Report of the Army Science Board
Independent Review
of
The Harry Diamond Laboratories

April 1990

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EXECUTIVE SUMMARY

As requested by the Assistant Secretary, the Army Science Board formed a panel to conduct an effectiveness review of the Harry Diamond Laboratories (HDL), Adelphi, Maryland. The panel addressed the mission of HDL and its relevance to important Army problems. In so doing, the quality of staff, facilities and technical programs at HDL was examined. The panel carried out its charter by conducting on-site visits to HDL, extensive discussions with HDL management, interviews with HDL personnel, and various meetings with primary HDL users, U.S. Army Laboratory Command, and key Army staff officials.

While the dedication and quality of HDL personnel is impressive, there is a need for a stronger mission focus at HDL. The panel believes that the needs of the Army will be better served as the breadth and scope of HDL activities are narrowed and focused on fewer programs and projects. Areas of HDL strengths and particular relevance to current Army needs are nuclear survivability, fuzing technology, and directed energy. While all of the primary users of HDL expressed satisfaction with its work, it was the panel's perception that HDL has an image problem, both within the Army laboratory community at large and with upper Army management.

Over the past years, there has been a high turnover rate of directors and upper level management at HDL. This lack of stability in laboratory leadership has produced turbulence in the management and administrative structure. The panel believes that it is important to stabilize the top management of the lab.

The panel was encouraged by the vision put forth for the Harry Diamond Laboratories by its new director. He outlined a set of goals and objectives for the laboratory for the next five years that, if followed, should lead to a more focused technology program that will better serve future Army needs and improve HDL's standing within the Army laboratory community.

The panel also believes that HDL has, in general, served its user community well in past years and will continue to do so in the future with competent, forward-looking management and a more narrowly-focused set of plans. HDL has good facilities and a competent workforce in place today. As with all of government, however, close attention should be given to maintaining both in a time of decreasing resources and less attractive government employment practices.

A. INTRODUCTION

1. Background -- Past studies of Federal laboratories have suggested the importance of independent reviews as a means of assuring continued laboratory excellence. Consistent with the findings of these studies and at the request of the Commander of the U.S. Army Materiel Command, the Army Science Board (ASB) has initiated a series of reviews of the AMC corporate laboratories and research, development, and engineering centers. This document reports ASB findings based on a review of the Harry Diamond Laboratories (HDL).

2. Panel Composition -- The review panel consisted of the following members:

Professor Alfred Gessow (Chairman)
Department of Aerospace Engineering
University of Maryland

Dr. Thomas E. Cooper
Vice President Aerospace Technology
General Electric

Dr. Philip Dickinson
E Systems
Center for Advanced Plans and Analysis

LTG Robert J. Lunn (USA Ret.)
Science Applications International Corporation

Dr. George Piegari
Professor of Mathematics and Computer Science
Virginia Military Institute

Dr. Tito T. Serafini
Assistant Chief Engineer
Applied Technology Division
TRW Space and Technology Group

3. Panel Activities -- The ASB panel was asked (Appendix 1, pages 11-12) to provide independent observations on the performance of HDL with particular emphasis on the following issues:

a. Quality of staff, facilities, and technical program;

b. Productivity of HDL in accomplishing its mission;

c. Relevancy of HDL's work to important Army problems.

In addition, the panel met with some primary users of HDL services to assess customer satisfaction; these included the Patriot Project Office, the U.S. Army Strategic Defense Command, and the Defense Nuclear Agency. The panel met with Department of

the Army and Army Materiel Command officials involved in laboratory and research, development, and engineering center management.

4. Acknowledgments -- The panel greatly appreciates the cooperative spirit of the HDL management, technical personnel, and support staff in assisting the review. In particular, they were candid in discussions and responded quickly to detailed questions and requests for support.

B. LABORATORY PROFILE

HDL is one of the seven corporate laboratories which make up the U.S. Army's Laboratory Command. HDL has a civilian staff of 702 (and 3 military) of which about sixty percent are science and engineering professionals. While the vast majority of its personnel are located at Adelphi, Maryland, HDL also utilizes facilities at Blossom Point, Maryland, and Woodbridge, Virginia. Electronic fuzing and nuclear survivability are two of the more prominent realms in the HDL technical lineage. During fiscal year 1989, HDL funding totaled $120 million ($78 million mission and $42 million customer). Approximately 36 percent of this total was spent in-house and 64 percent was spent on contracts or for support by other government activities. (Supporting details on organization, mission, staffing, facilities, and funding are in Appendix 2, pages 14-32).

C. FINDINGS

1. Mission -- The HDL mission needs rethinking and refocusing.

a. The current HDL mission is overly diverse. In fact, the panel experienced considerable difficulty in obtaining a concise statement of the HDL mission. After initially struggling through 19 pages of functions posing as a mission statement, the panel received the following:

> HDL performs and provides basic and applied research, exploratory and advanced development, technology leadership and evaluation, and initial procurement to support the following mission areas:
>
> - Nuclear Survivability
> - High-Power Microwave Survivability and Source Technology
> - Electronic Fuzing and Smart Munitions
> - Radar Technology
> - Antiradiation Missiles/Countermeasures
> - Information/Signal Processing.
>
> As agents for Program Executive Officers, Project Managers, and Research, Development, and Engineering Centers, HDL implements transfer of mission area technologies.

Although the panel recognizes the historical contribution and expertise of HDL in the first four mission areas (excepting smart munitions), it feels that further definition is warranted. Even in its diverse form, however, the HDL mission and its work program are contributing significantly to current Army needs. Its Nuclear Effects/Survivability work is a critical element in providing materiel that will survive and function on a nuclear battlefield. HDL's role in this area extends from basic phenomena research, through design guidelines for developers, to active support for testers and evaluators. HDL's fuze expertise is resident in weapon systems deployed today with U.S. combat forces. While the most prominent is the fuze on the Patriot missile system, numerous other examples can be cited. The Patriot fuze is indicative of another strength of the HDL staff. Not satisfied with simply providing a fuze that worked to required specifications, the HDL personnel conducted research to better define operational parameters and analyzed the impact on fuze design; having accomplished that, they created an improved design.

b. Management emphasis appears to have been on "gathering work" rather than utilizing the technical talent of available personnel. Continued expansion of the mission (it appears that the mission statement is expanded each time a new type of task is obtained) tends to emphasize "keep the work force occupied." This observation is based on in-house production efforts that appear inappropriate for a laboratory. In addition, a large HDL effort pertains to the procurement activity of program components such as the Patriot fuze. Such procurement activity should be accomplished by the system program office, not the laboratory. In FY89, twenty-two percent of HDL's available manpower was expended on procurement-related activities (Appendix 2, page 27).

c. An issue of interest is the percentages of total funding and manpower that are devoted to tech base (i.e., 6.1, 6.2, 6.3b) efforts. In FY89, fifty-one percent of the funds HDL received came from the tech base and fifty-five percent of its manpower resources was devoted to tech base efforts (Appendix 2, pages 26-27). While the panel considers this to be on the low side for an Army corporate laboratory, the proportion of tech base effort should increase as the HDL mission is refocused.

d. Further rethinking and focusing of the HDL mission deserves consideration. Discussion with the HDL director and the LABCOM commander indicated that further focusing of the core mission is planned within the major mission areas shown below.

