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19 ABSTRACT (Continue on reverse if necessary and identify by block number) This notebook provides an overview of the amended Manpower, Personnel and Training (MPT) Program for FY88 and FY89. It has been assembled for use by laboratory planners, and managers and headquarters personnel in the Services and OSD.				
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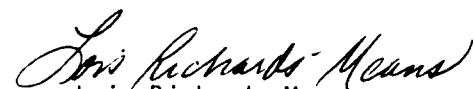
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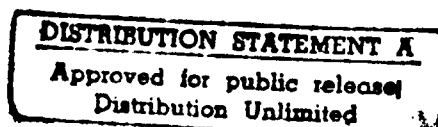
SUBJECT: Revised FY 1988-89 Training and Personnel Systems Technology
R&D Program Description

1. The Training and Personnel Systems Technology (TPST) R&D Program Description, as amended for FY 1988-89, was prepared by the Defense Technical Information Center (MATRIS Office, San Diego). It is a product of the Office of the Under Secretary of Defense for Acquisition (Research and Advanced Technology).
2. This document presents narrative and fiscal data available from the revised biennial FY 1988/89 budget as of April 3, 1988. The MATRIS Office will continue to update its database as later information becomes available.
3. The TPST R&D Program Description is produced and distributed each year to aggregate and summarize the program in a single report and, thereby, to facilitate the sharing of the information. It provides an excellent overview of the program, as well as fiscal summaries, and should serve both to encourage and to enhance the R&D-coordination process.
4. If additional copies are required, or if there are questions or comments, please contact the MATRIS Office at (619) 553-7000 or (AV) 553-7000.


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NOTICE

These pages revise the FY88-89 edition
of the
Training and Personnel Systems Technology
(TPST)
R&D program description issued in April, 1987.

This program description is a product of the
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I. INTRODUCTION

This reference document presents a comprehensive overview of the Manpower, Personnel and Training (MPT) Technology Area for FY 88 and FY 89, summarizing the R&D Program, Basic Research through to Development (6.1-6.4). It consolidates Program Element and Project information and serves as a management tool for laboratory managers and planners and headquarters personnel in the Services and OSD.

This document integrates summaries of the work being conducted by the laboratories and associated funding in the form of narratives, tables, and listings. Comprehensive in nature and using a variety of formats, it allows the user to view, extract, and aggregate vital information for decision-making and resource commitment.

This document contains:

Fiscal tables and graphs (Section II)

This section encompasses a series of cross-tabulations featuring FY 88 and FY 89 funding figures by Congressional Categories, DoD Organizations, Budget Categories, and MPT Goals.

Graphic formats display data for:

- (A) A comparison of estimated vs. actual total MPT R&D funding for President's Budget 1984-1987.
- (B) Breakdowns of total MPT Program funding by Budget Category, Congressional Category and Service for FY88 and FY89.

Program Element and Project synopses (Section III)

This section presents synopses of each Program Element and its associated projects, sorted by DoD organization, including the products and payoffs of that work.

Overall synopses and Project listings (Section IV)

This section summarizes the work being conducted by each Service within each Congressional Category. Listings specify the Projects that fall within each Congressional Category for each Service and within each MPT Goal for each Service.

Appendices (Section V)

This section contains: (a) a list of the Congressional Categories and sub-Categories, (b) a list of the Goals used for this edition of the work, (c) a list of the Projects completed in FY 88, (d) a list of the Projects to be initiated in FY 89, and (e) a selection of policy-level memoranda that impact the MPT program.

How to Use This Book

This document can be used in a variety of ways, depending upon the reader's needs. This discussion about how the book can be used is not intended to be comprehensive, but rather suggestive, through the use of several examples.

Let us look at how a reader might approach several different areas of interest using this MPT Program Description.

1. Work being done in the area of Simulation and Training

One can begin with a brief overview of the area by turning to Section IV-A, pp. 4, 8, and 12, and seeing what each of the Services is doing in the area. A reader less familiar with the MPT Program can read the brief narrative associated with that Congressional Category for each Service. The pages following each such narrative contain listings of all the Projects under which work in Simulation and Training is being carried out. The Projects are sorted by Program Element.

It might also pay to glance at Appendix A, which contains a brief list of the Congressional Categories and subcategories.

Having gotten an overview, one can turn to several sections. Using the lists of relevant Program Elements and Projects for each Service, the reader can flip to Section III-A, B and C (Army, Navy, and Air Force, respectively) and scan the appropriate Program Element and, particularly, Project synopses to get a more detailed view of the objectives, plans, payoffs, and accomplishments of the work being carried out in the area. Within each Service subsection, the synopses are in order of Program Element, and within that by Project.

Finally, one can turn to the funding cross-tabulations in Section II, to gain a better analytic understanding of funding apportionment. Tables in subsections 2, 3, 4, 8, 9, 11, 12 all offer detailed information about how funding for Simulation and Training is allocated by Service, Budget Category, DoD Goal, and by Program Element. This way one can gain a feel of the relative weight (in terms of funding) being assigned to various areas.

Note: a similar "strategy" could be carried out to gain an overview of some MPT Goal (e.g., Goal 4, Designing for System Readiness) by: (a) starting out with Appendix B to look at the overall Goal structure, (b) turning to Section IV-B to locate the Program Elements and Projects involved with particular Goals, (c) scanning the relevant Program Element and Project summaries in Section III, and (d) examining the tables in the Goal-relevant subsections of Section II.

2. How do the Services' funding compare in FY 1988 and FY 1989?

The fiscal tables in Section II are most directly relevant for this. Tables in subsection II-1 provide a quick overview, breaking down the Services' funding by Budget Category and by Congressional Category for FY 1988 and FY 1989, respectively. Thus, one can compare the Services' funding with each other and determine where the emphases lie for each Service and the overall MPT program. By glancing back and forth at the top and bottom charts on the two pages, funding for the two fiscal years can be compared.

Page III-ii in the beginning of Section III shows actual and planned funding for the fiscal years 1986-1989 for each Program Element, sorted and totaled by Service.

Further detail in these categories and others can also be gained by turning to the tables in subsections II-4 and -5 (Budget Category by Congressional Category cross-tabulations, overall (4) and by Service (5) for FY 1988 and 1989), I-6 and -7 (Budget Category by MPT Goal cross-tabulations, overall (6) and by Service (7) for FY 1988 and 1989), etc.

3. What new research Projects will begin in FY 1989?

Turn to Appendix E. For greater detail, turn to the relevant synopses in Section II.

4. Which Projects will be completed in FY 1988?

Turn to Appendix C. For greater detail, turn to the relevant synopses in Section II.

5. What work is planned in FY 1988 in MPT Basic Research?

Basic research is Budget Category 6.1. Plans for research in FY 1988 (and 1989/90) are contained in the narrative section (Section III) in the "Synopsis" portion of each Program Element and Project. Because the first two digits of each Program Element reflect the Budget Category it is in, and the Program Elements are in Program Element order, the 6.1 Program Elements and Projects can be easily located at the beginning of the narrative section for each Service.

Note: Plans for work beyond FY 1990 can be located in the "Future Directions" portion of each Program Element narrative.

6. What was accomplished in FY 1987 in Navy Human Factors work?

The past year's (FY 1987) accomplishments for each effort are located in the "Payoff/Utilization" portion of each Program Element and Project narrative in Section III. There are two ways of locating the Navy Human Factors efforts.

First, one could simply flip through the pages of subsection III-B (Navy narratives) and stop at each effort for which the Congressional Category is listed as "Human Factors".

Alternatively, as in Question 1 above, turn to subsection IV-A-5 and obtain the lists of Navy Human Factors Program Elements and Projects and then turn directly to the relevant narratives in subsection III-B.

Further Information

This document has been prepared by the Defense Technical Information Center, Manpower and Training Research Information System (MATRIS) Office, in San Diego. It is based on current Program Element and Project records in the MATRIS database, updated with the FY 1988/89 amended President's Budget submission.

The MATRIS database covers the MPT R&D Program at the Program Element, Project, and Work Unit levels. Further information about the MPT Program at any of these levels can be obtained by contacting:

MATRIS User Services
Defense Technical Information Center, DTIC-DMA
San Diego, CA 92152-6800

Phone: (619) 553-7000

Autovon 553-7000

SUGGESTIONS and COMMENTS

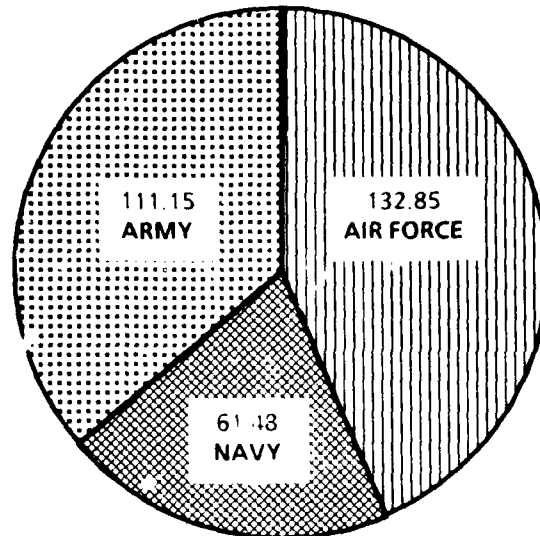
This document offers an overview of the MPT Program based on the latest amended President's Budget. It is intended to be informative and to provide a wide variety of information.

MATRIS, as the agency responsible for the production of this document, welcomes any suggestions for improving either the content, the presentation, or the timeliness of the MPT Program Description. If you have any suggestions or criticism which could help in improving the document, we would like to hear from you. This page of the Program Description has been included for your comments.

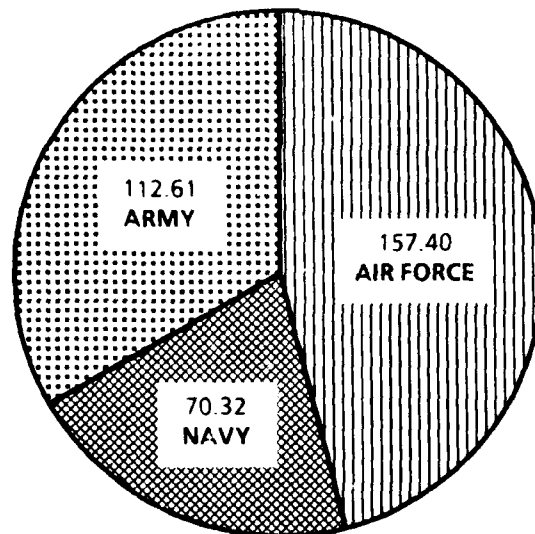
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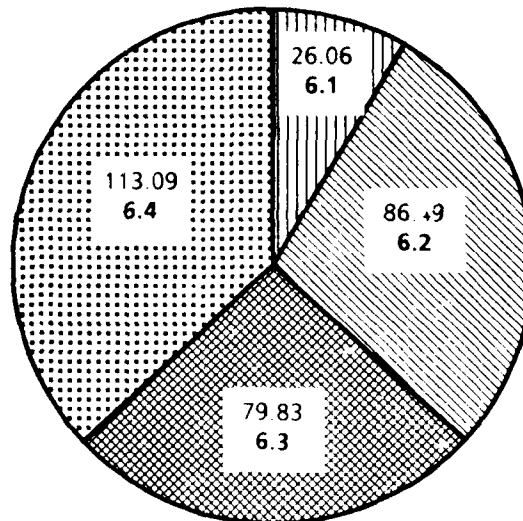
**MPT PROGRAM FUNDING IN 1988
BASED ON THE FY88/89 REVISED PRESIDENT'S BUDGET
BY SERVICE**



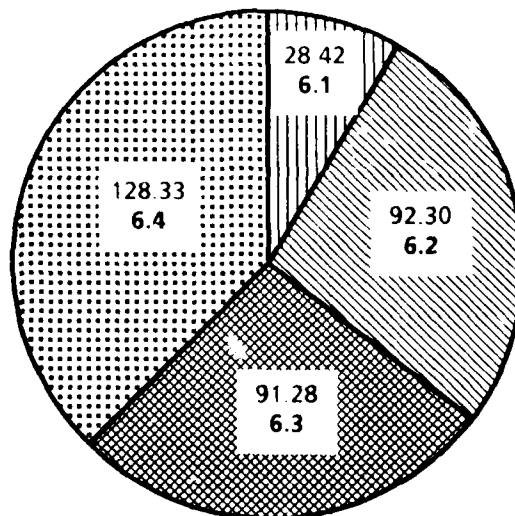
**MPT PROGRAM FUNDING IN 1989
BASED ON THE FY88/89 REVISED PRESIDENT'S BUDGET
BY SERVICE**



**MPT PROGRAM FUNDING IN 1988
BASED ON THE FY88/89 REVISED PRESIDENT'S BUDGET
BY BUDGET CATEGORY**

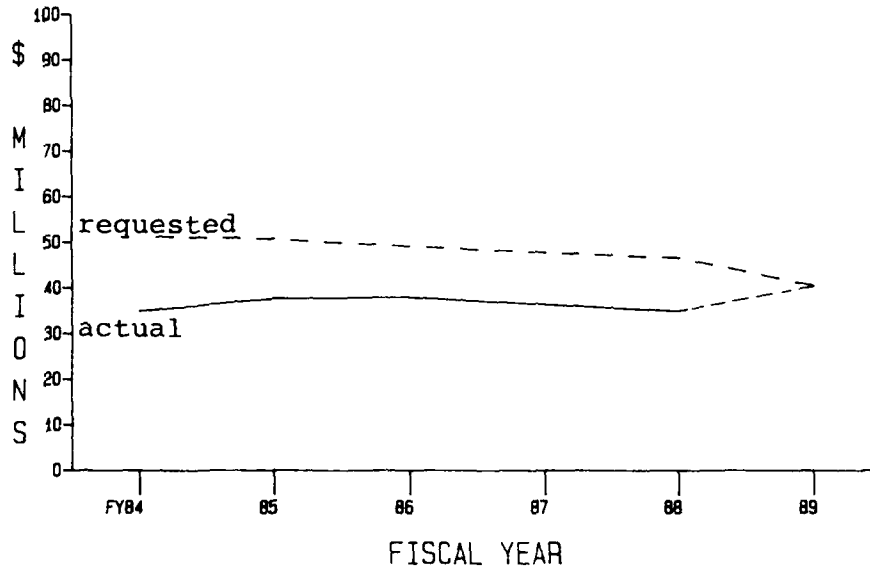


**MPT PROGRAM FUNDING IN 1989
BASED ON THE FY88/89 REVISED PRESIDENT'S BUDGET
BY BUDGET CATEGORY**

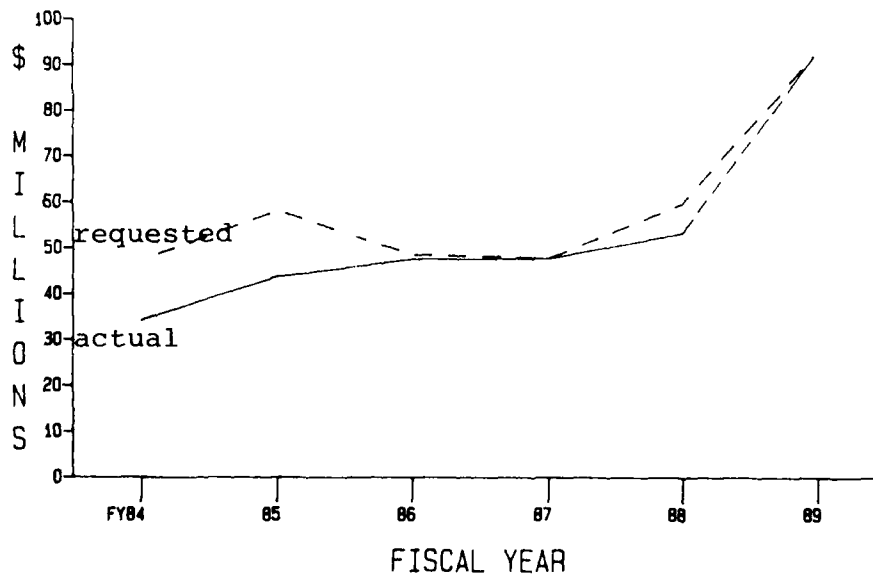


Comparison of requested versus actual
funds allocated by Congressional Category

MPT FUNDING FOR MP

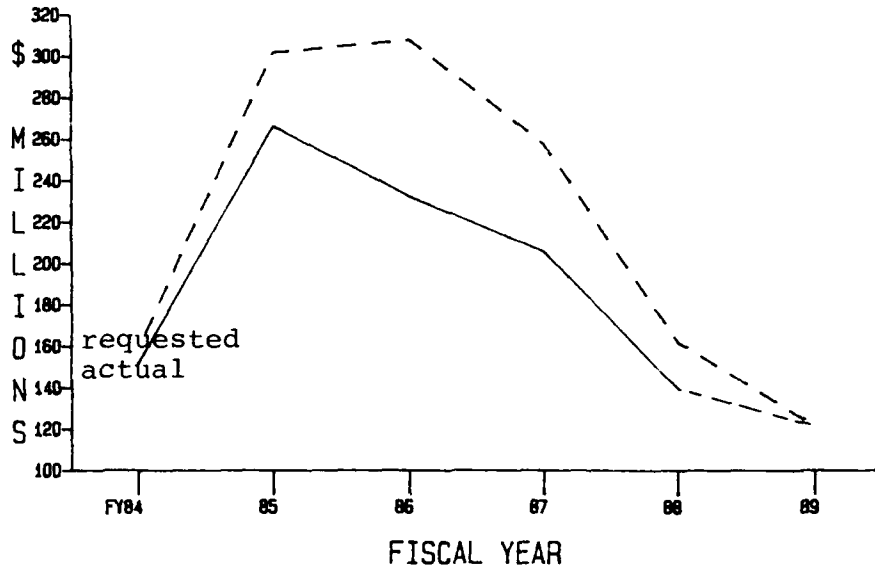


MPT FUNDING FOR ET

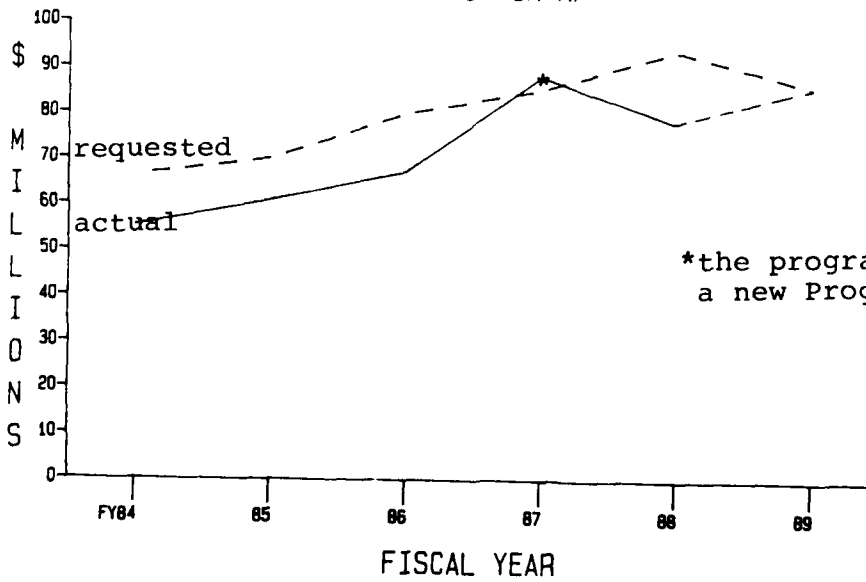


Comparison of requested versus actual
funds allocated by Congressional Category

MPT FUNDING FOR ST



MPT FUNDING FOR HF



01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

1000 1000 1000 1000 1000 1000 1000 1000

NOTE: The percentages shown in each table may not total correctly due to rounding.

