity, and the right to treatment.

Exclude research on deterrents to criminal acts, such as the development or improvement of crowd control

techniques and statistical studies of the incidence and patterns of crime (see VIII., LAW ENFORCEMENT AND JUSTICE). Also exclude studies of the contribution of substance abuse to social problems (see V. C., SUBSTANCE ABUSE).

3. MENTAL HEALTH BASE

Mental health research should be placed under the above two categories, as much as possible. If the primary objectives of any given research effort does not apply to the first two categories or is multi-directional in terms of research objectives, but is primarily mental health research, it should be reported under this category.

Exclude research which addresses fundamental psychological or social functioning, but is not directly related to mental problems (see X. M., PSYCHOLOGY or X. P., SOCIAL SCIENCES).

C. SUBSTANCE ABUSE

Includes research on all aspects of the problems associated with abuse of drugs, alcohol, and other substances, such as compounds containing aspirin, nicotine, or caffeine. Abuse herein refers to the misapplication, misuse, use for a wrong purpose or end, or excessive use of the above substances, including the use of medicinal agents for non-medicinal purposes.

Objectives common to substance abuse research efforts typically include the following: improve understanding of the chemistry of abused substances and the biochemical reactions of individuals to these substances; investigate psychological and epidemiological factors influencing substance abuse; and develop improved methods for diagnosing, treating, curing, and preventing substance abuse, including better ways to deliver associated health services.

Excludes research on the criminal actions of substance abusers and on preventive measures, such as criminal sanctions and seizures of illegal substances (see VII., LAW ENFORCEMENT AND JUSTICE).

1. ALCOHOLISM

Includes studies of alcohol, alcoholism, and alcohol abuse. Included are studies of the biological effects of

alcohol on central nervous system functions, metabolic processes, liver function, cardiac function, and hematology and circulation. Animal models of alcohol addiction are also included. Studies of the behavioral correlates of alcohol include psychological and emotional states associated with types of drinking episodes (e.g., memory functions, dysphoria, anxiety, depression, and work performance); and studies of the etiology, diagnosis, treatment and rehabilitation (including detoxification, behavioral intervention, motivation for treatment, and outcome criteria development), prevention, and consequences of alcoholism are included. Research on social environments leading to alcoholism, beverage control laws, and societal response to alcoholism is also included.

2. DRUG ABUSE

Includes research on opiates (e.g., heroin), marihuana, hallucinogens (e.g., LSD), stimulants (e.g., amphetamines, cocaine), and depressants (barbiturates). Studies concern biological, psychological and sociocultural problems, and include consideration of epidemiology and incidence of drug abuse, diagnosis and etiology, psychosocial characteristics of drug abusers, treatment (including narcotic antagonists, methadone maintenance, behavioral interventions, and psychological and social supportive therapies), and prevention. Also relevant are studies of drug abuse from a broad social perspective, including attitudes about drugs and drug abuse, and legal and correctional issues.

3. ABUSE OF OTHER SUBSTANCES

Includes research on the abuse of substances other than alcohol or drugs (see X. C. 2., DRUG ABUSE, for the types of drugs included in that section). Examples of abused substances included in this category are excessive amounts of food and compounds containing such agents as aspirin, nicotine, or caffeine.

D. HEALTH SERVICES DELIVERY

The primary purpose of research shown here is to improve existing or develop new methods and systems which will provide accessible, high quality and reasonably priced health care delivery. This section consists of lower levels of aggregation based upon the purpose for which the research is being conducted, not by the means by which that purpose

is being accomplished. Therefore, HEALTH SERVICES DELIVERY research directed towards such means as health service organization and management; the development, introduction, coordination, use and productivity of manpower and other resources; and statistical and data systems development, but research into such means will be classified by its primary purpose. For example, research to lower the costs of delivering health services by improving the productivity of health manpower is shown under V. D. 2., CONTROL AND REDUCE COST. Thus, manpower research will be reported throughout this section based upon the primary purpose of the manpower research.

Research which has a primary purpose of affecting the health service delivery associated with a specific entry in any of the first three sections of V., HEALTH, should be shown in those sections. For example, research to improve mental health care delivery specifically will be shown in V. B., MENTAL HEALTH, rather than in this section.

1. IMPROVE QUALITY

The purpose of the research shown here is to maintain and improve the quality of health care delivery. This section includes research on health service organization and management, on health service delivery resources (including manpower and plant resources) and on data and statistical systems whose primary purpose is to maintain or improve quality of health service delivery. Research to develop or assess the impact of financing methods whose primary purpose is to improve quality will be shown here.

The following research objectives exemplify the type of work to be shown here: devise methods to measure quality of health care delivery including development of health status indicators; identify what is to be measured, such as important elements of the health care process, relationships of that process to resources and their organization, etc.; design mechanisms to control the performance of various types of providers; compare alternative approaches to control and improve the quality of health services; and measure impact on quality of various changes in the structure and organization of health care delivery systems.

2. CONTROL AND REDUCE COST

The primary purpose of research shown here is to control or reduce the cost of health care delivery to the consumer. This includes research into health services organization and management, such as the improvement of health maintenance organizations; the introduction, development, coordination, use and productivity of resources (including manpower); and data and statistical systems whose primary purpose is to control or reduce costs. Research to develop or assess the impact of financing methods and reimbursement schemes whose primary purpose is to control or reduce costs will be shown here.

The following research objectives exemplify the type of work to be shown here: study work patterns of doctors and nurses which might result in economies; substitute different types of resources and alternative resource mix to deliver health services; examine effects of consumer preferences on the price of medical care; assess the impact on cost of alternative methods of capital financing; examine impact on costs of various reimbursement schemes and direct and indirect subsidies; and examine cost effects from over-use of health services due to new or improved financing methods (such as national health insurance).

3. IMPROVE ACCESSIBILITY

The primary purpose of research here is to improve the accessibility and availability of health services to consumers. Research into resource development, utilization and management, health service organization and management, and methods of educating the public about health problems and ways to counter them will be shown here. Research which has a primary purpose of alleviating inequities of access to health services among various socioeconomic groups and geographic areas will be shown here. Work to develop or improve alternative modes of insurance (including national health insurance), payment and reimbursement and other financing schemes whose primary purpose is to improve the accessibility of health service or research to assess the impact of such financing methods on the accessibility of health service will be shown here.

Research concerning the development of a system of national health insurance will be reported as a separate subtotal and will be included in the total for V. D. 3., IMPROVE ACCESSIBILITY.

The following research objectives exemplify the type of work to be shown here: examine barriers to preventative health services uses; develop regional forms of health service delivery organization to improve availability; communication techniques such as remote satellite clinics and "picture-phones" to improve accessability; examine effects on accessibility of hospital mergers; evaluate medical centers' impact on health service delivery; and examine effects on availability of financing methods that do not pay essential costs to the provider.

Exclude research into financing methods which are primarily oriented toward improving the quality or reducing or controlling the cost of health service delivery. Such research should be shown in the appropriate section in this objective (either V. D. 1., IMPROVE QUALITY, or V. D. 2., CONTROL AND REDUCE COST).

VI. HOUSING AND COMMUNITY DEVELOPMENT

HOUSING AND COMMUNITY DEVELOPMENT

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Encompasses research and development which will:

--Increase housing opportunities for those Americans with limited access to housing;

--Improve safety and standards to protect building owners and occupants;

--Improve construction and delivery of housing so as to reduce its cost;

--Improve housing management (particularly public housing);

--Improve housing maintenance processes;

--Improve neighborhood preservation and revitalization;

--Understand the forces of growth and development; and

--Develop strategies for those activities (such as taxation mechanisms and land use control techniques) which can shape the direction and quality of growth and development.

These objectives apply where appropriate to rural as well as urban growth and development.

Exclude research to minimize the adverse effects which housing, community and area development might have on the general environment (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

Exclude research to improve the capability, efficiency and effectiveness of state and local governments in planning, managing and delivering their programs and services which are not specifically related to housing or community development. Such research is shown where appropriate in XIII., OTHER.

Exclude research to develop systems and technologies which will

provide and utilize energy more efficiently and effectively (See II., ENERGY DEVELOPMENT AND CONSERVATION).

A. HOUSING

Encompasses research to develop programs which increase housing opportunities for those Americans with limited access to housing; research to improve safety and standards to protect building owners and occupants; research to improve construction and delivery of housing so as to reduce its costs; research to improve housing management (particularly public housing); and research to improve the housing maintenance processes.

1. INCREASING OPPORTUNITIES

Encompasses research to increase the understanding of the causes of inadequate housing and to increase housing opportunities for those Americans with limited access to adequate housing due to such problems as insufficient income, discriminatory housing practices, and housing requirements of special-user groups such as the aged and disabled. Also includes research to assess consumer needs and their interface with the housing market. The areas discussed below will assist in determining what research is shown here.

Provide Monetary Assistance To Enable People To Secure Adequate Housing: Ecompasses research to examine and understand people's inability to afford adequate housing and research to develop and test programs which enable people to afford adequate housing including direct cash assistance as well as other forms of subsidies. Examples of work shown here include research to determine how families are using their housing subsidy, how the housing market reacts to housing allowances, and how housing allowance programs can be better administered.

Eliminate Discrimination In The Housing Market: Encompasses research to improve understanding of discriminatory practices in the housing market; improve methods of complying with equal opportunity statutes and regulations; and develop and test techniques to promote equal opportunity and fair housing practices. Examples include research to study discrimination in real estate broker and salesperson examination and licensing, and develop equal opportunity housing practices in rural areas.

Address The Needs Of Special-User Groups: Encompasses research directed toward understanding and meeting housing requirements which are peculiar and unique to special-user groups. An example is research to develop property tax relief measures geared specifically for the elderly.

Housing Markets And Consumer Education: Encompasses research to improve the consumers understanding of and interaction

with the housing market so as to increase their capability to acquire adequate housing. Includes research to examine consumers' attitudes toward the housing market.

2. IMPROVING SAFETY AND STANDARDS

Encompasses research to achieve safer buildings including research to develop new methods, materials and technologies to construct safer buildings, research to promote the adoption and application of these new technologies, and research to determine safety standards for the buildings and their components.

Exclude research to develop technical reports, operating procedures and practical methods (such as architectural and structural security innovations, streetlighting, and alarm systems) which will prevent and reduce crime in housing developments and surrounding neighborhoods (See VII. A., PREVENTION OF CRIME).

The areas discussed below will assist in determining what type of research is shown here.

Fire Safety: Encompasses research to increase the fire safety of buildings. Includes research to develop new methods, materials and technologies; to promote the adoption of new fire safety technologies; to develop methods for comprehensive fire safety system analysis; and research to develop standards for fire safety systems which will increase the fire safety of buildings. Examples include research to test the flammability of housing material; to test smoke and flame spread, and to develop smoke detection devices.

Reduce The Hazard Of Lead-Based Paint Poisoning: Encompasses research to understand the nature and extent of lead-based paint poisoning and develop methods for its detection and elimination. Exclude research directed toward improved methods of treating lead-based paint poisonings (See V. A. 13., INJURIES NOT RELATED TO DISEASES).

Disaster Housing Research: Encompasses research on programs to improve temporary housing for disaster victims and improve buildings' resistance to natural disaster forces (including improving building design standards related to disaster resistance). Exclude research to understand or control natural disasters (See III. D.4., DISASTER AND NATURAL HAZARDS STUDIES AND CONTROL).

Increase Safety Of Buildings: Encompasses research to develop new methods, materials and technology which increases the safety of buildings; research to develop performance criteria, standards, and test methods by which housing systems or materials may be evaluated and used by local code officials, architects, engineers, etc.; and research to promote the adoption and application of new technology in the market. Examples include research to develop guidelines minimizing building failure risk, improving structural tests for building components, work to reduce the danger of gas explosion and studies on mobile home safety.

3. IMPROVING CONSTRUCTION, DELIVERY AND COSTS

Encompasses research to develop and demonstrate the latest methods amd materials by which houses and buildings can be built at a lower cost and/or a higher quality; research to determine the feasibility of improved construction techniques; research to increase material and natural resources' conservation in housing construction and operation; research to improve the understanding of factors affecting housing financing, production and supply; and research to increase savings in non-construction costs such as acquisition costs. Examples of work shown here include research to improve all weather construction methods, study new piping material and structural adhesives, and develop new masonry water proofing methods; research on new framing and sheathing methods which result in lumber savings; and investigations into rural housing financing and studies of land parcel recordings in order to reduce closing costs.

Exclude research performed primarily to develop and demonstrate construction methods which increase the safety of buildings. (See VI. A. 2., IMPROVING SAFETY AND STANDARDS).

Exclude research to increase energy conservation in housing construction and operation (See II. H., ENERGY CONSERVATION).

4. IMPROVING HOUSING MANAGEMENT

Encompasses research to improve the efficiency and effectiveness of housing management. Primarily includes research directed toward improving multi-family housing management, particularly public housing. This involves research to improve local housing authorities (LHA's) ability to manage low rent housing.

5. IMPROVE HOUSING MAINTENANCE

Encompasses research to promote the maintenance and rehabilitiation of basically sound but currently obsolete housing of all types for occupancy by all income groups. Research here focuses mainly on problems and restraints to the individual property owner as compared to problems of the entire community (See VI. B. 1., PRESERVE AND REVITALIZE NEIGHBORHOODS). Examples of research to show here are studies to understand present maintenance and rehabilitation processes and studies to determine better alternatives if any to these processes.

B. COMMUNITY DEVELOPMENT

Encompasses research to improve the preservation and revitalization of neighborhoods, to understand the forces of growth and development, and to develop strategies for those activities (such as taxation mechanisms and land use control techniques) which can shape the direction and quality of growth and development. These objectives include where applicable research directed toward rural as well as urban growth and development.

1. PRESERVE AND REVITALIZE NEIGHBORHOODS

Encompasses research to determine the appropriate public and private actions to prevent neighborhood decline; research to revitalize advanced decay areas; and to prevent decline where neighborhood instability is influenced by undisposed vacant properties. The areas discussed below will assist in determining what types of research to show here.

Preservation Analysis and Demonstration: Encompasses research to develop an understanding of the causes and processes of decline; to develop means which identify neighborhoods susceptible to decline and preservation activities; to identify those activities which can reverse the decline process and promote the preservation process; and demonstrate local actions which have been successful in neighborhoods.

Revitalize Neighborhoods: Encompasses research to develop and promote the adoption and application of successful revitalization programs.

Acquired Properties Disposition: Research to develop additional techniques to dispose of HUD acquired properties without promoting a decline in neighborhood value. Includes

research to design and test methods to prevent, cure, and treat defaults and foreclosures and thus reduce the drain on mortgage insurance funds.

2. COMMUNITY DEVELOPMENT AND GROWTH

Encompasses research to understand the forces of growth and development and to develop strategies for those activities (such as taxation mechanisms and land use control techniques) which can shape the direction and quality of growth and development. This objective includes where applicable rural as well as urban growth and development. The areas discussed below will assist in determining what type of research to show here.

Community Growth Research: Includes research to strengthen community strategies for growth and development as related to the economic feasibility of development program implementation and program effects on the community's economic base. An example is research to increase awareness and understanding of how local government can and does affect local economic development.

New Communities Research: Research to increase understanding of new communities as a mechanism for development and growth. Includes research to maintain the viability of existing new communities.

Taxation Mechanisms: Research to develop efficient and equitable taxing mechanisms which can be used to further State and local development and management strategies.

Land Use Control Techniques: Include research to develop land use control techniques as effective and equitable tools for community development and growth.