MAJOR MISSION AREAS

HDL DIRECTOR	LABCOM COMMANDER
Radiation Effects	Nuclear Effects/Survivability
Munition Effects	Directed Energy Phenomena/ Survivability
Signal Processing and Command, Control, and Communication	Radar Technology

One possibility is that HDL will become the Army Radiation Laboratory. In speaking out for a more focused mission, the panel wishes to be clear that some accompanying flexibility to explore areas and fill important voids and Army needs is also desirable. The overall perception is that more focus will make HDL, on balance, a more productive Army asset.

e. HDL stands as an important Army resource in electronic fuzes and as an important national resource in nuclear survivability. Maintaining that expertise is important, though in the case of fuzes more emphasis in the 6.1/6.2/6.3a area and less beyond 6.3a should be considered. It would not be prudent, however, to overly restrict HDL's production consultation role.

f. It appears that outside these two areas of excellence HDL has been floundering in its quest for new areas of technological excellence. A number of instances have been cited where HDL received a new technology mission but has not successfully moved forward in that mission. Very Intelligent Surveillance and Target Acquisition (VISTA), acoustics, and Automatic Target Recognition (ATR) are examples. While the panel is aware that technology false-starts are not uncommon, its perception is that HDL has missed some opportunities. On the other hand, HDL has taken a leading role in some aspects of the Army/DOD work in tactical directed energy phenomena and weapons. To assure its long-term relevance it is essential that higher management participate in the planning of future HDL endeavors. It appears that the current director is on the correct path and should be supported.

2. Staffing -- HDL has quality staff, which is in danger of declining.

a. A major strength has been that members of the staff are considered leaders in their field (e.g., nuclear hardening and fuzing). Another strength is that there is a strong sense of partnership between HDL and its customers. The historical roots of HDL's contributions in fuzing and radiation effects have built a team who believe in designing, testing, and producing fielded products. We found the staff enjoyed its work, had a positive attitude, and was adequately equipped to perform its tasks. In general, we found morale to be excellent.

b. A current problem with staffing is the loss of experienced personnel in the upper grades (GS-14 and above). From March 1987 through March 1989, HDL lost twenty-six professionals to early-out retirements, with eleven of those at the GS-14 grade or above. This is of concern because HDL has had engineers and scientists considered leaders in their field, some world renowned; the loss at the upper levels will make it increasingly difficult to attract, train, and retain replacements. It is the renowned individuals who serve as magnets to attract promising science and engineering graduates. This management void is going to be difficult to fill.

c. This staffing problem is exacerbated by the loss of a large number of personnel in the middle grades (GS-11 thru GS-13). Between March 1987 and March 1989, forty-four of seventy losses in the HDL science and engineering staff were at these middle grades. Transition to industry was a major cause. Professionals with advanced degrees and about five years of experience can usually earn considerably more in salary by working in industry. Half of HDL's FY89 science and engineer losses were to the private sector. The loss of persons at the middle and upper grades exacerbates both the training and retention of junior personnel, for it is they who supervise and serve as mentors.

d. Another indication of staff quality was given by a satisfied customer who views HDL as the premier laboratory in the U.S. in nuclear hardening and survivability, as extremely responsive, and as a producer of top-notch products. Nevertheless, he noted that although HDL was viewed in the 1970s as such a prestigious place to work that a professor might give up his university job to work there, he did not believe such is the case today. He believes that it is difficult to attract and retain high-quality, entry-level personnel, and that the professional environment is making it attractive for senior personnel to leave. When renowned senior personnel leave, there aren't replacements coming up. He indicated that other Army agencies, perhaps with a touch of self-interest, view HDL as having passed its peak.

e. To correct these apparent problems in its middle and upper grades and to assure a competent professional workforce, HDL must "grow" its required leaders by publicizing and emphasizing its programs of release time to pursue graduate study, cooperative agreements with colleges and universities, and comprehensive management training.

f. Government has difficulty hiring the brightest and best high technology graduates. It is not competitive in salaries, particularly for beginning personnel and for senior personnel, or in benefits for all personnel. In addition, the panel is also aware of the keen competition in recruiting scientists and engineers in the metropolitan Washington area. Although HDL has demonstrated an ability to recruit its required

numbers, many with good undergraduate records, it must continue to be concerned about the quality of its recruits.

3. Facilities -- HDL possesses adequate facilities, some of which are unique resources.

a. HDL occupies three physical locations as shown in Appendix 2 (pages 23-24). Its main administrative and laboratory facilities are located on 137 acres at Adelphi, Maryland. Its 579-acre Woodbridge (Virginia) Research Facility is the focal point for the Army's electromagnetic pulse research, test, and analysis. HDL conducts fuze-related research and testing on 1600 acres at Blossom Point, Maryland.

b. HDL has a variety of unique facilities which are essential to the accomplishment of its mission and have played an important role in HDL's success in the nuclear hardening and fuze areas. These include a radar clutter facility, electromagnetic pulse simulators, a nuclear radiation effects semiconductor facility, the world's largest flash x-ray facility, a high power microwave research and test facility, and dry room space for the fabrication of special purpose reserve batteries.

4. Image -- HDL has a mixed reputation.

a. Direct customers were uniform in their high praise of the support they received from HDL. For example, radiation hardening support to the Defense Nuclear Agency both in the laboratories and in the field, fuzing support to the Patriot program office, and HDL's leadership in high power microwaves have been first rate.

b. HDL is regarded by Department of the Army and by its peers within the Army Materiel Command in a less favorable light. For example, in a recent ranking of Army laboratories and research, development, and engineering centers, HDL did not score well. Contributing to this score was the thought that HDL has been resting on its laurels, with little recent innovative research and a small number of publications. An apparent lack of interest in being a team player in cooperative corporate laboratory programs was also mentioned.

c. It appears that HDL is having difficulty transitioning to a corporate laboratory role. It may be that HDL's past success as an independent entity which transferred technology from basic research to field use may be a hurdle to overcome.

d. In addition, HDL's image suffers because its mission is not well-focused. Also, its customer base is diffused. Whereas major weapons systems are well understood and supported within the Department of the Army, once one moves from the major weapon programs to areas such as radiation hardening and radio/radar fuzing, advocacy is greatly diminished. HDL has a difficult task in convincing the leadership of the Army that the

services it provides to system developers result in significantly better products that add a real measure to the strength of the force. The panel concludes nevertheless that these services are important to the Army.

5. Management Stability -- Management stability is non-existent.

a. Development and execution of a viable plan that establishes a solid basis for a laboratory is dependent upon the laboratory director and his tenure. HDL has had five different directors over the past five years, with obvious detrimental effects on laboratory morale, discipline and sense of identity. Such effects include lack of mission focus, excessive autonomy of middle management, minimal financial and operating plans, and no documented long-range plans. Other symptoms of lack of management continuity include weak financial performance and poor contract completion with regard to corporate laboratory co-op programs. In turn, these difficulties have contributed to an image problem for HDL within its sister Army Materiel Command laboratories. Procurement delays and problems have caused frustration and complaints on the part of the technical staff.

b. The current director, who took over in the Fall of 1988, has undertaken a number of steps to overcome the existing problems, with the objective to complete the process in FY90. In carrying them out, he appears to have the support and understanding of the Commander of the Laboratory Command. It is imperative that he be given the opportunity to remain at this post for a multi-year period to provide leadership and implementation of the improved management process required to achieve and maintain a sound organizational structure at HDL.