LIST OF ABBREVIATIONS USED IN FISCAL TABLES

Variable Name	Abbreviation	Used For
CONGRESSIONAL CATEGORY	ET	Education and Training
	HF	Human Factors
	MP	Manpower and Personnel
	ST	Simulation and Training Devices
DoD GOAL	1	Management Trade-offs
	2	Accession and Retention
	3	Unit Productivity
	4	Designing for System Readiness
	5	Improved Sustainability
	6	Training Systems
	VAR	Various (i.e., project applies to more than one goal)
BUDGET CATEGORY	6.1	Basic Research
	6.2	Exploratory Development
	6.3	Advanced Development
	6.4	Engineering Development
DoD ORGANIZATION	ARMY	Army
	NAVY	Navy and Marine Corps
	AF	Air Force

TABLE II-1

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 BUDGET CATEGORY BY DOD ORGANIZATION
 1988 (\$MILLIONS)

DOD ORGANIZATION	BUDGET CATEGORY				TOTAL
	6.1	6.2	6.3	6.4	
	-----	-----	-----	-----	-----
ARMY	7.03	32.55	33.57	38.01	111.16
(ROW%)	(6)	(29)	(30)	(34)	(100)
NAVY	10.41	11.04	21.74	18.31	61.49
(ROW%)	(17)	(18)	(35)	(30)	(100)
AF	8.64	42.91	24.54	56.78	132.87
(ROW%)	(7)	(32)	(18)	(43)	(100)
	-----	-----	-----	-----	-----
TOTAL	26.07	86.51	79.85	113.10	305.53
(ROW%)	(9)	(28)	(26)	(37)	(100)

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 BUDGET CATEGORY BY DOD ORGANIZATION
 1989 (\$MILLIONS)

DOD ORGANIZATION	BUDGET CATEGORY				TOTAL
	6.1	6.2	6.3	6.4	
	-----	-----	-----	-----	-----
ARMY	7.37	34.62	36.79	33.84	112.62
(ROW%)	(7)	(31)	(33)	(30)	(100)
NAVY	11.50	11.52	25.61	21.70	70.33
(ROW%)	(16)	(16)	(36)	(31)	(100)
AF	9.55	46.16	28.90	72.81	157.42
(ROW%)	(6)	(29)	(18)	(46)	(100)
	-----	-----	-----	-----	-----
TOTAL	28.42	92.31	91.30	128.35	340.38
(ROW%)	(8)	(27)	(27)	(38)	(100)

TABLE II-2

MPT PROGRAM FUDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 CONGRESSIONAL CATEGORY BY DOD ORGANIZATION
 1988 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	15.06 (14)	29.34 (26)	15.16 (14)	51.58 (46)	111.15 (100)
NAVY (ROW%)	12.70 (21)	8.89 (14)	11.28 (18)	28.61 (47)	61.48 (100)
AF (ROW%)	25.57 (19)	39.96 (30)	8.30 (6)	59.01 (44)	132.85 (100)
TOTAL (ROW%)	53.34 (17)	78.19 (26)	34.74 (11)	139.20 (46)	305.48 (100)

MPT PROGRAM FUDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 CONGRESSIONAL CATEGORY BY DOD ORGANIZATION
 1989 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	18.12 (16)	30.44 (27)	16.63 (15)	47.41 (42)	112.61 (100)
NAVY (ROW%)	14.50 (21)	9.67 (14)	15.91 (23)	30.24 (43)	70.32 (100)
AF (ROW%)	60.12 (38)	45.91 (29)	7.73 (5)	43.65 (28)	157.40 (100)
TOTAL (ROW%)	92.74 (27)	86.01 (25)	40.28 (12)	121.30 (36)	340.33 (100)

TABLE II-3

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
 WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION		CONGRESSIONAL CATEGORY				
	PROGRAM ELEMENT	ET	HF	MP	ST	TOTAL
		-----	-----	-----	-----	-----
ARMY						
	61102A	0.94	4.32	0.67	1.11	7.03
	(ROW%)	(13)	(61)	(9)	(16)	(100)
	62716A	0.00	14.56	0.00	0.00	14.56
	(ROW%)	(0)	(100)	(0)	(0)	(100)
	62727A	0.00	0.00	0.00	4.01	4.01
	(ROW%)	(0)	(0)	(0)	(100)	(100)
	62785A	1.82	4.15	4.48	3.54	13.98
	(ROW%)	(13)	(30)	(32)	(25)	(100)
	63003A	0.00	0.00	0.00	5.08	5.08
	(ROW%)	(0)	(0)	(0)	(100)	(100)
	63007A	6.91	6.32	10.02	5.24	28.49
	(ROW%)	(24)	(22)	(35)	(18)	(100)
	64715A	0.00	0.00	0.00	24.75	24.75
	(ROW%)	(0)	(0)	(0)	(100)	(100)
	64722A	5.40	0.00	0.00	0.00	5.40
	(ROW%)	(100)	(0)	(0)	(0)	(100)
	64801A	0.00	0.00	0.00	7.86	7.86
	(ROW%)	(0)	(0)	(0)	(100)	(100)
ARMY	TOTAL	-----	-----	-----	-----	-----
	(ROW%)	15.07	29.35	15.17	51.59	111.16
		(14)	(26)	(14)	(46)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
NAVY		-----	-----	-----	-----	-----
61153N		5.73	2.19	2.50	0.00	10.41
(ROW%)		(55)	(21)	(24)	(0)	(100)
62131M		0.23	0.00	0.25	0.00	0.48
(ROW%)		(48)	(0)	(52)	(0)	(100)
62233N		1.68	0.00	2.66	3.01	7.35
(ROW%)		(23)	(0)	(36)	(41)	(100)
62234N		0.00	3.21	0.00	0.00	3.21
(ROW%)		(0)	(100)	(0)	(0)	(100)
63701N		0.00	2.53	0.00	0.00	2.53
(ROW%)		(0)	(100)	(0)	(0)	(100)
63707N		0.00	0.00	3.04	0.00	3.04
(ROW%)		(0)	(0)	(100)	(0)	(100)
63720N		5.07	0.00	0.00	0.00	5.07
(ROW%)		(100)	(0)	(0)	(0)	(100)
63732M		0.00	0.00	1.86	0.00	1.86
(ROW%)		(0)	(0)	(100)	(0)	(100)
63733N		0.00	0.00	0.00	8.28	8.28
(ROW%)		(0)	(0)	(0)	(100)	(100)
63739N		0.00	0.96	0.00	0.00	0.96
(ROW%)		(0)	(100)	(0)	(0)	(100)
64703N		0.00	0.00	0.98	0.00	0.98
(ROW%)		(0)	(0)	(100)	(0)	(100)
64714N		0.00	0.00	0.00	0.50	0.50
(ROW%)		(0)	(0)	(0)	(100)	(100)
64715N		0.00	0.00	0.00	16.83	16.83
(ROW%)		(0)	(0)	(0)	(100)	(100)
NAVY		-----	-----	-----	-----	-----
TOTAL		12.71	8.90	11.29	28.62	61.50
(ROW%)		(21)	(14)	(18)	(47)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
AF						
61102F		0.00	7.78	0.87	0.00	8.64
(ROW%)		(0)	(90)	(10)	(0)	(100)
62202F		0.00	10.91	0.00	0.00	10.91
(ROW%)		(0)	(100)	(0)	(0)	(100)
62205F		9.21	5.51	6.94	10.35	32.01
(ROW%)		(29)	(17)	(22)	(32)	(100)
63106F		0.00	9.58	0.00	0.00	9.58
(ROW%)		(0)	(100)	(0)	(0)	(100)
63227F		1.04	0.00	0.50	6.95	8.48
(ROW%)		(12)	(0)	(6)	(82)	(100)
63231F		0.00	6.20	0.00	0.00	6.20
(ROW%)		(0)	(100)	(0)	(0)	(100)
63751F		0.00	0.00	0.00	0.28	0.28
(ROW%)		(0)	(0)	(0)	(100)	(100)
64227F		15.33	0.00	0.00	41.45	56.78
(ROW%)		(27)	(0)	(0)	(73)	(100)
		-----	-----	-----	-----	-----
AF	TOTAL	25.58	39.98	8.31	59.02	132.88
	(ROW%)	(19)	(30)	(6)	(44)	(100)
		-----	-----	-----	-----	-----
DOD	TOTAL	53.35	78.21	34.76	139.23	305.53
	(ROW%)	(17)	(26)	(11)	(46)	(100)

TABLE 11-3

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		CONGRESSIONAL CATEGORY				
PROGRAM ELEMENT		ET	HF	MP	ST	TOTAL
		----	----	----	----	-----
ARMY						
61102A		0.81	4.34	0.93	1.32	7.38
(ROW%)		(11)	(59)	(13)	(18)	(100)
62716A		0.00	15.07	0.00	0.00	15.07
(ROW%)		(0)	(100)	(0)	(0)	(100)
62727A		0.00	0.00	0.00	3.43	3.43
(ROW%)		(0)	(0)	(0)	(100)	(100)
62785A		2.84	3.23	7.17	2.88	16.12
(ROW%)		(18)	(20)	(44)	(18)	(100)
63003A		0.00	0.00	0.00	5.38	5.38
(ROW%)		(0)	(0)	(0)	(100)	(100)
63007A		7.61	7.81	8.55	6.59	30.55
(ROW%)		(25)	(26)	(28)	(22)	(100)
63738A		0.00	0.00	0.00	0.86	0.86
(ROW%)		(0)	(0)	(0)	(100)	(100)
64715A		0.00	0.00	0.00	19.79	19.79
(ROW%)		(0)	(0)	(0)	(100)	(100)
64722A		6.87	0.00	0.00	0.00	6.87
(ROW%)		(100)	(0)	(0)	(0)	(100)
64801A		0.00	0.00	0.00	7.18	7.18
(ROW%)		(0)	(0)	(0)	(100)	(100)
ARMY	TOTAL	18.13	30.45	16.64	47.42	112.63
	(ROW%)	(16)	(27)	(15)	(42)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
PROGRAM ELEMENT		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
NAVY						
61153N		6.33	2.42	2.76	0.00	11.50
(ROW%)		(55)	(21)	(24)	(0)	(100)
62131M		0.28	0.00	0.29	0.00	0.56
(ROW%)		(49)	(0)	(51)	(0)	(100)
62233N		1.75	0.00	2.76	3.12	7.63
(ROW%)		(23)	(0)	(36)	(41)	(100)
62234N		0.00	3.33	0.00	0.00	3.33
(ROW%)		(0)	(100)	(0)	(0)	(100)
63701N		0.00	2.46	0.00	0.00	2.46
(ROW%)		(0)	(100)	(0)	(0)	(100)
63707N		0.00	0.00	3.98	0.00	3.98
(ROW%)		(0)	(0)	(100)	(0)	(100)
63720N		6.15	0.00	0.00	0.00	6.15
(ROW%)		(100)	(0)	(0)	(0)	(100)
63732M		0.00	0.00	5.11	0.00	5.11
(ROW%)		(0)	(0)	(100)	(0)	(100)
63733N		0.00	0.00	0.00	6.45	6.45
(ROW%)		(0)	(0)	(0)	(100)	(100)
63739N		0.00	1.47	0.00	0.00	1.47
(ROW%)		(0)	(100)	(0)	(0)	(100)
64703N		0.00	0.00	1.03	0.00	1.03
(ROW%)		(0)	(0)	(100)	(0)	(100)
64714N		0.00	0.00	0.00	1.92	1.92
(ROW%)		(0)	(0)	(0)	(100)	(100)
64715N		0.00	0.00	0.00	18.76	18.76
(ROW%)		(0)	(0)	(0)	(100)	(100)

NAVY	TOTAL	14.51	9.67	15.92	30.25	70.34
	(ROW%)	(21)	(14)	(23)	(43)	(100)

TABLE II-3

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		CONGRESSIONAL CATEGORY				
	PROGRAM ELEMENT	ET	HF	MP	ST	TOTAL
		-----	-----	-----	-----	-----
AF						
	61102F (ROW%)	0.00 (0)	8.60 (90)	0.96 (10)	0.00 (0)	9.56 (100)
	62202F (ROW%)	0.00 (0)	11.90 (100)	0.00 (0)	0.00 (0)	11.90 (100)
	62205F (ROW%)	11.27 (33)	5.04 (15)	6.29 (18)	11.68 (34)	34.27 (100)
	63106F (ROW%)	0.00 (0)	13.85 (100)	0.00 (0)	0.00 (0)	13.85 (100)
	63227F (ROW%)	2.07 (26)	0.00 (0)	0.49 (6)	5.49 (68)	8.05 (100)
	63231F (ROW%)	0.00 (0)	6.54 (100)	0.00 (0)	0.00 (0)	6.54 (100)
	63751F (ROW%)	0.00 (0)	0.00 (0)	0.00 (0)	0.47 (100)	0.47 (100)
	64227F (ROW%)	46.79 (64)	0.00 (0)	0.00 (0)	26.02 (36)	72.81 (100)
AF	TOTAL (ROW%)	60.13 (38)	45.92 (29)	7.74 (5)	43.66 (28)	157.43 (100)
DOD	TOTAL (ROW%)	92.76 (27)	86.03 (25)	40.29 (12)	121.32 (36)	340.38 (100)

TABLE II-4

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 1988 (\$MILLIONS)

BUDGET CATEGORY	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
6.1	6.66	14.27	4.02	1.11	26.07
(ROW%)	(26)	(55)	(15)	(4)	(100)
6.2	12.93	38.34	14.32	20.90	86.49
(ROW%)	(15)	(44)	(17)	(24)	(100)
6.3	13.01	25.58	15.42	25.81	79.83
(ROW%)	(16)	(32)	(19)	(32)	(100)
6.4	20.73	0.00	0.98	91.38	113.09
(ROW%)	(18)	(0)	(1)	(81)	(100)
TOTAL	-----	-----	-----	-----	-----
(ROW%)	53.34	78.19	34.74	139.20	305.48
	(17)	(26)	(11)	(46)	(100)

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 1989 (\$MILLIONS)

BUDGET CATEGORY	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
6.1	7.13	15.34	4.64	1.31	28.42
(ROW%)	(25)	(54)	(16)	(5)	(100)
6.2	16.13	38.57	16.50	21.10	92.30
(ROW%)	(17)	(42)	(18)	(23)	(100)
6.3	15.83	32.10	18.11	25.24	91.28
(ROW%)	(17)	(35)	(20)	(28)	(100)
6.4	53.66	0.00	1.02	73.65	128.33
(ROW%)	(42)	(0)	(1)	(57)	(100)
TOTAL	-----	-----	-----	-----	-----
(ROW%)	92.74	86.01	40.28	121.30	340.33
	(27)	(25)	(12)	(36)	(100)

TABLE 11-5

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION		CONGRESSIONAL CATEGORY				
	BUDGET CATEGORY	ET	HF	MP	ST	TOTAL
		-----	-----	-----	-----	-----
ARMY						
6.1	(ROW%)	0.94 (13)	4.32 (61)	0.66 (9)	1.11 (16)	7.03 (100)
6.2	(ROW%)	1.82 (6)	18.71 (57)	4.48 (14)	7.55 (23)	32.55 (100)
6.3	(ROW%)	6.91 (21)	6.32 (19)	10.02 (30)	10.32 (31)	33.57 (100)
6.4	(ROW%)	5.40 (14)	0.00 (0)	0.00 (0)	32.61 (86)	38.01 (100)
ARMY TOTAL						
	(ROW%)	15.06 (14)	29.34 (26)	15.16 (14)	51.58 (46)	111.15 (100)

TABLE II-5

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
NAVY		-----	-----	-----	-----	-----
6.1	(ROW%)	5.72 (55)	2.18 (21)	2.50 (24)	0.00 (0)	10.40 (100)
6.2	(ROW%)	1.91 (17)	3.21 (29)	2.91 (26)	3.01 (27)	11.04 (100)
6.3	(ROW%)	5.07 (23)	3.49 (16)	4.90 (23)	8.28 (38)	21.73 (100)
6.4	(ROW%)	0.00 (0)	0.00 (0)	0.98 (5)	17.33 (95)	18.31 (100)
NAVY TOTAL		-----	-----	-----	-----	-----
	(ROW%)	12.70 (21)	8.89 (14)	11.28 (18)	28.61 (47)	61.48 (100)

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TABLE II-5

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
AF						
6.1	(ROW%)	0.00 (0)	7.77 (90)	0.86 (10)	0.00 (0)	8.64 (100)
6.2	(ROW%)	9.21 (21)	16.42 (38)	6.94 (16)	10.35 (24)	42.91 (100)
6.3	(ROW%)	1.04 (4)	15.77 (64)	0.50 (2)	7.22 (29)	24.53 (100)
6.4	(ROW%)	15.33 (27)	0.00 (0)	0.00 (0)	41.45 (73)	56.78 (100)
AF	TOTAL (ROW%)	25.57 (19)	39.96 (30)	8.30 (6)	59.01 (44)	132.85 (100)
DOD	TOTAL (ROW%)	53.34 (17)	78.19 (26)	34.74 (11)	139.20 (46)	305.48 (100)

TABLE II-5

MPT PROGRAM FUNDING IN 1989
BASED ON FY89 PRESIDENT'S BUDGETCONGRESSIONAL CATEGORY BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
ARMY		-----	-----	-----	-----	-----
6.1	(ROW%)	0.80 (11)	4.33 (59)	0.92 (13)	1.31 (18)	7.37 (100)
6.2	(ROW%)	2.84 (8)	18.30 (53)	7.17 (21)	6.31 (18)	34.62 (100)
6.3	(ROW%)	7.61 (21)	7.80 (21)	8.55 (23)	12.83 (35)	36.78 (100)
6.4	(ROW%)	6.87 (20)	0.00 (0)	0.00 (0)	26.96 (80)	33.84 (100)
ARMY	TOTAL (ROW%)	----- 18.12 (16)	----- 30.44 (27)	----- 16.63 (15)	----- 47.41 (42)	----- 112.61 (100)

II-5-4

TABLE II-5

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
NAVY		-----	-----	-----	-----	-----
6.1	(ROW%)	6.32 (55)	2.41 (21)	2.76 (24)	0.00 (0)	11.50 (100)
6.2	(ROW%)	2.02 (18)	3.33 (29)	3.05 (26)	3.12 (27)	11.52 (100)
6.3	(ROW%)	6.15 (24)	3.92 (15)	9.08 (35)	6.45 (25)	25.60 (100)
6.4	(ROW%)	0.00 (0)	0.00 (0)	1.02 (5)	20.67 (95)	21.70 (100)
NAVY	TOTAL (ROW%)	----- 14.50 (21)	----- 9.67 (14)	----- 15.91 (23)	----- 30.24 (43)	----- 70.32 (100)

II-5-5

TABLE II-5

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)				
BUDGET CATEGORY		CONGRESSIONAL CATEGORY				TOTAL
		ET	HF	MP	ST	
		-----	-----	-----	-----	-----
AF						
6.1	(ROW%)	0.00 (0)	8.59 (90)	0.96 (10)	0.00 (0)	9.55 (100)
6.2	(ROW%)	11.26 (24)	16.93 (37)	6.29 (14)	11.68 (25)	46.16 (100)
6.3	(ROW%)	2.07 (7)	20.38 (71)	0.49 (2)	5.96 (21)	28.90 (100)
6.4	(ROW%)	46.79 (64)	0.00 (0)	0.00 (0)	26.01 (36)	72.80 (100)
		-----	-----	-----	-----	-----
AF	TOTAL (ROW%)	60.12 (38)	45.91 (29)	7.73 (5)	43.65 (28)	157.40 (100)
		-----	-----	-----	-----	-----
DOD	TOTAL (ROW%)	92.74 (27)	86.01 (25)	40.28 (12)	121.30 (36)	340.33 (100)

II-5-6

TABLE II-6

MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY

1988 (\$MILLIONS)

BUDGET CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
6.1	0.00	0.86	3.44	14.93	0.00	6.83	0.00	26.07
(ROW%)	(0)	(3)	(13)	(57)	(0)	(26)	(0)	(100)
6.2	0.00	8.91	1.14	28.91	0.00	24.91	22.63	86.49
(ROW%)	(0)	(10)	(1)	(33)	(0)	(29)	(26)	(100)
6.3	1.86	13.56	0.96	24.62	0.00	38.83	0.00	79.83
(ROW%)	(2)	(17)	(1)	(31)	(0)	(49)	(0)	(100)
6.4	0.00	0.98	0.00	0.00	0.00	112.11	0.00	113.09
(ROW%)	(0)	(1)	(0)	(0)	(0)	(99)	(0)	(100)
TOTAL	1.86	24.31	5.53	68.46	0.00	182.68	22.63	305.48
(ROW%)	(1)	(8)	(2)	(22)	(0)	(60)	(7)	(100)

MPT PROGRAM FUNDING IN 1989
BASED ON FY89 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY

1989 (\$MILLIONS)

BUDGET CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
6.1	0.00	0.96	3.56	16.26	0.00	7.63	0.00	28.42
(ROW%)	(0)	(3)	(13)	(57)	(0)	(27)	(0)	(100)
6.2	0.00	10.49	1.30	28.81	0.00	27.82	23.88	92.30
(ROW%)	(0)	(11)	(1)	(31)	(0)	(30)	(26)	(100)
6.3	5.11	13.01	1.46	30.64	0.00	41.07	0.00	91.28
(ROW%)	(6)	(14)	(2)	(34)	(0)	(45)	(0)	(100)
6.4	0.00	1.02	0.00	0.00	0.00	127.31	0.00	128.33
(ROW%)	(0)	(1)	(0)	(0)	(0)	(99)	(0)	(100)
TOTAL	5.11	25.48	6.33	75.71	0.00	203.82	23.88	340.33
(ROW%)	(2)	(7)	(2)	(22)	(0)	(60)	(7)	(100)

TABLE II-7

MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
-----	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.94	4.98	0.00	1.11	0.00	7.03
(ROW%)	(0)	(0)	(13)	(71)	(0)	(16)	(0)	(100)
6.2	0.00	2.45	0.00	10.78	0.00	6.92	12.40	32.55
(ROW%)	(0)	(8)	(0)	(33)	(0)	(21)	(38)	(100)
6.3	0.00	10.02	0.00	6.32	0.00	17.23	0.00	33.57
(ROW%)	(0)	(30)	(0)	(19)	(0)	(51)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	38.01	0.00	38.01
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
ARMY TOTAL	0.00	12.48	0.94	22.08	0.00	63.27	12.40	111.16
(ROW%)	(0)	(11)	(1)	(20)	(0)	(57)	(11)	(100)

II-7-1

TABLE II-7
MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGET

DOD GOAL BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	2.50	2.19	0.00	5.72	0.00	10.41
(ROW%)	(0)	(0)	(24)	(21)	(0)	(55)	(0)	(100)
6.2	0.00	2.91	0.00	3.45	0.00	4.69	0.00	11.04
(ROW%)	(0)	(26)	(0)	(31)	(0)	(42)	(0)	(100)
6.3	1.86	3.04	0.96	2.53	0.00	13.34	0.00	21.74
(ROW%)	(9)	(14)	(4)	(12)	(0)	(61)	(0)	(100)
6.4	0.00	0.98	0.00	0.00	0.00	17.33	0.00	18.31
(ROW%)	(0)	(5)	(0)	(0)	(0)	(95)	(0)	(100)
NAVY TOTAL	1.86	6.92	3.46	8.17	0.00	41.08	0.00	61.50
(ROW%)	(3)	(11)	(6)	(13)	(0)	(67)	(0)	(100)

II-7-2

TABLE II-7

MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.86	0.00	7.77	0.00	0.00	0.00	8.64
(ROW%)	(0)	(10)	(0)	(90)	(0)	(0)	(0)	(100)
6.2	0.00	3.55	1.14	14.68	0.00	13.31	10.23	42.91
(ROW%)	(0)	(8)	(3)	(34)	(0)	(31)	(24)	(100)
6.3	0.00	0.50	0.00	15.78	0.00	8.26	0.00	24.54
(ROW%)	(0)	(2)	(0)	(64)	(0)	(34)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	56.78	0.00	56.78
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
AF TOTAL	0.00	4.92	1.14	38.23	0.00	78.36	10.23	132.87
(ROW%)	(0)	(4)	(1)	(29)	(0)	(59)	(8)	(100)
DOD TOTAL	1.86	24.31	5.54	68.47	0.00	182.71	22.63	305.53
(ROW%)	(1)	(8)	(2)	(22)	(0)	(60)	(7)	(100)

II-7-3

TABLE II-7

MPT PROGRAM FUNDING IN 1989
BASED ON FY89 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.80	5.26	0.00	1.31	0.00	7.37
(ROW%)	(0)	(0)	(11)	(71)	(0)	(18)	(0)	(100)
6.2	0.00	4.30	0.00	9.80	0.00	6.85	13.68	34.62
(ROW%)	(0)	(12)	(0)	(28)	(0)	(20)	(40)	(100)
6.3	0.00	8.55	0.00	7.81	0.00	20.44	0.00	36.79
(ROW%)	(0)	(23)	(0)	(21)	(0)	(56)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	33.84	0.00	33.84
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
ARMY TOTAL	0.00	12.84	0.80	22.86	0.00	62.44	13.68	112.62
(ROW%)	(0)	(11)	(1)	(20)	(0)	(55)	(12)	(100)