VII. LAW ENFORCEMENT AND JUSTICE

LAW ENFORCEMENT AND JUSTICE

VII. LAW ENFORCEMENT AND JUSTICE

Includes all research primarily directed toward improving the prevention or deterrence of criminal acts, the detection and investigation of crimes, the search for and apprehension of suspects, the trial and sentencing of criminal offenders, and the incarceration and rehabilitation of criminal offenders. Research into individual criminal behavior and research into the prevention and treatment of drug abuse and alcoholism is excluded from this objective (See V. B., MENTAL HEALTH and V. C., SUBSTANCE ABUSE).

A. PREVENTION OF CRIME

Encompasses research primarily directed toward improving society's ability to prevent or deter crime whether through the use of equipment, personnel information or other means. This includes research into architectural and structural security innovations, streetlighting, alarms or alarm systems, effective uses of available police forces, changing community attitudes to reduce the incidence of crime; surveillance techniques and controls to prevent or deter criminal acts directed toward persons and cargoes of domestic and international transportation systems (hijacks); improvements in communications techniques intended to improve the preventative capabilities of police forces; methods for reducing "crimes of opportunity"; police community relations activities; and training of police and other persons in prevention techniques. Research which is directed toward the prevention of alcoholism and drug abuse is excluded from this subobjective (See V. C., SUBSTANCE ABUSE). However, research into new or improved methods for preventing trafficking in illicit drugs is included and should be reported as a separate amount and as part of the total for PREVENTION OF CRIME. Exclude from this subobjective that research which is primarily directed toward prevention or deterring the delinquency of and crimes by juveniles (See JUVENILE JUSTICE, below).

B. LAW ENFORCEMENT

Encompasses all research directed toward improving the detection, identification and apprehension of persons suspected of committing a crime. Includes research into methods of identifying, acquiring, preserving and analyzing evidential matter, new types of evidential matter such as individualization of physiological fluids, investigative methods and techniques, the use of communications to increase police effectiveness and aid in suspect identification and apprehension. That research which is primarily directed toward the detection, identification and apprehension of persons suspected of trafficking in illicit drugs should be reported as a separate amount and as part of the total for LAW ENFORCEMENT. Exclude from this category research primarily directed toward detection, identification and apprehension of juveniles suspected of crime and research directed toward enforcing delinquency laws (See JUVENILE JUSTICE, below).

C. ADJUDICATION

Encompasses research into all aspects of the judicial process from the point following the arrest of a suspect to the sentencing of the convicted offender. Includes research into the operations of the court system, new or improved methods of processing criminals, the conduct of trials, the preparation and prosecution of cases, alternative sentences, the functions and handling of juries, the training of judges and other judicial personnel, and the increased participation of victims and witnesses in the adjudication process. Exclude from this subobjective research which is primarily directed toward improving the judicial processes for juvenile offenders (See JUVENILE JUSTICE, below).

D. CORRECTIONS

Encompasses research into the post-conviction handling of a criminal offender including research into probation, parole, recidivism, alternative correctional institutions, work-study programs, early-release, alternatives to incarceration, halfway houses, rehabilitation programs for prisoners, prison environments and characteristics, post-incarceration assistance to former convicts, and deinstitutionalization of offenders. Research dealing with the treatment of drug addicts and alcoholics which is directed toward curing addiction is excluded from this subobjective (See V. C.,

SUBSTANCE ABUSE). Also, research primarily directed toward the post-conviction handling of juvenile offenders is excluded from this subobjective (See JUVENILE JUSTICE, below).

E. JUVENILE JUSTICE

Encompasses all research primarily directed toward improving the prevention or deterrence of delinquency and crimes committed by juveniles, the enforcement of laws as it relates to juveniles, and judicial process for juvenile suspects, the post-conviction handling of juvenile offenders, and the understanding of juvenile crime and delinquency. Research directed toward the treatment of juvenile drug addicts and alcoholics which is directed toward curing addiction is excluded from this subobjective (See V. C., SUBSTANCE ABUSE). However, that research which is directed toward the prevention, and the detection, identification and apprehension of juveniles suspected of trafficking in illicit drugs should be reported as a separate amount and as part of the total for JUVENILE JUSTICE.

F. UNDERSTANDING OF CRIME

Encompasses research primarily directed toward improving the knowledge about and understanding of crime and criminal phenomenon which cannot be assigned to one of the other subobjectives. Included would be research into the incidence of a motivation for homicide in correctional institutions and studies of organized crime. Exclude research directed toward individual criminal behavior (See V. B., MENTAL HEALTH). Also exclude research directed toward the understanding of juvenile crime and delinquency (See JUVENILE JUSTICE, above).

G. JUSTICE TECHNOLOGY

Encompasses research directed toward the equipment, communications, information systems, weapons, vehicles, clothing, facilities and management and personnel techniques used by police and other law enforcement personnel which cannot be assigned to the other subobjectives.

VIII. MILITARY

VIII. MILITARY

Encompasses research to improve the systems, technology, equipment and operations that perform exclusively military objectives. More specifically, MILITARY includes research to improve the capability of deterring nuclear attack or failing this, allows effective and appropriate retaliation; defending the continental United States against attack; and conducting combat, primarily non-nuclear, activities.

The funding for Department of Defense research which also has potential to contribute to solving national problems, as defined in the balance of this overall structure, should be included under the appropriate non-military category. As examples, research to reduce the noise of military jet engines would be shown under III. C. 5., NOISE; research to improve the means of immunizing soldiers against malaria would be shown under V. A. 12., INFECTIOUS AND PARASITIC DISEASES; and research to increase the energy efficiency and reduce the energy consumption of most naval vessels will be shown under II. H. 4., REDUCE ENERGY CONSUMPTION BY END-USERS.

A. DETER ATTACK

The objective here is to develop, maintain and control a nuclear strike capability which will prevent or deter nuclear attack or coercion by threat of nuclear attack on the United States or its allies, and failing this, allows effective and appropriate retaliation. Research in this objective focuses on the TRIAD of delivery systems: land-based missiles, sea-based missiles and aircraft; their control and related nuclear weapons development.

Exclude research on weapons systems that is not conducted primarily to strengthen nuclear deterrence capability. However, research conducted primarily to improve an aircraft's capability to deliver nuclear weapons will be shown here regardless of its ability to deliver non-nuclear weapons also.

1. LAND-BASED MISSILES

This category focuses on research which pertains to improving and insuring the quality, survivability, penetration capability and flexibility of the force. Includes research and development to improve reentry vehicles for land-based missiles only.

Exclude research to provide site defense (See VIII. B., DEFEND CONTINENTAL UNITED STATES AGAINST ATTACK) and to improve reentry vehicles for sea-based missiles (See SEA-BASED MISSILES below).
The following specific goals exemplify the kind of work which will be shown under this category:

Upgrade hardness of silos;
Increase yield to weight ratio of present reentry vehicles;
Demonstrate capability to carry more reentry vehicles on present and future generations of land-based missiles;
Develop alternate basing modes;
Improve reentry vehicles materials;
Obtain very high accuracies for reentry vehicles;
Develop terminal guidance technique with all-weather capability;
Develop light penetration aids;
Improve maneuvering capability of reentry vehicles; and
Improve weapon delivery by using advanced targeting techniques;

2. SEA-BASED MISSILES

This objective includes research to maintain the survivability of ballistic missile submarines and the effectiveness of the missiles they launch and their reentry vehicle systems.
Examples of specific goals which comprise this category:

Provide longer range missiles;
Increase available operating areas for missile launch platforms;
Maintain survivability of older submarines by improving their sonar and navigation subsystems;

Develop new, smaller, less costly SSBNs;
Develop higher power long-life reactor cores necessary for increased ship speed and size, simpler operating and maintenance requirements and increased reliability and maintainability of reactor plant concepts;
Conduct conceptual design studies of nuclear propulsion plants for potential application in future ballistic missile submarines;
Explore threats and countermeasures for SSBNs;
Upgrade and advance SSBN-launched reentry vehicle flexibility, survivability, accuracy and penetration capability;
Determine phenomena contributing to systems vulnerability and develop countermeasures to enemy capabilities; and
Develop and improve cruise missiles which can be launched from standard size torpedo tube or surface ships.

Exclude research and development on cruise missiles used in non-nuclear deterrent situations.

3. AIRCRAFT

This objective includes research to improve the survivability, payload, bombing accuracy, speed and penetration capabilities of aircraft which can deliver nuclear weapons and consequently deter nuclear attack. Examples of specific goals which comprise this category:

Increase pre-launch survivability by improving reaction time, speed and hardness;
Provide a weapons platform to launch cruise missiles, SRAMs and gravity bombs;
Improve bomber defense weapons;
Improve design and performance characteristics of new tankers which assure adequate refueling support;
Enhance bomber penetration by ECM, self-defense systems warning sensors and active defense weaponry; and
Develop and improve cruise missiles which can be launched from aircraft and which carry nuclear weapons.

4. DETERRENT WEAPONS DEVELOPMENT AND PROTECTION

Includes research to improve the production of nuclear materials used in weapons manufacture; the development and test of specific weapons needed by DoD; and the capability to detect, locate and identify nuclear detonations.

This objective also includes research to understand better laser-induced and electron beam-induced implosion fusion with applications for weapons simulation and modelling and to improve means of controlling and protecting nuclear materials. Include here only that research and development which has military applications exclusively. Examples of specific goals which comprise this category:

Improve means of isotope separation techniques which apply only to nuclear weapons development;
Assure design integrity of weapons in development status and provide firm basis for future weapons development by continuously gathering information;
Participate in surface-based and satellite-based sensor programs to improve means of detecting nuclear detonations;
Improve weapons effects simulation and physics modelling by use of laser and electron beam-induced implosion fusions; and
Define threats, develop guard and response force structures, review safeguards systems, develop and analyze concepts and improve engineering development to protect and control nuclear materials and weapons.

Exclude research related to nuclear materials and processes that pertain to both civilian and military objectives. Also exclude from the entire research and development structure obligations for the production of nuclear weapons as approved by the President and the surveillance of completed nuclear weapons required to meet military needs. This is not research funding.

5. COMMAND AND CONTROL ELEMENTS OF NUCLEAR DETERRENCE

Includes research to provide reliable, survivable and secure systems to insure that nuclear deterrence forces are immediately responsive to political and military decisions to maintain deterrent credibility and provide confidence in ability to respond flexibly. Examples of specific goals which comprise this category:

Increase survivability, reliability and security in command and control systems;
Improve means of supporting decision-making and executing retaliatory strike orders after absorbing a massive attack which could include selected strategic targets;
Evaluate viability of communications systems in presence of interference from high altitude nuclear detonations; and
Improve the survivability of related satellites.

6. NUCLEAR DETERRENCE-GENERAL

Encompasses research development and technology which primarily applies to efforts to deter nuclear attack but which cannot be assigned to a specific sub-objective of that category or which can be assigned to two or more sub-objectives equally. For example, electronics, navigation or nuclear weapons effects research which relates to both land and sea-based missiles will be shown here.

B. DEFEND CONTINENTAL UNITED STATES AGAINST ATTACK

This objective focuses on research to improve warning, attack assessment and defense systems or capabilities related to intercontinental attacks launched at the Continental United States. It includes both ballistic missile and aircraft attacks. Also specifically included here is research related to satellites which are used to identify, provide warning of or defend against intercontinental attacks.

1. BALLISTIC MISSILE WARNING

This research focuses on improving defensive techniques and equipment needed to protect key U.S. systems from attack. It includes research to improve warning and identification capability and increase reliability and survivability of these systems. Includes research on satellite systems to detect rocket launches and to detect, track and identify flying objects and to improve the survivability of satellites used for these purposes. Examples of specific goals which comprise this category:

Provide warning coverage aginst new threats;
Reduce vulnerability of warning system to direct attack and electronic countermeasures;
Enhance the quality of information received from combination of warning sensors to characterize better the nature of attack;
Demonstrate feasibility of near realtime ground-based capability to detect and track objects; and
Increase systems resistance to degradation by weapons effects.

2. BALLISTIC MISSILE DEFENSE

This objective includes research to improve, consistent with existing Treaties, area and site ballistic missile

defense (BMD) systems and technical capabilities in BMD to insure the existence of a second strike capability. Examples of specific goals which contribute to this objective:

Provide lower cost defense of ICBM sites than Safeguard can provide;
Reduce costs and increase performance and reliability of sensor systems, computer software and interceptors;
Incorporate new technology into current systems; and
Provide technology base for design and development of new systems.

3. AIR DEFENSE

This objective focuses on research to improve means of detecting and destroying air breathing vehicles attacking the United States. Examples of specific goals directed toward this objective are:

Improve warning capability to detect penetrators, for example, radars and sensors;
Improve means of identifying unknown penetrators and restrict unchallenged overflight of U.S. air space;
Develop Over-the-Horizon Backscatter radar;
Develop single integrated surveillance system; and
Improve SAM capability and develop new air defense interceptor.

4. DEFEND CONTINENTAL UNITED STATES-GENERAL

Encompasses research, development and technology which primarily apply to improving the capability for defending the continental United States against attack but which cannot be assigned to a specific sub-objective of that category or which can be assigned to two or more sub-objectives equally. For example, weapons or communications research that benefits both ballistic missile and air defense should be shown here.

C. COMBAT CAPABILITY

Encompasses research to provide systems and equipment which enable forces to deploy, maneuver, defend and resupply themselves, and engage an enemy force. Work shown here relates to combat activity conducted on land, in the air and on or under water. COMBAT CAPABILITY includes, wherever appropriate, research on the environment or weather which relates directly and exclusively to defensive or offensive combat activities.

Research which has clear potential to contribute to solving national problems, as well as military objectives, should be included under the appropriate national problem. For example, research to improve all weather take-off and landing systems and traffic control systems will be shown under XII. A. 2., IMPROVE AVIATION OPERATIONAL ENVIRONMENT AND EFFECTIVENESS and research to reduce discharge of wastes from ships will be shown under III. C. 2., WATER.

1. LAND WARFARE

Research to provide our land forces with the capability of defending land areas against foreign non-nuclear aggression or establish control over land areas. All logistics research whose primary purpose is to support land warfare objectives will be shown in VIII. C. 1. f., LAND WARFARE LOGISTICS. Communications Command and Control research which can be applied entirely to a specific category within LAND WARFARE will be shown accordingly. Communications Command and Control research which applies equally to two or more categories in LAND WARFARE should be shown in VIII. C. 1. g., LAND WARFARE COMMUNICATIONS, COMMAND AND CONTROL.

Research which has progressed far enough to identify LAND WARFARE as its primary purpose but cannot be applied to any of the LAND WARFARE objectives should be shown in VIII. C. 1. h., LAND WARFARE-GENERAL. Examples of work to show in LAND WARFARE include research to develop counter-systems to armor, artillery, and air threats; increase survivability and effectiveness of attack helicopters and Close-Air-Support (CAS) aircraft; increase survivability, mobility, and firepower of tanks and infantry combat vehicles; increase capability to destroy hard point targets; increase anti-tank missile survivability against counter-measures; and improve systems' capability to perform in night and adverse weather conditions.

a. BATTLEFIELD SURVEILLANCE

Encompasses research to develop systems to provide timely, accurate information on the location, identification, and movement of enemy forces in the combat area. Includes research to: improve surveillance beyond the line-of-sight; identify the type of enemy target; improve means of locating enemy artillery and

mortar; and increase systems' capability to perform in difficult and obstructing geography and adverse weather.

b. CLOSE COMBAT

Encompasses research to develop the capability for infantry and armor to destroy enemy equipment, personnel, and will to fight, to defend positions, and to gain ground. Includes research to: improve tanks' gun armaments, survivability, mobility, and night fighting capability; improve mine detection and neutralization; and develop one-man machine guns, light-weight mortars, and light anti-tank weapons to improve infantryman's combat capability.

c. FIRE SUPPORT

Encompasses research to develop systems and equipment to provide ground gaining forces with close and continuous fire, to deliver counter-battery fire, and to fire on targets in areas of interest. Includes research to: increase weapon effectiveness against hard point targets; increase fire support systems' survivability and night and adverse weather capabilities; increase cannon artillery range; automate artillery data's transmission, receipt, and computation; increase survivability and effectiveness of Close-Air-Support (CAS) aircraft; and improve ocean vessel systems that deliver fire support for land warfare.

d. FIELD ARMY AIR DEFENSE

Encompasses research to develop systems and equipment to limit enemy air first-strike effectiveness against air bases, air defenses, command and control functions, troop concentrations, special ammunition support points and depots. Includes research to: provide medium-to-high, low-to-medium, and low altitude air defense; develop high portability air defense systems; and improve air defense gun systems.

e. LAND WARFARE INTELLIGENCE, RECONNAISSANCE, AND ELECTRONIC WARFARE

Encompasses research to develop electronic systems and technology as an element of combat power in land warfare.

