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<950> ABSTRACT

Mound Laboratory, Miamisburg, Ohio is operated by Monsanto Research Corporation and is responsible to the Albuquerque Operations Office. It is an integrated production and laboratory facility which performs production and process development for weapons programs and conducts research and development for several other ERDA programs. Its missions are directed toward explosives and nuclear technologies. Total authorized plant and equipment is valued at \$105.3 million. Gross operating funds for FY 1975 are estimated at \$42.5 million. FY 1975 employment at midyear was 1,699. This paper provides an overview of the staff and technical qualifications, and technical capabilities of the Mound Laboratory.

MLM-MU-75-63-0002

**CAPABILITIES, ACTIVITIES,
AND RESOURCES OF
MOUND LABORATORY**

**A Summary Prepared for
The Information Division,
Albuquerque Operations Office**

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March 18, 1975



Monsanto

MOUND LABORATORY

Miamisburg, Ohio
operated by

MONSANTO RESEARCH CORPORATION

a subsidiary of Monsanto Company

for the

**UNITED STATES ENERGY RESEARCH
AND DEVELOPMENT ADMINISTRATION**

U. S. Government Contract No. AT-33-1-GEN-53

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SUMMARY

Mound Laboratory, Miamisburg, Ohio is operated by Monsanto Research Corporation and is responsible to the Albuquerque Operations Office. It is an integrated production and laboratory facility which performs production and process development for weapons programs and conducts research and development for several other ERDA programs. Its missions are directed toward explosives and nuclear technologies. Total authorized plant and equipment is valued at \$105.3 million. Gross operating funds for FY 1975 are estimated at \$42.5 million. FY 1975 employment at midyear was 1,699.

Mound Laboratory originated as a technical organization in 1943 in Dayton, Ohio when Monsanto Chemical Company was requested to accept responsibility for determining the chemical and metallurgical properties of polonium as a project of the Manhattan Engineering District. Construction of a permanent facility for this activity was completed in nearby Miamisburg in 1948. All early programs were concerned with polonium-210 and its applications. Additional assignments soon led to a wide variety of technical activities, and during the last 26 years many diversified capabilities for highly specialized research, development, and production operations have been developed.

In 1948, the first of a large number of different precision calorimeters was built, to begin an activity which resulted in Mound Laboratory becoming a center for calorimetry technology in the ERDA complex. In the 1950's several programs for research on fuels for civilian power reactors were conducted.

Separation of the stable isotopes of noble gases began as an expansion of research on thermal diffusion columns which started

in 1954. Today, Mound Laboratory is recognized as a world leader in thermal diffusion research, and additional separation processes have been developed to provide a large number of nonradioactive isotopes for distribution throughout the free world.

In 1954 the thermoelectric generator fueled with polonium-210 was invented at Mound Laboratory. The first SNAP generator, SNAP-3A, was fueled with polonium-210. The utilization of plutonium-238 in heat sources was started in 1961. A large number of heat sources fueled with plutonium-238 have since been developed and fabricated for use in thermoelectric generators and heat sources for lunar experiments, weather satellites, navigational satellites, and spacecraft. The SNAP-27 units left on the moon during the Apollo program and the satellite for the Jupiter flyby mission were powered by plutonium-238 heat sources built at Mound. Other heat sources have been developed for use in life-support systems, swim suit heaters, artificial hearts and cardiac pacemakers.

In 1957 Mound Laboratory began the development, production, and surveillance of detonators and other explosives components for military applications, one of its major functions today.

Surveillance of components containing tritium, initiated in 1958, was the first of many activities in tritium technology, and led to an extensive capability for handling and studying tritium and tritium compounds.

In the early 1970's, as national concerns about the environment and the conservation of resources mounted, Mound expanded its comprehensive programs in environmental control, waste management, and energy conservation. Current research and development activities include several projects related to energy conversion systems.

FUNDING

	<u>Estimated FY 1975</u>	<u>Actual FY 1974</u>
	(in millions)	
Production Activities	28.5	24.2
Development, Laboratory Support, and Other Programs	14.0	13.6
Gross Operating	42.5	37.8

HUMAN RESOURCES

EDUCATION: HIGHEST DEGREE ATTAINED AND FIELD

<u>Field of Degree</u>	<u>Highest Degree</u>			<u>Total</u>
	<u>Bachelor</u>	<u>Master</u>	<u>Doctorate</u>	
<u>Engineering</u>				
Chemical	31	11	3	45
Civil	3			3
Electrical and Electronics	18	1		19
Mechanical	36	2		38
Nuclear and Reactor	2			2
Metallurgical	2	1		3
Petroleum Systems	1			1
Others				
Engineering Mgmt.		1		1
Aeronautical	1			1
Welding	1			1
Industrial	9			9
Environmental	1			1
Engineering, Other	5			5
Total	110	16	3	129
 <u>Mathematics and Related Areas</u>				
Mathematicians	11	1		12
Information Science Systems Analysis Operations Research				
Total	11	1		12
 <u>Physical and Earth Sciences</u>				
Chemists	88	27	42	157
Geologists and Geophysics				
Physicists	25	9	8	42
Metallurgists	1		2	3
Others				
Science	3			3
Other	8			8
Total	125	36	52	213