II-7-4

TABLE II-7

MPT PROGRAM FUNDING IN 1989
BASED ON FY89 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
-----	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	2.76	2.42	0.00	6.32	0.00	11.50
(ROW%)	(0)	(0)	(24)	(21)	(0)	(55)	(0)	(100)
6.2	0.00	3.05	0.00	3.61	0.00	4.87	0.00	11.52
(ROW%)	(0)	(26)	(0)	(31)	(0)	(42)	(0)	(100)
6.3	5.11	3.98	1.47	2.46	0.00	12.61	0.00	25.61
(ROW%)	(20)	(16)	(6)	(10)	(0)	(49)	(0)	(100)
6.4	0.00	1.03	0.00	0.00	0.00	20.68	0.00	21.70
(ROW%)	(0)	(5)	(0)	(0)	(0)	(95)	(0)	(100)
NAVY TOTAL	5.11	8.05	4.22	8.48	0.00	44.47	0.00	70.33
(ROW%)	(7)	(11)	(6)	(12)	(0)	(63)	(0)	(100)

II-7-5

TABLE II-7

MPT PROGRAM FUNDING IN 1989
BASED ON FY89 PRESIDENT'S BUDGETDOD GOAL BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.96	0.00	8.60	0.00	0.00	0.00	9.55
(ROW%)	(0)	(10)	(0)	(90)	(0)	(0)	(0)	(100)
6.2	0.00	3.15	1.30	15.40	0.00	16.10	10.21	46.16
(ROW%)	(0)	(7)	(3)	(33)	(0)	(35)	(22)	(100)
6.3	0.00	0.49	0.00	20.38	0.00	8.03	0.00	28.90
(ROW%)	(0)	(2)	(0)	(71)	(0)	(28)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	72.81	0.00	72.81
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
AF TOTAL								
	0.00	4.59	1.30	44.38	0.00	96.94	10.21	157.42
(ROW%)	(0)	(3)	(1)	(28)	(0)	(62)	(6)	(100)
DOD TOTAL								
	5.11	25.48	6.33	75.72	0.00	203.85	23.89	340.38
(ROW%)	(2)	(7)	(2)	(22)	(0)	(60)	(7)	(100)

11-7-6

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - ET

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
BUDGET CATEGORY	DOD GOAL							TOTAL
	1	2	3	4	5	6	VAR	
ARMY								
6.1	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.94
(ROW%)	(0)	(0)	(100)	(0)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	0.98	0.84	1.82
(ROW%)	(0)	(0)	(0)	(0)	(0)	(54)	(46)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.91	0.00	6.91
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	5.40	0.00	5.40
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
ARMY TOTAL	0.00	0.00	0.94	0.00	0.00	13.29	0.84	15.07
(ROW%)	(0)	(0)	(6)	(0)	(0)	(88)	(6)	(100)

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - ET

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						TOTAL
	1	2	3	4	5	6	VAR	
	----	----	----	----	----	----	----	----
NAVY								
6.1	0.00	0.00	0.00	0.00	0.00	5.72	0.00	5.72
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.2	0.00	0.00	0.00	0.23	0.00	1.68	0.00	1.91
(ROW%)	(0)	(0)	(0)	(12)	(0)	(88)	(0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	5.07	0.00	5.07
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.23	0.00	12.47	0.00	12.70
(ROW%)	(0)	(0)	(0)	(2)	(0)	(98)	(0)	(100)

II-8-2

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	----	----	----	----	----	----	----	----
AF								
6.2	0.00	0.00	0.00	0.00	0.00	6.24	2.97	9.21
(ROW%)	(0)	(0)	(0)	(0)	(0)	(68)	(32)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	1.04	0.00	1.04
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	15.33	0.00	15.33
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
AF TOTAL	0.00	0.00	0.00	0.00	0.00	22.61	2.97	25.58
(ROW%)	(0)	(0)	(0)	(0)	(0)	(88)	(12)	(100)
DOD TOTAL	0.00	0.00	0.94	0.23	0.00	48.37	3.81	53.35
(ROW%)	(0)	(0)	(2)	(0)	(0)	(91)	(7)	(100)

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
ARMY								
6.1	0.00	0.00	0.00	4.32	0.00	0.00	0.00	4.32
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	10.78	0.00	0.00	7.93	18.71
(ROW%)	(0)	(0)	(0)	(58)	(0)	(0)	(42)	(100)
6.3	0.00	0.00	0.00	6.32	0.00	0.00	0.00	6.32
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
ARMY TOTAL	0.00	0.00	0.00	21.41	0.00	0.00	7.93	29.34
(ROW%)	(0)	(0)	(0)	(73)	(0)	(0)	(27)	(100)

II-8-4

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - HF

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	----	----	----	----	----	----	----	----
NAVY								
6.1	0.00	0.00	0.00	2.19	0.00	0.00	0.00	2.19
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	3.21	0.00	0.00	0.00	3.21
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.3	0.00	0.00	0.96	2.53	0.00	0.00	0.00	3.50
(ROW%)	(0)	(0)	(28)	(72)	(0)	(0)	(0)	(100)
NAVY TOTAL	0.00	0.00	0.96	7.93	0.00	0.00	0.00	8.90
(ROW%)	(0)	(0)	(11)	(89)	(0)	(0)	(0)	(100)

II-8-5

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						TOTAL
	1	2	3	4	5	6	VAR	
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.00	0.00	7.77	0.00	0.00	0.00	7.77
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	14.68	0.00	0.00	1.74	16.42
(ROW%)	(0)	(0)	(0)	(89)	(0)	(0)	(11)	(100)
6.3	0.00	0.00	0.00	15.78	0.00	0.00	0.00	15.78
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
AF TOTAL								
	0.00	0.00	0.00	38.23	0.00	0.00	1.74	39.97
(ROW%)	(0)	(0)	(0)	(96)	(0)	(0)	(4)	(100)
DOD TOTAL								
	0.00	0.00	0.96	67.58	0.00	0.00	9.67	78.21
(ROW%)	(0)	(0)	(1)	(86)	(0)	(0)	(12)	(100)

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL

ARMY								
6.1	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.66
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	2.45	0.00	0.00	0.00	0.00	2.03	4.48
(ROW%)	(0)	(55)	(0)	(0)	(0)	(0)	(45)	(100)
6.3	0.00	10.02	0.00	0.00	0.00	0.00	0.00	10.02
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)

ARMY TOTAL	0.00	12.48	0.00	0.66	0.00	0.00	2.03	15.17
(ROW%)	(0)	(82)	(0)	(4)	(0)	(0)	(13)	(100)

II-8-7

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - MP

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	2.50	0.00	0.00	0.00	0.00	2.50
(ROW%)	(0)	(0)	(100)	(0)	(0)	(0)	(0)	(100)
6.2	0.00	2.91	0.00	0.00	0.00	0.00	0.00	2.91
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
6.3	1.86	3.04	0.00	0.00	0.00	0.00	0.00	4.90
(ROW%)	(38)	(62)	(0)	(0)	(0)	(0)	(0)	(100)
6.4	0.00	0.98	0.00	0.00	0.00	0.00	0.00	0.98
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
NAVY TOTAL	1.86	6.92	2.50	0.00	0.00	0.00	0.00	11.28
(ROW%)	(16)	(61)	(22)	(0)	(0)	(0)	(0)	(100)

II-8-8

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - MP

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.86
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
6.2	0.00	3.55	1.14	0.00	0.00	0.00	2.25	6.94
(ROW%)	(0)	(51)	(16)	(0)	(0)	(0)	(32)	(100)
6.3	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.50
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
AF TOTAL	0.00	4.92	1.14	0.00	0.00	0.00	2.25	8.30
(ROW%)	(0)	(59)	(14)	(0)	(0)	(0)	(27)	(100)
DOD TOTAL	1.86	24.31	3.63	0.66	0.00	0.00	4.28	34.75
(ROW%)	(5)	(70)	(10)	(2)	(0)	(0)	(12)	(100)

II-8-9

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	0.00	0.00	1.11	0.00	1.11
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	5.94	1.61	7.55
(ROW%)	(0)	(0)	(0)	(0)	(0)	(79)	(21)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	10.32	0.00	10.32
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	32.61	0.00	32.61
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
ARMY TOTAL	0.00	0.00	0.00	0.00	0.00	49.98	1.61	51.59
(ROW%)	(0)	(0)	(0)	(0)	(0)	(97)	(3)	(100)

II-8-10

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1988 (\$MILLIONS)						
BUDGET		DOD GOAL						
CATEGORY	1	2	3	4	5	6	VAR	TOTAL
-----	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.2	0.00	0.00	0.00	0.00	0.00	3.01	0.00	3.01
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	8.28	0.00	8.28
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	17.33	0.00	17.33
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.00	0.00	28.61	0.00	28.61
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)

II-8-11

TABLE II-8

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - ST

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.2	0.00	0.00	0.00	0.00	0.00	7.07	3.27	10.35
(ROW%)	(0)	(0)	(0)	(0)	(0)	(68)	(32)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	7.22	0.00	7.22
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	41.45	0.00	41.45
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
AF TOTAL	0.00	0.00	0.00	0.00	0.00	55.75	3.27	59.02
(ROW%)	(0)	(0)	(0)	(0)	(0)	(94)	(6)	(100)
DOD TOTAL	0.00	0.00	0.00	0.00	0.00	134.34	4.88	139.22
(ROW%)	(0)	(0)	(0)	(0)	(0)	(96)	(4)	(100)

II-8-12

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY	DOD GOAL							TOTAL
	1	2	3	4	5	6	VAR	
ARMY								
6.1 (ROW%)	0.00 (0)	0.00 (0)	0.80 (100)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.80 (100)
6.2 (ROW%)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	1.69 (60)	1.15 (40)	2.84 (100)
6.3 (ROW%)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	7.61 (100)	0.00 (0)	7.61 (100)
6.4 (ROW%)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	6.87 (100)	0.00 (0)	6.87 (100)
ARMY TOTAL (ROW%)	0.00 (0)	0.00 (0)	0.80 (4)	0.00 (0)	0.00 (0)	16.17 (89)	1.15 (6)	18.13 (100)

II-8-13

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	0.00	0.00	0.00	6.32	0.00	6.32
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.2	0.00	0.00	0.00	0.28	0.00	1.75	0.00	2.02
(ROW%)	(0)	(0)	(0)	(14)	(0)	(86)	(0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.15	0.00	6.15
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.28	0.00	14.22	0.00	14.50
(ROW%)	(0)	(0)	(0)	(2)	(0)	(98)	(0)	(100)

II-8-14

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ET

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	----	----	----	----	----	----	----	----
AF								
6.2	0.00	0.00	0.00	0.00	0.00	7.90	3.37	11.27
(ROW%)	(0)	(0)	(0)	(0)	(0)	(70)	(30)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	2.07	0.00	2.07
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	46.79	0.00	46.79
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
AF TOTAL	0.00	0.00	0.00	0.00	0.00	56.76	3.37	60.13
(ROW%)	(0)	(0)	(0)	(0)	(0)	(94)	(6)	(100)
DOD TOTAL	0.00	0.00	0.80	0.28	0.00	87.15	4.52	92.75
(ROW%)	(0)	(0)	(1)	(0)	(0)	(94)	(5)	(100)

II-8-15

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						TOTAL
	1	2	3	4	5	6	VAR	
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	4.33	0.00	0.00	0.00	4.33
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	9.80	0.00	0.00	8.51	18.31
(ROW%)	(0)	(0)	(0)	(54)	(0)	(0)	(46)	(100)
6.3	0.00	0.00	0.00	7.81	0.00	0.00	0.00	7.81
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
ARMY TOTAL	0.00	0.00	0.00	21.94	0.00	0.00	8.51	30.44
(ROW%)	(0)	(0)	(0)	(72)	(0)	(0)	(28)	(100)

II-8-16

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	0.00	2.42	0.00	0.00	0.00	2.42
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	3.33	0.00	0.00	0.00	3.33
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.3	0.00	0.00	1.47	2.46	0.00	0.00	0.00	3.92
(ROW%)	(0)	(0)	(37)	(63)	(0)	(0)	(0)	(100)
NAVY TOTAL	0.00	0.00	1.47	8.20	0.00	0.00	0.00	9.67
(ROW%)	(0)	(0)	(15)	(85)	(0)	(0)	(0)	(100)

II-8-17

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = HF

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.1	0.00	0.00	0.00	8.60	0.00	0.00	0.00	8.60
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	0.00	0.00	15.40	0.00	0.00	1.53	16.93
(ROW%)	(0)	(0)	(0)	(91)	(0)	(0)	(9)	(100)
6.3	0.00	0.00	0.00	20.38	0.00	0.00	0.00	20.38
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
AF TOTAL	0.00	0.00	0.00	44.38	0.00	0.00	1.53	45.91
(ROW%)	(0)	(0)	(0)	(97)	(0)	(0)	(3)	(100)
DOD TOTAL	0.00	0.00	1.47	74.53	0.00	0.00	10.04	86.03
(ROW%)	(0)	(0)	(2)	(87)	(0)	(0)	(12)	(100)

II-8-18

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET		DOD GOAL						
CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	----	----	----	----	----	----	----	----
ARMY								
6.1	0.00	0.00	0.00	0.92	0.00	0.00	0.00	0.92
(ROW%)	(0)	(0)	(0)	(100)	(0)	(0)	(0)	(100)
6.2	0.00	4.30	0.00	0.00	0.00	0.00	2.87	7.17
(ROW%)	(0)	(60)	(0)	(0)	(0)	(0)	(40)	(100)
6.3	0.00	8.55	0.00	0.00	0.00	0.00	0.00	8.55
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
ARMY TOTAL	0.00	12.84	0.00	0.92	0.00	0.00	2.87	16.64
(ROW%)	(0)	(77)	(0)	(6)	(0)	(0)	(17)	(100)

II-8-19

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = MP

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.1	0.00	0.00	2.76	0.00	0.00	0.00	0.00	2.76
(ROW%)	(0)	(0)	(100)	(0)	(0)	(0)	(0)	(100)
6.2	0.00	3.05	0.00	0.00	0.00	0.00	0.00	3.05
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
6.3	5.11	3.98	0.00	0.00	0.00	0.00	0.00	9.08
(ROW%)	(56)	(44)	(0)	(0)	(0)	(0)	(0)	(100)
6.4	0.00	1.03	0.00	0.00	0.00	0.00	0.00	1.03
(ROW%)	(0)	(100)	(0)	(0)	(0)	(0)	(0)	(100)
NAVY TOTAL	5.11	8.05	2.76	0.00	0.00	0.00	0.00	15.92
(ROW%)	(32)	(51)	(17)	(0)	(0)	(0)	(0)	(100)

II-8-20

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - MP

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY		DOD GOAL						
	1	2	3	4	5	6	VAR	TOTAL
AF								
6.1 (ROW%)	0.00 (0)	0.96 (100)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.96 (100)
6.2 (ROW%)	0.00 (0)	3.15 (50)	1.30 (21)	0.00 (0)	0.00 (0)	0.00 (0)	1.84 (29)	6.29 (100)
6.3 (ROW%)	0.00 (0)	0.49 (100)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.49 (100)
AF TOTAL (ROW%)	0.00 (0)	4.59 (59)	1.30 (17)	0.00 (0)	0.00 (0)	0.00 (0)	1.84 (24)	7.73 (100)
DOD TOTAL (ROW%)	5.11 (13)	25.48 (63)	4.06 (10)	0.92 (2)	0.00 (0)	0.00 (0)	4.71 (12)	40.28 (100)

II-8-21

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - ST

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
		DOD GOAL						
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY								
6.1	0.00	0.00	0.00	0.00	0.00	1.31	0.00	1.31
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.2	0.00	0.00	0.00	0.00	0.00	5.16	1.15	6.31
(ROW%)	(0)	(0)	(0)	(0)	(0)	(82)	(18)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	12.83	0.00	12.83
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	26.97	0.00	26.97
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
ARMY TOTAL	0.00	0.00	0.00	0.00	0.00	46.26	1.15	47.41
(ROW%)	(0)	(0)	(0)	(0)	(0)	(98)	(2)	(100)

II-8-22

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY - ST

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

DOD ORGANIZATION		1989 (\$MILLIONS)						
BUDGET CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
	-----	-----	-----	-----	-----	-----	-----	-----
NAVY								
6.2	0.00	0.00	0.00	0.00	0.00	3.12	0.00	3.12
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	6.45	0.00	6.45
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	20.68	0.00	20.68
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
NAVY TOTAL	0.00	0.00	0.00	0.00	0.00	30.25	0.00	30.25
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)

II-8-23

TABLE II-8

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR CONGRESSIONAL CATEGORY = ST

DOD GOAL BY BUDGET CATEGORY
 WITHIN DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	DOD GOAL							
BUDGET CATEGORY	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
AF								
6.2	0.00	0.00	0.00	0.00	0.00	8.21	3.47	11.68
(ROW%)	(0)	(0)	(0)	(0)	(0)	(70)	(30)	(100)
6.3	0.00	0.00	0.00	0.00	0.00	5.96	0.00	5.96
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
6.4	0.00	0.00	0.00	0.00	0.00	26.02	0.00	26.02
(ROW%)	(0)	(0)	(0)	(0)	(0)	(100)	(0)	(100)
AF TOTAL	0.00	0.00	0.00	0.00	0.00	40.18	3.47	43.65
(ROW%)	(0)	(0)	(0)	(0)	(0)	(92)	(8)	(100)
DOD TOTAL	0.00	0.00	0.00	0.00	0.00	116.69	4.62	121.31
(ROW%)	(0)	(0)	(0)	(0)	(0)	(96)	(4)	(100)

II-8-24

TABLE II-9

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 DOD GOAL BY CONGRESSIONAL CATEGORY
 1988 (\$MILLIONS)

CONGRESSIONAL CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ET (ROW%)	0.00 (0)	0.00 (0)	0.94 (2)	0.23 (0)	0.00 (0)	48.36 (91)	3.81 (7)	53.34 (100)
HF (ROW%)	0.00 (0)	0.00 (0)	0.96 (1)	67.57 (86)	0.00 (0)	0.00 (0)	9.66 (12)	78.19 (100)
MP (ROW%)	1.86 (5)	24.31 (70)	3.63 (10)	0.66 (2)	0.00 (0)	0.00 (0)	4.28 (12)	34.74 (100)
ST (ROW%)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	134.32 (96)	4.88 (4)	139.20 (100)
TOTAL (ROW%)	1.86 (1)	24.31 (8)	5.53 (2)	68.46 (22)	0.00 (0)	182.68 (60)	22.63 (7)	305.48 (100)

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 DOD GOAL BY CONGRESSIONAL CATEGORY
 1989 (\$MILLIONS)

CONGRESSIONAL CATEGORY	DOD GOAL						VAR	TOTAL
	1	2	3	4	5	6		
ET (ROW%)	0.00 (0)	0.00 (0)	0.80 (1)	0.28 (0)	0.00 (0)	87.15 (94)	4.52 (5)	92.74 (100)
HF (ROW%)	0.00 (0)	0.00 (0)	1.46 (2)	74.51 (87)	0.00 (0)	0.00 (0)	10.04 (12)	86.01 (100)
MP (ROW%)	5.11 (13)	25.48 (63)	4.06 (10)	0.92 (2)	0.00 (0)	0.00 (0)	4.71 (12)	40.28 (100)
ST (ROW%)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)	116.68 (96)	4.62 (4)	121.30 (100)
TOTAL (ROW%)	5.11 (2)	25.48 (7)	6.33 (2)	75.71 (22)	0.00 (0)	203.82 (66)	23.88 (7)	340.33 (100)

TABLE II-10

MPT PROGRAM FUNDING IN 1988
BASED ON FY89 PRESIDENT'S BUDGET

DOD GOAL BY DOD ORGANIZATION

1988 (\$MILLIONS)

		DOD GOAL						
DOD ORGANIZATION	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY	0.00	12.47	0.94	22.07	0.00	63.26	12.40	111.15
(ROW%)	(0)	(11)	(1)	(20)	(0)	(57)	(11)	(100)
NAVY	1.86	6.92	3.46	8.16	0.00	41.08	0.00	61.48
(ROW%)	(3)	(11)	(6)	(13)	(0)	(67)	(0)	(100)
AF	0.00	4.91	1.14	38.23	0.00	78.35	10.23	132.85
(ROW%)	(0)	(4)	(1)	(29)	(0)	(59)	(8)	(100)
TOTAL	1.86	24.31	5.53	68.46	0.00	182.68	22.63	305.48
(ROW%)	(1)	(8)	(2)	(22)	(0)	(60)	(7)	(100)

MPT PROGRAM FUNDING IN 1989
BASED ON FY89 PRESIDENT'S BUDGET

DOD GOAL BY DOD ORGANIZATION

1989 (\$MILLIONS)

		DOD GOAL						
DOD ORGANIZATION	1	2	3	4	5	6	VAR	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----
ARMY	0.00	12.84	0.80	22.86	0.00	62.43	13.68	112.61
(ROW%)	(0)	(11)	(1)	(20)	(0)	(55)	(12)	(100)
NAVY	5.11	8.05	4.22	8.48	0.00	44.46	0.00	70.32
(ROW%)	(7)	(11)	(6)	(12)	(0)	(63)	(0)	(100)
AF	0.00	4.59	1.30	44.38	0.00	96.93	10.21	157.40
(ROW%)	(0)	(3)	(1)	(28)	(0)	(62)	(6)	(100)
TOTAL	5.11	25.48	6.33	75.71	0.00	203.82	23.88	340.33
(ROW%)	(2)	(7)	(2)	(22)	(0)	(60)	(7)	(100)

TABLE II-11

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR BUDGET CATEGORY = 6.1,6.2

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	2.75 (7)	23.02 (58)	5.14 (13)	8.66 (22)	39.57 (100)
NAVY (ROW%)	7.64 (36)	5.40 (25)	5.40 (25)	3.01 (14)	21.44 (100)
AF (ROW%)	9.21 (18)	24.19 (47)	7.80 (15)	10.35 (20)	51.54 (100)
TOTAL (ROW%)	19.60 (17)	52.61 (47)	18.34 (16)	22.01 (0)	112.56 (100)