6. Procurement.

a. Federal Procurement Policy, as interpreted by the DOD and the Army, has resulted in a system which is painfully slow in responding to the needs of small buyers. The typical procurement cycle for items costing a few thousand dollars is in excess of one year.

b. The lengthy and complex procurement process is particularly stifling and frustrating to laboratory personnel who have frequent need to purchase equipment, services, and supplies. The situation at HDL, in which the procurement office is not under its direct control, exacerbates the problem.

D. THE BOTTOM LINE

1. Rethinking and Refocusing the Mission.

HDL has been and continues to be an important Army resource. Over the years it has earned a reputation for accomplishment that has encouraged the Army to come to HDL for a

wide variety of purposes. This has resulted in an overly diverse range of effort. HDL and its Army management need to contemplate the future scope of HDL's mission and refocus the HDL mission on areas critical to the Army and compatible both with HDL's role as a corporate laboratory and its areas of technical excellence.

2. Management Stability.

HDL has experienced a number of years of instability in its upper management. This has undoubtedly contributed to the lack of focus in its mission. To chart and follow its course to the future, HDL needs stability in its upper-level management. The Laboratory Command, the Army Materiel Command, and the Army staff should be attentive to this need for stability in HDL's management.

3. Assessment.

The panel believes that HDL has served its user community well in past years and will continue to do so in the future with competent, forward-looking management and a more narrowly-focused mission. HDL has good facilities and a competent workforce in place today. As with all of government, however, close attention should be given to maintaining both in a time of decreasing resources and less attractive government employment practices.

APPENDIX 1

TASKING LETTER

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, DC 20310-0103

8 DEC 1988

Mr. Gilbert F. Decker
Chair, Army Science Board
Penn Central Federal Systems
Company
1800 Diagonal Road
Suite 500
Alexanddria, VA 22314-2840

Dear Mr. Decker:

A number of recent studies of Federal Laboratories have pointed out the importance of external effectiveness reviews as a means of assuring their continuing excellence. Accordingly, I ask that you appoint an Army Science Board panel of four to eight members to conduct an effectiveness review of the Harry Diamond Laboratories, Adelphi, Maryland. The panel should provide independent observations on potential and actual performance of the laboratory, including professional judgment on the cause of deficiencies, if any. A proposed framework for the assessment is enclosed. Specifically, the panel should address the following questions:

a. What is the quality of staff, facility and technical programs?

b. How productive is the lab in accomplishing its mission?

c. How relevant is the lab's work to important Army problems?

d. How can we improve the assessment methodology and procedures?

e. What are the lessons learned from conducting the review?

Lieutenant General Jerry M. Bunyard, Deputy Commanding General, United States Army Materiel Command, is the Sponsor. Major General Richard D. Beltson, Deputy for Technology and Assessments, Office of the Assistant Secretary of the Army (RDA), will serve as the OASA(RDA)

Cognizant Deputy. Mr. Thomas Nolan, U.S. Army Materiel Systems Analysis Activity, will serve as the DA Staff Assistant.

It is not anticipated that your inquiry will go into any "particular matters" within the meaning of Section 208 of Title 18, United States Code.

The panel should begin as soon as possible and complete its review by 1 June 1989.

Sincerely,

J. R. Sculley
Assistant Secretary of the Army
(Research, Development and Acquisition)

Enclosure

PARTICIPANTS LIST

Army Science Board Ad Hoc Subgroup
on
HARRY DIAMOND LABORATORIES
Adelphi, Maryland

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TRW Space and Technology Division
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STUDY SPONSOR
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Deputy Commanding General for Research, Development & Acquisition
U.S. Army Materiel Command
5001 Eisenhower Avenue
Alexandria, VA 22333
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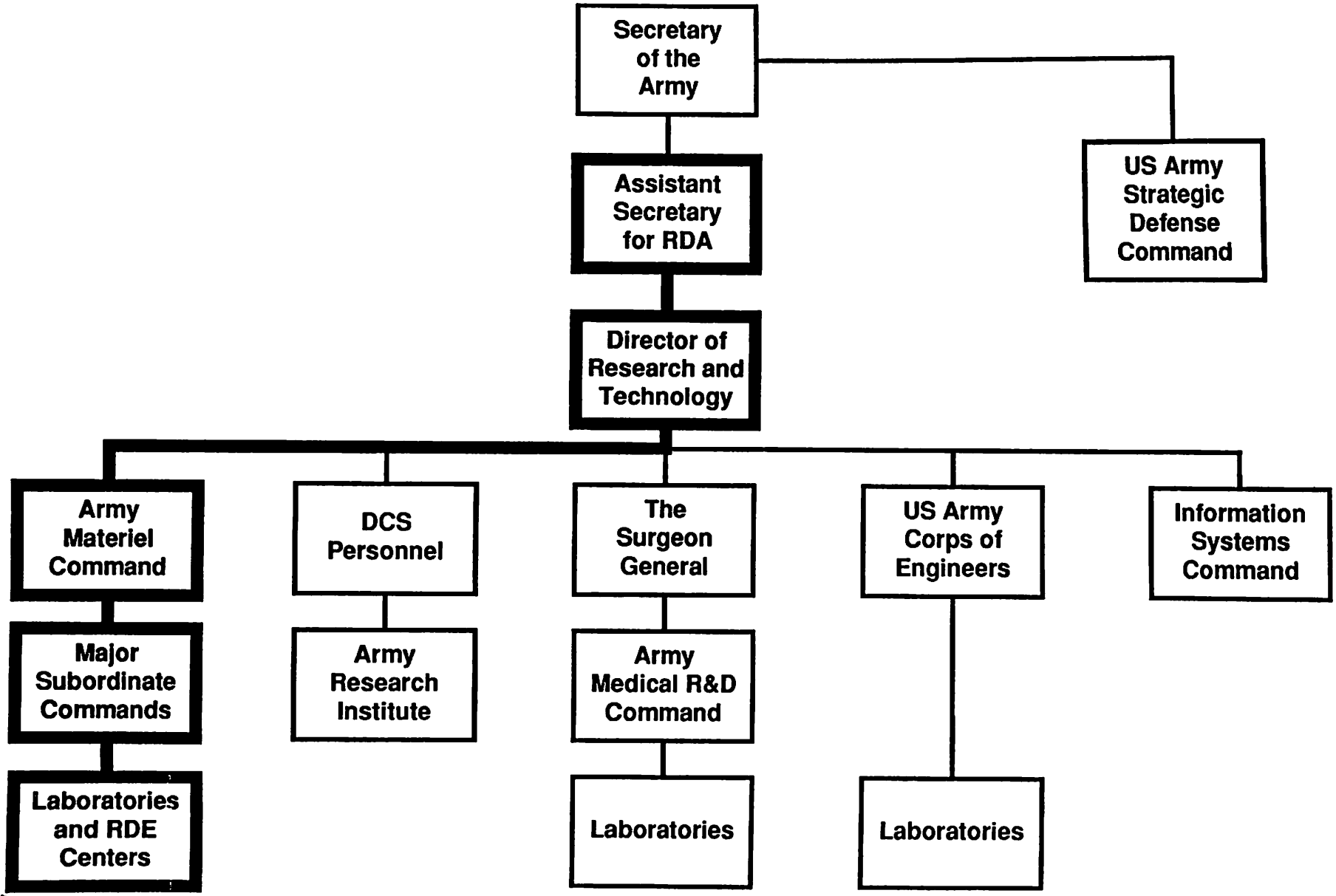
COGNIZANT DEPUTY
MG Richard D. Beltson
Deputy for Technology and Assessment
Office, Assistant Secretary of Army