<u>Field of Degree</u>	<u>Highest Degree</u>			<u>Total</u>
	<u>Bachelor</u>	<u>Master</u>	<u>Doctorate</u>	
<u>Environmental Sciences</u> Total				
<u>Agricultural Sciences</u> Total				
<u>Medical Sciences</u> Total			2	2
<u>Biological Sciences</u> Total	8			8
<u>Psychology</u> Total	1	1		2
<u>Social Sciences</u> Total	12			12
<u>Business and Management</u>				
Administration (Eng., Public, etc.)	20	3		23
Finance				
Accounting	13	1		14
Management Science				
Personnel	<u>2</u>	<u>1</u>	<u>—</u>	<u>3</u>
Total	35	5		40
GRAND TOTALS	302	59	57	418

OCCUPATIONS

	Number of	Data Source	
		<u>"working as"</u>	<u>"educational records"</u>
Officials and Managers	225	x	
Professional Scientists:			
Physics	22	x	
Chemistry	92	x	
Math	3	x	
Biology			
Agriculture			
Medical	2	x	
Environment	5	x	
Other			
Total	124		
Professional Engineers:			
Chemical	10	x	
Civil			
Electrical and Electronics	10	x	
Mechanical	21	x	
Nuclear & Reactor			
Metallurgical	5	x	
Petroleum			
Systems	1	x	
Other			
Quality Control	20	x	
Project Design	11	x	
Product	24	x	
Safety	5	x	
Automation	7	x	
Development	16	x	
Industrial	8	x	
Total	138		
Other Professional	142	x	
Technicians	345	x	
Office and Clerical	214	x	
Craftsman (Skilled)	185	x	
Operatives (Semi-Skilled)	155	x	
Laborers (Unskilled)	21	x	
Service Workers	120	x	
GRAND TOTAL	1699		

FACILITIES

Mound Laboratory, located on a 180-acre site, currently includes 89 buildings with a total floor area of 788,000 sq ft of useful space. Approximately 220,000 sq ft is occupied by production and laboratory facilities, 130,000 sq ft by administrative services, and 438,000 sq ft by other supporting functions.

<u>Large and/or Unique Facilities and Equipment</u>	<u>Purchase Value</u>
Plutonium-238 Processing and Encapsulation Facility	\$6,545,000
Alpha Fuels Environmental Test Facility	3,847,000
Nuclear Component Development and Production Equipment	2,418,000
Tritium Technology Facility	1,960,000
Tritium Effluent Control Laboratory	599,000
Pyrotechnic Facility	134,000
Fine Powder Technology Facility	325,000
Process Mechanization Facility	867,000
Thermal Diffusion Cascades for Isotope Separation	639,000
Carbon Monoxide Still	80,000
Sulfur Isotopes Chemical Exchange Cascade	300,000
Cryogenic Distillation Equipment	70,000
Equipment for Separation of Heavy Radioisotopes	243,100
Molecular Beam Chamber	170,000
Impact Gun for Impact Testing	385,000
Destructive and Nondestructive Testing Equipment for Explosives Materials	1,764,000
Quality Assurance Testing Equipment for Nuclear Components	1,680,000

<u>Large and/or Unique Facilities and Equipment</u>	<u>Purchase Value</u>
Shipping Container Test Facility	\$ 85,000
Calorimetry and Safeguards Equipment	673,000
Equipment for Analysis of Radioactive and Nonradioactive Materials	1,235,000
Dimensional Standards Laboratory	250,000
Electrical Standards Laboratory	200,000
Environmental Standards Laboratory	320,000
Mass Standards Laboratory	182,000
Equipment for Welding and Joining of Refractory Metals	2,400,000
Precision Machining Equipment	1,082,000
Hydroform Press	66,200
Personnel Monitoring Equipment	200,000
Environmental Monitoring Equipment	320,000
Whole Body Counter	210,000
IBM 360/50 Computers and Ancillary Equipment	3,390,000