Includes research to develop systems that detect, identify, and locate enemy forces in non-combat areas and under all weather conditions and to provide the ground commander protection through a full range of countermeasures. Examples of work shown here include research to: develop penetration aids and countermeasures to hostile ground based and airborne weapons; improve mapping, charting, and geodetic position-location systems for field support; and reduce our forces vulnerability to electronic warfare.

f. LAND WARFARE LOGISTICS

Encompasses research whose primary purpose is to improve equipment procurement, supply, and maintenance; improve personnel movement; and provide facilities in support of one or several of the above LAND WARFARE objectives. Includes work to: improve aerial delivery of supplies to isolated units with enemy contact; provide over-the-track support of forces ashore; provide rapid and positive identification of mass casualties; and provide offshore support of amphibious assault and subsequent operations ashore to reduce the size, number, and vulnerability of logistic facilities ashore.

g. LAND WARFARE COMMUNICATIONS, COMMAND AND CONTROL

Communications Command and Control research which applies or supports equally more than one category in LAND WARFARE or which has progressed far enough to identify LAND WARFARE as its primary purpose but cannot be applied to any of the LAND WARFARE categories should be shown here. Communications Command and Control research which can be specifically applied to a single category within LAND WARFARE should be shown in that category.

h. LAND WARFARE-GENERAL

Encompasses research which has progressed far enough to identify Land Warfare as its primary purpose but cannot be applied to primarily one LAND WARFARE category.

2. AIR WARFARE

Encompasses research that provides the capability to defend and/or establish control of the air by dominating air battle over the forward edge of the battle area (FEBA), striking targets deep in enemy territory, and developing countermeasures to enemy air defense systems. All logistics research whose primary purpose applies or supports one or more AIR WARFARE objectives is shown in VIII. C. 2. e., AIR WARFARE LOGISTICS. Communications Command and Control research which can be applied entirely to a specific objective within AIR WARFARE should be shown as such. Communications Command and Control research which applies or supports equally two or more objectives in AIR WARFARE is shown in VIII. C. 2. f., AIR WARFARE COMMUNICATIONS, COMMAND AND CONTROL.

Research which has progressed far enough to identify AIR WARFARE as its primary purpose but cannot be applied primarily to one AIR WARFARE category is shown in VIII. C. 2. g., AIR WARFARE-GENERAL.

Exclude research on those air systems which perform LAND WARFARE objectives. For example, exclude research to improve Close-Air-Support aircraft. (See VIII. C. 1. c., FIRE SUPPORT.) Exclude research which has definite applications and benefits to objectives in the overall structure other than MILITARY. For example, exclude heavy lift helicopter technology (See XII. A. 1., IMPROVE VEHICLES).

a. AIR SUPERIORITY

Encompasses research to provide systems enabling U.S. to gain and maintain dominance in air battle over the forward edge of the battle area and enemy territory. Includes research to provide air combat maneuvering training to our pilots against dissimilar aircraft; and improve short range air-to-air missiles, cannon systems, ammunitions, and anti-radiation missiles.

b. DEEP STRIKE/INTERDICTION

Encompasses research which provides the capability to destroy highly defended targets (such as shelters, runways, and command centers) beyond the forward edge of the battle area and in the enemy's heartland under day/night and adverse weather conditions. Includes research to develop: munitions for use against hard targets, cluster munitions for area targets, land and shallow water mines, and anti-personnel fuel-air explosives.

c. AIR DEFENSE SUPPRESSION

Encompasses research to provide systems and technology which will locate, degrade, and/or destroy enemy air defense systems from beyond their lethal range. Includes research to develop high-speed missiles to destroy SAM's and enemy radar and self-protection systems against SAM's for strike aircraft.

d. AIR RECONNAISSANCE AND INTELLIGENCE

Encompasses research to develop systems and technologies to detect, locate, classify and identify enemy forces in order to achieve AIR WARFARE objectives. Includes systems and techniques to correlate, disseminate, and display this information for immediate operational use. Includes work to: develop an all-weather reconnaissance and surveillance capability; provide real-time target information to strike elements; develop processing, dissemination, and display systems to provide correlated information; and provide information on enemy targets and threat activity.

Exclude reconnaissance and intelligence research directed towards LAND WARFARE objectives, (See VIII. C. 1., LAND WARFARE).

e. AIR WARFARE LOGISTICS

Encompasses logistics research whose primary purpose is to improve equipment procurement, supply, and maintenance, personnel movement, and provide facilities in support of one or several of the above AIR WARFARE objectives.

f. AIR WARFARE COMMUNICATION, COMMAND, AND CONTROL

Encompasses Communications Command and Control research which applies or supports equally more than one objective in AIR WARFARE or which has progressed far enough to identify AIR WARFARE as its primary purpose but cannot be applied to any of the AIR WARFARE objectives. That research which can be specifically applied to a single objective within AIR WARFARE should be shown under that objective.

g. AIR WARFARE-GENERAL

Encompasses research which has progressed far enough to identify AIR WARFARE as its primary purpose but cannot be applied primarily to one AIR WARFARE objective.

3. OCEAN CONTROL

Encompasses research to enable naval forces to provide freedom and protection of sea lanes for material supply to U.S. industrial and defense needs and resupply during a war and provide a flexible naval response in crisis situations. Logistics research whose primary purpose is to support OCEAN CONTROL objectives is shown in VIII. C. 3. f., OCEAN CONTROL LOGISTICS. Communications Command and Control research which applies equally to two or more objectives in OCEAN CONTROL is shown in VIII. C. 3. g., OCEAN CONTROL COMMUNICATIONS, COMMAND AND CONTROL, Communications, Command and Control research which can be applied entirely to a specific objective within OCEAN CONTROL should be shown as such.

Research which has progressed far enough to identify OCEAN CONTROL as its primary purpose but cannot be applied to any of the OCEAN CONTROL objectives is shown in VIII. C. 3. h., OCEAN CONTROL-GENERAL.

a. OCEAN SURVEILLANCE

Encompasses research to develop systems and methods to acquire, correlate and provide data on the deployment, location, and type of major combatants (including enemy submarines and Ballistic Missile Submarines) and to provide surveillance of any ocean waters in

which the Navy performs its missions. Includes research to: improve signal, information processing, localization and tracking systems; improve system performance in all environments; and develop mobile/deployable systems.

b. FLEET OFFENSE

Encompasses research to improve and develop weapons to increase the Navy's capability and survivability in performing the following missions: destroy enemy ships; inhibit enemy commercial and military traffic movement through blockades; conduct tactical strikes against land targets (if such attacks are conducted to achieve or support objectives in LAND WARFARE, show research in support of these attacks in VIII. C. 1., LAND WARFARE); and support troops ashore. Includes only that research on submarines, surface combatants and aircraft weapon systems intended to destroy ships. Research on other parts of the fleet's offensive capability are shown in other sections of OCEAN CONTROL based upon their primary purpose. Exclude research on launched weapons intended for use against shore targets. Exclude research to improve amphibious assaults. (See VIII. C. 1. b., CLOSE COMBAT)

c. FLEET AIR DEFENSE

Encompasses research directed toward area defense weapon systems to defend high value ships and self defense weapon systems for short-range defense of ships in which they are installed. Area defense systems research is conducted to provide the naval forces with a capability of reducing attacking air threat to levels which can be defended by individual ship self defense systems. Self defense systems research is directed towards developing the capability to defend against a few anti-ship air threats delivered in a short time interval.

d. FLEET ANTI-SUBMARINE WARFARE (ASW)

Encompasses research to provide the capability to protect naval forces and material shipped by sea transport from hostile submarines. Examples of work to show here include systems to offset countermeasures and systems to improve kill probability.

Exclude research to improve location, tracking, and other surveillance type systems for submarines. (See VIII. C. 3. a., OCEAN SURVEILLANCE).

e. NAVAL MINE WARFARE

Encompasses research to improve mine systems performance in offensive and defensive roles. Includes mine research to provide the exact level of attrition in (and only in) the intended area with reliability, target selectivity, and resistance to anticipated countermeasures; improve the detection, localization, and neutralization of hostile mining operations; and improve delivery platform destruction, area neutralization (mine sweeping), individual mine locations and neutralization (mine hunting), and individual ship protection measures.

Exclude countermeasures against mine delivery vehicles. Such work is shown in the section whose purpose is to locate and destroy such vehicles.

f. OCEAN CONTROL LOGISTICS

Encompasses logistics research whose primary purpose is to improve equipment procurement, supply, and maintenance, personnel movement, and provide facilities in support of one or several of the above OCEAN CONTROL objectives. For example, research to improve underway replenishment of combatant ships is shown here.

g. OCEAN CONTROL COMMUNICATIONS, COMMAND AND CONTROL

Encompasses Communications, Command, and Control research which applies or supports equally more than one objective in OCEAN CONTROL or which has progressed far enough to identify OCEAN CONTROL as its primary purpose but which cannot be specifically applied to any of the OCEAN CONTROL objectives. That Communications, Command and Control research which can be specifically applied to a single objective within OCEAN CONTROL should be shown under that objective.

h. OCEAN CONTROL-GENERAL

Encompasses research which has progressed far enough to identify OCEAN CONTROL as its primary purpose but cannot be applied primarily to one OCEAN CONTROL objective.

4. COMBAT CAPABILITY-GENERAL

Encompasses research which has progressed far enough to identify COMBAT CAPABILITY as its primary purpose but cannot be applied primarily to a COMBAT CAPABILITY objective. Also includes research which applies to, supports, or performs equally more than one objective in COMBAT CAPABILITY, has wide applicability and cannot be entirely applied to a single objective within COMBAT CAPABILITY. For example, includes logistical systems to improve equipment maintenance or work to increase communication systems service speed which supports more than one objective within COMBAT CAPABILITY. More specifically, includes research to improve aircraft carriers which launch aircraft that perform LAND WARFARE, AIR WARFARE, and/or OCEAN CONTROL objectives.

5. THEATER NUCLEAR FORCES

Conventional forces are primarily used to counter conventional aggression. But circumstances worse than those for which conventional forces are planned could warrant the use of Theater Nuclear Forces (TNF) in conjunction with conventional forces. Research shown here is to develop the capability of limited but effective TNF use in the immediate battle area and a capability for a range of limited attacks against fixed theater-wide targets. Includes work to provide TNF with: minimal vulnerability to attack, advantages over conventional force alternatives; capability for flexible, limited, selective, effective attacks without excessive collateral damage; and security against unauthorized use.

D. DEFENSEWIDE APPLICATIONS

To the maximum extent practicable, research which has exclusively military applications will be classified under DETER ATTACK, DEFEND CONTINENTIAL UNITED STATES AGAINST ATTACK and COMBAT CAPABILITY. If research does not apply primarily to one of those categories but is exclusively military research, it should be reported here. In addition, DEFENSEWIDE APPLICATIONS includes military research which is conducted to meet two or more military objectives equally. As examples, research to improve sensing devices deployed to gather intelligence to facilitate air warfare would be shown under VIII. C. 2., AIR WARFARE while intelligence gathering research and development

which applies equally to DETER ATTACK and COMBAT CAPABILITY will be shown here.

This objective includes research to improve defensewide communications, develop more accurate navigation and position-fixing systems, improve support for current users of intelligence, study nuclear effects, improve military personnel management and resolve biomedical problems that apply solely to military personnel.

Exclude research which has clear potential for civilian contribution as well as military contribution (See notes under MILITARY). Such research would be shown elsewhere in the structure.

1. INTELLIGENCE SYSTEMS

Includes research conducted to improve the means and methods of collecting, analyzing and disseminating information about potential threats to the security of the U.S. and its armed forces. Includes work to give longer lead time in crisis warnings to field commanders so they can deploy their forces; expand technical collection to cope with sophisticated target environment and monitor detente treaties; provide better information to the analyst more quickly; and improve intelligence presentation to user. Specific examples include work to: develop programs which determine enemy force capabilities; develop systems to correlate and automate data support and information dissemination; improve systems to monitor deployment and operation of threat forces; and systems to provide threat data and projections to support weapons development.

Exclude that work on intelligence which can be assigned solely to a specific weapon system and show such work under the objective with which the weapon system is identified. In addition, exclude intelligence work which can be applied entirely to a specific objective/sub-objective in the Military structure. For example, exclude research on intelligence to increase survivability of our Missile Attack Warning system which would be shown under DEFEND CONTINENTAL UNITED STATES AGAINST ATTACK/BALLISTIC MISSILE WARNING.

2. COMMUNICATIONS, COMMAND AND CONTROL

Research to improve the performance, effectiveness and security of defense-wide Communication, Command and Control systems is shown here. Includes work to:

Provide interoperability of cryptographic and voice processing equipment;
Provide end-to-end security;
Improve voice quality and intelligibility and eliminate or reduce manual interface;
Increase ability to restore DCS trunks and extend long-haul service into remote areas;
Provide long-haul switched digital networks for high-speed, real-time, secure, computer-to-computer and computer-to-remote terminal communications; and
Improve fixed-plant switched control increased reliability and speed.

Exclude work which can be applied entirely to a specific objective/sub-objective in the MILITARY structure. For example, exclude research on communications systems directed towards land warfare purposes and show it in the appropriate subheading of VIII. C. 1., LAND WARFARE or if the work applies equally to more than two of those subheadings, show it in VIII. C. 1. g., LAND WARFARE COMMUNICATIONS, COMMAND, AND CONTROL.

3. AREA NAVIGATION SYSTEMS

Include research to develop accurate and survivable navigation and position-fixing systems which have equal application to two or more objectives in the MILITARY structure. Specifically includes work in the areas of navigation and position-fixing, mapping, and charting, and work to support that ordnance delivery which cannot be applied to military objectives other than DEFENSEWIDE APPLICATIONS. For example, navigation research to support ordnance delivery which applies equally to bombers in nuclear deterrence and ships in ocean control would be shown here.

Also exclude navigation research which does not have exclusively military applications and which can be applied to civilian situations.

Exclude research which can be applied to specific objectives within the MILITARY structure. For example,

exclude, navigation research which improves nuclear weapon delivery to improve nuclear deterrence capability. (See VIII. A. DETER ATTACK).

Another example is navigation systems research to improve the effectiveness of air deep strikes. (See VIII. C. 2., AIR WARFARE).