DA STAFF ASSISTANT
Mr. Thomas Nolan
Chief, Combat Simulation Branch
U.S. Army Materiel Systems Analysis Activity
Aberdeen Proving Ground, 21005
301-278-6610

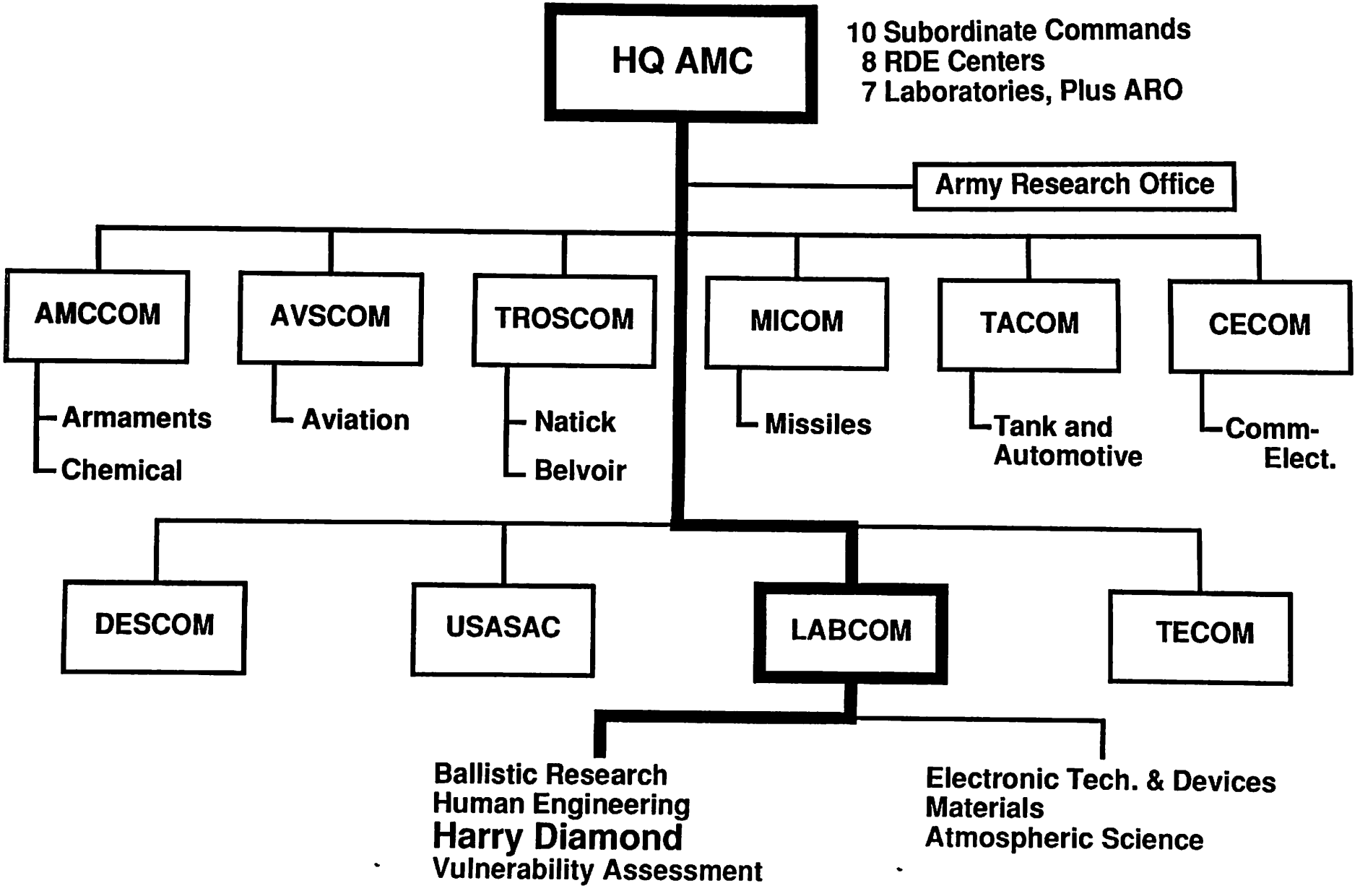
APPENDIX 2

ORGANIZATION, MISSION, STAFF, FACILITIES, FUNDING

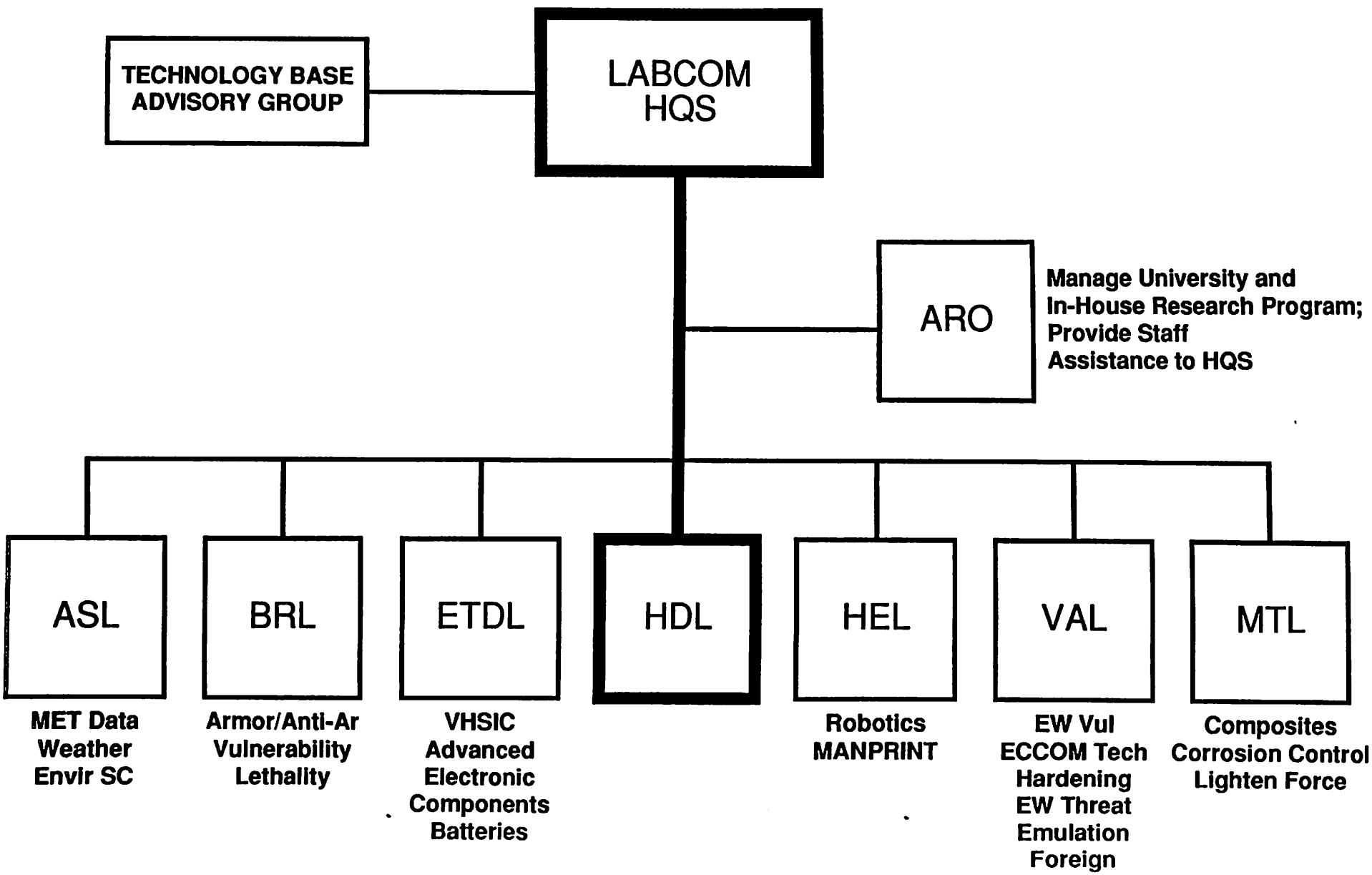
ARMY TECHNOLOGY BASE ORGANIZATION



AMC RDA ORGANIZATION

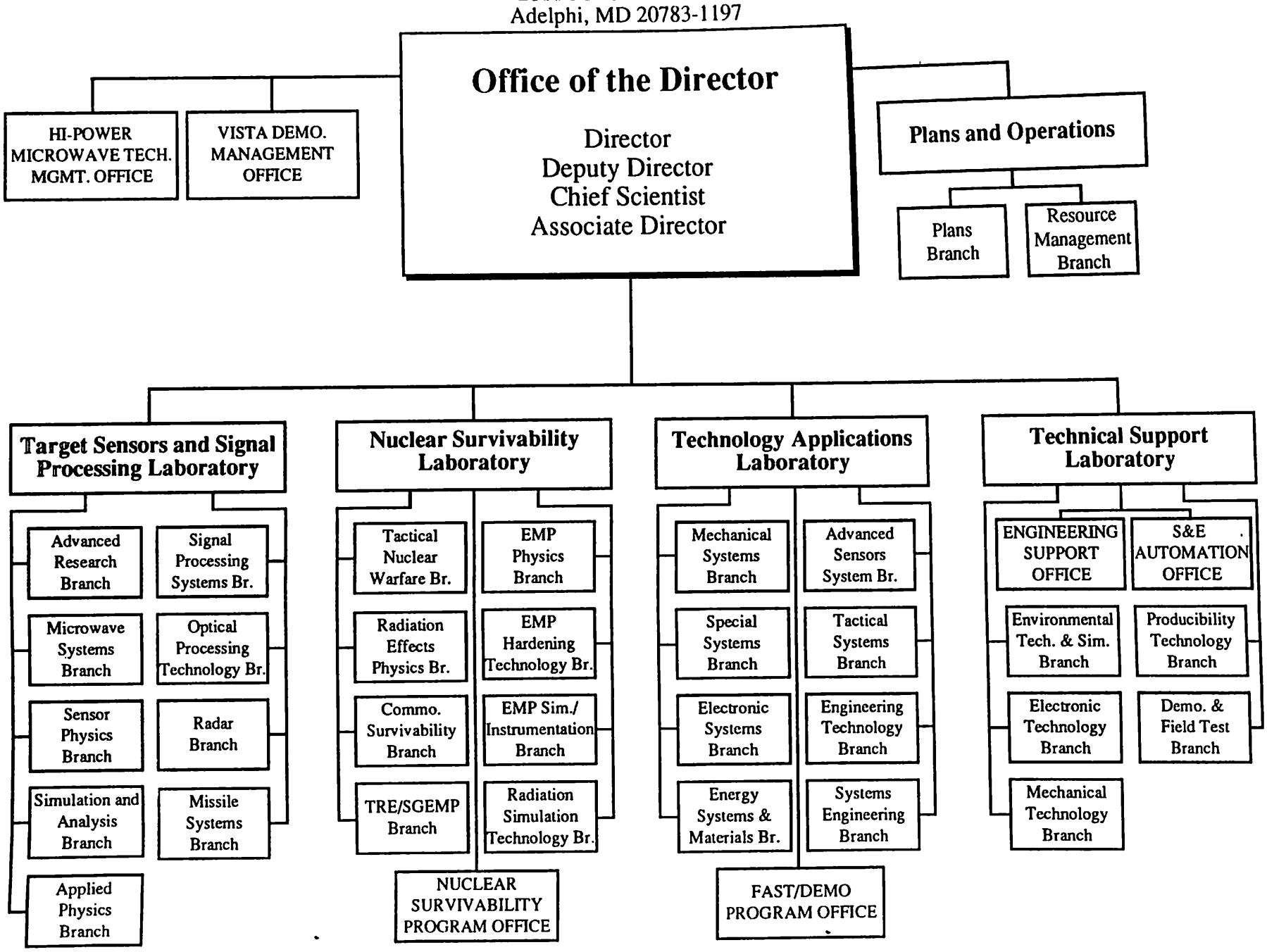


LABCOM
THE "CORPORATE LABORATORIES"



HARRY DIAMOND LABORATORIES

2800 Powder Mill Road
Adelphi, MD 20783-1197



HARRY DIAMOND LABORATORIES (HDL)

MISSION STATEMENT

U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

HDL performs and provides basic and applied research, exploratory and advanced development, technology leadership and evaluation and initial procurement to support the following mission areas:

Nuclear Survivability
High-Power Microwave Survivability and Source Technolgy