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR BUDGET CATEGORY = 6.1,6.2

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	3.65 (9)	22.64 (54)	8.09 (19)	7.62 (18)	41.99 (100)
NAVY (ROW%)	8.35 (36)	5.75 (25)	5.81 (25)	3.12 (14)	23.02 (100)
AF (ROW%)	11.26 (20)	25.52 (46)	7.24 (13)	11.68 (21)	55.71 (100)
TOTAL (ROW%)	23.26 (19)	53.91 (45)	21.14 (18)	22.41 (0)	120.71 (100)

TABLE II-12

MPT PROGRAM FUNDING IN 1988
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR BUDGET CATEGORY = 6.1,6.2,6.3

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1988 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	9.67 (13)	29.34 (40)	15.16 (21)	18.97 (26)	73.14 (100)
NAVY (ROW%)	12.70 (29)	8.89 (21)	10.30 (24)	11.28 (26)	43.18 (100)
AF (ROW%)	10.24 (13)	39.96 (53)	8.30 (11)	17.57 (23)	76.07 (100)
TOTAL (ROW%)	----- 32.61 (17)	----- 78.19 (41)	----- 33.77 (18)	----- 47.82 (25)	----- 192.39 (100)

MPT PROGRAM FUNDING IN 1989
 BASED ON FY89 PRESIDENT'S BUDGET
 FOR BUDGET CATEGORY = 6.1,6.2,6.3

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1989 (\$MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY				TOTAL
	ET	HF	MP	ST	
	-----	-----	-----	-----	-----
ARMY (ROW%)	11.25 (14)	30.44 (39)	16.63 (21)	20.44 (26)	78.77 (100)
NAVY (ROW%)	14.50 (30)	9.67 (20)	14.89 (31)	9.57 (20)	48.62 (100)
AF (ROW%)	13.33 (16)	45.91 (54)	7.73 (9)	17.63 (21)	84.60 (100)
TOTAL (ROW%)	----- 39.08 (18)	----- 86.01 (41)	----- 39.25 (19)	----- 47.65 (22)	----- 211.99 (100)

III. PROGRAM ELEMENT AND PROJECT SYNOPSES

MANPOWER, PERSONNEL AND TRAINING
PROGRAM FUNDING BY SERVICE - JAN 1988

PE	TITLE	(\$ MILLIONS)			
		FY86	FY87	FY88	FY89

ARMY					

61102A	DEFENSE RESEARCH SCIENCES	7.4	6.5	7.1	7.4
62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY	12.3	21.2	14.6	15.1
62717A	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	0.0	0.0	0.0	0.0
62722A	MANPOWER, PERSONNEL AND TRAINING	0.0	0.0	0.0	0.0
62727A	NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY	2.9	3.7	4.1	3.5
62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY	11.8	15.4	14.0	16.2
63003A	AVIATION ADVANCED TECHNOLOGY	12.0	13.0	5.1	5.4
63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	36.6	28.8	28.5	30.6
63216A	SYNTHETIC FLIGHT SIMULATOR DEVELOPMENT	0.0	0.0	0.0	0.0
63731A	MANPOWER AND PERSONNEL	0.1	0.0	0.0	0.0
63736A	HUMAN FACTORS ENGINEERING APPLICATIONS	0.1	0.0	0.0	0.0
63738A	NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED DEVELOPMENT	1.9	3.4	0.1	0.9
63739A	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS	0.0	0.0	0.0	0.0
63743A	EDUCATION AND TRAINING	0.0	0.0	0.0	0.0
63744A	TRAINING SIMULATION	0.0	0.0	0.0	0.0
64217A	SYNTHETIC FLIGHT TRAINING SYSTEMS	0.0	0.0	0.0	0.0
64715A	NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING DEVELOPMENT	41.2	35.3	24.8	19.8
64722A	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT	8.4	4.2	5.4	6.9
64801A	AVIATION ENGINEERING DEVELOPMENT	5.5	7.3	7.9	7.2

SUBTOTAL - ARMY:		139.6	138.3	111.1	112.6

NAVY					

61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES	12.1	12.0	10.5	11.5
62131M	MARINE CORPS LANDING FORCE TECHNOLOGY	0.5	0.7	0.5	0.6
62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA	7.7	8.7	7.4	7.7
62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA	4.1	3.5	3.3	3.4
62744N	MARINE CORPS AIR-GROUND TECHNOLOGY	0.0	0.0	0.0	0.0
62757N	HUMAN FACTORS AND SIMULATION TECHNOLOGY	0.0	0.0	0.0	0.0
62763N	PERSONNEL AND TRAINING TECHNOLOGY	0.0	0.0	0.0	0.0
63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT	2.1	2.5	2.6	2.5
63707N	MANPOWER AND PERSONNEL SYSTEMS	3.3	2.9	3.1	4.0
63710N	MAN-MACHINE TECHNOLOGY	0.0	0.0	0.0	0.0
63720N	EDUCATION AND TRAINING	3.0	4.8	5.1	6.2
63727N	ADVANCED TECHNOLOGY FOR LOGISTICS INFORMATION	0.0	0.0	0.0	0.0
63732M	ADVANCED MANPOWER/TRAINING SYSTEMS	2.2	2.4	1.9	5.2
63733N	SIMULATION AND TRAINING DEVICES	6.9	8.4	8.3	6.5
63739N	NAVY LOGISTICS PRODUCTIVITY	0.8	0.1	1.0	1.5
64703N	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS	5.3	1.0	1.0	1.1
64709N	JOINT SERVICE MANPOWER/PERSONNEL PROTOTYPES	0.0	0.0	0.0	0.0
64714N	AIR WARFARE TRAINING DEVICES	0.1	0.1	0.6	2.0
64715N	SURFACE WARFARE TRAINING	18.7	22.4	16.9	18.8
64716N	SUBMARINE WARFARE TRAINING DEVICES	0.0	0.0	0.0	0.0

SUBTOTAL - NAVY:		66.0	68.6	61.5	70.3

MANPOWER, PERSONNEL AND TRAINING
PROGRAM FUNDING BY SERVICE - JAN 1988

PE	TITLE	(\$ MILLIONS)				
		FY86	FY87	FY88	FY89	

AIR FORCE						

61102F	DEFENSE RESEARCH SCIENCES	6.7	8.5	8.7	9.6	
62202F	AEROSPACE BIOTECHNOLOGY	10.6	10.9	11.0	11.9	
62205F	PERSONNEL, TRAINING, AND SIMULATION	31.3	32.5	32.0	34.3	
62703F	PERSONNEL UTILIZATION TECHNOLOGY	0.0	0.0	0.0	0.0	
63106F	LOGISTICS SYSTEMS TECHNOLOGY	6.5	10.8	9.6	13.9	
63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY	8.1	7.5	8.5	8.1	
63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY	4.4	8.2	6.3	6.6	
63365F	SPACE BIOTECHNOLOGY	0.0	0.0	0.0	0.0	
63704F	MANPOWER AND PERSONNEL SYSTEMS TECHNOLOGY	0.0	0.0	0.0	0.0	
63751F	TRAINING SYSTEMS TECHNOLOGY	0.1	0.1	0.3	0.5	
64227F	FLIGHT SIMULATOR DEVELOPMENT	111.6	92.8	56.8	72.9	

SUBTOTAL - AIR FORCE:		178.8	170.9	132.8	157.4	

TOTAL:		384.5	377.8	305.5	340.3	

TRAINING AND PERSONNEL TECHNOLOGY
RESEARCH ORGANIZATIONS

ARMY

AVRADCOM	Army Aviation Research and Development Center
ARI	Army Research Institute
HEL	Army Human Engineering Laboratory
PMTRADE	Project Manager for Training Devices

NAVY

HQMC	Headquarters, US Marine Corps
NADC	Naval Air Development Center
NAMRL	Naval Aerospace Medical Research Laboratory
NAVAIR	Naval Air Systems Command
NAVELEX	Naval Electronic Systems Command
NAVSEA	Naval Sea Systems Command
NOSC	Naval Ocean Systems Center
NPRDC	Navy Personnel Research and Development Center
NSRDC	Naval Ship Research and Development Center
NSWC	Naval Surface Weapons Center
NTSC	Naval Training Systems Center
ONR	Office of Naval Research

AIR FORCE

AAMRL	Armstrong Aerospace Medical Research Laboratory
AFHRL	Air Force Human Resources Laboratory
AFOSR	Air Force Office of Scientific Research
AMD	Aerospace Medical Division
TS SPO	Deputy for Training Systems

III.A. ARMY PROGRAM ELEMENT AND PROJECT SYNOPSES

PE	TITLE	PAGE
61102A	DEFENSE RESEARCH SCIENCES	III-A-1
62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY DEVELOPMENT	III-A-11
62727A	NON-SYSTEM TRAINING DEVICES TECHNOLOGY	III-A-15
62785A	MANPOWER, PERSONNEL AND TRAINING TECHNOLOGY	III-A-17
63003A	AVIATION ADVANCED TECHNOLOGY	III-A-26
63007A	HUMAN, FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY	III-A-31
63738A	NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED DEVELOPMENT	III-A-37
64715A	NON-SYSTEM TRAINING DEVICES ENGINEERING	III-A-40
64722A	EDUCATION AND TRAINING SYSTEMS	III-A-44
64801A	AVIATION ENGINEERING DEVELOPMENT	III-A-48

Table III-A-1: Listing of Projects - Lists projects for each ARMY program element. Lists contain performing organization, funding, Congressional Category and goal information.

PROGRAM ELEMENT OVERVIEW

PE: 61102A

DEFENSE RESEARCH SCIENCES

DoD ORGANIZATION:

ARMY

FUNDING:

FY88 \$ 7.0M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 7.4M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to produce data, concepts, and technology needed to support applied R&D advances in MPT.

To accomplish this objective, the research will: (a) capitalize on relevant new behavioral technological opportunities that have potential for increasing future operational Army personnel performance, (b) involve innovative civilian sector (university and industry) scientists in the discovery and adaptation of new technology to Army needs, and (c) form the behavioral science base to build new technologies for soldier and system effectiveness.

This effort includes the theoretical and experimental research to provide techniques to develop skills for the individual soldier, to improve soldier interactions with equipment, and to improve the soldier's performance in the combat environment.

In FY 87, the research focussed on new priorities which include: (a) planning, problem solving, and decision making, (b) unit performance, (c) skill building technology, and (d) designing systems for people. Planned Project emphasis on integration of human operators in systems design, Army unit performance, and organization and decision making could not be intensified because of late funding decrements.

The funding decrease for FY 88 reduces resources to meet an urgent requirement to develop tools to produce general officers and senior executive service leadership and to investigate, identify, and adapt unconventional techniques to enhance soldier capabilities in training, in operations, and under the stress that will be present on tomorrow's battlefields. To this end, project efforts to include research on accelerated learning, resistance to stress, and improved sustained operations techniques could only be achieved at the cost of reducing research efforts in leadership.

This program sustains the U.S. Army science and engineering base required to exploit new opportunities in rapidly advancing technological fields. The program supports theoretical and experimental research in the physical, mathematical, biological, environmental, terrestrial and behavioral sciences. This research is focused on the Army's key goals for effectiveness in the airland battle environment and the Army 21 concept to provide a lethal, integrated, supportable, highly mobile force with enhanced soldier effectiveness. Research areas are determined and prioritized in order to meet Army needs as stated in mission area analyses and in Army 21, and to exploit scientific opportunities.

RELATED ACTIVITIES:

Project #BH57, Scientific Problems with Military Applications which was previously reported in this Program Element (PE) is now in PE #61103A, (University Research Initiatives). The work done in this PE (#61102A) is performed within the Army laboratory system and complements the University work performed in PE #61103A (University Research). The Navy, Air Force, and the other Department of Defense agencies, National Aeronautics and Space Administration, National Science Foundation, Department of the Interior, Department of Energy, National Bureau of Standards, other Government

agencies, government agencies of allied nations, and the industrial and academic community sponsor related research in areas of this program. Coordination to eliminate duplication is accomplished by tri-Service topical reviews; exchange of progress reports and technical reports; inter-Service/agency liaison; and formal national and international meetings and symposia. Informal coordination occurs through; visits to governmental, industrial, and academic laboratories and installations; review of the scientific literature; and publications of current research. The Army's Defense Research Sciences Program is included in the Tri-Service Technology Coordinating Papers.

The work is performed by 33 Army laboratories and activities and by academic institutions, not-for-profit organizations, and industrial laboratories through contracts and grants.

PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Program Element is a behavioral science base on which to build new technologies to improve the effectiveness of soldiers and systems.

This basic research's contribution to the Army lies substantially in seeding new exploratory and advanced development to enhance soldier performance and behavior, and in enlisting civilian scientific skills and facilities (university and industry) to cooperatively address Army needs to explore and transition new technologies into application to solve Army personnel problems.

Research in FY 86 fell into the four categories identified in the Synopsis above and included: (a) data and findings from the investigations of high stress materialistic settings point the way to develop Army decision aids and training for leaders in command and control, to enhance both individual and group decision making under extreme conditions, (b) transition of Stratified Systems Theory to application in ODCSPER organizational design, and (c) successful demonstration of prediction instruments to select, assign, and train on the basis of non-academic abilities or practical versus academic knowledge.

FUTURE DIRECTIONS:

In FY 89 and beyond, plans include research to support soldier performance in the areas of soldier/machine interface, individual soldier performance, and soldier protection as represented by the following efforts: (a) research to focus on filling soldier performance knowledge voids for improved human data processing in tactical environments, and the effects of stress and high mental workload imposed by high technology weapons systems, and (b) determine leadership qualities and evaluate leadership performance required for the distributed battlefield of the future.

PROJECT OVERVIEW

		88	89
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PROJECT: B74A	HUMAN ENGINEERING	\$ 3.0M	\$ 3.1M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to support human factors engineering by generating soldier performance data to develop better engineering design principles.

New information is needed on the capabilities and limitations of men and women so predictions can be made about soldier performance when using military equipment under all field conditions in all environments. Findings are used in the design of displays, controls, workspaces, and complex equipment such as command and control facilities. This effort will support fundamental research to stimulate scientific progress and novel human engineering concepts to provide options for future Army technology and to ensure against surprises in the operational capability of potential adversaries. The use of scientific results in Army applications, in exploiting novel concepts, and in efficiently transferring programs into exploratory development programs should maintain or increase the U.S. lead in critical areas of military technology.

In FY 88, it is planned to: (a) determine critical visual detection and recognition features of armored combat vehicles which will permit the design of less detectable combat vehicles in the future, (b) prepare, in conjunction with the Tank and Automotive Command, the guidelines for reducing interior and exterior noise for future tracked vehicles.

Plans for FY 89 are to: (a) investigate the psychological/physiological stress effects on soldier performance as related to future small arms design, and (b) study crew speech communication/performance under high noise environments to assist in future armored combat vehicle design.

Also in FY 89, it is planned to: (a) initiate a joint program between HEL, NVEOC, and TACOM utilizing the HEL oculometer research system to assess detection and recognition features of US armored combat vehicles through foreign sensor imaging, (b) investigate the physiological and psychological mechanisms of stress and develop a model of stress susceptibility, and (c) continue to explore the implications of hearing hazard.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) the enhancement of the soldier-machine interface, to increase the soldier's ability to operate and maintain Army materiel, and (b) reduction of the manpower required to accomplish Army missions.

By fully understanding the soldier's physical and mental capabilities and limitations designers will be able to develop equipment that achieves the optimum man-machine interface and increases battlefield effectiveness. This would greatly improve operational readiness, combat effectiveness and sustainability in all mission crews.

In FY 87, accomplishments included: (a) development of a mathematical model

ARMY/61102A

of the human ear which predicts the hazard levels of impulse noise such as that which occurs when firing weapons, and (b) establishment of a design criteria for new weapons which are safe to fire by individual soldiers and gun crews.

PROJECT OVERVIEW

		88	89
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PROJECT: B74F-ET	UNIT PERFORMANCE	\$ 0.9M	\$ 0.8M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Task is to develop methods and systems which will provide more rapid, efficient measures for training units.

Most Army training focuses on the individual, whether enlisted or officer; however, the Army typically fights and operates in units. As few methods exist for characterizing the adequacy group performance or for measuring improvement in group functions as a result of group or individual training, research is needed on tasks where responsibility is distributed.

Basic to functioning of the Army is the structure of the organization, and the need to know more about how people behave in organizations. Another focus is to find improved methods to measure leadership, cohesion, organizational dynamics, and job satisfaction. Additionally, the Army needs a model of unit performance to help guide researchers in the most productive areas of research on unit performance.

PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) training cost reductions, (b) more effective unit training and performance, and (c) provision of a force multiplier effect.

Specific accomplishments in FY 87 included: (a) a review of techniques for enhancing human performance resulting in a National Academy of Sciences report, and (b) the development of principles of learning and instruction to guide the new generation of Army intelligent training devices.

PROJECT OVERVIEW

		88	89
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PROJECT: B74F-HF	DESIGNING SYSTEMS FOR PEOPLE	\$ 1.3M	\$ 1.2M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Task is to provide the human capabilities and skills data to design more easily trained and more effectively used equipment systems.

More data are required by designers on the skills and capabilities of Army personnel if they are to successfully design optimally useable equipment. This need is particularly evident in the area of human interaction with complex equipment or where training cannot cover all anticipated conditions. There is also a less evident need for additional research in the more traditional areas of human factors because of the continuing development of new sensors, displays, and response devices.

Designers need convenient procedures, aids, or devices in order to incorporate data on human capabilities and skills in their designs. Better methods of information transfer and utilization are required if the human factors discipline expects its findings to be applied to real-world problems.

In FY 87, research will: (a) be completed describing the theory for combining diverse forms of sensor inputs, where each sensor is subject to its own type of resolution error, (b) be initiated focusing on coping with unanticipated situations during message-driven intelligence products, and (c) examine human computer interfaces and advanced methods for weapons systems design to support the MANPRINT (manpower integration) initiative.

PAYOFF/UTILIZATION:

The payoff of this Task includes better and more effectively utilized manpower, personnel, and training data, resulting in equipment that can be more mission-effective and easier to train and maintain.

In FY 86, accomplishments include: (a) development of a new spatial representation and problem solver for intelligence fusion threat assessment use, and (b) since assessment methods are robust and are not peculiar to a specific geography nor variety of opposing forces, research will support the development of an intelligence threat assessment system which may be used within any tactical environment and against a wide variety of forces.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: B74F-MP	PLANNING, PROBLEM SOLVING AND DECISION MAKING	\$ 0.7M	\$ 0.9M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Task is to understand the biases and logical fallacies in human judgement, reasoning, and decision making, and to discover what can be done to compensate for these limitations.

As a result of larger, more rapid, and increasingly sophisticated computer-driven Army systems, decision-makers must function under conditions of extreme time stress and potential information overload. In numerous problem-solving situations, people perform more poorly than would be predicted on the basis of their existing knowledge or performance on related problems. They often do not use the knowledge they have, or are fixed in their approach to problems. Research is needed that will help: (a) to understand the process of knowledge access, cognitive flexibility, and generation of multiple and conflicting hypothesis, and (b) to design problem solving or planning aids to overcome these limitations.

Traditionally, decision research has relied on analysis of utilities, costs, and benefits, yielding decision support systems that quantify these factors and produce decision recommendations. However, recent efforts show that people do not use information as these models imply. Moreover, in real decision situations, available data may be incomplete or questionable. The psychology of decision-making and how intelligent computer systems could aid this process in a manner compatible with human thought processes needs to be investigated so that compatible systems can be designed. The relationship between decision making, planning, and problem-solving by individuals and group also needs to be addressed.

The development of computerized aids for problem-solving is of great interest to the Army. Methods and procedures used to solve problems include: (a) procedures of interactive branching techniques used in heuristic problem-solving, (b) rule-based problem-solving, (c) goal-directed problem-solving, (d) the nonlinear approach often used by experts, and (e) the inductive approach whereby individuals reason backward from fragmentary, less-than-perfect pieces of evidence to determine an underlying scheme, purpose, or reason. It is anticipated that, in the future, some Army problems will require rapid solutions from two or more individuals physically removed from each other who may not have access to identical databases. Types of network controls and mechanisms are necessary for such distributed group problem-solving and the extent of data based redundancy required in such situations is of concern.

Research is underway in the area of structured planning, particularly into the rules and procedures used to plan for ill-defined future scenarios. ARI supports research on how planners generate new goals, modify goals, and create alternate goals. Most current planning systems are limited in that they incorporate fixed goals which are incapable of changing. This research aims at providing more adaptive planning systems in the future. Experienced planners or decision makers often incorporate subjective value judgements into their planning and decision-making processes which they cannot verbalize

but which often turn out to be valid. ARI also supports research to develop methods for incorporating the user's value judgement into machine systems planning operations.

Research is also needed on constraint modification and development of alternatives. Current planning systems have constraints built into them when they are initiated. However, constraints often differ according to level of importance, and some may be modified by human users during operation. Additional areas of support include: (a) distributive planning, in which experts in different subject matter areas are geographically removed from each other, (b) generic planning, to develop systems capable of producing plans for different subsets of related areas or situations, and (c) meta-planning, or planning for planning.

In FY 88, plans are to develop computational models of case-based or analogical reasoning.

In FY 89 plans are to: (a) validate a new theory and test of practical intelligence, and (b) to develop a theory of decision making in adversarial, dynamically changing situations.

PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) providing the basis for designing planning and decision aids that can organize, analyze, and synthesize data in ways which will be maximally useful in C3I contexts, and (b) enabling the Army to more effectively aid and train its leaders to make decisions.

In FY 86, specific accomplishments include: (a) research that identified "tacit knowledge" as an important factor in practical intelligence, with the results being used to develop new methods of predicting job performance in specific jobs and improved methods to train people to obtain better performance, (b) developed and tested a leadership model which specifies the conditions under which the leader's and the group members' intellectual abilities contribute to effective group performance, (c) developed techniques relating brain activity to personality and performance during intense stimulation and high workloads, with the results permitting careful evaluation of individual differences in performance under stress, and (d) completed research that has shown that spatial skills are critical for people to effectively operate computers, indicating both the importance of new methods for training computer users and the optimal structure for the design of user aids.