4. MILITARY PERSONNEL MANAGEMENT AND UTILIZATION

Encompasses research to achieve maximum effective use of military manpower. Includes research on new and better ways of maintaining and improving the performance of military personnel; to develop new and better ways to access, classify, train, sustain and manage careers of an adequate number of servicemen and women; to improve decisionmaking capability; to reduce life-cycle cost of weapon system ownership by reducing personnel and training costs; and to develop training devices and simulators. Exclude research on post-military careers - veterans employment. (See XIII. D., MANPOWER).

5. BIOMEDICINE WITH EXCLUSIVE MILITARY APPLICATIONS

Includes research to find better ways to maintain and sustain performance in adverse circumstances or treat injuries which only result from military operations such as minefields, high velocity fragmentation weapons, anti-aircraft missiles, chemical or biological weapons, nuclear weapons effects on personnel and combat stress. Also includes efforts to provide standards and criteria for exposure to those specific environmental hazards which adversely and exclusively affect military personnel; to improve protective design in equipment, systems and mission operations, such as aircraft armaments, diverse combat situations and submarines; to improve man-machine and man-mission assignment criteria for use in systems, equipment and mission design and utilization. Furthermore, those health activities which have exclusively military applications, such as personnel armor and the development of deep submergence biomedical equipment and techniques, will be shown here.

However, biomedical research which does not apply exclusively to military environments will be excluded and shown under

the appropriate sub-category of HEALTH or other objectives in the overall structure. For example, infectious disease research will be shown in V. A. 12., INFECTIOUS AND PARASITIC DISEASES; alcoholism or drug abuse research will be shown under V. C. 1., ALCHOLOISM, or V. C. 2., DRUG ABUSE; and work to develop aircraft crash injury prevention systems will be shown under XII. A. 3., IMPROVE AVIATION SAFETY. Also exclude that work which applies to non-military situations or environments as well, such as heat, cold, altitude, deep-diving, radar, lasers and aircraft accelerations.

6. NUCLEAR WEAPONS EFFECTS

Includes research to assure maximum survivability against attack and minimizes vulnerability of forces when penetrating enemy defenses.

The work shown here does not apply primarily to another objective or sub-objective of the MILITARY objective. Exclude that nuclear effects research which is conducted primarily to resolve specific problems such as nuclear weapon-carrying missiles survivability and combat fighter survivability. (See VIII. A., DETER ATTACK and VIII. C., COMBAT CAPABILITY).

Also exclude research on nuclear effects on military personnel. (See VIII. D. 5., BIOMEDICINE WITH EXCLUSIVE MILITARY APPLICATIONS).

7. CHEMICAL/BIOLOGICAL WEAPONS

Encompasses research on chemical or biological weapons to improve the capability to defend against or deter such an attack. This includes research into means of warning against attack and delivering these weapons if deterrence fails.

Exclude research oriented toward medical research into the development of vaccines, prophylactic and other therapeutic drugs and other protective measures. (See VIII. D. 5., BIOMEDICINE WITH EXCLUSIVE MILITARY APPLICATIONS).

8. WEATHER MODIFICATION

Includes all research conducted to develop weather as a

destructive force. The research shown here has the primary purpose of creating difficulties or causing damage or harm to an enemy force by modifying the weather which affects an enemy force.

Exclude research which has an exclusive military purpose that is reflected elsewhere in MILITARY and which is conducted to improve the effectiveness of troops, weapons and equipment. This sort of research would be shown elsewhere in MILITARY.

Also exclude research which has the potential to contribute to civilian applications. For example, exclude fog dispersion or lightning modifications. (See III. D. 2., CLIMATE STUDY AND WEATHER MODIFICATION).

IX. NATURAL RESOURCES

NATURAL RESOURCES

IX. NATURAL RESOURCES

Encompasses research on improving the means of assessing, protecting, managing, extracting, processing, marketing, using and reusing resources which exist naturally and can be used for man's advantage. Specifically included here are water; minerals; forests and related resources; land resources like grassland and rangeland; wildlife; and recreation opportunities.

Exclude primarily pollution-oriented research which is conducted to identify pollutant effects, understand pollutant processes and abate or control pollution that may affect the resources shown here (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

A. FORESTS

Includes research to improve the means and methods of assessing, protecting, managing, processing, utilizing, distributing and marketing forest and related resources and products. Also includes research to develop new or improved uses of these resources. The following work exemplifies the research which should be shown here:

Increase timber supply;
Improve management of trees and timber;
Eliminate or control destructive insects and diseases;
Improve means of evaluating forest resources;
Improve management of forest watersheds;
Increase utilization of forest products and forest or milling residues;
Improve economics and marketing of forest resources; and
Improve technology to utilize wood and paper wastes.

Exclude research conducted to improve food and agricultural production, processing, and related activities (See IV., FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS).
Exclude research related to reducing and fighting forest fires (See III. D. 3., DISASTER AND NATURAL HAZARDS SUTDIES AND CONTROL), forest wildlife and forest recreation (See WILDLIFE and RECREATION below, respectively).

B. LAND

Includes research to assess, protect and manage non-foragable wasslands, rangelands, tundra and similar resources. For example, efforts to improve reclamation methods after strip mining or other disturbances will be shown here.

Exclude research related to forest products (see above) and/or research to protect, manage and improve the quality of soil used in food production (See IV. B., IMPROVE PRODUCTION).
Exclude research on land use planning which will be shown throughout the structure where it applies.

C. MINERALS

Includes research to improve the means and technology used in locating, assessing, extracting, processing and recycling minerals. This includes minerals which are on or under the ocean floor.

Exclude metallurgy research (See X. H., MATERIALS).
Exclude research related to energy producing minerals such as oil, gas, coal and uranium (See II., ENERGY DEVELOPMENT AND CONSERVATION).
Exclude research related to minerals which is conducted because of environmental considerations, for example, to reduce pollution which results from iron ore processing. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).
Exclude research related to mining safety (See XIII. F., SAFETY).

1. IMPROVE MEANS OF LOCATING AND ASSESSING MINERAL SOURCES

Includes research to improve the methods and technology used in locating and assessing mineral resources. Work to be shown here is exemplified by efforts to enhance mineral alteration halos.

2. IMPROVE MINERAL EXTRACTION AND RECOVERY TECHNIQUES

Includes research to increase the effectiveness and efficiency of mining techniques. Research to be shown here is exemplified by efforts to:
Maximize recovery of irreplaceable resources;
Improve fragmentation, materials handling and ground control;
Improve water handling and control technology used in mining;

Develop advanced, highly mechanized and automated mining systems;
Improve the use of explosives in mining;
Improve mine layouts, undercutting and ore removal; and
Prevent subsidence and improve fill techniques.

Exclude research to improve means of reclaiming land which has been strip mined (see LAND above).

3. IMPROVE MINERAL PROCESSING TECHNIQUES

Includes research to improve the methods used in processing minerals which have been extracted from the earth. This entry is exemplified by research to recover minerals from ore grades of progressively lower grades, to increase understanding of and technology for materials substitutability, and to improve waste handling and disposal.

4. IMPROVE TECHNIQUES FOR REUSING AND RECYCLING MATERIALS OR PRODUCTS MADE FROM MINERALS

Includes research on improving methods of recovering and recycling mineral products.

5. IMPROVE MINERAL SUPPLY/DEMAND ANALYSIS

Includes research conducted to increase knowledge of mineral information-related activities.

D. RECREATION

Includes research to increase and improve the use of natural resources for recreation purposes. This entry is exemplified by research to:
Improve resource management practices;
Increase understanding of the use of forests, open spaces and parks as recreation environments; and
Identify and coordinate better the various uses of forests.

Exclude research related to wildlife which is shown below. Exclude research to resolve water quality problems that result from increased recreational use. (See III. C. 2., CONTROL AND ABATE POLLUTANTS/WATER).

E. WATER

Includes research to improve the resource assessment, development, planning, conservation and management of estuaries, watersheds and fresh water. Also includes research to improve methods used to convert saline or brackish water to fresh water. In this analysis, snow and ice are considered water sources. This entry specifically includes efforts to increase the water supply for residential, municipal or industrial purposes. In addition, marine plants which are not used for food are included here. The following work exemplifies the research to be shown here:

Develop means of reuse and recycling of water;
Improve water resources planning, policymaking, management, financing, operation, and regulation;
Protect fresh water from overdraft;
Improve the efficiency of water use;
Improve means of measuring and predicting snow accumulation and melt;
Increase useful conversion of snow and ice;
Improve seawater desalting systems which use membranes;
Improve systems which recover fresh water from brackish water; and
Study saline water conversion methods for applicability to geothermal brines.

Exclude research to improve means of irrigation. (See IV. B., IMPROVE PRODUCTION).

Exclude research related to water quality and conversely water pollution such as the adverse impacts of thermal discharges, general degradation of fresh water by pollutants and soil runoff. (See pertinent entries in III., ENVIRONMENTAL QUALITY IMPROVEMENT).

Exclude research to increase understanding of the processes and characteristics of oceans, estuaries and inland water bodies (See X. K., OCEANOGRAPHIC SCIENCES).

Exclude research related to marine animal life (See WILDLIFE below).

F. WILDLIFE

Includes research to assess, maintain and increase diversity and productivity of wildlife and marine animals, to develop and implement

recovery plans for endangered species and develop effective means of controlling undesirable wildlife. Also includes research related to sport fisheries. Work to be included here is exemplified by research to:

Develop better means for enabling salmon to bypass dams on rivers like the Columbia;

Develop more effective means of increasing the Bald Eagle population; and

Develop means of dispersing, distributing or eliminating huge starling and grackle flocks.

Exclude research to determine the effects of environmental contaminants on wildlife, especially on fishery resources (See III. A., IDENTIFY POLLUTANT EFFECTS).

X. SCIENCE AND TECHNOLOGY BASE

SCIENCE AND TECHNOLOGY BASE

X. SCIENCE AND TECHNOLOGY BASE

For the purpose of this analysis the goal of strengthening the nation's SCIENCE AND TECHNOLOGY BASE is defined to include the following:

--Those activities which are undertaken to enhance understanding of any scientific and technological subject and which are not directed primarily toward any other objective in the balance of the structure;

--Those activities which are undertaken to apply knowledge to produce and/or demonstrate the feasibility of new concepts, designs and products and which cannot be said to be clearly directed to any single objective in the balance of the structure but which have equal potential payoffs in two or more objectives; and

--Those activities which are undertaken to develop the basis for broad national science policy decisions.

Specific examples of items to be either included in or excluded from the disciplines within SCIENCE AND TECHNOLOGY BASE may be found within each scope note.

A. ASTRONOMY

Encompasses research to promote a better understanding of our solar system; to better understand the physical structure and evolution of stars; to understand the characteristics of stellar aggregations with small dimensions as compared with the galaxy; and to increase our knowledge of the interstellar medium, the Milky Way Galaxy, extragalactic objects and the evolution and structure of the Universe. A separate entry, ASTRONOMICAL

INSTRUMENTATION AND DEVELOPMENT, is provided for research to improve the instrumentation used in astronomical observations if this or improved instrumentation applies to more than one sub-heading under ASTRONOMY. If it applies exclusively to one sub-heading, it should be shown there. Facilities and instrumentation funding which supports astronomy will be treated as an overhead item in accordance with the GUIDELINES FOR PREPARATION.

1. OUR SOLAR SYSTEM

Encompasses research to promote a better understanding of the several components of our solar system including the sun; planets and satelites; asteroids, comets and the interplanetary medium; and the origin and evolution of the solar system.

Exclude studies of the sun's features which are shared with many other stars as opposed to those studies which relate mainly to the sun itself.

2. STARS AND STELLAR EVOLUTION

Encompasses research to improve the understanding of the physical structure and evolution of stars. All stellar electromagnetic radiations (x-rays, ultraviolet, visible, infrared and radio waves) are observed and studied. Includes research to study stellar births, stellar composition, atmospheric and internal structure of stars, stellar evolution and stability at all evolutionary phases, stellar deaths, and cataloging of the properties of stars.

Exclude solar and binary star research. (See X. A. 3., STELLAR SYSTEMS AND MOTIONS.)

3. STELLAR SYSTEMS AND MOTIONS

Encompasses research to understand the characteristics of stellar aggregations with dimensions small compared with the galaxy, especially as those characteristics are revealed by stellar motions including dynamic coupling. Includes research to study precise observations and catalogs of the positions, motions and parallaxes of stars; stellar associations and clusters; and dynamics of small systems.

4. GALACTIC AND EXTRAGALACTIC ASTRONOMY

Encompasses research to increase knowledge and understanding of the interstellar medium, the Milky Way Galaxy, extragalactic objects and the evolution and structure of the Universe. Includes research to study cosmology, extragalactic objects, Milky Way Galaxy, interstellar medium, radio sources, high energy astrophysics, and cataloging of galaxy properties.

5. ASTRONOMICAL INSTRUMENTATION AND DEVELOPMENT

Encompasses research to improve the instruments used in making astronomical observations. This instrumentation development includes research on the feasibility of new, promising techniques, application of new technologies to astronomical use, design and construction of new instruments, and improvement of existing instruments.

Exclude instrumentation research and development which applies exclusively to one sub-heading within ASTRONOMY and show it there.

B. ATMOSPHERIC SCIENCES

The purpose of the research shown here is to provide a fundamental understanding and knowledge of the physical and chemical properties, the composition, behavior and processes of the planetary atmospheres of the solar system. Includes research on the problems of the mesosphere and thermosphere including the ionosphere, and studies of such phenomena as airglow, aurorae, magnetic fields and radiation belts. Also includes solar-terrestrial research which studies the highest extents of the earth's atmosphere and the near-earth space environment in order to: understand the sun's transmittal of plasmas, radiant energy, and fields into space; study interactions of the sun's particles, fields and radiation with earth's atmosphere; understand coupling processes between the magnetosphere and ionosphere; and use the earth's magnetosphere to observe fundamental plasma processes. The following work exemplifies the type of research to be shown here:

Remote sensing techniques to study physical and chemical processes at various atmospheric heights;
Study ionized components with radar;
Study ultraviolet radiation charged particle interactions;
Assess all phenomena associated directly with luminescence in the high atmosphere;

Study temperature, pressure, density, turbulence and other dynamic and kinetic properties of the upper atmosphere;
Study earth and solar atmospheres' influence on magnetic fields;
Investigate atmospheric plasma instabilities; and
Study relation between sun's magnetic field and communication black outs on Earth.

C. BIOLOGY

Encompasses research to increase the understanding of life and living matter in all its forms and phenomena, both terrestrial and extraterrestrial, except biological oceanography (See X. K., OCEANOGRAPHIC SCIENCES.) All research and development related to biology for which the primary purpose is directed toward another major objective in this structure should be shown there. For example, studies of the contribution of genetic traits to such diseases as tuberculosis, arthritis, or kidney disease should be reported under the specific disease category in the HEALTH objective. Specific exclusions are identified below. Biology is divided below into smaller components for definitional purposes only.

Cellular Biology: This section aims to understand the role of the cell in biological functions. Research is focused on the cell as the fundamental organizational unit of living organisms. It involves the analysis of cellular phenomena at the molecular and subcellular levels and involves the use of a wide range of viruses, bacteria, algae, protozoa, fungi, and higher plant and animal cells. Phenomena for which understanding is sought are: fertilization; cell division, intercellular interactions; the nature, replication, transmission, and expression of genetic material; growth and development; the development, organization, structure, and function of cell organelles; differentiation and acquisition of specialized cell function; and aging. The major elements of cellular biology are described further in the paragraphs below.

Developmental Biology focuses on mechanisms that underlie cell differentiation and the changes that occur in organisms as they pass from the embryonic to the adult state. The goals of research in this segment are to increase our understanding in such areas as fertilization; control of molecular, cellular, and tissue interactions by genetic and epigenetic regulartory mechanisms; mechanisms of cell division and cell movement; differentiation of organelles; ultrastructural morphology of cells and the development of

specialized cell functions.