TECHNICAL CAPABILITIES

<u>Major Ongoing Activities</u>	<u>Average Staff, Mid FY-1975</u>
Engineering and Manufacturing of Explosives Products	261
Quality Assurance, Explosives Products and Stockpile Samples	178
Explosives Process Development	59
Automation Development and Engineering	10
Manufacturing of Nuclear Components	5
Quality Assurance, Stockpile Sample of Nuclear Components	15
Nuclear Process Development	23
Tritium Recovery	8
Development of Tritium Effluent Control	8
Pu-238 Heat Source Development and Encapsulation	77
Stable Isotopes Separation and Sales	14
Heavy Radioisotopes Separation	12
Applied Physics	18
Destructive and Nondestructive Testing	64
Analytical and Instrumental Analysis	55
Calorimetry	9
Environmental Control	23
Health Physics	49
Precision Machining, Toolmaking, Modelmaking	56
Facilities Engineering	35
Data Processing and Computer Technology	27

MISSION: CURRENT PROGRAM ACTIVITIES AND PLANS FOR THE FUTURE

Mound Laboratory is operated by Monsanto Research Corporation, a wholly owned subsidiary of Monsanto Company. It is an integrated production and laboratory facility which performs a wide variety of weapons production and process development activities and conducts research and development for several other ERDA programs. Based on specialized capabilities established during the last 26 years, its missions today emphasize work in explosives technology, tritium technology, plutonium-238 isotopic heat source development and encapsulation, and isotope separation.

The current major production activity is the fabrication of explosive components - such as detonators, explosive timers, explosive-actuated transducers and fire sets, and explosive pellets - for nuclear weapons. Work with explosives materials has recently been expanded to include development and production of electronically initiated pyrotechnic components. Other manufacturing activities include the fabrication of nuclear components and small isotopic heat sources for weapons systems. Closely related is an extensive reliability testing program on stockpile samples of explosive detonators and components containing radioactive materials; design and construction of testing equipment is an important part of this quality assurance program.

Process development activities include a broad range of studies to develop materials, processes, and equipment for potential production applications, in support of programs at several ERDA laboratories. Mound also supplies one-of-a-kind components and specialized materials for ERDA laboratories.

As an outgrowth of weapons production activities involving components containing tritium, Mound recovers and purifies tritium from all types of wastes generated at ERDA sites which handle tritium. In associated work advanced techniques for tritium effluent control are being developed which are potentially applicable to nuclear reactor sites and various parts of the ERDA complex. Basic studies on tritium compounds have led to investigation of metal hydrides for energy conversion systems.

A leader in the application of energy from decay of radioisotopes, Mound develops and fabricates a variety of heat sources fueled with plutonium-238 for space and terrestrial use. Currently in development are heat sources for the Lincoln Experimental Satellite and the Mariner-Jupiter-Saturn mission scheduled for the late 1970's.

A worldwide program for sales of stable (nonradioactive) isotopes is conducted in conjunction with isotope separation and enrichment activities. Over 25 isotopes of the noble gases, carbon, nitrogen, oxygen, and sulfur are currently marketed. Potentially important to fission energy systems, the separation of uranium isotopes by a macrocyclic polyether chemical is currently being investigated.

In association with all program activities, Mound conducts multidisciplinary research and development on materials and instrumentation. For example, a comprehensive program for the development of plastics, elastomers, and adhesives is conducted in connection with production operations. Development of methods to form, machine, and join exotic metals is a continuing activity associated with the fabrication of heat sources and test assemblies. Calorimetry research, a longtime specialty, often includes the construction of highly accurate calorimeters for other ERDA sites. This research and development

capability is being increasingly applied to energy-related projects. Current projects include an evaluation of tritium interactions potentially important in fusion reactor systems, development of processes for coal utilization, and development of instrumentation for the Nuclear Safeguards program.

Coordinated with all operations are comprehensive programs for health safety and environmental control which have been highly successful in maintaining personnel exposures and discharges of radioactive and other toxic materials well below existing standards. Current activities are dedicated to continued development of technology for maximum practical containment of radioactive and toxic materials, in line with national goals to protect the environment as new energy sources are developed.

Mound Laboratory will continue its vital role in the maintenance of the nuclear weapon stockpile. Work on explosives and pyrotechnics technology, isotopic heat sources, isotope separations, tritium waste control and technology, and the development of materials and hardware will also continue to be major activities. Concurrently, Mound plans to expand the application of its diverse capabilities to energy-related technology, environmental control, and regulatory techniques. Current activities, for example, could be extended in the immediate future to programs related to material assay and control, controlled thermonuclear research, hydrogen technology, coal utilization, and waste control.

From its varied assignments in the past, Mound Laboratory has developed an organization keyed to the concurrent management of many intricate and demanding programs. Prime responsibilities are distributed between two operating departments, Explosives Operations and Nuclear

Operations, as shown in the attached organization chart. Supporting functions are administered in four associate departments. Appropriate disciplines from all departments are integrated for concerted response to program objectives.

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MONSANTO RESEARCH CORPORATION
MOUND LABORATORY
MIAMISBURG, OHIO