PROJECT OVERVIEW

		88	89
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PROJECT: B74F-ST	SKILL BUILDING TECHNOLOGIES	\$ 1.1M	\$ 1.3M
PE: 61102A	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Task is to apply new techniques and technologies in intelligent and robotic computers to aid personnel and train them faster in the full use of their increased weapons and information capabilities.

With advancing weapons and communication technology, the quantity and complexity of information to be dealt with by officers and enlisted personnel have increased by orders of magnitude. This research will access and evaluate technologies underlying reports concerning unconventional human technologies for enhancing performance. These technologies may provide the means for accelerating learning, increasing attention, and providing for increased mental and physical peak performance to sustain troops under combat conditions. This research will investigate whether these technologies may also provide improved methods for job classification and assignment.

One of the major problems of many large-scale systems is determining how to collate and organize information for future use and the appropriate categories and mechanisms for retrieving it at the needed time. Research on human knowledge has resulted in a variety of knowledge structures: hierarchies, networks, schematic representation, prototypes, and decision rules. A critical issue is what kinds of representations are most appropriate for various knowledge domains and purposes. Research is needed on methods of knowledge transfer, from one expert or a variety of sources, into a comprehensive system. Methods of coding, collating, organizing, storing, and retrieving need to be developed. Research is also needed on flexibility of knowledge representations, representing dynamic information, and inclusion of value information or weighting in knowledge bases.

Research on development of expertise in complex task domains is critical in order to design effective instructional and training systems. Practically no research has addressed the perceptual reorganization that occurs when one advances from the journeyman to expert level of functioning. The Army needs to examine the fundamental mechanisms of learning in a cognitive science framework that lead to the development or reorganization of knowledge schemata, and subsequently conduct research on how to structure the learning environment to enhance such learning.

Much training has been based on superficial task analyses, yet areas in which significant training improvements have been made have resulted from a deeper understanding of the cognitive and contextual factors involved in performance. These analyses have resulted in descriptions of the users' "mental models" which are the critical intermediaries of performance. Research is needed on how people develop and structure mental models in several complex task areas, particularly where transfer or generalization of learned skills has been poor, or where retention or updating of skills is a serious issue.

A primary focus of research within the area of learning is methods for initially creating new databases from discrete information and for incorporating new information into an existing database. This latter topic

applies both to information from the outside environment and to internally generated input based on the experience of an individual user of the system itself. Finally, although it is well known that new tasks often are learned by extrapolation from previous learning experiences or through analogies, basic research is needed to explore the mechanisms by which humans accomplish this kind of learning and how these mechanisms could be incorporated into machine programs.

Specific plans for FY 88 include the analysis of mental models for complex devices and their relation to system operation and troubleshooting.

PAYOFF/UTILIZATION:

The payoffs of this Task include the necessary knowledge to develop more effective Army systems by improving both the skills of the soldiers who operate the systems and by reducing the apparent complexity and difficulty of equipment operation itself.

In FY 86, accomplishments include: (a) development of a software tool to facilitate the man-machine interface between an expert level intelligence analyst and an automated message fusion process, and (b) demonstrated in non-monotonic logic interval based probability the adverse impact of inverse reasoning because a computer must excessively rely upon its models, creating a bias which discourages recognition of novel battlefield deployments.

PROGRAM ELEMENT OVERVIEW

PE: 62716A

HUMAN FACTORS ENGINEERING TECHNOLOGY

DoD ORGANIZATION:

ARMY

FUNDING:

FY88 \$ 14.6M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 15.1M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to maximize the effectiveness of the soldier and his materiel in order to service and win wars.

Soldiers using materiel win wars, and for materiel to be most effectively used by soldiers, it must be designed for soldiers. The rapid changes in technology and the ever increasing emphasis on soldier and equipment performance provide the driver for this effort. Specialized laboratory investigations and field evaluations are conducted to collect performance data on the capabilities and limitations of soldiers and materiel, with particular attention to their interaction. The resulting data are the basis for design standards, guidelines, handbooks, and soldier training requirements for operation and maintenance of weapon systems and equipment. Application yields reduced workload, fewer errors, enhanced soldier protection, user acceptance, and improved soldier equipment.

RELATED ACTIVITIES:

The Human Engineering Laboratory (HEL): (a) is a leader in joint Service coordination for the DoD Human Factors Technology Advisory Group, (b) participates in an HFE standardization subcommittee and the human factors test and evaluation subcommittee, and (c) is the US Army Missile Command (MICOM) agent for Human Factors (HFAC) Standardization.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include technologies, designs, data, and procedures that: (a) reduce workload, errors, and time to accomplish tasks, (b) increase soldier protection and soldier equipment compatibility for individual and crew weapons in aviation, armor, artillery, and air defense, and (c) enhance particular individual items of equipment, information displays, operating controls, computer programs, and crew working environments.

FUTURE DIRECTIONS:

Future thrusts include plans to develop and exploit state-of-the-art technologies such as artificial intelligence and expert systems for application to battlefield robotics, supply and materiel handling and management, next-generation armor and artillery systems, small arms and antiarmor weapons, soldier tasks/loads, soldier protection, aviation and air defense control/display systems, and future hybrid/multiple integrated weapons and defense systems.

PROJECT OVERVIEW

		88	89
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PROJECT: A1QL	ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)	\$ 6.0M	\$ 7.2M
PE: 62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to program costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY 87, RDTE funds to finance overall management and administration of RDTE, A laboratories were prorated to R&D research, systems development projects, and other Army customers. Adjustments were made on a zero-sum basis within Army appropriations.

PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

PROJECT OVERVIEW

		88	89
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PROJECT: AH70	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT	\$ 8.5M	\$ 7.9M
PE: 62716A	HUMAN FACTORS ENGINEERING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY HUMAN ENGINEERING LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are to: (a) generate data on soldier-system interfaces, soldier-system performance, and the capabilities and limitations of soldiers, and (b) provide for the application of these data throughout the Army materiel development process.

Human engineering acquires human performance data and provides design guidance for all types of equipment that are worn, operated, or maintained by soldiers. Specific and precise information is also developed on soldiers' physical and psychological capabilities and limitations, so that Army materiel systems will be designed for maximum field effectiveness in the hands of the soldier. This is increasingly important as weapon systems and materiel become more sophisticated.

In FY 88, it is planned to: (a) develop and publish, as part of the Manpower and Personnel Integration (MANPRINT) initiative, a task analysis standard for Army and DoD implementation to permit better design of materiel for soldier use; (b) develop an Army aviation baseline counterair crew station concept that focuses on man/machine/command and control interfaces for use by the aviation and air defense communities in order to increase effectiveness of aviation and air defense assets, and maximize total system performance; (c) conduct comparative mobility/portability and human factors engineering evaluations of antiarmor weapon system candidates, with assessments focusing on compatibility with other equipment, ease of operation, and the physiological costs of handling, carrying, and firing; results will influence the design and selection of antiarmor systems; (d) evaluate fire support maneuver commanders' tasks, equipment, and information requirements; determine the efficacy of using automation and digital display devices as aids for combat decision making; (e) continue robotic research efforts to address critical soldier-robot interface issues of multiple control, low rate of visual data transmission, and robotic hand and wrist capabilities.

In FY 89, it is planned to: (a) develop artificial intelligence/expert system concepts for application to the planning, forecasting, and scheduling system distribution of battlefield ammunition; (b) publish a Human Factors Guide for Small Arms Design, incorporating performance data to be used by designers to ensure soldier compatibility and maximize hit probability, sustainability, and target acquisition capability; (c) demonstrate innovative field materiel handling robotic concepts which will increase productivity in the handling of ammunition in forward area ammunition supply points; and (d) examine Forward Area Air Defense control and display concepts, configurations, and automatic cueing techniques to determine their effect on operator performance; results will serve as design guidance for air defense improvement programs.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) human performance data and design guidance for equipment worn, operated, or maintained by soldiers, and (b)

specific, precise information on soldiers' physical and psychological capabilities and limitations so that sophisticated Army materiel systems will be designed for maximum field effectiveness.

In FY 87, Project accomplishments include: (a) field evaluation with 3 test bed vehicle concepts at the Field Artillery School, demonstrating that innovative technology aids, such as improved displays, ammunition loader assists, and built-in training devices, can be incorporated into future fire support equipment, significantly extending the ability of crews to operate in a hostile battlefield environment; (b) field assessments of soldier marksmanship performance using optical sights, as part of the Joint Service Small Arms Program (JSSAP). This research determined that any extension of the combat day by adding these sights was minimal and did not provide the anticipated benefit over cost. Follow-on assessments are planned; (c) participation in successful efforts in support of the Field Assistance in Science and Technology (FAST) program to significantly improve sustainability of the M1 main battle tank in combat. Improvements included enhanced light signals for night operations in armored combat vehicles, improved calibration tools for boresighting the M1 main battle tank, enhanced crew sleeping capability in tanks, and improved communication (speech intelligibility) while wearing chemical-protective masks; and (d) development of the Army Robotics Master Plan, focusing on soldier-machine interface issues, such as specialized operator interfaces and supervisory control, which are critical issues in the application of robotics to the battlefield.

PROGRAM ELEMENT OVERVIEW

PE: 62727A NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY

DoD ORGANIZATION: ARMY

FUNDING: FY88 \$ 4.0M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 3.4M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide exploratory development of state-of-the-art generic training methods and equipment to increase overall combat effectiveness while reducing Army training costs.

Arrival of sophisticated, high-technology equipments and their complex relations to each other, coupled with increased constraints on personnel, money, and time in the field training environment makes this effort critical to the overall success of the Army. As an example, support from this program resulted in a Multiple Integrated Laser Engagement Simulation System (MILES), Gas-Operated Cannon Simulator for 20mm, 25mm, and 30mm ammunition which eliminated the need to develop and produce blank rounds, at a peacetime savings per year of over \$10 million.

RELATED ACTIVITIES:

The technology/devices developed within this program normally progress to PE #63738A (Non-System Training Devices (NSTD) Development) and/or PE #64715A (NSTD Engineering). Activities are coordinated through joint-Service effort in standardizing simulation databases, with participation of DMA, NAVAIR, and AF Deputy for Training Systems.

The work is performed by the PM TRADE, Naval Training Systems Center (NTSC), Army Research Institute (ARI), and NASA-Jet Propulsion Laboratory (JPL).

PAYOFF/UTILIZATION:

The payoff of this Program Element includes support for the development of technology for training devices that ties together battlefield weapon systems, mobility, and command, control, communications, and transfers this training to real-world combat effectiveness.

Previously, this program supported exploratory development which resulted in, for example, a Multiple Integrated Laser Engagement Simulation System (MILES) gas-operated cannon simulator for 20mm, 25mm, and 30mm ammunition which eliminated the need to develop and produce blank rounds, resulting in peacetime savings per year of over \$10 million.

FUTURE DIRECTIONS:

In FY 90, work includes: (a) continuation of the development and validation of embedded training models and guidelines for field use with Army Research Institute (ARI), (b) continuation of simulation complexity test bed experiments (ARI), (c) initiation of the hostile environment simulation experiments (HEL), and (d) initiation of a Multiple Integrated Laser Engagement System (MILES) adaptation for Military Operations in Urban Terrain (MOU). Beyond FY 90 the major thrusts will include quantification of the future battlefield to define training needs associated with high risk/high payoff components, advancement of Army embedded training, and development of technologies and techniques which will permit more effective and efficient instruction with Army units.

PROJECT OVERVIEW

		88	89
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PROJECT: A230	NON-SYSTEM TRAINING DEVICES	\$ 4.0M	\$ 3.4M
PE: 62727A	NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

PROJECT SYNOPSIS:

The objective of this Project is to provide for the exploratory development of training devices technology that supports general military training and training on more than one item or system.

This program provides the necessary front end analytical effort needed to transition suitable developments into full-scale development.

In FY 88, it is planned to: (a) develop combined arms communication networking simulation; and (b) develop a system for rapid reconfiguration of computer-generated imagery.

In FY 89, it is planned to: (a) update simulation networking; and (b) integrate system for rapid reconfiguration of computer-generated imagery with Air Force program to establish joint-Service database.

PAYOFF/UTILIZATION:

The payoff of this Project includes a variety of exploratory development efforts in training devices technology to support general military training and training on more than one item or system.

Non-system training device requirements vary in scope and complexity and include simulations to support force-on-force engagement simulation training, collective training of crews and units (as well as individual basic skills) and integration and sustainment training. Results of this Project's technology base efforts are inserted directly into advanced simulator designs or transitioned to a product-oriented demonstration or directly into production.

FY 87 accomplishments include the establishment of Army requirements used for a system database capable of rapid reconfiguration of computer-generated imagery.

PROGRAM ELEMENT OVERVIEW

PE: 62785A MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY

DoD ORGANIZATION: ARMY

FUNDING: FY88 \$ 14.0M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 16.1M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide a scientifically sound basis for maximizing soldier and unit performance: (1) How can the workload be 'shifted from the head to the hardware' in the design of new weapon systems; (2) What information must be available to system designers to ensure compatible man-machine systems; (3) What simulator and training device design features are necessary to ensure effective training at minimal cost; and (4) With a dwindling supply of military-age adults and an increasing demand for 'high tech' skills, how can behavioral science help improve the recruiting, selection, and retaining of quality soldiers in this high-technology environment?

RELATED ACTIVITIES:

Results of this program transition to Advanced Development in Program Element #63007A (Human Factors, Personnel, and Training Advanced Technology). Potential for duplication of effort is reduced through an annual Science and Technology Review chaired by a representative of the Secretary of Defense. Coordination is furthered through DoD Topical Reviews, participation on the DoD Human Factors Engineering Technical Group, and the DoD/NASA Simulation Technology Coordination Panel. This Program Element is further coordinated with 'people R&D' organizations of the other services: the Air Force Human Resources Laboratory (AFHRL), the Navy Personnel Research and Development Center (NPRDC), the Army Project Manager for Training Devices (PM TRADE), the Army Human Engineering Laboratory (HEL), and the Naval Training Systems Center (NTSC).

PAYOFF/UTILIZATION:

The payoffs of this Program Element include a scientifically sound technology base to support the development of: (a) engineering designs for new systems so that strengths and limitations of operators and maintainers are appropriately utilized or compensated for, (b) improved methods for attracting, selecting, assigning, and retaining quality soldiers, and (c) methods for improving individual and collective (unit) training.

FUTURE DIRECTIONS:

Future plans include continuing efforts to: (a) achieve a better understanding of the optimal interface and division of labor between man and machine, as well as of how human factors, manpower, personnel, and training information are considered in new weapon systems, (b) improve decision-making in command and control operations, (c) ensure the most cost-effective soldier selection and assignment, (d) target enlistee training requirements more precisely, and (e) focus on new personnel selection and training issues.

PROJECT OVERVIEW

		88	89
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PROJECT: A2AL-ET	ADMINISTRATION AND	\$ 0.8M	\$ 1.2M
	MANAGEMENT - ARMY		
	RESEARCH INSTITUTE (ARI)		
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to improve resource management and costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY 87, RDTE funds to finance overall management and administration of RDTE, A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero-sum basis within Army appropriations.

This new Project was created with the restructuring and transfer of Projects from PE 62717A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

PROJECT OVERVIEW

		88	89
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PROJECT: A2AL-HF	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 1.9M	\$ 1.3M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to improve resource management and costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY 87, RDTE funds to finance overall management and administration of RDTE, A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero-sum basis within Army appropriations.

This Project was transferred from PE 62717A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

PROJECT OVERVIEW

		88	89
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PROJECT: A2AL-MP	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 2.0M	\$ 2.9M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to improve resource management and costs associated with overall management and administration of RDTE, A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY 87, RDTE funds to finance overall management and administration of RDTE, A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero-sum basis within Army appropriations.

This new Project was created with the restructuring and transfer of Projects from PE 62717A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

PROJECT OVERVIEW

		88	89
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PROJECT: A2AL-ST	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)	\$ 1.6M	\$ 1.2M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to program costs associated with overall management and administration of RDTE,A laboratories in separately identified R&D Laboratory projects.

These costs include pay, travel, and general support costs of civilian management personnel and their administrative support staff. Prior to FY 87, RDTE funds to finance overall management and administration of RDTE,A laboratories were prorated to research, systems development projects, and other Army customers. Adjustments were made on a zero-sum basis within Army appropriations.

This Project was transferred from PE 62717A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project is improved resource management for the Army.

PROJECT OVERVIEW

		88	89
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PROJECT: A790-HF	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	\$ 2.3M	\$ 1.9M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objectives of this Project are to: (a) experimentally determine the most effective integration of human decision makers and automated information technology in new Army systems, and (b) obtain empirical data for relating human factors, manpower, personnel, and training variables to weapon systems effectiveness measures.

The battlefield of the future will place greater demands on soldiers and leaders alike; the tactical employment of more sophisticated, more lethal weapons systems, and the operation of automated command, control, communication and intelligence (C3I) systems will require quick reactions and confident decisions.

In FYs 88 and 89, it is planned to: (a) focus efforts on the identification of methods for control of excessive operator workload in modern weapon systems (that would otherwise result in decreased operational capability and increased decision-making time), (b) continue efforts on methods to improve decision-making in command and control operations, ensuring that technological innovations will support rather than overwhelm the tactical command group, (c) develop and demonstrate in the laboratory concepts for effective exploitation of advanced software and microprocessor-based technologies to aid human decision making and to provide the basis for low-cost simulators, so that the methods showing the most potential can be adapted for application in operational situations, (d) continue work to aid the system designer in the man/machine task allocation process, and (e) continue work toward developing a better understanding of how human factors, manpower, personnel, and training information are considered in the weapon system design process, and how this process can be enhanced through the introduction of advanced design tools.

This Project was transferred from PE 62717A, effective FY 88.

PAYOFF/UTILIZATION:

The payoffs of this Project include improved use of human capabilities and modern technology in the design of new systems to ensure greater effectiveness in the battlefield.

In FY 87, accomplishments included: (a) efforts to identify and control excessive operator workload in modern weapon systems that results in decreased operational capability and reduced decision-making time, and (b) establishment of a new effort to examine the use of human factors, manpower, personnel, and training information within the weapon system design process, and how the weapon system designer can be assisted with improved human factors, manpower, personnel, and training design tools.

PROJECT OVERVIEW

		88	89
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PROJECT: A790-ST	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION	\$ 1.9M	\$ 1.7M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objectives of this Project are to: (a) experimentally determine the minimum design requirements for simulators/training devices that will achieve effective training at the least cost, and (b) experimentally determine the most effective integration of human decision makers and automated information technology in new Army systems.

The battlefield of the future will place greater demands on soldiers and leaders alike. The tactical employment of more sophisticated, more lethal weapons systems, and the operation of automated command, control, communication and intelligence (C3I) systems will require quick reactions and confident decisions. Effective training is one way of achieving this.

Research for this project focuses on determining the minimum requirements for simulators and training devices that will achieve effective training at the least cost.

In FYs 88 and 89, it is planned to: (a) develop and demonstrate in the laboratory concepts for effective exploitation of advanced software and microprocessor-based technologies to aid human decision making and to provide the basis for low-cost simulators, so that the methods showing the most potential can be adapted for application in operational situations, and (b) continue work toward developing a better understanding of how human factors, manpower, personnel, and training information are considered in the weapon system design process and how this process can be enhanced through the introduction of advanced design tools.

This Project was transferred from PE 62717A, effective FY 88.

PAYOFF/UTILIZATION:

The payoffs of this Project include cost-effective training by determining: (a) the minimum design requirements for simulators and training devices that will achieve effective training at the least cost, and (b) the requirements for automating maintenance training "courseware" development.

In FY 87, accomplishments included: (a) efforts to identify effective design strategies for ensuring that automated decision support systems are consistent with the training, experience, and expertise of the soldier-user, (b) establishment of a new effort to examine the use of human factors, manpower, personnel, and training information within the weapon system design process, and how the weapon system designer can be assisted with improved human factors, manpower, personnel, and training design tools, and (c) work on computer-aided maintenance training development technologies, as well as work to develop job aids for computer-based instruction designers, developing software for maintenance training devices and breadboard software for simulations of automated procedures for test and further development.

PROJECT OVERVIEW

		88	89
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PROJECT: A791-ET	MANPOWER, PERSONNEL AND TRAINING	\$ 1.0M	\$ 1.7M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to provide the scientific basis for training methods based on instructional theory which cost-effectively provide needed high technology skills for both soldiers and their leaders, for both the active Army and the Reserve Components.

To meet future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel in the face of a dwindling supply of young adults, and competition from the private sector, the Army needs to improve the methods for carrying out these functions.

In FY 88, plans include: (a) development and testing of methods for comparing military occupations on critical performance components, (b) experimental techniques for enhanced training realism for command post exercises and field training exercises, (c) experimental design for a low-complexity, computer image generator, and (d) training measurement system for use at the National Training Center (NTC) and on networked simulators (e.g., SIMNET).

In FY 89, plans include: (a) preliminary training model for reducing accidents in aviation and ground weapon systems, (b) experimental training techniques for complex communications/electronics tasks, and (c) AI-based techniques to help military linguists acquire and sustain job-relevant foreign language skills.

This Project was transferred from PE 62722A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project includes improved methods for meeting future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel.

In FY 87, accomplishments included: (a) artificial intelligence (AI)-based tools for developing intelligent computer-assisted instruction (ICAI), and (b) preliminary specification for an 'expert' system to design literacy instruction.

PROJECT OVERVIEW

		88	89
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PROJECT: A791-MP	MANPOWER, PERSONNEL AND TRAINING	\$ 2.5M	\$ 4.3M
PE: 62785A	MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to provide the scientific basis for: (a) force structure planning, analysis of compensation policies and computer-based selection tests, (b) integrated methods for estimating manpower levels and soldier skills required by new Army weapon systems, and (c) objective methods for assessing crew and unit performance.

To meet future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel in the face of a dwindling supply of young adults, and competition from the private sector, the Army needs to improve the methods for carrying out these functions.

In FY 88, plans include demonstration of an algorithm to estimate the effect of compensation on Army retention.

In FY 89, plans include: (a) demonstration of prototype model measuring effects of compensation and other factors on active/reserve enlisted retention, and (b) design of Army Requirement Projection Model to determine manpower requirements.

This Project was transferred from PE 62722A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project includes improved methods for meeting future demands for recruiting, selecting, assigning, training, and effectively utilizing personnel.

In FY 87, accomplishments included development of techniques for modeling analyst expertise in combat planning and military intelligence analysis.