Genetic Biology concentrates on understanding the organization, transmission, and functioning of the hereditary information. This includes the molecular analysis and organization of genetic material; its replication, recombination, and alteration; and its translation into various cell components. Emphasis is placed on studies of the genetic control of cellular functions. Studies are carried out with viruses, bacteria, and other microorganisms, as well as on higher plant and animal cells.

Human Cell Biology fosters work in mammalian (particularly human) cell research with special emphasis on problems that require multidisciplinary coordinated effort for solution. The specific aim of this group of research is to increase our understanding of molecular organization and structure of chromosomes and membranes, and also the molecular aspects of intracellular regulation. Such research requires support of facilities for growing cells in culture on a mass scale and the development of cell culture and microchemical analysis technology.

Exclude research and development which is performed to contribute to the elucidation of causes, cures, diagnoses, and methods of preventing human diseases (See V. A., DISEASES AND INJURIES.)

Ecology and Population Biology: Research in this group is responsible for promoting an understanding of the attributes of associations of organisms as they occur naturally, as well as those of distinct kinds of plants and animals. This section is further described in the paragraphs below.

Systematic Biology examines the affinities of similar species of organisms and species groups in terms of differentiation, identification and their probable modes of evolutionary origin and development. The aim of such research is to encourage descriptive and evolutionary studies (including population genetics) utilizing theoretical and experimental methods for a wide spectrum of organisms. It includes projects designed to sample endangered biotas and provide baseline descriptive accounts focused on improving basic environmental studies. This section also includes research on the forms of life existing in previous geological periods (paleontology.)

Ecology is concerned with the interrelationships among organisms, and between organisms and their nonliving environment. Organisms occur in nature as population of distinct species of plants and animals within biotic assemblages of definable geographic extent. Their ecological relationships may be studied at several levels of complexity; individual organisms in their abiotic environment, populations, communities and ecosystems. The purpose here is to promote research on the interactions of organisms within various terrestrial and in-land water ecosystems.

Ecosystem Studies are concerned with the comprehensive description of ecosystem structure, the ordering of processes, responses of ecosystems to manipulation or stress, and meaningful simulation and analysis of characteristics. The basic thrust is oriented toward understanding patterns of organization and dynamics of function in ecosystems. Because ecosystems are integrated wholes, it is necessary to maintain parity among component processes and population with respect to depth of understanding. Emphasis is placed on increasing the types of ecosystems under investigation, studying important ecosystem processes, and developing more realistic and efficient simulations and analyses.

Biological research resources insure the availability of resources that are national in scope and considered essential for the conduct of biological research, such as field-research facilities, systematic research collections, living-organism stock centers, and data banking.

Exclude the biological aspects of research projects whose primary objective is the prevention and control of agricultural diseases (See IV. B., IMPROVE PRODUCTION or IV. E., IMPROVE SAFETY), water pollution and pesticide effects (See III. ENVIRONMENTAL QUALITY IMPROVEMENT), and forest and water resources (See IX., NATURAL RESOURCES.)

Biochemistry and Physiology: This group of research is concerned with functional mechanisms operating at three biological levels--molecular, metabolic, and integrative. The objective of research at the molecular level is to identify and characterize the chemical properties and complex interactions of the molecules involved in biological function. The objective at the metabolic level is to investigate the pathways and regulation of the processes involved in the building up and destruction of protoplasm.

The integrative level objective is to study the hormonal and neural mechanisms which underlie the functional states of organisms and their adaptive behavior. Living organisms, in particular multicellular plants and animals, must have a means of transporting materials between their different parts as well as a means of relaying messages so that the different parts and functions operate in a coordinated fashion. Understanding a given function ultimately depends upon elucidating the reactions of its chemical components, identifying the bases of their functional states, and resolving the regulatory mechanisms by which a given process is integrated to function in the organism as a whole. The biochemistry and physiology section is further described in the paragraphs below.

Biochemistry is concerned primarily with the chemical properties and interactions of purified molecules and complexes of molecules involved in biological function. It aims at understanding a given reaction in molecular terms, and how cell structures achieve the high degree of internal molecular order that allows them to carry out sequential and coordinated chemical reactions.

Biophysics promotes investigations of molecular systems at the interface of the biological and physical sciences. Emphasis is oriented toward solving the structure of enzymes, nucleic acids and other micromolecules, and analyzing changes that occur during the functional state in physiochemical terms.

Regulatory Biology promotes research on those processes by which cells, tissues, and organisms are regulated from birth to death. This research effort focuses on the balance and regulation of physiological processes essential for survival in the varied internal and external environments. It includes also the role of hormones in regulating and communication roles.

Metabolic Biology is concerned with those chemical changes in which energy is created or used by biological reactions. This includes the synthesis of new material for the repair of cells, or for growth, or the formation of specialized cell products and also the catabolic processes involved in the destruction of cell materials. The aim of this research is to understand bioenergetic processes such as photosynthesis and nitrogen fixation, transport processes by which materials are moved across and distributed within cells, and nutrition.

Neurobiology has a relatively narrow focus upon the nervous system and its integrative functions. That includes environmental stimuli, their reception by sense organs, processing by the central nervous system, the resulting effect on other body organs, and the consequent behavior of the organisms and a range of methods extending from morphological to biochemical.

Psychobiology supports a broad spectrum of research in experimental psychology and ethology. It focuses on sensory and perceptual processes, learning, memory, thinking and problem solving, motivation, genetic and environmental effects on behavior, and laboratory and field studies of early experience, imprinting, orientation, reproductive behavior, and the social and communicative behavior of animals.

Exclude research to study non-biological molecular processes (See X. D., CHEMISTRY), human behavior and psychological phenomena (See X. P., SOCIAL SCIENCES or X. M., PSYCHOLOGY), manipulation and control of experimental procedures (See X. E., COMPUTERS), and the development of new instrumentation with broad applications (See X. F., ENGINEERING). Also excluded is research which is performed to contribute to the elucidation of causes, cures, diagnoses, and methods of preventing human diseases (See V. A., DISEASES AND INJURIES).

D. CHEMISTRY

Encompasses research to provide a fundamental understanding of the synthesis, structure, properties and mutual interconversion of substances. More specifically includes research into the sub-fields of chemistry below.

Synthetic Organic and Natural Product Chemistry: The study of synthetic methodology and chemistry of aliphatic and aromatic hydrocarbons (both substituted and unsubstituted by functional groups), heterocyclic compounds, organophosphorous, organosulfur and organosilicon compounds. Also, the isolation, characterization and synthesis of naturally occurring substances.

Synthetic Inorganic and Organometallic Chemistry: The study of the synthesis, characterization and chemistry of compounds whose properties are determined predominantly by elements other than carbon. Depending upon the bonding arrangements of the constituent elements the compounds are generally classified in one of the following categories--inorganic; coordination; organometallic; or organometalloid.

Structural Chemistry: Studies of the molecular structure of solids, gases, liquids, and solutions using a variety of spectroscopic and diffraction techniques. These techniques must be capable of supplying data concerning the geometrical relationships between the atoms in a molecule.

Quantum Chemistry: Studies in quantum and balance theory including quantum mechanical calculations of wave functions, energy levels, transition moments, and other atomic and molecular properties. Includes experimental (mostly molecular beam) and theoretical research on scattering phenomena with emphasis on collision cross sections, chemical reaction rates, potential energy surfaces, and intermolecular forces. Electronic spectroscopy, optical pumping, and electron spin resonance are used to provide information about energy levels and electron distributions in molecules. Also includes the chemistry of excited states, studies in energy transfer, fluorescence, nonradiative processes, and chemiluminescence, and research on laser development.

Chemical Dynamics: Dynamics is concerned with research on mechanisms and kinetics of chemical transformations. The reactions of neutral molecules, radicals, and ions, in ground and excited states, and in condensed or gas phases are included. Photochemistry, theoretical studies on reaction rates, mechanistic studies of biochemical transformations and radiation chemistry, and studies to generalize and predict chemical phenomena are also included.

Chemical Analysis: Chemical analysis involves sampling, separation, and determination of the composition of matter. Projects range from trace level characterization to ultra pure sample research and involve both macroscopic and microscopic studies. Primary areas of focus include separation science; electroanalytical chemistry; emission absorption, electron and mass spectrometry; trace analysis, microscopy, thermal and data acquisition methods, interpretation and control.

Nuclear Chemistry: Studies of nuclear reactions, nuclear spectroscopy and structure and radiochemistry.

Chemical Thermodynamics: Studies to understand thermodynamic and other equilibrium properties of bulk matter. Includes work to develop principles and acquire data on chemical change energetics; improve understanding of phase changes; study structure and dynamics of liquids; study solid-gas and solid-liquid interfaces; and acquire and analyze equilibrium and thermodynamic data on high temperature inorganic vapor species. Also includes work in colloid chemistry which studies the properties of surfaces including research in heterogenous

catalysis, physisorption and chemisorption, molecular beam studies of surfaces, auger spectroscopy, surface states, surface transport, and surface tensions.

Exclude research to examine: Chemical properties and processes of seawater, large lakes, and related aqueous solutions; naturally occurring and man-made compounds in oceans, lakes and related water bodies; biogeochemical processes in natural waters; and chemical aspects of oceanatmospheric interactions from this section. (See X. K., OCEANOGRAPHIC SCIENCES).

Exclude studies to understand the earth's chemistry, composition, age, and mineral origins, and the chemical processes that shape the earth. (See X. G., GEOLOGICAL SCIENCES).

Exclude research to understand the chemical properties and interactions of molecules involved in biological function. (See X. C., BIOLOGY).

Exclude research to understand scientific and engineering principles underlying the chemical processes used in various "process industries" such as polymer, glass, pharmaceutical, and paper industries. (See X. F., ENGINEERING).

Exclude studies to understand the chemistry of chrystalline solids, amorphous materials, semi-ordered liquids and cryogenic liquids and research in the preparation, characterization, and physical and chemical properties of polymers, (See X. H., MATERIALS).

Exclude Solid State chemistry research which includes the study of amorphous solids, glasses, and crystal chemistry. (See X. H., MATERIALS).

E. COMPUTERS

Encompasses research directed toward the development of advanced computer systems and formulation of policies to deal with the technological aspects of the computer's impact on society. Includes research to: develop new techniques and design approaches for operating systems software, programming languages, compilers, program verification techniques and analysis of algorithms; develop advanced computer hardware design and development leading to the enhancement of capacity, reliability and usability; develop computer network including specifically applicable communication system considerations; and analyze problems of secure systems and controlled access to data bases to provide a basis for needed regulation.

Exclude research which is primarily directed toward advancing the use of computer technology in a particular discipline, objective or problem as outlined elsewhere in this structure. Such research should be included with the appropriate discipline, objective or problem.

F. ENGINEERING

The purpose of this research is to improve the understanding of engineering principals and methodologies. Engineering is concerned with the application of knowledge in the design and creation of structures, systems, processes and devices. Engineering research provides improved understanding of the fundamental principles involved in these engineering activities and also produces general methodologies applicable to broad classes of engineering problems. Each component of engineering research comprising this section yields general information useful for engineering activities in a range of various applications. Engineering research is performed in many different disciplines. This research includes but is not limited to work in the categories below.

Chemical Processes Used in Process Industries: Petroleum, metallurgy, cement, food.

Mechanics: Response of materials and structures to stress loading, dynamics and vibrations of machinery and structures, interaction of constructed systems with natural environments (soil mechanics and geological effects associated with foundations in the earth, structural stress due to wind or water waves), fluid flow and related phenomena (including turbulence, acoustics, hydrology, flows in porous media such as soils).

Electrical and Optical Phenomena: Electronic circuits and devices, information storage, processing and transmission, optical transmission and reception, laser devices for local and remote sensing.

Systems Analysis and Control: Methodology useful for analysis, design, and control of large interacting systems.

Exclude and show where appropriate engineering research projects aimed at any one of the objectives elsewhere in the overall structure. For example, exclude research concerned with design of a particular system, structure, process, or device which will improve a specific natural resource use, develop a new energy source, or improve a transportation system. (See IX., NATURAL RESOURCES; II., ENERGY DEVELOPMENT AND CONSERVATION; or XII., TRANSPORTATION; respectively). The following work exemplifies the type of research to exclude from this section:

Develop specific sensing and pattern analysis devices to measure crop yields or detect pest and bacterial effects (See IV., FOOD, FIBER, AND OTHER AGRICULTURAL PRODUCTS);
Develop remote sensing equipment to detect a particular scarce mineral or energy source (See IX., NATURAL RESOURCES or II., ENERGY DEVELOPMENT AND CONSERVATION);
Use an engineering technique for health services delivery (See V., HEALTH); and
Develop a ship traffic control system (See XII. D., MARINE).

G. GEOLOGICAL SCIENCES

Encompasses research to provide man with a fundamental understanding and knowledge of the earth, the structure and composition of its rocks and the processes which form and modify these rocks. For convenience, studies of planetary and lunar rocks are included in this section. In addition, that part of hydrological cycle that deals with water on and in the continental crust are included here. More specifically this objective includes research in the areas of interest below.

Geology: Includes research whose primary purpose is to increase the understanding of the rocks of the earth's crust, its land forms, and the processes that have formed and are continually modifying them. Research pertinent to testing the Plate Tectonics theory should be shown here. The following work illustrates the kind of research to be shown here:
Field investigations of geometrical configuration of folds, faults, related rock structures, distribution of rock strata, and minerological composition of rock bodies;
Laboratory simulation of natural geological processes such as stream erosion, sedimentation, shoreline dynamics, and glacial flow mechanics;
Stratigraphic studies to obtain data on the changing climates of the past; and
Floral and faunal content of sedimentary rocks.

Geochemistry: Includes research on the earth's chemistry, the composition, age, and origin of its minerals, and the nature of chemical processes that have shaped and are shaping it. Chemical changes and processes in mineral structure and systems, as they relate to the Plate Tectonics theory are shown here. The following research exemplifies the type of work to be shown here:
Absolute (radioisotope) ages of rocks and specific minerals;
Temperatures prevailing during past geological events;
Chemical character of rock masses and evolutionary history of those bodies;
Physical-chemical conditions under which natural materials were

formed; and
Chemical nature of other bodies in our solar system thru study of extra-terrestrial samples.

Geophysics: Includes physical properties of the solid earth, such as studies to determine the earth's dimensions, its magnetic, electrical and gravitational fields, and its dynamic processes. Studies of physical changes and processes as they relate to the Plate Tectonics theory should be reported here. The following research exemplifies the kind of work to be shown here:
Material behavior under high temperatures and pressures which exist deep in the earth;
Paleomagnetic reconstruction of continental positions;
The earth's magnetic field including its origin and reversals;
Determine physical properties of earth materials in temperature and pressure regions of earth's interior; and
Gravity and heat flow studies to better understand plate movements.
Exclude seismology research conducted primarily to understand the physical basis of earthquakes or to improve earthquake prediction and prevention. Also exclude research on other natural hazards such as volcanoes and landslides. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT).

Exclude research which increases the fundamental knowledge in geological sciences but which is primarily conducted to accomplish one of the specific objectives in the overall structure and show where appropriate. For example, exclude research to better understand earth's resources, such as mineral deposits. (See IX., NATURAL RESOURCES).

Exclude research in geology, geochemistry and geophysics of marine areas. (See X. K., OCEANOGRAPHIC SCIENCES).