Electronic Fuzing and Smart Munitions
Radar Technology
ARM/CM
Information/Signal Processing

As agents for Program Executive Officers, Project Managers and Research, Development and Engineering Centers HDL implements transfer of mission area technologies.

HARRY DIAMOND LABORATORIES

2800 POWDER MILL ROAD
ADELPHI, MD 20783-1197

DIRECTOR, MR. JERRY L. REED
COMM (202) 394-1001
AV 290-1001

MISSION

HARRY DIAMOND LABORATORIES IS THE ARMY'S TECHNOLOGY LEADER FOR RADAR, NUCLEAR SURVIVABILITY AND ELECTRONIC FUZING.

MAJOR PROGRAMS

DEDICATED TO MAINTAINING STRONG IN-HOUSE CAPABILITY TO SUPPORT THE USER, HDL IS RESPONSIBLE FOR BASIC AND APPLIED RESEARCH, EXPLORATORY AND ADVANCED DEVELOPMENT, AND TECHNOLOGY LEADERSHIP IN THE FOLLOWING AREAS.

RADAR TECHNOLOGY

HDL IS THE ARMY'S LEAD LAB IN THE DEVELOPMENT OF THE TECHNOLOGY BASE FOR NEXT GENERATION SYSTEMS INCLUDING MULTISTATIC, NETTED AND MILLIMETER-WAVE RADARS.