PROGRAM ELEMENT OVERVIEW

PE: 63003A

AVIATION ADVANCED TECHNOLOGY

DoD ORGANIZATION:

ARMY

FUNDING:

FY88 \$ 5.1M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 5.4M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide for the advanced development of full-scale components and subsystems.

The work supported by this Program Element directly addresses those critical needs essential to future operational effectiveness through full-scale flight testing and demonstration of advanced technology components and subsystems, placing emphasis on: (a) advanced composite rotary-wing structures to achieve 20 to 30 percent lower weight, 20 percent lower costs, unlimited fatigue life, and improved survivability, (b) advanced rotors for improved performance and ballistically-tolerant material requirements, (c) electronic hardware to enable day/night, adverse weather aviation operations (avionics), and (d) advanced flight controls for reduced weight and cost, improved survivability, and reduced pilot workload and initial training requirements. Selected near-term advances may be applied to aircraft such as the UH-60 Blackhawk and AH-64 Apache as block improvements.

Modern Army aircraft will face an awesome array of air defense threat systems to include: (a) optically and radar-guided 23mm, 30mm, and 57mm weapons, (b) SA-6, 7, and 9 infrared and radar-guided missiles, and (c) potential nuclear/biological/chemical and laser threats directed and delivered both from the ground and air vehicles. As a result, the aircraft must possess improved mobility, agility, firepower, and inherent features to include durability and sustainability for extended periods of combat at an affordable cost. Army aircraft must be durable, damage tolerant, easy to repair and maintain, and possess the highest level of availability possible. The application of composite materials to primary aircraft structures, advanced weapons and fire control, fiber-optic technology to flight controls, advanced engines and drive trains, advanced simulation technology, advanced avionics, and advanced rotor technology to existing and proposed rotor systems is the key to providing reliable, survivable Army aircraft essential to the future integrated battlefield. These demonstration programs represent investments in technology to maximize Army aviation's future capability to perform its combat mission.

This program is a new Program Element which combines the Projects formerly reported under six Program Elements: 63201A (Aircraft Power Plants & Propulsion), 63206A (Aircraft Weapons), 63207A (Aircraft Avionics Equipment), 63211A (Rotary Wing Controls, Rotors and Structures), 63216A (Synthetic Flight Simulators), and 63221A (NOE Avionics and Navigation Equipment), all of which are used to demonstrate Army aircraft technology.

RELATED ACTIVITIES:

Close liaison is maintained with the other services, Army laboratories, and industry to avoid duplication of effort. As part of that coordination, the Army participates in the Department of Defense Tri-Service Joint Technical Coordination Group for Munitions Development, Acoustical Society of American Standards, Committee on Acoustics and Noise, Air Standardization Coordination Committee, Working Party 10, Advisory Group for Aerospace Research and Development, and Military Agency for Standardization, Aircraft Instruments and Aircrew Stations and Working Group, North Atlantic Treaty Organization Air Armament working party and the Air Standardization Coordinating Committee of NATO. These groups and working parties provide a medium for exchange of

technical information and determination for joint use and standardization of airborne weaponization items. An Army representative serves on the Air Munitions Requirements and Development Committee (AMRAD), an organization within the Office of the Secretary of Defense. One function of this committee is the establishment of Joint Service requirements and development of air munitions. Related concept exploration is conducted under Program Element 62211A (Aviation Technology) and full-scale development under PE #64801A (Aviation Engineering Development) and PE #64202A (Aircraft Weapons). An important element of the coordination on-going is the Memorandum of Agreement (MOA), which exists with the Air Force between the US Army Avionics Research and Development Activity (AVRADA) and Air Force Wright Aeronautical Laboratories. Under that MOA, AVRADA is responsible for participation as an active member in the ICNIA program described below under Project DB97 providing the statement of work, specifications, and necessary funding to modify the system to include Army-unique requirements, and contract monitoring. Another example of cooperation/coordination is the Army rotocraft simulator, which utilizes a National Aeronautics and Space Administration Vertical Motion Simulator at the NASA Ames Research Center, as its basic motion platform thus minimizing program costs. Other cooperative programs include: The Technical Cooperation Program (TTCP), NASA Research and Technology Committees; the North Atlantic Treaty Organization (NATO) Advisory Group on Aerospace Research and Development (AGARD); mutual exchanges of information with the USAF, the USN and the USMC. This Program Element is the consolidation of six PEs to achieve an OSD and Congressional direction to reduce the number of PEs. Project D435 has been restructured from PE #63260A, (Aircraft Weapons) and Projects DB41, D315 and D436 from PE #63211A, (Rotary Wing Controls, Rotors, and Structures). Projects DB34 and DB39 have been restructured from PE #63216A (Synthetic Flight Simulators). Projects DB72 and D447 were restructured from PE #63201A (Aircraft Power Plants and Propulsion). Project DB97 was restructured from PE #63207A (Aircraft Avionics Equipment). Efforts under this Program Element are related to activities under PE #63220A (Advanced Rotorcraft Technology Integration-LHX) to investigate Army aircraft maneuverability and systems integration. There is no unnecessary duplication of effort within the Army or Department of Defense.

The developers of the technology under this Program Element include: Training Devices, and US Army Aviation Systems Command. Work related activities is performed by the National Aeronautics and Space Administration (NASA).

PAYOFF/UTILIZATION:

The payoffs of this Program Element include improved aircraft mobility, agility, firepower, and inherent features to include durability and sustainability for extended periods of combat at an affordable cost.

Army aircraft will be durable, damage tolerant, easy to repair and maintain, and possess the highest level of availability possible.

FUTURE DIRECTIONS:

The efforts to be accomplished under this Program Element will be a significant part of the technology base for the next-generation Army aircraft of the mid-to-late 1990s. This program funds technology thrusts that are essential if Army aviation is to effectively contribute to the Air-Land Battle of the 1990s and into the 21st century as it does to the current Army combined arms team.

Failure to fund these efforts will preclude the development of: (a) critical optical components for use in advanced flight control systems, (b) advanced avionics, (c) advanced composite aircraft structures, and (d) advanced power plants and advanced rotor hubs, all of which are required to improve aircraft effectiveness and survivability.

PROJECT OVERVIEW

		88	89
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PROJECT: DB34	ROTORCRAFT SYSTEM	\$ 3.4M	\$ 4.0M
	INTEGRATION SIMULATOR		
	(RSIS)		
PE: 63003A	AVIATION ADVANCED TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	AVSCOM		

PROJECT SYNOPSIS:

The objective of this Project is to develop the Rotor System Integration Simulator (RSIS) by expanding the capabilities of the National Aeronautics and Space Administration's (NASA's) Vertical Motion Simulator (under a joint Army-NASA agreement), in order to reduce costs and development time on new helicopter systems.

Numerous studies, including those by the Army Scientific Advisory Panel (ASAP), an ad hoc working group on research facility requirements for nap-of-the-earth (NOE) day/night visual flight studies, recommended that the Army, as the lead Service for helicopter R&D, place increased emphasis on R&D in helicopter flying qualities using ground-based simulation. The Army-NASA agreement minimizes costs of a high-fidelity simulator, and allows for increased technical expertise in the development of this Aeronautical Engineering Research Facility.

In FY 88, it is planned to: (a) continue support for Army R&D aviation simulations; (b) finish detailed design for new cab modification; (c) initiate fabrication of new cab assembly; (d) initiate integration of RSIS/CSRDF facilities; (e) develop air-to-air capability; (f) continue extension of computer databases and math modeling capabilities for advanced configurations; and (g) acquire and integrate support simulations on Helicopter Air Combat (HAC) IV, Apache development, and Helicopter Maneuver Envelope Enhancement (HELMEE).

In FY 89, it is planned to: (a) complete fabrication of cab and modify image projection subsystem in accordance with design and Man-Rating Board Review; (b) continue development of compatibility/integration of RSIS with CSRDF; and (c) complete development of math model visualization, validation, and checkout methodologies.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) more detailed evaluation of engineering concepts before a commitment to aircraft hardware, (b) compressed development time, and (c) reduced cost.

In FY 87, accomplishments included: (a) initiation of modifications and refurbishment to Vertical Motion Simulator (VMS) tower, and on the Man-rated Interchangeable Cab (ICAB) on the Rotor Systems Motion Generator (RSMG); (b) start of work on Advanced Cab and Visual System (ACAVS); (c) investigation of requirements for integration of RSIS with Crew Station Research and Development Facility (CSRDF) to share computational processing hardware, combat mission scenario software/database, and computer generated imagery (CIG) subsystem resources; (d) investigation of feasibility of, and preparation of plans for, coupling RSIS and CSRDF facilities to conduct air-to-air engagement simulations; and (e) support for UH-60 accident investigations, RAND/Institute for Defense Analysis air-to-air study, and

ARMY/63003A

development of MIL STD 8501B.

PROJECT OVERVIEW

		88	89
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PROJECT: DB39	FLIGHT SIMULATOR COMPONENTS	\$ 1.7M	\$ 1.3M
PE: 63003A	AVIATION ADVANCED TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

PROJECT SYNOPSIS:

The objective of this Project is to develop and demonstrate advanced flight simulation techniques and components for incorporation into the design of future simulators and for improving training capabilities of current simulators.

This effort is being accomplished through cooperative development with Navy and Air Force laboratories. Efforts are directed to developing visual simulation components designed to provide full mission training capability for nap-of-the-earth (NOE) flight, navigation, gunnery, and survivability in a combat environment. The current program includes preliminary design studies and brassboard demonstration for the development of wide-angle, high resolution, high-pictorial-detail visual simulation techniques that provide large frontal and downward angle viewing for NOE flight. These techniques will also integrate multiple viewpoint sensor displays which are vitally needed for simulating weapon systems tactical missions and crew integration training. Technology includes computer-generated image (CGI) edge management techniques for full mission simulation.

In FY 88, it is planned to continue incorporation of Ada computer language, and work on modular cockpit designs of Army flight simulators.

In FY 89, it is planned to continue incorporation of Ada computer language, and work on modular cockpit designs.

This project was transferred from PE 63216A, effective FY 88.

PAYOFF/UTILIZATION:

The payoff of this Project includes development of visual simulation components designed to provide full mission training capability for NOE flight, navigation, gunnery, and survivability in a combat environment.

These devices will enhance the navigational and target recognition and acquisition skills of rotorcraft system crews, increasing Army aviation combat readiness and proficiency. Visual technology developed in this program will be applied to all air and ground based simulators to improve training quality and reduce training and acquisition costs.

In FY 87, accomplishments included the application of Ada computer language to Army flight simulator for demonstration and evaluation. The objective is to have flight simulators which use the same software as the aircraft and thereby maximize commonality.

PROGRAM ELEMENT OVERVIEW

PE: 63007A HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

DoD ORGANIZATION: ARMY

FUNDING: FY88 \$ 28.5M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 30.5M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to perform advanced technology development focusing on four areas of soldier performance issues: (a) scientifically sound methods for recruiting, selection, and retention to better match manpower and personnel supply and demand, (b) human factors concerns in the design of new systems, (c) improved theory-based education and training techniques exploiting modern computers, and (d) R&D on design alternatives for lower-cost and less complex simulators and training devices.

This Program Element is, in part, the Army's response to a Congressional requirement for a Department of Defense-wide effort to relate selection tests and retention criteria to successful job performance. This work is also responsive to the increasingly important need to specify personnel requirements, training requirements, and skill mixes early in weapon system development, and to relate them to the country's available pool of manpower.

This is the Army's concept of Manpower and Personnel Integration (MANPRINT). Human factors development will examine electronic technology for use in the design of soldier-friendly interfaces between the soldier and the sophisticated equipment he or she must operate and maintain.

This Program Element resulted from the consolidation of Program Elements 63731A, 63739A, 63743A, and 63744A, and the restructuring of their Projects into this Program Element, effective FY 88.

RELATED ACTIVITIES:

Manpower and personnel advanced technology development in this program is coordinated with Program Element #62763N (Naval Personnel Support Technology); Program Element #63707N (Navy Manpower Control System Development); Program Element #62703F (Air Force Personnel Utilization Technology). Exploratory technology for this program is developed in Program Element #62785A (Manpower, Personnel and Training Technology), formerly Program Element #62717A (Human Performance Effectiveness Simulation) and Program Element #62722A (Manpower, Personnel and Training). Coordination of research to prevent unwanted duplication is accomplished through annual DoD budget and management reviews and through membership in tri-service committees such as the Human Factors Technology Coordination Group, the Human Factors Test and Evaluation Subgroup, and DoD/National Aeronautics and Space Administration (NASA) Simulation Working Group. Simulation and training device development is coordinated on a continuing basis directly with the Defense Advanced Research Project Agency (DARPA).

The work is performed by the US Army Research Institute for the Behavioral and Social Sciences (ARI).

PAYOFF/UTILIZATION:

The payoffs of this Program Element include advances in all four areas of soldier performance: (a) manpower supply will be better matched to demand, (b) new system designs will incorporate human factors considerations, (c) education and training will become more technology-based, and (d) less

expensive, less complex simulators and trainers will be developed.

Efforts to improve MANPRINT estimation methods will permit more accurate and timely estimations. This program will further develop expanded application of electronic technology to reduce the cost of training while increasing soldier proficiency. A specific effort on integrating simulator needs with overall training will provide scientific bases for the design of lower cost and less complex simulators for use in military units and will answer a 1984 Congressional concern.

FUTURE DIRECTIONS:

Beyond FY 89, it is planned to continue efforts to develop training methods, techniques, and systems to reduce training time and costs and personnel, while improving job performance and training management. Simulator "test beds" will also continue to be used to design lower-cost, less complex simulators and training devices for use in units.

PROJECT OVERVIEW

		88	89
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PROJECT: A792	MANPOWER AND PERSONNEL	\$10.0M	\$ 8.6M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objectives of this Project include developing and evaluating: (a) methods to attract needed personnel to the Army, to select the most qualified, and to assign them to Military Occupational Specialties that capitalize on their aptitudes and vocational interests, and (b) programs to retain highly qualified personnel.

Approaching the year 2000, the number of military-age people in the population will be 20 percent fewer than now. There will also be fewer high school graduates, who are the highest performers and have the lowest attrition rates. The Army must develop ways to attract larger proportions of these high-quality individuals and must improve procedures for their selection and job utilization.

In FY 88, plans include: (a) demonstration of AMCOS for Reserve Components, (b) family survey to determine relationship of family factors to new individual performance measures, (c) construction of model of civilian personnel functions, and (d) field-validated methods for predicting design-sensitive manpower requirements in developmental Army weapon systems.

In FY 89, plans include: (a) validation of new entrance tests for predicting first-term attrition and measuring vocational interests, (b) demonstration of AMCOS for civilians, (c) data collection to test hypotheses about career decision making and readiness in Army families, (c) cost-benefit analysis for selection procedures for Army civilian personnel, and (d) test of method for identification of manpower savings available from alternative maintenance concepts for the All Source Analysis System (ASAS).

This Project was transferred from PE 63731A, effective FY 88.

PAYOFF/UTILIZATION:

The payoffs of this Project include improved methods and programs to: (a) attract, select, and retain the most qualified personnel for the Army, (b) assign them to military occupational specialties (MOS) best using their aptitudes and vocational interests, (c) develop the cohesive units and leaders required for combat readiness in the high-technology Army, and (d) identify aggregated future manpower and personnel needs.

In FY 87, accomplishments included: (a) demonstration of empirical validity of background and life experience measures as predictors of first tour discipline problems, (b) demonstration of prototype enlisted personnel allocation system (EPAS) for assigning new recruits to MOS, (c) demonstration of Army manpower cost system (AMCOS) for estimating manpower costs of weapon systems, and (d) demonstration of empirical validity of Armed Services Vocational Aptitude Battery (ASVAB) for predicting technical aspects of first-term performance.

PROJECT OVERVIEW

		88	89
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PROJECT: A793	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS	\$ 6.3M	\$ 7.8M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objectives of this Project are to develop and evaluate: (a) improved methods for identifying human factors, manpower, personnel, and training (HMPT) requirements early in the weapon system development process, (b) improved empirically based methods for assessing the impact of HMPT variables on weapon system operability and maintainability, and (c) prototype technologies for integrating soldiers into complex, information-based weapon systems and command, control, communications, and intelligence (C3I) systems.

Modern weapon systems are becoming both more sophisticated and more lethal. Future battlefields will also be more tactically complex and will place greater demands on the soldier for information processing and decision making. To realize the full potential offered by modern weapons technology, the special capabilities and limitations of the soldier must be systematically considered early in the weapon system development process. Proper consideration of HMPT trade-offs involves relating these factors to combat effectiveness.

In FY 89, plans include testing improved methods for assessing HMPT tradeoffs for Army's weapon system life cycle cost models.

This Project transferred from PE 63739A, effective FY 88.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) methods to recognize and account for the special capabilities and limitations of soldiers early in system design, and thus improve combat capability, (b) improved design of soldier-machine interfaces through appropriate allocation of tasks between soldier and machine in both weapon systems and command and control systems, and (c) decreased disruption of unit readiness with the introduction of new equipment.

In FY 87, accomplishments included: (a) collection of empirical data for critical HMPT estimates for the source selection of Pedestal Mounted STINGER component of the Forward Area Air Defense System, (b) assessment of proposed LHX operations and maintenance organizational design using experimental MANCAP model, and (c) proof-of-concept test of method to identify operator requirements for Army's Common Sensor Intelligence Collection System.

PROJECT OVERVIEW

		88	89
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PROJECT: A794	EDUCATION AND TRAINING	\$ 6.9M	\$ 7.6M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to lead to theory-based training methods that produce more highly proficient soldiers without any increases in training resources (instructors, time, facilities, and travel). It will experimentally investigate alternative methods for cost-effective application of computers and related electronic technology to training, with emphasis on individual combat, technical, and maintenance skills; collective (crew, team, and unit) training; and combined arms training methods to sustain the readiness of the Reserve Components.

In FY 88, plans include: (a) performance-based training concepts for the Army's Advanced Field Artillery System (AFAS), (b) testing cognitive skills assessment techniques for use with students at National and Army War Colleges, (c) prototype methods for assessing soldier-machine C3I performance at division and corps levels, and (d) combat task measurement system for NTC and home station training.

In FY 89, plans include: (a) home station predictors of NTC performance, and (b) proof-of-concept evaluation of asynchronous computer conferencing for officer training at widely separated sites.

This Project was transferred from PE 63743A, effective FY 88.

PAYOFF/UTILIZATION:

The payoffs of this Project include reductions in training time, costs, facilities and travel while providing equally or more highly proficient soldiers.

FY 87 accomplishments include: (a) prototype M1 tank maintenance training program for Reserve Components, (b) data for tactical 'lessons learned' from National Training Center (NTC) exercises for improved unit training program design, and (c) preliminary model for evaluating battalion task force performance.

PROJECT OVERVIEW

		88	89
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PROJECT: A795	TRAINING SIMULATION	\$ 5.2M	\$ 6.6M
PE: 63007A	HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to provide the Army's Training and Doctrine Command (TRADOC) and the Project Manager for Training Devices (PMTRADE) with scientifically-based recommendations for the design of lower-cost, lower-complexity simulators and training devices, focusing on aviation, armor, and maintenance training.

The need for effective simulators and training devices is increasing in order to avoid the high cost of using actual equipment for training and to enable the Army to train as it will fight.

In FY 88, plans include: (a) AI-based ('SMART') HAWK radar maintenance tutor, and (b) design test of minimal-cost simulator training for initial entry rotary wing aviators.

In FY 89, plans include: (a) prototype unit training exercises designed for combined arms simulators (i.e., SIMNET), and (b) design guidelines for low-cost full-mission helicopter simulators.

This Project was transferred from PE 63744A, effective FY 88.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) development of modern simulation and training technologies which can result in significant savings and improvements in flight, maintenance, and tactical training for units in the field, (b) guidance to TRADOC and PMTRADE on their design of more cost-effective simulators and training devices, and (c) development of alternatives to high-cost, operational systems for training and maintaining the skills of a combat-ready force.

FY 87 accomplishments include: (a) joint US/Canada development of testbed for flight simulator research, (b) proof-of-concept test of AI-based HAWK radar maintenance equipment simulator, and (c) design of pre-prototype low-cost visual system for UH-1FS.

PROGRAM ELEMENT OVERVIEW

PE: 63738A NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED
 DEVELOPMENT

DoD ORGANIZATION: ARMY

FUNDING: FY88 \$ 0.0M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 0.9M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide for the advanced development of Non-System Training Devices (NSTD), used to support general military training and training on more than one item or system (in contrast to system devices that support a specific item or system).

The combat effectiveness of Army personnel is the key to both compensating for the numerical superiority of opposing forces and for maintaining a ready force. Training devices and training simulation provide soldiers with opportunities for realistic, meaningful training without prohibitive costs. Improved training devices, now available through modern technology, must continue to be developed to provide the training required to prepare U.S. soldiers to fight and defeat a numerically superior adversary.

RELATED ACTIVITIES:

Close coordination is maintained with other Services through: (a) Training and Personnel Technology Conferences, (b) a Joint Service Technical Coordinating Group, (c) worldwide staffing of training device requirements, (d) the collocation of the office of the Project Manager for Training Devices (PMTRADE), the Naval Training Systems Center (NTSC), and the Defense Training and Performance Data Center (TPDC) in Orlando, Florida. This coordination is designed to preclude duplication of effort.

The devices contained in this program have normally progressed to Advanced Development from related Program Element 62727A (Non-System Training Devices), and normally continue development in Program Element 64715A (Non-System Training Devices Engineering).

The work is performed by the Project Manager for Training Devices (PM TRADE), the Naval Training Systems Center (NTSC), and the Product Manager for Army Communicative Systems.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved combat effectiveness through the development and use of more realistic, meaningful combat scenarios during training, (b) a well-trained, ready force prepared to fight and defeat a numerically superior adversary, and (c) reduced training costs.

Modern weapons systems are being integrated into the force at unprecedented rates. Arrival of this sophisticated, complex equipment coincides with increased constraints on people, dollars, and time in a training environment where ammunition and fuel costs continue to rise. Training devices and training simulations help maximize the transfer of knowledge, skills, and experience from the training situation to the combat situation.

FUTURE DIRECTIONS:

In the future, this Program Element will continue to provide advanced development for non-system training devices to improve training realism and reduce training costs.