H. MATERIALS

Encompasses research to study the condensed phase including crystalline materials, amorphous solids and glasses, and liquids. Special consideration is given their properties and behavior from the standpoint of atomistic, crystallographic, electronic, optical, thermal, mechanical properties and in particular of the structure-sensitive relationships. A direct result of the quantitative approaches taken in the study of materials has been the elucidation of predictive, fundamental mechanisms for the physical, chemical, electrical and mechanical processes and phenomena that occur in, on, to, and with the condensed phase. The results of materials research are often multidirectional and hence supportive to more than one objective in the overall structure.

Includes research to increase our understanding and ability to explain,

predict, and control physical and chemical properties of materials. This involves studies of the electronic structure, optical, magnetic, structural, transport, and thermal properties of solids, liquids, quantum liquids, thin films, and surfaces. The following work exemplifies the type of research shown here:

Investigations of the electronic structure of solids;
The energy, symmetry and lifetime of electronic states in solids;
Modes of motion in solids; and
Studies on the nonequilibrium phenomena and phase transitions in solids and liquids.

Includes research to enhance our capability to provide techniques for preparing new materials as well as to improve on the preparation of known materials. Also of interest is the characterization of materials as well as studies of bonding, valency and associated effects, the structure and mobility of defects in solids, catalysts, chemisorption, and the amorphous state. Emphasis here lies in the bulk properties of materials as opposed to chemical systems viewed from an atomic or molecular perspective. (See CHEMISTRY above).

Includes research to increase our understanding and to control the behavior and properties of metals, alloys, ceramics, composites, and polymers. Depending on the material, the following typical studies are shown here: transformations, transport phenomena, corrosion, erosion, abrasion, phase equilibria, strengthening mechanisms, fracture, fatigue, crazing, oxidation, solidification, sintering, vapor deposition, elasticity, plasticity, grain growth, etc.

Exclude and show where appropriate materials research which can be reported elsewhere in the overall structure. For example, exclude research which develops knowledge to support performance of specific implant materials in the human body and its physiological response to the implant. (See V., HEALTH).

Exclude research to improve the means and technology of locating, extracting, processing and recycling minerals. (See IX. C., MINERALS).

I. MATHEMATICAL SCIENCES

The primary purpose of research shown here is to increase the knowledge of mathematical sciences by creating new mathematical structures and studying the relations which exist between them. This includes work to analyze, generalize, codify, and transform mathematical techniques and ideas into tools of wide applicability for the solution of problems in the other sciences. The mathematical sciences constitute one of the most highly structured of all scientific disciplines, but

has as major subdivisions core ("pure") mathematics, applied mathematics, statistics, and numerical methods (apart from implementation of algorithmic aspects on the computer). Includes research into the subdivisions of MATHEMATICAL SCIENCES and subareas which compose them as discussed below.

Classical Analysis: This area considers research in that portion of analysis which has to do with the older and more traditional techniques. The stimulus for much research in this area is frequently the application of mathematics to problems of engineering and physics, hence with differential and integral equations. Subareas include differential and integral equations, theory of complex variables, approximation theory, real variable theory, and potential theory.

Modern Analysis: Modern Analysis is in large degree associated with mathematics developing from the study of abstract spaces, e.g. Hilbert space. Major subareas are functional analysis, harmonic analysis, topological groups and group representations, operator theory, and ergodic theory.

Algebra: This area deals with the properties of formal systems such as groups, rings, fields, etc., whose genesis lies in attempts to solve algebraic equations. Included also is research in number theory and algebraic geometry. In short, this program considers research for which the algebraic structure is not overlaid extensively with topological or differential structure. Subareas include groups, rings, fields, linear and multilinear algebras and matrix theory, algebraic geometry, number theory, combinatories and graph theory, and category theory and homological algebras.

Topology: Topology is descendent of geometry, and has, roughly, to do with properties of geometric objects (lines, surfaces, etc.) which are unaltered by stretching, twisting, or compression without tearing or cutting. As with much modern mathematics, topology has recently undergone some interpenetration by both algebra and analysis, so that some arbitrariness exists in whether certain areas are classified algebraic topology, and geometric topology.

Foundations: As might be expected from the title, research on the foundations of mathematics is a highly abstract subject which has to do with logical processes and to the reduction of logical thought to the manipulation of symbols. The principle subareas are set theory, model theory, and recursion theory.

Geometry: Research in Euclidean and projective geometries form only a small portion of this program. It is dominated by a fusion of

analysis and algebra with the traditional notions of geometry, which give rise to differential geometry on the one hand and to global analysis (study of relations between the geometric properties of manifolds (surfaces or generalization of surfaces) and the analysis of partial differential equations on these manifolds. Subareas include differential geometry, global analysis, theory of convexity, and classical and projective geometry.

Probability: Probability deals with a priori numerical evaluation of the relative frequencies with which events, or combination of events, are predicted to occur under repetition of a set of conditions. Modern probability theory is symbiotic with measure theory and functional analysis, and has been much stimulated by technological problems such as arise in information theory and quality control, as well as by other areas of mathematics such as potential theory and partial differential equations. Major sub-fields are foundations of probability theory, distribution theory, probabilistic limit theorems, stochastic processes, and probabilistic and stochastic models.

Statistics: Statistical theory has to do with the application of probability theory to the collection, analysis, and interpretation of numberical observational data. Principal areas of research resulting from these operations are foundations of statistics, theory of inference, decision theory, multivariate analysis, sequential analysis, and design of experiments.

Applied Mathematics: Applied mathematics has to do with contributions to mathematical knowledge which arise in the course of solving problems of the physical and social world in which man lives. The mathematical problems result from the abstraction of concepts of physics, engineering, biology, economics, and other sciences in the form of mathematical models. Only if the research seems productive of new concepts in mathematics or of using mathematical techniques in a novel and substantive way to illuminate mathematical theories should it be considered in the applied mathematics subprogram. The principal elements of the program are theory of equations of mathematical physics, engineering, biology, economics, etc.; theory of control, information, and systems; game theory; mathematical programming and optimization; and numerical methods.

Exclude and show under the appropriate objective in X., SCIENCE AND TECHNOLOGY BASE, research primarily directed towards applying mathematical techniques to the solution of problems in the physical, social, biological, computer and engineering sciences. Also exclude research to apply mathematical techniques to a particular problem or objective in the structure other than the SCIENCE AND TECHNOLOGY BASE and show such research under the appropriate objective or problem. For example,

exclude work to develop better statistical techniques to analyze observational and experimental data in the health fields. (See V., HEALTH).

J. MEASUREMENT AND STANDARDS TECHNOLOGY

Encompasses research to provide a consistent and adequate system of physical measurements and standards; to improve measurement and standard setting procedures; to provide the basis for modern measurements and standards; and to advance the state of measurement science required by evolving technologies and public safety. This includes research on measurements and standards which cannot be assigned or do not primarily relate to specific objectives elsewhere in the structure. This entry includes research on measurements and standards of basic physical units of mass, length, time, temperature, electrical current and luminosity intensity together with secondary or derived units commonly used, such as electrical voltage, density and pressure.

Exclude measurement or standard research which is conducted primarily to advance or improve a specific objective shown elsewhere in the structure. For example, exclude efforts to improve measurement technology to the levels needed to achieve the environmental quality standards required by law, (See ENVIRONMENTAL QUALITY IMPROVEMENT); exclude research to improve measurements and standards that pertain to consumer products. (See either XIII. F., SAFETY or II., ENERGY DEVELOPMENT AND CONSERVATION); and exclude research to improve measurements of biological phenomena. (See X. C., BIOLOGY).

K. OCEANOGRAPHIC SCIENCES

The primary purpose of research to be shown here is to increase the understanding of oceans and the evolution of ocean basins and marine life. Research shown here addresses such objectives as increasing the knowledge of the ocean's nature, processes, motions and their causal forces; understanding seafloor structures and the processes that have formed them; determining the nature and distribution of marine organisms and ecosystems and understanding their behavior in oceanic and estuarine environments. This section includes research to increase the understanding of ocean-atmosphere interactions. Also, shown here will be research studying the geology, geophysics and geochemistry of the crust and upper mantle underlying the ocean basins. The objectives of this section also apply to research conducted in large lakes. For example, this section includes research to understand certain chemical processes and physical properties of the Great Lakes. Similarly this section's objectives apply to work done for oceanographic purposes in estuaries, coastal waters or until the

water is out of the ocean's influence. Studies on the crust and upper mantle under ocean basins as related to Plate Tectonics are shown here. More specifically, OCEANOGRAPHIC SCIENCES include research discussed below.

Physical Oceanography: The purpose of this research and development is to increase the understanding of physical properties and processes which control water circulation in open oceans, near shore areas, estuaries and large lakes. This section includes research to examine the physical description and processes of the ocean, geophysical fluid dynamics, air/sea interactions, and physical processes in large lakes.

Marine Chemistry: Research and development shown here is conducted to increase the understanding of chemical processes in lakes, estuaries, and the ocean. This includes research and development to assess chemical properties of and reactions occurring in seawater and related (continental) waters, to examine naturally occurring and man-made compounds in oceans, lakes, and related (or continental) waters, and research to examine chemical aspects of ocean-atmosphere and water-sediment interactions.

Submarine Geology and Geophysics: Research and development shown here is conducted primarily to increase the knowledge of history of the ocean and its basins, sediment deposits, marine life, and natural processes which control this evolutionary history. This section includes studies to examine how physical, chemical, and biological processes form and alter ocean floor and continental margin sediments and rocks. Also, studies to examine the crust and upper mantle of the solid earth beneath the ocean basins including studies of Plate Tectonics and plate interactions.

Biological Oceanography: Research and development performed to understand the nature and distribution of ocean life and marine ecosystems and the interactions between organisms and the marine environment will be shown here. This section includes studies to determine how natural marine ecosystems evolve and function and to develop predictive models for their behavior under natural or man-induced stresses. It also includes studies to examine the rates and mechanisms by which organisms, in concert with physical and chemical processes, maintain and affect the concentrations of metals and other chemical species in the marine environment.

Exclude research which increases the fundamental knowledge or understanding of the oceans but does so for the pursuit of specific objectives in our structure other than the SCIENCE AND TECHNOLOGY BASE.

For example, exclude oceanography research studying the occurrence, fate and effects of thermal and other pollutants in coastal and estuarine waters. (See III., ENVIRONMENTAL QUALITY IMPROVEMENT). Also exclude research on marine food sources. (See IV., FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS).

L. PHYSICS

Encompasses research to increase the knowledge and understanding of the fundamental forces and elementary constituents of matter. Includes research on elementary few-body interactions of particles and fields, the elementary constituents of all matter, and manifestations of energy, as well as the collective phenomena exhibited by large aggregates of matter; the symmetry principles governing particle interactions and the determination and classification of particle properties; fundamental laws of atomic and nuclear structure, dynamics and interactions; laws governing matter at the atomic level and at higher levels of aggregations; larger aggregates of molecules with long-range coherence and order involving phenomena in the plasma and gaseous states over a broad range of conditions and temperatures; and the structure of space time, as well as the gravitational interaction.

Exclude research performed in physics whose primary purpose can be applied to another area within the SCIENCE AND TECHNOLOGY BASE. For example, exclude work to develop concepts which explain and predict the electronic structure, optical, magnetic, structural, transport, thermal and other physical properties of solids, liquids, quantum liquids, thin films, surfaces and liquid crystals (Solid State Physics). (See X. H., MATERIALS). Cosmic ray and black hole studies to understand sections of the universe are shown in ASTRONOMY above whereas black hole studies to understand gravity are shown here.

M. PSYCHOLOGY

Encompasses research concerning behavior, mental processes, and individual and group characteristics and abilities. The bases for normal and abnormal behavior are specific targets of research in this category. Typical research topics include:

Studies of the emotions, personality, higher mental processes, and learning;
Research in experimental, comparative, and physiological psychology and ethology;
Studies of biological and experiential determinants of behavior and behavior change;
Studies involving direct manipulation (anatomical, physiological, biochemical) of the central nervous system, and

the measurement of resulting effects on behavior; and
Studies of social and cultural phenomena in relation to human behavior.

Other topics include studies of motivation, cognition, psycholinguistics, intelligence, perception, attitudes, communication, psychophysiology, the contribution of genetic factors and hormonal functioning to behavior patterns, the biological substrates of sensation and perception, behavioral capacity related to brain structure or function, understanding behavioral or sensory processes through neurophysiological investigations or studies of artificial intelligence, the contribution of behavioral processes to the development of social norms and roles, and child behavior.

Excluded from this category are studies of sociolinguistics, family units, and studies for which the primary purpose of the research is to examine social interaction and group processes (See X. P., SOCIAL SCIENCES). Also excluded is research on specific mental and social problems (See V. B., MENTAL HEALTH).

N. SCIENCE INFORMATION TECHNOLOGY

This activity has the broad objectives of developing and demonstrating new techniques leading to the establishment of more effective science information dissemination services and facilitating national and international coordination among scientific and technical information activities. More specifically includes research to:

Improve management of scientific and technical information services;
Establish operational methods that lead to self supporting services;
Create and test the feasibility of advanced information networks for retrieval and the production of published materials;
Achieve intersystem compatibility and increased efficiency among major systems;
Increase the accessibility of scientific information to wider audiences of users; and
Improve national and international coordination among scientific and technical information services.

Exclude operational information programs funded to disseminate the results of research shown in other portions of the structure and show where appropriate. (See GUIDELINES FOR PREPARATION).

O. SCIENCE POLICY, MANAGEMENT TECHNOLOGY AND OTHER SPECIAL PROGRAMS

Encompasses studies and operations leading to the development of national science policy of a broad nature; activities involved with the development of increased capability by state and local government for use of the results of science and technology in decision-making; research into incentives for and results of technological innovation; general grants for institutional improvement that have no central specific objectives; and research into new techniques for management including those which lead to improving resource allocation and utilization and/or increased understanding of factors affecting the performance of individuals and organizations.

Exclude any activity which can be identified to any other part of the structure. For example, exclude studies of food production to assess the world situation (See IV., FOOD, FIBER AND OTHER AGRICULTURAL PRODUCTS) and exclude studies of energy research and development policy issues (See II., ENERGY DEVELOPMENT AND CONSERVATION).

P. SOCIAL SCIENCES

Encompasses research and development which is directed toward understanding various aspects of society and forms of social activity including the functioning of groups and social institutions and the actions of individuals as members of groups. The disciplines associated with the social sciences are anthropology, economics, history, linguistics, political science, and sociology, among others. The content of these disciplines is discussed below.

Anthropology: Includes studies in the areas of archaeology, culture, society and ethnology, and applied anthropology.

Economics: Includes research on econometrics and economic statistics, history of economic thought, international economics, industrial and labor economics, macroeconomics, microeconomics, public finance and fiscal policy, economic theory, and economic systems and development.

History: Includes work in the areas of cultural, political, and social history, and the history and philosophy of science.

Linguistics: Includes research and development on the anthropological-archaeological and computational aspects of linguistics and socio-linguistics.

Political Science: Includes research on comparative government, history of political ideas, international relations and law, national political and legal systems, political theory, and public administration.

Sociology: Includes research and development on comparative and historical aspects of organizations, complex organizations, culture and social structure, demography, group interactions, social problems and social welfare, and sociological theory.

Social Sciences, not elsewhere classified: Includes research and development in social sciences and on social issues not elsewhere classified in this structure, and, more specifically, research in law and in socioeconomic geography. The social sciences category concerns the development of general knowledge about the functioning of societal organizations and institutions.

Exclude social research which has a principal objective related primarily to other sections and topics in this structure and show where appropriate. For example, exclude research in agricultural economics (See IV. D., IMPROVE DISTRIBUTION AND MARKETING).