NUCLEAR SURVIVABILITY

AS THE ARMY'S LEAD LABORATORY FOR NUCLEAR SURVIVABILITY STUDIES, HDL DEVELOPS AND DISSEMINATES INFORMATION ON RADIATION AND ELECTROMAGNETIC PULSE HARDENING TECHNOLOGY. IT OPERATES THE WORLD'S LARGEST GAMMA RADIATION SIMULATOR-AURORA--FOR THE DEFENSE NUCLEAR AGENCY. IT ALSO OPERATES THE ARMY'S THREAT-LEVEL EMP TEST FACILITY AT ITS WOODBRIDGE (VA) RESEARCH FACILITY.

ELECTRONIC FUZES

HDL IS THE PREMIER DOD TECHNOLOGY CENTER FOR ELECTRONIC FUZING. CURRENTLY, THE LAB IS EXPANDING ITS EFFORTS TO DEAL WITH THE DESIGN AND EVALUATION OF GUIDANCE-INTEGRATED FUZING FOR SELF-CONTAINED MUNITIONS.

IN ADDITION, HDL HAS THE TRI-SERVICE LEAD FOR ANTI-RADIATION MISSILE COUNTERMEASURES AND HIGH-POWER MICROWAVE TECHNOLOGY. HDL IS THE ARMY LEADER IN BATTLEFIELD INFORMATION PROCESSING, ACOUSTO-OPTIC SIGNAL PROCESSING, AIDED TARGET RECOGNITION, C3I NUCLEAR SURVIVABILITY, AND DOMESTIC TECHNOLOGY TRANSFER. THE SIGNATURES, SENSORS AND SIGNAL PROCESSING TECHNOLOGY ORGANIZATION IS PART OF HDL.

BACKGROUND

THE ORIGINS OF HDL BEGAN IN 1953 WHEN THE ORDNANCE DEVELOPMENT DIVISION OF THE NATIONAL BUREAU OF STANDARDS WAS TRANSFERRED TO THE ARMY'S OFFICE OF THE CHIEF OF ORDNANCE. THE NEW LABORATORY WAS NAMED THE DIAMOND ORDNANCE FUZE LABORATORY AFTER HARRY DIAMOND, ONE OF THE INVENTORS OF THE RADIO PROXIMITY FUZE IN WORLD WAR II. IT WAS RENAMED HARRY DIAMOND LABORATORIES IN 1962 TO REFLECT HOW THE SCOPE OF THE LAB'S TECHNOLOGY INVOLVEMENT HAD EXPANDED FAR BEYOND FUZING.

Scientists and Engineers	412	418
Management, Administrators and Clerical	112	118
Technician	122	130
Wage Grade (WG)	34	36
Total	680	702

Military	Authorized	Actual
Officer	3	3
Warrant Officer	0	0
Enlisted	0	0
Total	3	3

As of 31 Dec 88.

PERSONNEL PROFILE

Civilian	Authorized	Actual
Scientists and Engineers	412	418
Management, Administrators and Clerical	112	118
Technician	122	130
Wage Grade (WG)	34	36
Total	680	702

Military	Authorized	Actual
Officer	3	3
Warrant Officer	0	0
Enlisted	0	0
Total	3	3

As of 31 Dec 88.

HDL Science and Engineering Degree Profile

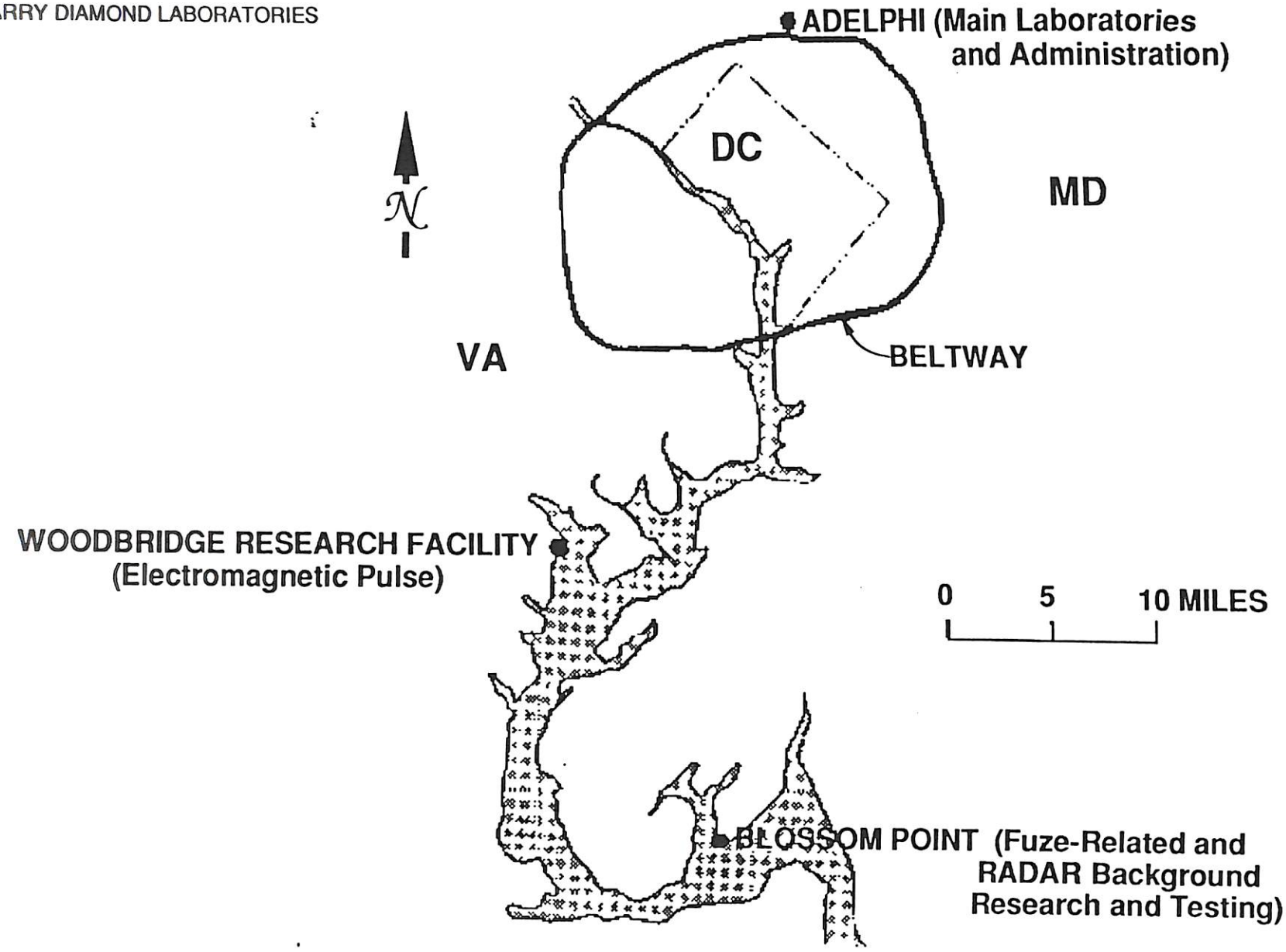
Degree	Bachelors	Masters	PhD	Totals
Aerospace Engineering	3			3
Mechanical Engineering	38	14	2	54
Electrical/ Electronic Engineering	139	39	8	186
Chemistry	10	7		17
Physics	37	24	30	91
Mathematics	2	2		4
Physical Science	7	2	5	14
Computer Science	10			10
Other	10	3		13
TOTALS	256	91	45	392

As of Jan 90.