PROJECT OVERVIEW

		88	89
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PROJECT: D335	COMMUNICATIVE NON-SYSTEM TRAINING DEVICES (NSTD)	\$ 0.0M	\$ 0.9M
PE: 63738A	NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED DEVELOPMENT		

DoD ORGANIZATION: ARMY

RESPONSIBLE ORGANIZATION: PROJECT MANAGER FOR TRAINING DEVICES

PROJECT SYNOPSIS:

The objective of this Project is to develop various Non-System Training Devices (NSTD) to provide general military training and training on more than one item/system, as compared with System Devices which support a specific item/system.

Training devices and training simulation provide soldiers with the opportunity for realistic training without prohibitive cost. Improved training devices, available through modern technology, must continue to be developed to provide the training required to prepare US soldiers to fight and defeat a numerically superior adversary.

In FY 88, this program is unfunded.

In FY 89, plans include in-house work on electronic information delivery systems and authoring systems.

PAYOFF/UTILIZATION:

The payoff of this Project includes more efficient, cost-effective delivery of training information to soldiers in school or at their places of work, while significantly decreasing the present need for voluminous documentation storage.

The Militarized Electronic Information Delivery System (MEIDS) is an electronic job performance aid/refresher trainer which will improve maintenance diagnosis and troubleshooting as well as hands-on training. The Automated Army Authoring System will automate the conversion of existing paper documentation to software, and will develop new software for information delivery systems.

FY 87 accomplishments include: (a) development of Electronic Information System Authoring Software System for Interactive Simulation and Training (EIDS ASSIST) to support development of interactive video disk courseware, and (b) continued in-house development of Militarized Electronic Information Delivery System (MEIDS).

PROGRAM ELEMENT OVERVIEW

PE: 64715A NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING
DEVELOPMENT

DoD ORGANIZATION: ARMY

FUNDING: FY88 \$ 24.8M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 19.8M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide for engineering development of various Non-System Training Devices (NSTD) to support general military training and training on more than one item or system, rather than a single item or system.

Modern weapon systems are being integrated into the force at unprecedented rates, and the Army is faced with increased constraints on people, dollars, time, and real estate in a training environment where ammunition and fuel costs continue to rise. Training devices and training simulation provide force multipliers that can improve combat effectiveness by providing realistic training scenarios while helping to control rapidly escalating costs. Maintaining the combat effectiveness of Army personnel is the key to maintaining a ready force. This combat effectiveness can best be achieved by innovative, efficient, and results-oriented training. The major thrust in development of new training devices is to maximize the transfer of knowledge, skills, and experience from the training situation to a combat situation. Improved training devices, available through modern technology, must continue to be developed to provide the training required to prepare US soldiers to fight and defeat a numerically superior adversary.

The Projects within this Program Element have been restructured in FY 87 to reflect the close interrelationship between the efforts involved in the work of these Projects. Work previously planned to be associated with Projects D237 (NTSD - Artillery/Air Defense/Engineer), D239 (NSTD - Infantry), and D572 (NTSD - Armor/Anti-armor) have been combined with work planned under Project D241 (NSTD - Combined Arms) where all future work necessary will be funded. This restructuring reflects the true purpose of the NSTD program, which is to develop combined arms/multiple system training systems that are concerned with the collective unit mission proficiency, as opposed to system training devices, which are concerned with developing individual proficiency in the operation and maintenance of specific systems.

RELATED ACTIVITIES:

Close coordination is maintained with other Services through Training and Personnel Technology Conferences, a Joint Service Technical Coordinating Group, worldwide staffing of training device requirements, and the collocation of the Office of the Project Manager for Training Devices (PMTRADE), the Naval Training Systems Center (NTSC) and the Defense Training and Performance Data Center (TPDC) in Orlando, Florida. This coordination is designed to preclude duplication of effort. The devices contained in this program have normally progressed to Engineering Development from related Program Element 63738A (Non-System Training Devices (NSTD) Development) and/or Program Element 62727A (Non-System Training Devices (NSTD) Technology). This program also funds an Inter-Service Support Agreement that makes available for Army use the resources of the Naval Training Systems Center (NTSC), which is collocated with Project Manager for Training Devices (PM TRADE).

The work is performed by the Naval Training Systems Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include engineering development efforts for a variety of training devices and battle simulation systems which will provide realistic, effective, and economical training in marksmanship, gunnery, air defense, and nuclear, biological, and chemical (NBC) warfare.

In FY 87, some major accomplishments for Projects within this Program Element included: (a) support of Project Manager for Training Devices (PM TRADE) personnel and a proportionate Army share of the operating costs of the Naval Training Systems Center (NTSC), (b) annual review of interservice support agreement, (c) development of AGES II (completed), (d) continued development of SAWE-IF and SAWE-MES, (e) continued development of Signal Intelligence/Electronic Warfare (SIGINT/EW) Equipment Operator Simulator (SEOS), and (f) initiation of development of the Guard Unit Armory Device Full Crew Interactive Simulator for Armor and Artillery applications (GUARDFIST I, II).

FUTURE DIRECTIONS:

In FY 1990 and beyond, planned efforts include taking advantage of current technology and pressing the research of emerging technologies to develop training devices and simulators that make training more efficient and effective for both the active and Reserve Components of the Army.

These efforts are being pursued in accordance with the Secretary of Defense guidance to the Service Secretaries to increase funding on development of training technology and accelerate efforts to apply technology to solving training problems.

PROJECT OVERVIEW

		88	89
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PROJECT: D241	NON-SYSTEM TRAINING DEVICES - COMBINED ARMS	\$17.8M	\$13.3M
PE: 64715A	NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING DEVELOPMENT		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

PROJECT SYNOPSIS:

The objective of this Project is to develop prototype training devices to support combined arms (Infantry, Armor, Aviation, Air Defense, Artillery, Engineer, Chemical, and support troops) training and multisystem training within the Army, including the Reserve Component.

The purpose of this Project is to improve the effectiveness and efficiency of Army training. This is done by developing training devices which facilitate the transfer to trainees of the knowledge, ability, and experience required to fight outnumbered and win on the modern battlefield (e.g., Air-Ground Engagement System (AGES II), which provides realistic force-on-force, real-time casualty simulation training capability to the AH-64, UH-60, and CH-47; and Simulated Area Weapons Effect for Indirect Fire (SAWE-IF) and Mine Effects Simulation (SAWE-MES), which provide realistic MILES (Multiple Integrated Laser Engagement System)-compatible casualty assessment during tactical engagement exercises). These devices will enable the Army to train the collective unit to obtain the synergistic results which occur when a unit's weapons and support systems are employed in their respective battlefield roles. Utilizing modern technology, these devices will enhance training effectiveness while minimizing the requirements for scarce resources.

In FY 88, it is planned to: (a) complete development of SEOS, (b) continue development of GUARDFIST, SAWE-IF and SAWE-MES, and (c) initiate development of Corps Battle Simulation (Deep Battle Simulation Training).

In FY 89, it is planned to: (a) complete development of GUARDFIST and SAWE-MES, (b) continue development of Corps Battle Simulation, and (c) initiate development of Simulated Area Weapons.

PAYOFF/UTILIZATION:

The payoffs for this Project include: (a) more realistic and meaningful training opportunities with less cost, (b) safer training conditions, while still providing high transfer of training to combat situations, and (c) increased ability to fight and defeat a numerically superior adversary.

In FY 87, accomplishments included: (a) development of the AGES II (completed), (b) continued development of SAWE-IF and SAWE-MES, (c) continued development of Signal Intelligence/Electronic Warfare (SIGINT/EW) Equipment Operator Simulator (SEOS), and (d) initiation of development of the Guard Unit Armory Device Full Crew Interactive Simulator for Armor and Artillery applications (GUARDFIST I, II).

PROJECT OVERVIEW

		88	89
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PROJECT: D573	PMTRADE AND NTSC SUPPORT	\$ 7.0M	\$ 6.5M
PE: 64715A	NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING DEVELOPMENT		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

PROJECT SYNOPSIS:

The objective of this Project is to fund the support of Project Manager for Training Devices (PMTRADE) personnel and to fund a proportionate Army share of the operating costs of the Naval Training Systems Center (NTSC).

This Project provides the Army with a unique and specialized capability in all phases of research and development of cost-effective simulators for use as training devices to assure safe, economical, and effective training in establishing and maintaining the highest attainable degree of operational readiness. This arrangement is the result of an Inter-Service Support Agreement that is reviewed annually.

In FY 88/89, it is planned to continue funding PM TRADE personnel and NTSC support.

PAYOFF/UTILIZATION:

The payoff of this Project is that this arrangement makes available all Naval Training Systems Center (NTSC) resources for Army use.

These resources include: (a) over 800 civilian employees, of which almost 40 percent are professional personnel specializing in research, development, and training technology, and (b) extensive simulation facilities, including laboratories in areas such as physical sciences, electronics, visual simulation, computers, and human factors. Thus, the PM TRADE, collocated at NTSC, with a limited number of Army personnel, performs a mission for the Army in the training area similar to those of development commands in other areas. Also, it includes contractual services for support which NTSC cannot provide due to manpower constraints.

FY 87 accomplishments include: (a) funding support of PM TRADE personnel and a proportionate Army share of the operating costs of NTSC, and (b) annual review of Inter-Service Support Agreement.

PROGRAM ELEMENT OVERVIEW

PE: 64722A

EDUCATION AND TRAINING SYSTEMS DEVELOPMENT

DoD ORGANIZATION:

ARMY

FUNDING:

FY88 \$ 5.4M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 6.9M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to demonstrate the joint-Service effectiveness of advanced technology in education and training.

This Program Element responds to Congressional and Department of Defense (DoD) mandates for joint-Service demonstration and acquisition of emerging technologies that can be quickly prototyped and offered to the Services for education and training uses. This Joint-Service Manpower and Training Technology Development (JSMTTD) program competitively selects Service and industry laboratory efforts of high potential for Service as well as other public and private sector implementation. This selection process enables the early identification of useful education and training technologies emerging from the service R&D programs, aligns them with Service requirements and needs, and accelerates their demonstration and evaluation in both operational and institutional environments.

This Program Element has eight products at various stages of development: (a) a Personalized Electronic Aid for Maintenance (PEAM), which is an attache case-size, artificial intelligence-based device that is designed to aid technicians in troubleshooting and checkout tasks, (b) the Computerized Hand-held Instructional Prototype, (CHIP), a hand-held interactive device that facilitates individual, initial, remedial, and refresher training, (c) the Intelligent Conduct of Fire Trainer (INCOFT), which is an interactive trainer designed for initial and update training for the Patriot Missile Fire Control Officer, using a simulation of the operational setting, (d) the Joint Service Multipurpose Arcade Simulator (JMACS), which is a low-cost marksmanship trainer for individual and crew weapons which simulates the weapon firing experience through the use of fiber optic technology and a target generator presenting targets in a cathode ray tube, (e) the Automated Performance and Readiness Training System (APARTS), which is a computer software system which facilitates training management through the collection, analyses, and presentation of data on trainee performance, (f) the Automated Simulator Test and Assessment Routine (ASTAR), which is a computer software system designed to forecast the probable effectiveness of simulator or training device-based training before actual development of the simulator or training device, (g) the Intelligent Air Attack System (IAAS), which is a rule-based artificial intelligence system that interacts with aircrews in an effort to reduce cockpit workload without usurping the aircrew's decision-making prerogatives, and (h) the Interactive Management Game (IMAGE), which is a dynamic manpower management training simulation that portrays effects of changing variables (numbers, types, scales, levels, availability and time, etc.) on a typical large-scale manpower system, enabling service manpower managers to learn quickly the effects of proposed changes in the system.

RELATED ACTIVITIES:

The JSMTTD program is one of two Engineering Development Program Elements aimed at demonstrating maturing manpower and training technologies. Previous funding was provided through Program Element #64709N, (Prototype Manpower/Personnel Systems). Duplication of effort within the Army is avoided by annual Tech Base Reviews chaired by the Director of Army Research and Technology, and within the Department of Defense by annual Science and Technology Reviews chaired by a representative of the Office of the Under

Secretary of Defense for Acquisition (R&AT). In addition, effective coordination of this Joint Service program is assured through a Joint Service Committee that monitors the activities and selects promising advanced technology development products to be prototyped and field tested. Project/task leaders for each proposed JSMTT Development project enlist the support and advice of operational users in two or more services. Memoranda of Agreement (MOA) between the Army Research Institute and organizations participating in this program further help to coordinate this program. These organizations include: the Naval Training Systems Center (NTSC), the Air Force Human Research Lab (AFHRL), the Navy Personnel Research and Development Center (NPRDC), the Army Program Manager for Training Devices (PM TRADE), the Naval Weapons Center (NWC), and the Defense Training Performance and Data Center (TPDC).

The work is performed by the US Army Research Institute for the Behavior and Social Sciences (ARI). In this JSMTT effort, ARI is supported by the Naval Training Systems Center, Navy Personnel Research and Development Center, Air Force Human Resources Laboratory, and Defense Training Performance and Data Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved skill levels of maintenance personnel, (b) reduced burden for Service training, (c) reduced training costs, and (d) significant cost savings through implementation of developments from this Program Element by multiple Services, eliminating parallel developments and achieving economies of scale through joint-Service procurement of hardware and software training support.

Advanced training methods, simulators and training devices using state-of-the-art information technology reduce the heavy personnel requirements of Service training, while maintaining or increasing the effectiveness of training. PEAM, for example, is expected to reduce errors in field maintenance tasks by 20 percent and will completely replace paper-based organizational maintenance manuals. CHIP can be used in units for training in procedural skills in a variety of Military Occupational Specialties (MOSSs), and it will enable training to be completely personalized and self-paced.

FUTURE DIRECTIONS:

Beyond FY 89, engineering changes will be incorporated into the technical data package for each developmental item, which will then transition to the U.S. Army Project Manager for Training Devices (PMTRADE), Orlando, Florida, for joint-Service procurement.

PROJECT OVERVIEW

		88	89
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PROJECT: D750	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT	\$ 5.4M	\$ 6.9M
PE: 64722A	EDUCATION AND TRAINING SYSTEMS DEVELOPMENT		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	ARMY RESEARCH INSTITUTE		

PROJECT SYNOPSIS:

The objective of this Project is to provide demonstrations of joint Army, Navy, Air Force, and Marine Corps prototype, technology-based, training and job-aiding devices that will meet the Services' most pressing training problems.

The Services must deal with training problems due to fewer available personnel, lower verbal and mathematical skills of entry-level personnel, more numerous and complex weapon systems, and rapidly increasing training costs. The House Armed Services Committee requested that the Services apply more research and development funds to joint-Service developmental and demonstration projects. In October 1981, a Program Decision Memorandum from the Office of the Secretary of Defense directed the Army to establish a joint-Service program to identify high-payoff, technology-based instructional methods resulting from defense and civilian research and development, and to demonstrate their use in full-scale prototypes for training, education areas, and job performance aids.

The first three engineering developments undertaken have been a Personal Electronic Aid for Maintenance (PEAM), an integrated, computer-based instructional system (TRIADS), and a Computerized Hand-Held Instructional Prototype (CHIP), an interactive training device in field-useable form. The PEAM effort uses portable delivery systems to electronically present maintenance information to field technicians and a supporting maintenance information authoring and management system. The TRIADS effort integrates software and hardware for computer-based instruction separately developed by the Services. CHIP is a battery-powered training aid which weighs under four pounds, is notebook-sized, and features computerized speech as an instructional and feedback medium with replaceable memory cartridges. It can be used in units for training in procedural skills in a variety of Military Occupational Specialties (MOSs). CHIP can maximize training in field exercises and in nontraditional environments such as motor pools, dayrooms, and living areas.

In FY 88, it is planned to: (a) test, evaluate, and transition to users a prototype training aid for tactical radar interceptor operator, (b) complete prototype automated system for estimating training simulator effectiveness, (c) complete prototype 'intelligent' conduct of fire trainer, and (d) complete benefit analysis for Computerized Handheld Instructional Prototype.

In FY 89, it is planned to: (a) test, evaluate, and transition prototype system for estimating training simulator effectiveness, (b) complete development for a transportable, computer-based system to present instruction outside the school setting; transfer technology to Service schools, (c) test and evaluate prototype cockpit management system to aid the pilot during a hostile engagement, and (d) develop, test, and transfer for operational use a database structure and operator interface for joint-Services' Unit Training exercises after-action reports.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) more effective military job performance, (b) less reliance on institutional training, (c) reduced requirements for training support personnel, and (d) more efficient and effective production, delivery, and management of computer-based training materials for all the Services.

PEAM is expected to reduce errors in field maintenance tasks by 20 percent, thus reducing spare parts inventories. TRIADS will integrate software and hardware for computer-based instruction developed separately by the Services. CHIP will convert equipment down-time into training time. CHIP can be integrated into many programs of instruction and can be used for initial, refresher, and cross-training.

In FY 87, accomplishments included: (a) completion of RDTE for the prototype Personal Aid for Electronic Maintenance, (b) delivery of CHIP with joint-Service applications, (c) delivery, demonstration, and testing of joint-Service utility of prototype rifle combat simulator, and (d) a developmental prototype of a transportable, computerized system for presenting instruction outside the school setting for technical subjects such as acquisition management.

PROGRAM ELEMENT OVERVIEW

PE: 64801A AVIATION ENGINEERING DEVELOPMENT

DoD ORGANIZATION: ARMY

FUNDING: FY88 \$ 7.9M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 7.2M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to support aviation engineering developments associated with Synthetic Flight Training Systems (SFTS), Aviation Life Support Equipment (ALSE), and Aviation Non-Systems Training Devices.

SFTS is a project that supports development of a family of high-fidelity flight, weapon, and mission helicopter simulators to support initial entry helicopter pilot training, transition training, and combat operational training.

ALSE addresses those items of equipment used to sustain Army aircrews and passengers throughout the flight profile and flight environment, enhancing mission performance and aircraft and aircrew survivability during operational missions, aircraft crash, and the post-crash period prior to rescue.

The Aviation Non-System Training Devices project supports development of aviation training devices that are applicable to more than one aviation system.

The Combat Mission Simulator being developed for the AH-64 Attack Helicopter is being accomplished by extending the technology achieved in the previous development of the UH-1, CH-47, AH-1, and UH-60 helicopter simulators. In FY 89, the Synthetic Flight Training Systems block improvement program will begin. It is expected that computers will be replaced and visual system development will be included to enhance training.

This Program Element was transferred from PE 64217A, effective FY 88.

RELATED ACTIVITIES:

The following Program Elements/Projects are closely related to Aviation Engineering Development: #63801A Aviation Advanced Development; #62211A/1E1 Aviation Technology; #62786A/283 Logistics Technology. Inter-Service coordination for ground power generation is coordinated through the Project Manager, Mobile Electric Power. Aviation Life Support Equipment programs are coordinated through several tri-service and allied working groups and steering committees, appropriate Army, Air Force, and Navy development commands, and aircraft PMs to prevent duplication of effort and ensure proper priority of efforts. PE #63003A/312 Aviation Advanced Technology, and #62727A Non-System Training Device Technology perform flight simulation component research and development. Where activities are engaged in flight simulation component research and development, close coordination with the Air Force and Navy is maintained. Many joint projects are effected between the services to prevent unnecessary duplication in the flight simulation area.

The work was performed by US Army Aviation Systems Command. Other Army activities involved are: Applied Technology Laboratory, Human Engineering Laboratory, Natick Research and Development Center, Chemical Research and Development Command, and Research Technology Laboratory. Responsible developing agency is the US Army Project Manager for Training Devices collocated with the US Naval Training Systems Center, and has an Air Force liaison officer.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) a reduction in operations and support cost, and (b) a better trained pilot.

The simulators are used to complement the training accomplished in actual aircraft during formal courses of instruction and for maintenance of combat readiness by rated aviators. Each hour flown in a simulator offsets an hour which would have been flown in an aircraft. An hour in an AH-64 aircraft will cost approximately \$3000, while the simulator will cost less than \$600 per hour. Each simulator will be used 3645 hours per year, and therefore, each simulator reduces annual operations and support cost by \$8,748,000 ($3000 - 600 = 2400 \times 3645$), while concurrently providing a better trained pilot. The reduction in operations and support cost is included in the Army's flying hour program request.

FUTURE DIRECTIONS:

Beyond FY 88, the Aviation Non-Systems Training Devices project will complete prototype development and testing, transition to production and complete fielding. The ACATT program is scheduled for completion in 1991.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: D275	SYNTHETIC FLIGHT	\$ 0.0M	\$ 4.4M
	TRAINING SYSTEMS		
PE: 64801A	AVIATION ENGINEERING DEVELOPMENT		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

PROJECT SYNOPSIS:

The objective of this Project is to develop a family of high-fidelity operational flight, weapon and combat mission helicopter simulators to support initial entry helicopter pilot training, transition training, and combat operational training.

A major thrust is the development of a simulation of the combat environment for tactical flight, including nap-of-the-earth (NOE), weapons engagement, and enemy interaction, to provide realistic and cost-effective training in a totally safe environment. The simulators complement the training accomplished in actual helicopters during formal courses of instruction and maintain combat readiness of rated aviators. Each simulator is a replica of the helicopter cockpit, mounted on a motion system, plus an instructor's station with the equipment necessary for the instructor to control the training scenario, the operating environment, and the measurement of the pilot's performance. Each simulator has a visual system to provide the aircrew with a view of the terrain outside the helicopter.

During FYs 87 and 88, the MOD program will be delayed due to heavy fielding of Synthetic Flight Training Systems (SFTS).

In FY 89, it is planned to initiate, and continue, flight simulator upgrades to ensure the same configuration as the operational aircraft. It is expected that computers will be replaced and visual system development will be included to enhance training.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) the AH-64 Combat Mission Simulator, which will be the first training simulator capable of simulating the full combat mission, including hostile enemy interaction, and (b) considerable cost savings, since the Army would have to fly real aircraft if the simulators were not available.

In FY 86, accomplishments included: (a) development of the Combat Mission Simulator, including inplant testing, tear down and installation, and (b) incorporating all AH-64 flight and weapons systems required for aircrew training, including the gunner's Target Acquisition Designation Sensor (TADS) and the Pilot's Night Vision Sight (PNVS), in the simulator.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: DE70	AVIATION NON-SYSTEM TRAINING DEVICES	\$ 7.9M	\$ 2.8M
PE: 64801A	AVIATION ENGINEERING DEVELOPMENT		
DoD ORGANIZATION:	ARMY		
RESPONSIBLE ORGANIZATION:	PROJECT MANAGER FOR TRAINING DEVICES		

PROJECT SYNOPSIS:

The objective of this Project is to develop aviation training devices that are applicable to more than one aviation system or are applicable to no major aircraft or aviation system.