Exclude research concerning indivdual and group behavior which is not oriented toward the functioning of social groups and institutions. (See X. M., PSYCHOLOGY). Exclude research on various behaviors which are considered the results of mental diseases or disorders. (See V. B., MENTAL HEALTH).

Q. SURVEYING, MAPPING, CHARTING AND GEODESY

Encompasses research to improve the means of preparing surveys, maps, charts and of locating or inventorying resources, pollution and so forth. It also includes work to improve satellite equipment used for these purposes. More specifically, this entry includes research to improve the techniques and equipment used in making a drawing or other representation of all or part of the earth's surface or of a part of the sky; in preparing outline maps which plot geographically special information, such as weather conditions, economic resources and so forth; in measuring or determining the shape of the earth or a large part of its surface or in locating exactly points on its surface; in determining the location, form or boundaries of a tract of land; and in identifying the nature and extent of natural and economic resources on or near the earth's surface.

Exclude that surveying, mapping, charting and geodetic research which primarily applies to a specific entry in the overall structure. For example, exclude research to improve the means of locating petroleum resources through aerial surveys. (See II. A. 1., IMPROVE RESOURCE ASSESSMENT).

R. TELECOMMUNICATIONS

Includes research on the science or technology of communications over a distance, such as by cable, radio, telegraph, telephone, or television. Overall research objectives are to improve understanding of the phenomena surrounding telecommunications, and to develop new or improved telecommunications systems without respect to a particular major objective listed elsewhere in this structure. More specifically includes research to: Improve understanding of and develop methods to prevent or correct, telecommunications interference; develop new or improved methods for managing and utilizing the telecommunications spectrum; assess the impact of innovative telecommunications systems; develop better ways of evaluating telecommunications system performance, and improve understanding of, and develop better methods to counter, problems in telecommunications security.

Excludes research on the regulatory aspects of communications (See XIII. E., REGULATORY ACTIVITIES). Also excludes telecommunications technology research which is performed to contribute to the solution of a national problem or the furtherance of a national goal or objective. This latter research should be reported under the various other major objectives in the structure according to the primary objective of the research. For example, exclude research on telecommunications innovations associated with new or improved space vehicles. (See XI. B. 2., INFORMATION AND COMMUNICATION SYSTEMS).

XI. SPACE FLIGHT SYSTEMS TECHNOLOGY

SPACE FLIGHT SYSTEMS TECHNOLOGY

XI. SPACE FLIGHT SYSTEMS TECHNOLOGY

Encompasses research to develop operational space transportation systems, to improve the equipment used in both manned and unmanned space flight, and to enhance the quality and productivity of space-based activities.

Research to increase standardization and reduce the cost of equipment and components should be shown throughout the structure wherever the work pertains. For example, research to develop the standard equipment and components for communications and data handling will be shown under XI. B. 3., INFORMATION AND COMMUNICATION SYSTEMS.

Research conducted in or from space and directed towards another objective in the overall structure will be shown under that objective. For example, Viking - Mars Orbiter/Lander funding in Fiscal Year 1976 will be shown under X. A., ASTRONOMY since that project focuses on learning about Mars rather than on improving the equipment used in the experiment. In addition, research which has a clear potential for contributing to the solution of non-space national problems, such as II., ENERGY DEVELOPMENT AND CONSERVATION and III., ENVIRONMENTAL QUALITY IMPROVEMENT, will be shown under the appropriate entry in those objectives.

Exclude space systems or equipment technology research which is conducted for military or national defense purposes (see pertinent entries in VIII., MILITARY).

A. SPACE TRANSPORTATION SYSTEMS

Encompasses research conducted to develop distinct and complete vehicles or systems for transporting men and equipment through space. This research involves the development of transportation systems which will be used for future missions that have not been fully defined or planned at this time. When a space transportation system has developed to the point where it is known what missions it will support, its costs will be assigned to those missions. The work shown here includes the Space Shuttle and all other aspects of space transportation systems.

1. SPACE SHUTTLE

This system is being developed to provide economic and routine access to space. The reuseable vehicles will carry many different types of payloads, will be able to retrieve and deploy satellites, to repair and redeploy them, to service or update them, to return them to earth for refurbishment and to make possible rapid space rescue. The Shuttle program involves efforts to develop the Orbiter, the reuseable airplane-like vehicle which can be used for many purposes in low earth orbital operations; the main engine; reuseable solid rocket boosters; the external fuel tank; and launch and landing equipment and systems.

2. SPACELAB

Includes studies of engineering cost trades, payload safety, payload accommodations, software development, and payload operations pertaining to Spacelab which is a payload carrier flown to and from space from the Space Shuttle.

3. INTERIM UPPER STAGE/TUG

Includes efforts to develop a system to provide the capability to deploy Shuttle launched payloads to high energy and escape orbits which are not attainable by the Shuttle itself.

4. OTHER SPACE TRANSPORTATION SYSTEMS

Includes research on space transportation systems other than those discussed above. Systems shown here also are being developed for future missions which have not been precisely defined at this time.

B. SPACE FLIGHT EQUIPMENT ENGINEERING

Includes research to improve the equipment or systems used in both manned and unmanned space flight and to enhance the quality and productivity of space-based flights and activities. The research shown here is directed at space flight problems that do not directly apply to the space transportation systems which are shown separately in XI. A., SPACE TRANSPORTATION SYSTEMS, above.

1. ENERGY SYSTEMS

Includes research to reduce costs of energy systems used by space vehicles while increasing their life, reliability and power density.

Work to be shown here is exemplified by research to:
Advance energy density of flexible solar arrays;
Improve component capability, equipment designs and circuit techniques to meet future spacecraft needs for higher power, longer life and lower costs;
Develop high efficiency gas turbine conversion system for use with isotope heat sources in space to reduce costs and conserve fuel;
Improve high power lasers to provide advances in power generation, conversion and transmission which will be the basis of future space capabilities and conceivably earth needs; and
Produce, confine and utilize plasmas for advanced power and propulsion systems.

Exclude research which has clear potential for contributing to non-space energy problems defined in ENERGY DEVELOPMENT AND CONSERVATION.

2. HUMAN OPERATIONS IN SPACE

Focuses on work related directly to man's health and survivability in space. Medical research done in the unique space environment for application on Earth should be classified under the appropriate entry in V., HEALTH.

a. SPACE LIFE

Work to be shown here is exemplified by research to conduct medical, behavioral and biological research and biomedical experiments to investigate the biological

and human responses to space flight and enhance man's ability to function effectively and safely during space flight.

b. LIFE SUPPORT AND PROTECTIVE EQUIPMENT

Work to be shown here is exemplified by research to improve high performance space suits and regenerable atmospheric control and improve waste management, water reclamation, sampling for medical research and processing.

c. BIOINSTRUMENTATION AND MAN-MACHINE TECHNOLOGY

Work to be shown here is exemplified by research to:
Develop technology and procedures for measurement of physiological, medical and performance responses of man and other selected life species living and working in the space environment; and
Develop instrumentation for measurement of cardiovascular, metabolic, musculoskeletal, respiratory and other physiological functions for space medical research and on board health care delivery systems for crew and passengers.

3. INFORMATION AND COMMUNICATIONS SYSTEMS

Includes research to develop components, systems and techniques needed for gathering, processing, transmitting and reducing data from planetary and earth orbiting spacecraft; to improve earth to space, space to earth and space to space communications. This research emphasizes improving the means of communication with and between space vehicles.

Work to be shown here is exemplified by research to:
Create sensor and control devices with problem solving capability;
Create devices which avoid problems caused by time delay between Earth and planets and which can operate in a hostile environment;
Provide more effective and economical devices for detecting, storing and processing information;
Extend capabilities to handle multiple spacecraft support and increase data rates;
Improve real time control techniques and use of minicomputers for Deep Space Network; and

Increase accuracy of tracking techniques by developing laser tracking, atomic frequency timing standards and mathematical modelling for mission simulation.

Exclude research to develop or improve equipment used in preparing surveys, maps and charts which identify, measure or inventory resources, crops or pollution on earth (see X. Q., SURVEYING, MAPPING, CHARTING AND GEODESY).

4. MATERIALS USED IN SPACE VEHICLES

Includes research to provide efficient, stable, long-lived materials for the structures, propulsion systems, entry bodies and electronic equipment for spacecraft.

Work to be shown here is exemplified by research to:
Synthesize new and improved bearings, seals and lubricants;
Increase the reliability of heat shield materials; and
Improve materials resistance to extreme temperatures, such as insulations, lubricants and optical materials.

5. PROPULSION SYSTEMS

Includes research on chemical, electric and nuclear propulsion systems for space vehicles conducting any potential mission.

Exclude exhaust effects and control studies which should be shown under III., ENVIRONMENTAL QUALITY IMPROVEMENT.

a. CHEMICAL

Work to be shown here is exemplified by research to provide long-life systems for satellites and spacecraft by improving reusable H_2-O_2 systems and provide high energy propulsion for difficult space missions.

b. ELECTRIC

Work to be shown here is exemplified by research to provide auxiliary electric propulsion for station-keeping and attitude control of long-life application-type satellites.

c. NUCLEAR

Work to be shown here is exemplified by research to advance applications of nuclear energy in space, achieve efficiencies up to 30% with low operating temperatures for thermionic energy conversion; and investigate the production of fission energy with nuclear fuel in the gaseous and plasma state: gas-core reactor research.

6. SPACE VEHICLE AEROTHERMODYNAMICS

Includes research to improve spacecraft design, safety, reliability and assure more efficient aerodynamic operation of maximum payloads for earth orbital missions and planetary exploration.

Work to be shown here is exemplified by research to improve spacecraft design, safety and reliability related to entry problems and resolve problems of high speed entry and spacecraft flight in atmospheres of Earth and other planets.

7. SYSTEMS AND DESIGN STUDIES

Includes research to identify areas for future technological focus, examine current technology objectives to ensure appropriateness and payoff and provide necessary technical and economic decision base to support selection of future system and experimental programs.

Work to be shown here is exemplified by research to determine technology requirements, costs, benefits and impacts of advanced space systems based on mission, systems and conceptual designs and modify and improve technology used on existing projects.

8. VEHICLE AND SATELLITE STRUCTURES

Includes research to improve efficiency and reliability of space structures, reduce their costs and demonstrate feasibility for design applications.

Work to be shown here is exemplified by research to:
Increase use of composites for major structural systems to improve weight savings;

Improve spacecraft payload acoustic and vibration analysis and test methods to reduce the cost of future space systems; and
Improve vehicle structural design methods such as providing fracture capability control and life prediction procedures and determining the reliability and efficiency of future long-life, weight critical space transportation systems.

9. VEHICLE GUIDANCE AND CONTROL

Includes research to provide and improve guidance, navigation and control technology which will permit reductions in vehicle or mission costs while maintaining or improving performance standards.

Work to be shown here is exemplified by research to:
Advance navigation techniques to minimize propellant requirements, increase mission pointing accuracy and lower operational costs of planetary exploration;
Strap down guidance system components consisting of inertial sensors and computer technology; and
Improve techniques for ground-based navigation of planetary orbiters, landers, swingby and earth orbiter missions.

XII. TRANSPORTATION

TRANSPORTATION

XII. TRANSPORTATION

This objective encompasses research into improving the vehicles (present and future), the operational effectiveness and the safety features of all modes of transportation. Research related to transporting specialized cargoes--such as LNG, oil or gas--is included as is research conducted in conjunction with military objectives which has a clear potential for contribution to civilian transportation.

Exclude research and development to abate noise, decrease air pollution and control pollution from transportation-related spillage (see III., ENVIRONMENTAL QUALITY IMPROVEMENT).

A. AIR

Includes research and development to improve present and future aircraft, aviation operational environment and effectiveness and aviation safety. Work conducted by the Department of Defense which has a clear potential for contribution to civilian aviation is included here while work which has exclusively military applications, such as improving an aircraft's missile launching capability, will be excluded (see VIII., MILITARY).

Includes work related to long-haul aircraft (radius over 500 miles), short-haul aircraft (50 to 500 mile radius) and general aviation aircraft. Aeronautics research will be reported where applicable under the following objectives. For example, work in propulsion and aerodynamics will be included under IMPROVE VEHICLES which encompasses efforts to achieve higher speeds and greater payloads.

1. IMPROVE VEHICLES (INCLUDES PERTINENT AERONAUTICS RESEARCH)

This subobjective focuses on problems internal to the vehicle. It includes, but is not limited to, work to increase the speed, range, capacity or payload; to reduce the cost of construction and operation; to improve the passenger/cargo environment; to develop new and more productive vehicles; and to meet special transportation needs of the elderly and handicapped. However, research conducted

on the vehicle specifically to improve the safety of the passengers and cargo will be excluded (see IMPROVE SAFETY, below).

2. IMPROVE AVIATION OPERATIONAL ENVIRONMENT AND EFFECTIVENESS (INCLUDES PERTINENT AERONAUTICS RESEARCH)

This objective focuses on problems and activities that are external to the vehicle itself and that relate directly to the efficiency and operation of the air transportation system and the aircraft environment--the terminal and flight paths. For example, it includes research to improve connectivity in the terminals to increase capacity or reduce trip time; to improve scheduling, accessibility and dependability; to improve traffic control systems and terminal area operations; to improve communications and navigation related to air transportation; to reduce air transportation systems costs; to modernize regulations and legislation; and to enhance commercial development. Research related to the air operational environment but conducted specifically to improve the safety of passengers and cargo will be shown under IMPROVE SAFETY. Exclude research to improve or expedite transfer at modal interface (see XII. F., MULTI- AND INTER-MODAL, below).

Report air traffic control as a separate line item and as a portion of the total for this subobjective.

3. IMPROVE AVIATION SAFETY

Includes research undertaken primarily to protect passengers, operating personnel, cargo and the system from harm or destruction from natural or accidental causes. For example, this subobjective includes work to prevent or avoid accidents caused by human or vehicle failures or hazards associated with fixed installations; develop methods and equipment to counteract adverse conditions such as fog, snow and wake vortices; reduce injury or damage incurred in an accident; increase cargo safety; and improve search and rescue techniques and equipment for people involved in accidents. Include here only that communications and navigation work which is conducted to improve crash avoidance capability.

Exclude work to increase people and cargo security by developing more effective surveillance and control methods to prevent criminal acts (see VII., LAW ENFORCEMENT AND JUSTICE). Also exclude work which has safety implications, such as engine reliability, but which is conducted primarily to improve the vehicle's performance or efficiency (see IMPROVE VEHICLES, above).

B. RAIL

Includes research directed toward improving transportation systems that move on rails. Work shown here involves existing and future conceptual rail transportation equipment and systems which operate on an urban and interurban basis.

1. IMPROVE RAIL VEHICLES

This subobjective focuses on problems internal to the vehicle. It includes, but is not limited to, work to increase the speed, range, capacity or payload; to reduce the cost of construction and operation; to improve the passenger/cargo environment; to develop new and more productive vehicles; and to meet special transportation needs of the elderly and handicapped. However, research conducted on the vehicle specifically to improve the safety of the passengers and cargo will be excluded (see IMPROVE SAFETY, below).

2. IMPROVE OPERATIONAL ENVIRONMENT AND EFFECTIVENESS

This objective focuses on problems and activities that are external to the vehicle itself and that relate directly to the efficiency and operation of the rail transportation system and the rail environment--stations and pathways. For example, it includes research to improve connectivity in the terminals to increase capacity or reduce trip time; to improve scheduling, accessibility and dependability; to improve traffic control systems and terminal area operations; to improve communications related to rail transportation; to reduce rail transportation systems costs; to modernize regulations and legislation; and to enhance commercial development. Research related to the rail operational environment but conducted specifically to improve the safety of passengers and cargo will be shown under IMPROVE SAFETY, below. Exclude research to improve or expedite transfer at a modal interface (see XII. F., MULTI- AND INTER-MODAL, below).