HARRY DIAMOND LABORATORIES
LOCATION OF FACILITIES

US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



HARRY DIAMOND LABORATORIES FACILITIES

U. S. ARMY LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- HDL Has Three Locations

Location	Square Footage of Buildings	Acres
Adelphi, MD	234,872	137
Blossom Point, MD	928	1600
Woodbridge, VA	39,160	579

- Quality of facilities at all 3 sites is excellent, as needed to meet Army needs
  - Buildings are relatively new and of high quality for laboratory and adminsitrative support
  - Designed specifically for HDL's Army Research & Development mission
  - Continuously updated with both mission and producibility funding
  - Woodbridge configured to meet Army needs with emphasis on modern and specialized one-of-a-kind research and simulation test facilities
  - Blossom Point has no permanent administrative structures and contains only specialized test facilities which are continuously reconfigured for research purposes

HARRY DIAMOND LABORATORIES
MAJOR FACILITIES

U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- 1,400 Square Feet of Dry Room Space (less than 2% relative humidity)
- 3,000 Square Feet of Chemistry Laboratories
- Developmental Ordnance Loading Building and Explosive Storage Magazine
- Ballistic Simulation Facility (air guns)
- Hybrid Circuit Prototyping Facility
- Anechoic Chambers
- AURORA Flash X-Ray Facility
- High Power Microwave Research and Test Facility
- Nuclear Radiation Effects Semiconductor Research Facility
- EMP Simulator Operations Center and EMP Simulators
- Continuous Wave Test Facility
- High Voltage Test and Research Facility
- Scale Model Test Facility
- Electromagnetic Computations Facility
- Fuze Encounter Test Facility and Mortar Proximity Fuze Test Facility
- Radar Clutter Measurement Facility

Funds HDL Received–FY89

(Thousands of Dollars)

Type	Source				Total
	Army	Air Force	Navy	Other	
MISSION					
Tech Base *	46,775	0	0	0	46,775
Other RDTE **	28,918	0	0	0	28,918
Procurement	1,536	0	0	0	1,536
Other	829	0	0	0	829
Total	78,058	0	0	0	78,058
CUSTOMER					
Tech Base	11,724	0	1,018	1,975	14,717
Other RDTE	7,670	175	316	691	8,852
Procurement	14,441	320	240	291	15,292
Other	2,572	0	329	192	3,093
Total	36,407	495	1,903	3,149	41,954
COMBINED					
Tech Base	58,499	0	1,018	1,975	61,492
Other RDTE	36,588	175	316	691	37,770
Procurement	15,977	320	240	291	16,828
Other	3,401	0	329	192	3,922
Total	114,465	495	1,903	3,149	120,012

* 6.1, 6.2, 6.3a

** 6.3b-6.7

HDL Man-Year Expenditures–FY89

Type	Man-Years	Percent
MISSION		
Tech Base	228	92
Other RDTE	18	7
Procurement	0	0
Other	2	1
Total	248	100
CUSTOMER		
Tech Base	159	35
Other RDTE	108	24
Procurement	152	34
Other	32	7
Total	451	100
COMBINED		
Tech Base	387	55
Other RDTE	126	18
Procurement	152	22
Other	34	5
Total	699	100

HDL MISSION RESOURCES

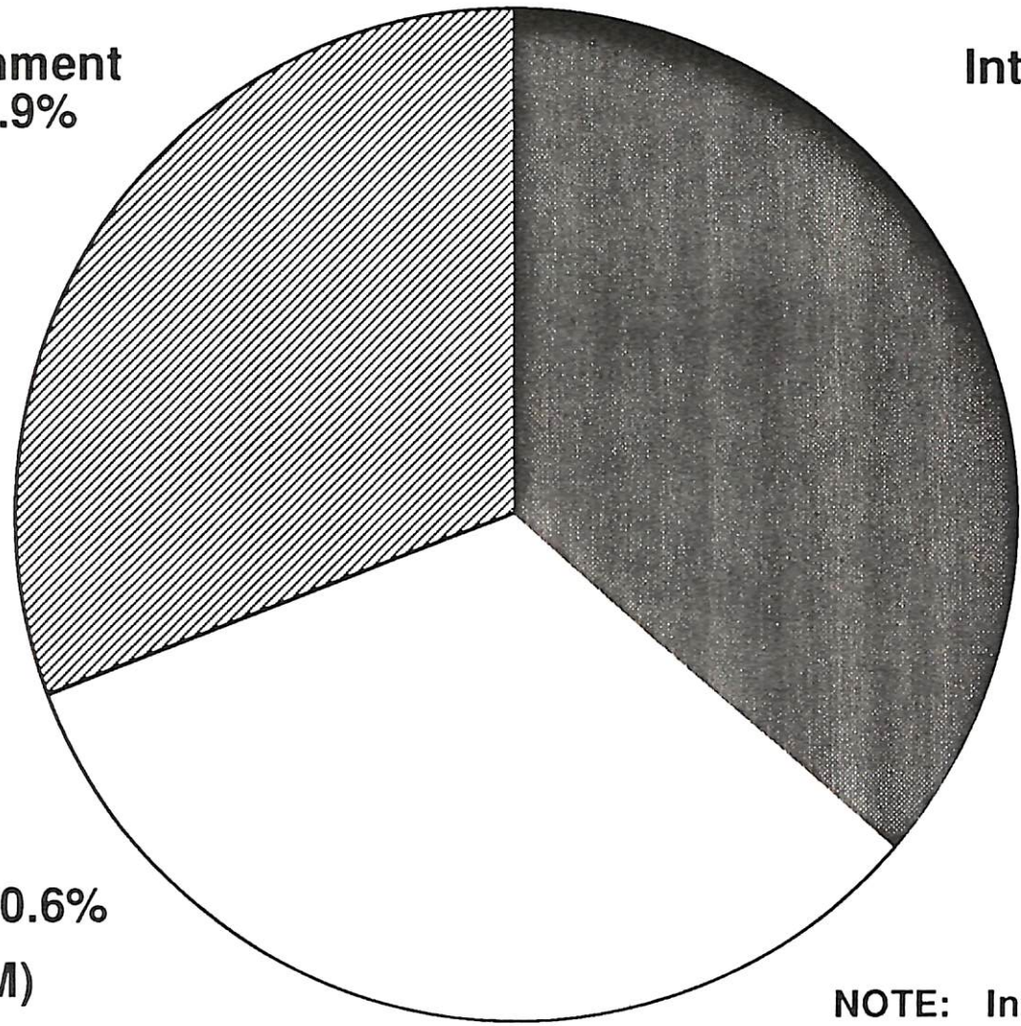
Program	Project		FY89 $K	FY89 Man-Yr	FY90 $K	FY90 Man-Yr
6.1	A91A	ILIR	0	0.0	525	4.5
	AH44	Sensor Sys	2,420	23.3	2,369	20.4
6.2	AH16	Fuze Tech Base	2,754	23.6	5,196	42.3
	H25	Nuc Effects	10,173	25.3	6,183	25.8
	A035	HPM	4,803	8.4	3,472	5.3
	A1PL	Admin & Mgmt	7,571	49.2	0	0.0
	A140	HPM	3,467	12.6	8,454	20.8
	H9511	ATCURE	1,000	0.2	0	0.0
	H93	CSTA	5,161	18.5	7,608	56.7
	42711	Nuc Surv Eff	921	3.8	0	0.0
	DC46	Tractor Flop	0	0.0	1,767	0.0
6.3	D221	CBT Veh	445	0.0	0	0.0
	181	Arm Cm	3,217	13.1	0	0.0
	422	Dir Energy	0	0.0	0	0.0
	431	Adv Dev Eff	1,219	0.0	0	0.0
	153	NEST	4,835	3.3	2,035	17.2
	F32	Adv Elec	1,659	3.0	1,976	11.2
	K21	TEAM/MESA	1,965	17.8	0	0.0
	32D	Alpha Spec Int	17,658	3.9	0	0.0
	DC24	Tractor Hole	0	0.0	9,111	5.0
6.5	MM40	SBIR	811	0.0	484	0.0
	650	Foreign	253	1.3	261	0.2
	E8	RESHAPE	394	0.7	0	0.0
	E9	QRIP	3,607	0.0	0	0.0
	DC16	FAST	0	0.0	15	0.2
6.7	DE50	MMT OPA 2	1,212	0.2	1,890	13.8
	E66	Indiv Mod Incre	148	0.5	0	0.0
RDTE TOTAL			75,693	214.4	51,346	223.2
OMA			829	1.5	1,025	1.5
PROCUREMENT			1,536	0.0	0	0.0
TOTAL			78,058	215.9	52,371	224.7

HDL Customer Resources

Customer	FY89 $K	FY89 Man-Yrs	FY90 $K	FY90 Man-Yrs
US Army				
Sig War Ctr	7,639	50.8	3,148	43.9
Stra Def Cmd	5,241	41.9	8,527	34.1
Armt R&D Ctr	2,337	48.1	4,424	37.4
PM-PATRIOT	3,608	28.1	2,627	16.6
Chem R&D Ctr	2,357	17.5	0	0.0
Spec Opns Force	2,256	21.2	1,583	7.0
PM-CHAP/FAAR	2,244	18.7	3,524	29.8
Army Intel Agcy	2,000	8.9	5,500	10.5
AMCCOM	979	6.5	2,068	20.8
USAISMA	917	6.1	0	0.0
MICOM	654	13.5	180	1.2
TAAWS	238	1.8	675	5.3
SDI	0	0.0	3,500	14.3
PM-BINARY	0	0.0	2,007	14.1
Other LABCOM	1,225	23.5	531	8.3
Other Army	4,712	62.4	2,943	59.4
Total Army	36,407	349.0	41,237	302.7
Other DOD				
USAF	495	8.3	0	0.0
USN	1,903	15.8	1,748	16.7
DNA	2,465	17.5	6,485	26.2
Other	530	0.6	30	1.0
Total DOD	41,800	391.1	49,500	346.6
Non-DOD	154	2.0	0	0.0
TOTAL	41,954	393.1	49,500	346.6

NOTE: Man-Years do not include overhead: 91.8 in FY89, 125.5 in FY90.

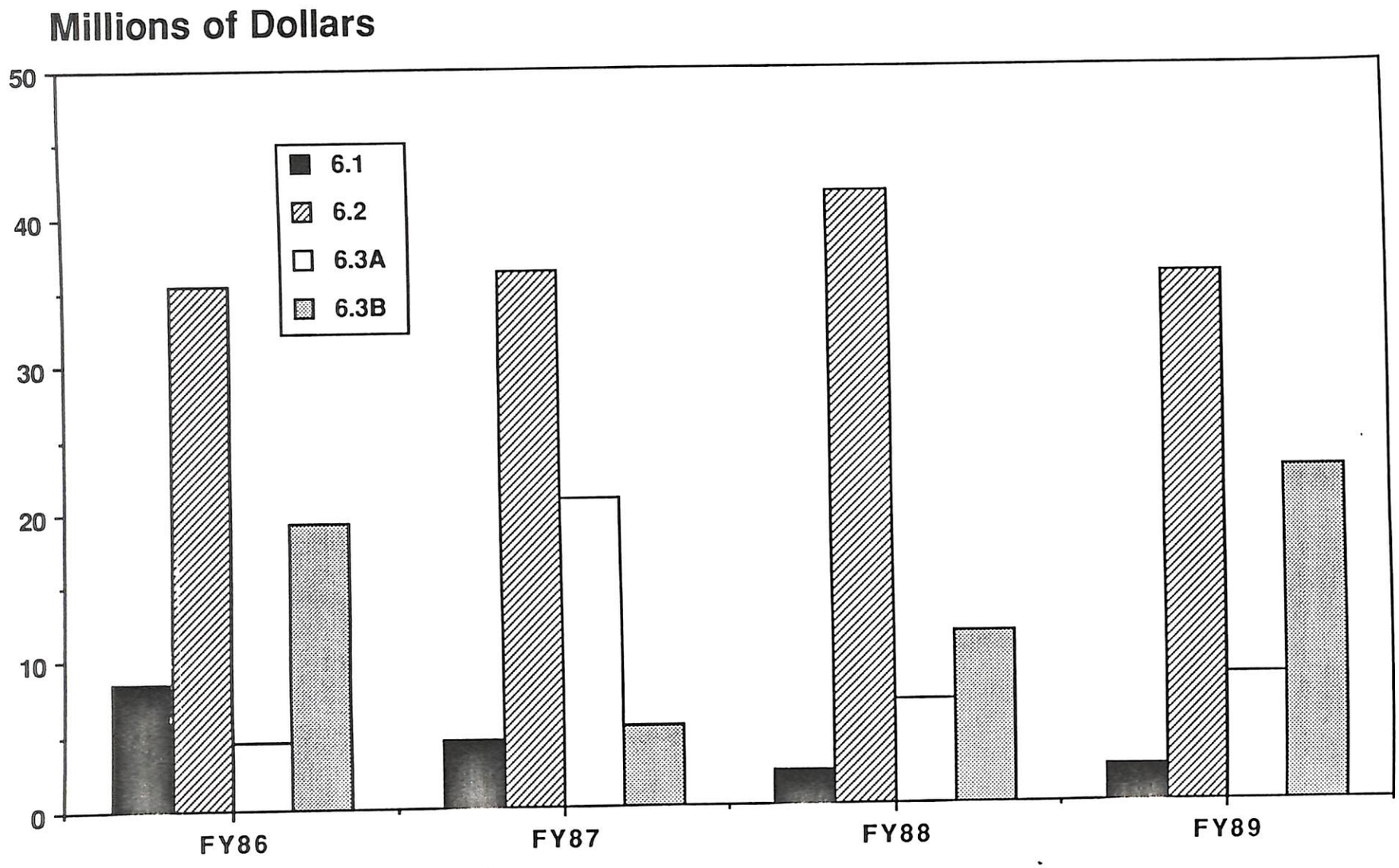
HDL: FY89 Funds Obligated



NOTE: Includes carryover.

Funding Profile

RDT&E Mission



Funding Profile

RDT&E Mission

(Continued -- Scale Change)