Report rail traffic control as a separate line item and as a portion of the total for this subobjective.

3. IMPROVE RAIL SAFETY

Includes research undertaken primarily to protect passengers, operating personnel, cargo and the system from harm or destruction from natural or accidental causes. For example, this subobjective includes work to prevent or avoid accidents caused by human or vehicle failures or hazards associated with fixed installations; develop methods and equipment to counteract adverse conditions such as fog and snow; reduce injury or damage incurred in an accident; increase cargo safety; and improve search and rescue techniques and equipment for people involved in accidents. Include here only that communications research which is conducted to improve crash avoidance capability.

Exclude research to increase people and cargo security by developing more effective surveillance and control methods to prevent criminal acts (see VII., LAW ENFORCEMENT AND JUSTICE). Also exclude work which has safety implications, such as engine reliability, but which is conducted primarily to improve the vehicle's performance or efficiency (see IMPROVE VEHICLES, above).

C. HIGHWAY

This subobjective includes research which concerns transportation vehicles and systems that use highways, streets and roads and do not require rails or guideways. This includes passenger vehicles, buses, trucks and other vehicles which use highways and which operate both within and between urban centers.

Exclude research on vehicles of this nature which have exclusively military applications (see VIII., MILITARY).

1. IMPROVE VEHICLES

This subobjective focuses on problems internal to the vehicle. It includes, but is not limited to, work to increase the speed, range, capacity or payload; to reduce the cost of construction and operation; to improve the passenger/cargo environment; to develop new and more productive vehicles; and to meet special transportation needs of the elderly and

handicapped. However, research and development conducted on the vehicle specifically to improve the safety of the passengers and cargo will be excluded (see IMPROVE SAFETY, below). Also exclude research primarily directed to conserve energy used by highway vehicles (see II., ENERGY DEVELOPMENT AND CONSERVATION).

2. IMPROVE OPERATIONAL ENVIRONMENT AND EFFECTIVENESS

This objective focuses on problems and activities that are external to the vehicle itself and that relate directly to the efficiency and operation of the transportation system and the highway environment--interchanges and highways. For example, it includes research to improve connectivity in the terminals to increase capacity or reduce trip time; to improve scheduling, accessibility and dependability; to improve traffic control systems and terminal area operations; to promote more efficient traffic flow; to improve communications related to highway transportation; to modernize regulations and legislation; and to improve highway surfacing techniques. Research related to the highway operational environment but conducted specifically to improve the safety of passengers and cargo will be shown under IMPROVE SAFETY, below. Exclude research to improve or expedite transfer at modal interfaces (see XII. F., MULTI- AND INTERMODAL, below).

Report traffic control as a separate line item and as a portion of the total for this subobjective.

3. IMPROVE HIGHWAY SAFETY

Includes research undertaken primarily to protect passengers, operating personnel, cargo and the system from harm or destruction from natural or accidental causes. For example, this subobjective includes work to prevent or avoid accidents caused by human or vehicle failures or hazards associated with fixed installations; develop methods and equipment to counteract adverse conditions such as fog and snow; reduce injury or damage incurred in an accident; increase cargo safety; and improve search and rescue techniques and equipment such as air bags for people involved in accidents. Include here only that communications work which is conducted to improve crash avoidance capability.

Exclude work to increase people and cargo security by developing more effective surveillance and control methods to prevent criminal acts (see VII., LAW ENFORCEMENT AND JUSTICE). Also exclude work which has safety implications, such as engine reliability, but which is conducted primarily to improve the vehicle's performance or efficiency (see IMPROVE VEHICLES, above).

D. MARINE

Includes transportation research that concerns marine vehicles, operational environment and effectiveness, and safety. This includes work on existing and future conceptual marine transportation, equipment and systems that travel on the ocean and inland waterways.

Exclude research on marine vehicles which have exclusively military applications, such as destroyers (see VIII., MILITARY).

1. IMPROVE MARINE VEHICLES

This subobjective focuses on problems internal to the vehicle. It includes, but is not limited to, work to increase the speed, range, capacity or payload; to reduce the cost of construction and operation; to improve the passenger/cargo environment; to develop new and more productive vessels; and to meet special transportation needs of the elderly and handicapped. However, research and development conducted on the vehicle specifically to improve the safety of the passengers and cargo will be excluded (see IMPROVE SAFETY, below).

2. IMPROVE MARINE OPERATIONAL ENVIRONMENT AND EFFECTIVENESS

This objective focuses on problems and activities that are external to the vehicle itself and that relate directly to the efficiency and operation of the marine transportation system and the environment--ports and sea lanes. For example, it includes research to improve connectivity in the terminals to increase capacity or reduce trip time; to improve scheduling, accessibility and dependability; to improve traffic control systems and terminal area operations; to improve communications and navigation related to marine transportation; to modernize regulations and legislation; to improve fleet and cargo flow management and the related shipping operations, information systems and communications to maximize efficiency; and to enhance commercial development. Research related to the marine operational environment but conducted

specifically to improve the safety of passengers and cargo will be shown under IMPROVE SAFETY, below. Exclude research to improve or expedite transfer at modal interface (see XII. F., MULTI- AND INTER-MODAL, below).

Report traffic control as a separate line item and as a portion of the total for this subobjective.

3. IMPROVE MARINE SAFETY

Includes research undertaken primarily to protect passengers, operating personnel, cargo and the system from harm or destruction from natural or accidental causes. For example, this subobjective includes work to prevent or avoid accidents caused by human or vehicle failures or hazards associated with fixed installations; develop methods and equipment to counteract adverse conditions such as fog, snow and high seas; reduce injury or damage incurred in an accident; increase cargo safety; and improve search and rescue techniques and equipment for people involved in accidents. Include here only that communications and navigation work which is conducted to improve crash avoidance capability.

Exclude work to increase people and cargo security by developing more effective surveillance and control methods to prevent criminal acts (see VII., LAW ENFORCEMENT AND JUSTICE). Also exclude work which has safety implications, such as engine reliability, but which is conducted primarily to improve the vehicle's performance or efficiency (see IMPROVE VEHICLES, above).

E. PIPELINE

Includes research and development on existing pipeline transportation equipment and systems which carry oil, gas, water and any other material and work on future conceptual equipment and systems.

1. IMPROVE PIPELINE EQUIPMENT AND OPERATIONAL EFFECTIVENESS

Includes all efforts aimed at improving pipeline flow by increasing capacity, increasing the speed of material flow, improving construction techniques and reducing the costs of constructing and operating pipeline. Also includes efforts to improve connectivity in terminals or other modal interfaces;

develop new and more productive pipeline systems; and reduce costs associated with pipelines such as planning, research and development, investment, acquisition, operating and maintenance.

2. IMPROVE PIPELINE SAFETY

Includes all efforts to protect the system and material being moved from loss from natural or accidental causes. This includes work on both existing and future pipeline systems. Specifically, it includes work to prevent accidents caused by human failures or hazards associated with the terrain through which the pipeline runs, to protect loss of cargo by leakage or rupture of pipelines, to locate pipeline leaks and to repair leaks or breaks in pipelines.

Exclude work to evaluate the impact of pipeline construction and of potential leaks on the environment surrounding the pipeline (see III., ENVIRONMENTAL QUALITY IMPROVEMENT).

F. MULTI- AND INTER-MODAL

Multi-modal research and development encompasses activities which involve or affect more than one mode, such as tunneling, telecommunications and transportation systems planning and operational analysis as well as vehicles which function in more than one mode. Also include specialized activities of advanced ground transportation modes, such as vehicle propulsion, vehicle suspension, path design, communications and command and control technology that involve or affect more than one mode or the interchange of two or more modes.

Inter-modal research and development provides efficient transfer of passengers and cargo among the various transportation modes and efficient control through all stages of the trip.

In addition, include all efforts to reduce costs associated with constructing, operating and maintaining these systems and to increase the safety of their use.

XIII. OTHER

XIII. OTHER

This objective encompasses research primarily directed toward developing techniques and systems to improve the delivery of community services, such as sanitation or fire protection; to develop better ways of conducting foreign affairs; to improve the efficiency, effectiveness and equity of income assistance; to improve management and optimize the use of manpower resources; to assess the need for, effectiveness of, and impact of regulatory activities; and to protect and assure occupational and consumer product safety.

This objective is limited to that research which cannot be applied to other parts of the structure. For example, research efforts directed toward the community service aspects of such objectives as housing (see VI., HOUSING AND COMMUNITY DEVELOPMENT) or health (see V., HEALTH) are excluded from this objective.

A. COMMUNITY SERVICES

Encompasses research directed primarily toward improving the efficiency, effectiveness, equity and delivery of services to meet the general needs of the entire public (such as sanitation systems and fire protection) as well as services directed toward more specific needs of definable groups of people (such as child adoption services and foster care). Includes research to determine the different needs for community services; develop alternative approaches to meet these needs and their effects; develop better means of delivering community services; improve the capabilities of Federal, State and local governments to plan, manage and deliver their programs and services; develop inputs for the demand and supply of community services and social program and policy development; determine costs and benefits of alternative organizations which could cope with problems State and local governments confront; reform State and local organizational structures to alleviate such problems as overlapping jurisdictions and authority distribution; provide improved

analytical and management tools to State and local governments; and improve information flow in local governments.

Exclude that research which can be applied to other parts of the overall structure. For example, exclude research to improve the availability and quality of health care delivery, a community service (see V., HEALTH), and exclude research to develop alternative transportation services, also a community service (see XII., TRANSPORTATION). Other parts in the overall structure which may include aspects of community service research are VI., HOUSING AND COMMUNITY DEVELOPMENT; I., EDUCATION AND TRAINING; VII. LAW ENFORCEMENT AND JUSTICE; XIII. C., INCOME ASSISTANCE; and XIII. D., MANPOWER.

B. FOREIGN AFFAIRS

Includes research to develop better ways of conducting international relations through improved foreign aid operations, improved understanding of international trade and tariffs, refined methods for consummating and enforcing international agreements, and better methods for formulating U.S. foreign policy. Also includes research on the peculiar problems of specific developing or less developed countries and studies in which existing U.S. technology and research results are applied to these situations or ways to apply it are developed.

Excludes all research which has a primarily U.S. domestic objective. This excluded research will be shown in the other sections of this structure which correspond to its primary objective. For example, research on cancer or heart disease, unless it solely studies the contributing factors which are unique to other countries, will be shown under V. A. 4., CANCER or V. A. 11., HEART AND VASCULAR DISEASES, respectively.

1. FOREIGN AID

Includes research to improve the effectiveness and the administration and management of U.S. foreign aid operations. Also includes research on the specific problems of developing or less developed countries, such as food, health and nutrition, population planning, education, and economic growth and productivity.

Typical research objectives relating to foreign aid include the following: improve the quality and quantity of food production and nutrient value of foods, develop better ways of assisting less developed countries in improving the

health status of the indigent portions of their populaces; increase understanding of the factors affecting population planning, including birth and death rates, average life expectancy, and cultural, religious, and moral views of population planning, and develop methods to influence these factors; improve the quality, accessibility, and availability of education services; and improve understanding of the factors affecting and develop methods to increase economic growth and productivity, including such factors as the level of science and technology, land use practices, urbanization tendencies, natural resource availability and management capacity, costs of public goods and services, and human welfare and maintenance needs.

2. INTERNATIONAL AGREEMENTS AND FOREIGN POLICY

Includes research concerning negotiations and policy formulations, and methods of enforcing agreements on such international issues as arms control and disarmament, strategic weapons testing, tariffs and foreign trade, disaster relief, technology exchange, and economic growth and development. Also includes research to improve the conduct of relations between two or more countries, and to develop better methods for formulating U.S. foreign policy.

Excludes research on the specific methodologies required to provide foreign aid (see XIII. B. 1., FOREIGN AID).

C. INCOME ASSISTANCE

Research shown here is conducted primarily to improve the efficiency, effectiveness and equity of various income assistance programs such as Income Maintenance, Social Security benefits and Unemployment Insurance. Includes research to determine the different needs for income assistance, to study alternative approaches to meet these needs and their effects, and to improve the delivery of income assistance.

Exclude and show where appropriate research on programs to provide money as a means of achieving an overriding objective shown elsewhere in the overall structure. For example, in meeting housing objectives programs may provide cash to designated recipients to be used specifically as a housing allowance. Research to develop such a program as an efficient and effective means to meet housing objectives is excluded from here (see VI., HOUSING AND COMMUNITY DEVELOPMENT).

D. MANPOWER

Encompasses research primarily directed toward improving the utilization and management of manpower resources. This includes, but is not limited to, research to improve the methods for developing manpower policy; develop solutions to unemployment and other manpower malutilizations; improve the allocation and productivity of manpower resources; improve abilities to assess needs and plan and manage governmental manpower programs; and improve understanding of various influences on the U.S. labor market, including immigrants, illegal entries, etc.

Exclude research to improve programs and methods (such as vocational training programs) which prepare individuals for specific jobs and vocations (see I. D., VOCATIONAL TRAINING).

Exclude research directed toward improving methods to provide income assistance to the unemployed such as research to improve unemployment insurance (see XIII. C., INCOME ASSISTANCE).

Exclude research to develop job opportunities for ex-prisoners (see VII. D., CORRECTIONS).

Exclude research to optimize the management and use of Federal, State and local manpower resources in delivering their programs and services (see XIII. A., COMMUNITY SERVICES DELIVERY).

E. REGULATORY ACTIVITIES

Encompasses research which is conducted primarily to develop methods which determine the costs and benefits of governmental regulatory activities, to determine the effects of regulation and deregulation upon economic productivity, to assess the need for regulation, and to increase the social effectiveness of regulation.

Exclude research which studies specific regulatory activities of the major objectives presented elsewhere in this structure. For example, exclude research to assess the impact on U.S. transportation system of deregulating the railroad industry (see XII. B., RAIL).

F. SAFETY

Encompasses research conducted to protect and assure personal safety in various situations that are not specifically addressed

elsewhere in the overall structure. For example, this entry includes research related to occupational safety and health and consumer products safety that is conducted to isolate causes of injuries, determine the health effects in work environments, identify or measure safety threats and control or prevent these thre

Exclude research to treat or cure diseases or injuries which result from these threats (see V., HEALTH).

Exclude research to determine, prevent or control the effects of radioactive pollutants on workers (See II. D. 7., NUCLEAR SAFETY).

Exclude research to improve safety in different transportation modes (see XII., TRANSPORTATION).

1. OCCUPATIONAL SAFETY AND HEALTH

Includes research conducted to isolate causes of injuries or diseases in the work environment; measure or determine the kind and extent of the threat; and in most cases, control the activity or pollutant so that safety standards can be established and worker's health and safety protected. A specific example of this includes research to determine threats to workers in mines. All aspects of mine safety research will be shown here.

Exclude occupational safety and health research which can be applied to a single objective elsewhere in the overall structure. For example, exclude research to determine radiation effects on nuclear power plant workers. (See II. D. 7., NUCLEAR SAFETY).

2. CONSUMER PRODUCTS SAFETY

Encompasses research on consumer products which is conducted to develop methods which determine and isolate threats to safety caused by consumer products. This research involves efforts to test and assure the safety of consumer products and might lead to the banning or modification of harmful products. Includes research on the safety of non-food, non-agricultural products such as drugs and patent medicines.

Exclude research on the safety of food and non-food agricultural products (See IV. E., IMPROVE SAFETY).