In FY 88, it is planned to continue full-scale engineering development of the Aviation Network (AIRNET).

In FY 89, it is planned to continue full-scale development of AIRNET.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) an improved team training capability, and (b) growth capabilities for future weapons systems as a result of using a modular approach in development.

The ACATT will also be capable of simulating full combat mission and combat integration of Scout and Attack aircrews under all environmental conditions (i.e., day, night, adverse weather, full weapons effects and nap-of-the-earth flight).

In FY 87, accomplishments included the initiation of full-scale engineering development of the Aviation Network (AIRNET) in conjunction with the Defense Advanced Research Projects Agency (DARPA).

III-A-1: LISTING OF ARMY PROJECTS

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
62716A					HUMAN FACTORS ENGINEERING TECHNOLOGY
A1QL	HEL	6.038	7.212 HF	V A R	ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)
AH70	HEL	8.522	7.859 HF	4	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT
		----- 14.561	----- 15.071		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62716A :					
					FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988					----- 14.560 15.071

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62727A						NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY
A230	PMTRADE	4.011	3.429	ST	6	NON-SYSTEM TRAINING DEVICES
		-----	-----			
		4.012	3.430			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62727A :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 4.011 3.429

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ET	ARI	0.839	1.149	ET	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-HF	ARI	1.888	1.293	HF	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-MP	ARI	2.028	2.872	MP	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-ST	ARI	1.609	1.149	ST	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A790-HF	ARI	2.257	1.939	HF	4	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
A790-ST	ARI	1.928	1.728	ST	6	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
A791-ET	ARI	0.976	1.694	ET	6	MANPOWER, PERSONNEL AND TRAINING
A791-MP	ARI	2.452	4.295	MP	2	MANPOWER, PERSONNEL AND TRAINING
		----- 13.978	----- 16.120			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 13.977 16.120

(CONTINUED)

III-A-1: LISTING OF ARMY PROJECTS

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A792	ARI	10.022	8.545	MP	2	MANPOWER AND PERSONNEL
A793	ARI	6.315	7.805	HF	4	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS
A794	ARI	6.913	7.605	ET	6	EDUCATION AND TRAINING
A795	ARI	5.236	6.589	ST	6	TRAINING SIMULATION
		-----	-----			
		28.486	30.545			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
						FY88 FY89

						THE PRESIDENT'S BUDGET, JANUARY 1988 28.486 30.544

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(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63738A						NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED DEVELOPMENT
D335	PMTRADE	0.000	0.860	ST	6	COMMUNICATIVE NON-SYSTEM TRAINING DEVICES (NSTD)
		----- 0.000	----- 0.861			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63738A :						FY88 FY89 ----- 0.000 0.860
THE PRESIDENT'S BUDGET, JANUARY 1988						

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715A						NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING DEVELOPMENT
D241	PMTRADE	17.752	13.251	ST	6	NON-SYSTEM TRAINING DEVICES - COMBINED ARMS
D573	PMTRADE	6.993	6.539	ST	6B	PMTRADE AND NTSC SUPPORT
		24.746	19.791			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64715A :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						24.745 19.790

(CONTINUED)

III-A-1: LISTING OF ARMY PROJECTS

(CONTINUED)

(CONTINUATION)

III-A-1: LISTING OF ARMY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64801A						AVIATION ENGINEERING DEVELOPMENT
D275	PMTRADE	0.000	4.389	ST	6D	SYNTHETIC FLIGHT TRAINING SYSTEMS
DE70	PMTRADE	7.864	2.785	ST	6D	AVIATION NON-SYSTEM TRAINING DEVICES
		----- 7.865	----- 7.175			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 64801A :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1968	----- 7.864	----- 7.174

III.B. NAVY PROGRAM ELEMENT AND PROJECT SYNOPSES

PE	TITLE	PAGE
61153N	DEFENSE RESEARCH SCIENCES	III-B-1
62131M	MARINE CORPS LANDING FORCE TECHNOLOGY	III-B-7
62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA	III-B-11
62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA	III-B-16
63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT	III-B-19
63707N	MANPOWER AND PERSONNEL SYSTEMS DEVELOPMENT	III-B-22
63720N	EDUCATION AND TRAINING	III-B-26
63732M	MARINE CORPS ADVANCED MANPOWER TRAINING SYSTEMS	III-B-30
63733N	TRAINING DEVICES TECHNOLOGY	III-B-32
63739N	NAVY LOGISTICS PRODUCTIVITY	III-B-35
64703N	TRAINING AND PERSONNEL SYSTEM DEVELOPMENT	III-B-40
64714N	AIR WARFARE TRAINING DEVICES	III-B-43
64715N	SURFACE WARFARE TRAINING DEVICES	III-B-45

Table III-B-1: Listing of Projects - Lists projects for each NAVY program element. Lists contain performing organization, funding, Congressional Category and goal information.

PROGRAM ELEMENT OVERVIEW

PE: 61153N

DEFENSE RESEARCH SCIENCES, SUBELEMENT 42:
BEHAVIORAL AND ORGANIZATIONAL SCIENCES

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 10.4M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 11.5M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of this Program Element is to sustain U.S. Naval scientific and technological superiority and to be a source of new concepts and technological options for the maintenance of naval power and national security.

The objectives of the MPT Subelement are to develop fundamental knowledge about human capabilities and characteristics, which support and guide Navy and Marine Corps efforts to improve: (a) personnel selection and classification, (b) training, (c) equipment design for ease of human use and maintenance, (d) team composition, (e) leadership, and (f) group decision-making procedures.

Major areas are: (a) Personnel and Training, which includes research on: (1) psychological measurement for selection, classification, and training, (2) human learning and instructional processes, and (3) the cognitive and neural bases of skill and knowledge acquisition, (b) Engineering Psychology, which covers research on basic human performance (such as inference, judgment, decision-making, auditory and visual perception, and system control) and on factors underlying the design of human-compatible interfaces in high technology systems, and (c) Group Psychology, which focuses on group processes, group behavior, leadership, and other factors that determine the productivity, morale, and retention of personnel. Research approaches include theoretical formulations, laboratory and simulator experimentation, mathematical modeling, correlational analyses, and observation and measurement in operational settings.

Research results from the program impact design of Navy systems such as the Computerized Adaptive Testing version of the Armed Services Vocational Aptitude Battery; classroom training programs that incorporate intelligent automated tutors; input/output interfaces between men and machines that include automated speech recognition systems; programs for supervisory control of remotely operated underwater vehicles and manipulators; and organizational arrangements and decision protocols for future command and control systems.

This Subelement coordinates within ONR with Biological Sciences, Information Sciences, and Mathematics Divisions in several interdisciplinary programs. Coordination with basic research sponsoring agencies within DoD is maintained through reviews for the Office of the Under Secretary of Defense for Research and Engineering, through joint-Service Technical Advisory Groups and through the NRC Committee on Human Factors sponsored by elements of Army, Navy, Air Force, NASA and NSF. International coordination is effected through NATO panels and the Technical Cooperation Program.

RELATED ACTIVITIES:

All research activity undergoes formal coordination through reviews by the Office of Under Secretary of Defense for Research and Engineering, through active Navy and Marine Corps participation in interagency committees, and through interaction with the scientific community. Coordination and review mechanisms can be either common or specific to program subelements and, where significant, are described under the appropriate subelement in Paragraph H.

The work is performed by the Office of Naval Research (Defense Research Sciences Element). The performers include various university, industry, not-for-profit institutions and Navy laboratories. About 56 per cent of funding goes to universities, 35 per cent to Navy laboratories and 9 per cent to industrial and other sources.

PAYOFF/UTILIZATION:

The payoffs of this Subelement include research support for: (a) advanced training technology by the Navy training community, (b) operational man-machine systems, and (c) manpower and personnel policies and practices which affect recruitment, retention, and productivity.

This research effort is the primary means for determining scientific understanding and the needed technologies underlying improvements in Navy capabilities and operations. Increased research is needed to reach technological parity in some areas and gain/maintain superiority in others. Research is directed to search out, assess, and exploit potential solutions to naval problems.

Progress made in the areas of personnel and training research, engineering psychology, and group psychology include: (a) development of methods of modeling human performance on psychological tests that will reduce the cost and improve the quality of test calibration, (b) the discovery of differences in problem-solving strategies of low- and high-spatial ability persons, enabling the design of better aptitude tests, (c) improved understanding of observer judgments of object orientation and directionality in 3-D space, (d) development of a new metric for describing color space which will improve the design of multicolor displays, (e) development of an innovative conceptualization of the processes and contexts which determine the effectiveness of industrial, commercial, and government organizations, and (f) creation of a theoretical framework for understanding the processes whereby high school students learn to adapt, or fail to adapt, to school requirements and to work rules after leaving school (including military service).

FUTURE DIRECTIONS:

The FY 89 Program will tie all research in psychological processes more strongly to appropriate areas of neuroscience, particularly to the areas of attentional, perceptual, and cognitive processes.

PROJECT OVERVIEW

		88	89
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PROJECT: RRO4206	PERSONNEL AND TRAINING	\$ 5.7M	\$ 6.3M
PE: 61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	OFFICE OF NAVAL RESEARCH		

PROJECT SYNOPSIS:

The objective of this Project is to begin theoretical work toward estimating complex abilities from multidimensional tests.

Cognitive processes research will emphasize dynamic changes in knowledge representation as a novice learner progresses toward expert level skill, and learning and training research will begin to include social and motivational factors in transitioning from traditional classroom instruction to learning environments with advanced technologies such as intelligent tutor systems.

In FY 87, it is planned that: (a) research in personnel measurement will continue to explore multidimensional trait estimation using *non-parametric estimation methods*, (b) cognitive processes research will be directed toward development of a formal theory of transition from novice to expert states of knowledge, and (c) research in learning and training will emphasize development of a theory for intelligent tutorial systems of instruction, and will be integrated with research in cognitive processes.

In FY 88, it is planned to: (a) continue with research concerned with instructional theory to investigate the scientific issues underlying intelligent computer-assisted instruction, especially in the acquisition of complex skills, (b) pay special attention to the representation of knowledge during intermediate stages of learning because of its important role in the transition from novice to expert, (c) compare data on the memory, learning, and performance skills of brain-damaged individuals to those of normal individuals, to provide a deeper level of understanding of the organization of functional mechanisms involved, and (d) continue investigation, in personnel measurement research, of response models for test items that measure multiple ability dimensions, but shift emphasis from traditional verbally presented tests to the measurement of abilities on more complex performance tasks, and on sequential tasks in which significant dependencies exist between responses.

PAYOFF/UTILIZATION:

The payoff of this Project includes the solution of many training problems in the Navy through the introduction of more individualized, automated, and simulator-based instruction.

In FY 86, representative accomplishments include: (a) personnel measurement research developed robust methods for estimating abilities from a very few test items, (b) initiated new theoretical work towards estimating complex abilities from multidimensional tests, (c) cognitive processes research was expanded to include both psychological and neurophysiological approaches, (d) learning and training research developed models of knowledge and strategies used by expert troubleshooters of marine power plants as a basis for instructional system innovations, and (e) began new efforts to investigate social and motivational factors in transitioning from traditional classroom instruction to learning environments with advanced technologies such as

intelligent tutorial systems.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: RR04208	GROUP PSYCHOLOGY	\$ 2.5M	\$ 2.8M
PE: 61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	OFFICE OF NAVAL RESEARCH		

PROJECT SYNOPSIS:

The objective of this Project is to increase understanding of the psychological and organizational variables that determine the performance of individuals, groups, teams, and units in the Navy and Marine Corps.

In FY 87, research in group psychology will continue formal model development and theory-guided experimentation on performance in small groups, particularly those which perform under stressful conditions.

In FY 88, research will continue the development of rigorous methodology and quantitative models of small group performance, and will extend these methods and models into the area of team performance and team training.

PAYOFF/UTILIZATION:

The payoffs of this Project include improved quality of Navy and Marine Corps personnel, reduction of personnel attrition and losses of Petty Officers in shortage categories, and enhanced effectiveness of military and civilian employees.

In FY 86, representative accomplishments include the initiation of development of theories and models for small, task-oriented team performance, which will build around major themes of cohesion, decision-making and information processing, incentive and reward systems, productivity and resistance to stress.

PROJECT OVERVIEW

	88	89
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PROJECT: RRO4209	ENGINEERING PSYCHOLOGY	\$ 2.2M \$ 2.4M
PE: 61153N	DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES	

DoD ORGANIZATION: NAVY

RESPONSIBLE ORGANIZATION: OFFICE OF NAVAL RESEARCH

PROJECT SYNOPSIS:

The objective of this Project is the development of enhanced group decision-making procedures.

In FY 87, it is planned that: (a) research in decision-making will continue to emphasize coordinated development of formal models and behavioral data in distributed decision-making architectures, (b) perception research will expand in vision, touch and auditory pattern recognition, with animal models being emphasized in all three sensory processing modalities, and (c) research in human-computer integration will include experiments to test formal models for optimizing human-algorithm interactions in image processing.

In FY 88, engineering psychology plans include: (a) research on computational and neurological theory as a basis for understanding visual perception, and extend to include other perceptual areas such as audition, kinesthesia and touch, (b) in addition to this feature-based, or "bottoms-up" approach to perception, research will be initiated to investigate the "top-down" mechanisms by which previous experience and learning influence the perceptual processes, and (c) beginning multi-model studies to integrate touch, vision and motor control.

PAYOFF/UTILIZATION:

The payoff of this Project will be improved human performance in high technology systems to meet Navy and Marine Corps operational requirements.

In FY 86, representative accomplishments include: (a) decision-making research that included experiments to test predictions from recently developed models of risk attitude, while other research tested hypotheses about how decision problem conditions determine the choice heuristic human will employ, (b) multi-person, distributed decision-making research tested model predictions about relative effectiveness of different structural architectures, (c) the consequences of various mixes of expertise in command systems that will generate new work, (d) continued perception research to emphasize computational approaches and added new work in primate neurophysiology and anatomy to develop neural models of processing architecture for vision, and (e) initiated new projects in pattern recognition in touch and in audition; these projects include primate studies of neural processing of touch information in object discrimination, and studies of neural processing of auditory information in target recognition.

PROGRAM ELEMENT OVERVIEW

PE: 62131M MARINE CORPS LANDING FORCE TECHNOLOGY

DoD ORGANIZATION: MC

FUNDING: FY88 \$ 0.5M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 0.6M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element (PE) is to develop managerial and statistical concepts and techniques that will lead to more cost-effective personnel and training management policies and procedures.

Efforts will focus on: (a) developing faster, more accurate assessment of individual aptitudes and abilities, (b) improving personnel retention, (c) reducing short-term personnel transfers, (d) developing low-cost training simulators, (e) developing training standards for all unit levels, and (f) developing an improved, less manpower-intensive procedure to match training to job requirements.

To avoid duplication of work, close coordination is maintained with all the other Armed Services and selected DoD agencies, the National Aeronautics and Space Administration (NASA), and industrial research and development (IR&D) projects. The Marine Corps Manpower and Training Technology area includes: PE 62722A (Manpower, Personnel and Training), PE 63743A (Education and Training), PE 63732M (Marine Corps Manpower and Training Systems), Joint Service Job Performance Measurements Working Group, Computerized Adaptive Testing Interservice Coordinating Committee, and PE 62233N (Mission Support Technology).

In FYs 87/88, it is planned to: (a) complete developmental prototype of an information delivery system for the Personnel Cohorts Rates Task (transition to PE 63732M in FY 88), (b) validate the designed procedures for developing training standards for tasks performed by a combat service support group (transition Collective Training Standards task to PE 63732M in FY 88), (c) develop a neuroelectric and neuromagnetic recording capability for muscles, sensory-cognitive-motor relationships and stress tasks as part of the Biopsychometric Assessment task, and (d) begin Tour Systems Optimization Task.

This Technology Area subsumes efforts transferred from Program Element 62744N, under Projects F44-521 and F44-522.

RELATED ACTIVITIES:

Because of the broad spectrum of technology covered by this program, close coordination is maintained with all the other Armed Services and selected DoD agencies, NASA, and industrial research and development programs. This coordination prevents unnecessary duplication of effort.

The work is performed by the Naval Ocean Systems Center, Naval Coastal Systems Center, Naval Surface Weapons Center, David W. Taylor Naval Ship Research and Development Center, Naval Civil Engineering Laboratory, Naval Weapons Center, Navy Personnel Research and Development Center, and the Naval Research Laboratory.

PAYOFF/UTILIZATION:

The payoffs of the MPT portion of this Program Element are improved utilization and increased readiness of personnel through: (a) more accurate assessment of individual aptitudes and abilities, (b) improved personnel

retention, (c) reduced short-term personnel transfers, (d) the development of low-cost training simulators, (e) better training standards from all unit levels, and (f) improved, less manpower-intensive procedures for matching training to job requirements.

In FY 86, accomplishments included: (a) completion of utility testing of the CAT-ASVAB, (b) determining the feasibility of using biopsychometric measures to improve personnel selection, classification, fitness, and performance prediction under fatigue and stress, and (c) a final report on Drill Instructor Stress Training.

FUTURE DIRECTIONS:

Plans for the future include: (a) testing results of individual biopsychometric assessments as a measure of successful school and stressful duty performance, (b) transition of new techniques for the Tour Systems Optimization model to PE 63732M, (c) transition of Biopsychometric Assessment task to PE 63732M (FY 90), and (d) start of development of new technology for the selection, classification, and assignment of personnel.

PROJECT OVERVIEW

		88	89
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PROJECT: CC31-521	MANPOWER TECHNOLOGY	\$ 0.3M	\$ 0.3M
PE: 62131M	MARINE CORPS LANDING FORCE TECHNOLOGY		
DoD ORGANIZATION:	MC		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Subproject is to develop managerial and statistical concepts and techniques that will lead to more cost-effective personnel management policies and procedures through focusing on: (a) faster, more accurate assessment of individual aptitudes and abilities (a joint-Services project), (b) improvement of personnel retention, and (c) reduction of short-term personnel transfers.

This Subproject was transferred in FY 85 from Program Element (PE) 62744N, Marine Corps Air-Ground Technology, to the current Program Element as part of the Marine Corps Manpower and Training technology area.

In FY 87, it is planned to: (a) complete developmental prototype of an information delivery system for the Personnel Cohort Rates project, allowing manpower analysts to access a variety of personnel statistics within 5-10 seconds, (b) develop neuroelectric and neuromagnetic recording capability for muscles, sensory-cognitive-motor relationships, and stress tasks as part of the Biopsychometric Assessment task, and (c) begin Tour Systems Optimization task, which will explore, develop, and test new techniques to solve large-scale integer problems with side constraints, and to demonstrate the feasibility of using the techniques in Tour Systems Models.

In FY 88, it is planned to: (a) transition Personnel Cohort Rates task to PE 63732M, and (b) continue personnel testing and data assessment and validation process for the Biopsychometric Assessment task.

PAYOFF/UTILIZATION:

The payoff of this Subproject is improved utilization of personnel and thus increased readiness through: (a) more accurate assessment of individual aptitudes and abilities, (b) improved personnel retention, and (c) reduced short-term personnel transfers.

In FY 86, accomplishments included: (a) completion of utility testing of the Computerized Adaptive Test-Armed Services Vocational Aptitude Battery (CAT-ASVAB), and (b) determination of the feasibility of using biopsychometric measures to improve personnel selection, classification, fitness for duty, and performance prediction under baseline fatigue and stressful conditions.

PROJECT OVERVIEW

		88	89
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PROJECT: CC31-522	TRAINING TECHNOLOGY	\$ 0.2M	\$ 0.3M
PE: 62131M	MARINE CORPS LANDING FORCE TECHNOLOGY		
DoD ORGANIZATION:	MC		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Subproject is to develop managerial and statistical concepts and techniques that will lead to more cost-effective training management policies and procedures through focusing on development of: (a) training standards for all unit levels, and (b) an improved, less manpower-intensive procedure for matching training to job requirements.

This Subproject was transferred in FY 85 from Program Element (PE) 62744N, Marine Corps Air-Ground Technology, to the current PE as part of the Marine Corps Manpower and Training technology area.

In FY 87, it is planned to complete validation of the procedures used in the development of collective training standards.

In FY 88, it is planned to transition the Collective Training Standards task to PE 63732M.

PAYOFF/UTILIZATION:

The payoff of this Subproject is increased readiness of personnel through improved training resulting from: (a) low-cost training simulators, (b) better training standards for all unit levels, and (c) improved, less manpower-intensive procedures for matching training to job requirements.

In FY 86, accomplishments included completing a final report on Drill Instructor Stress Training.

PROGRAM ELEMENT OVERVIEW

PE: 62233N MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING
AND SIMULATION TECHNOLOGY AREA

DoD ORGANIZATION: NAVY

FUNDING: FY88 \$ 7.4M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 7.6M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to provide mission support technologies essential for all naval operations, specifically through the support of effective recruitment, training, and retention of military personnel and the development of training device simulation technology.

This Technology Area subsumes Manpower and Personnel, and Education and Training Projects transferred from Program Element 62763N, and a Simulation and Training Project transferred from Program Element 62757N. Funding indicated includes only the MPT portion of this Program Element.

In FY 88, it is planned to: (a) complete analyses and policy recommendations for new assignment and career development programs designed to increase the performance and retention rates of naval officers, (b) complete design and evaluation of computer-based tools to support the construction of simulation models and intelligent instructional systems, (c) complete evaluation of embedded training technology for shipboard training and skill maintenance, and (d) complete evaluation of techniques for converting photographic data to an Inverse Synthetic Aperture Radar (ISAR) database for training ISAR recognition skills.

In FY 89, it is planned to: (a) complete development of long-range forecasting techniques to predict personnel loss and continuation rates, (b) complete development of an automated instructional system for teaching procedural skills, (c) complete demonstration and evaluation of a computer image generation database for sensor simulation, and (d) complete evaluations of training techniques and equipment for improving performance under chemical/biological warfare defense conditions.

RELATED ACTIVITIES:

Efforts are in consonance with progress in other services and are coordinated through informal exchanges of information as well as formal technical Advisory Groups, Working Groups, Committees, Joint Memoranda of Understanding and/or Joint Service Agreements. There is no unnecessary duplication of effort within the Navy or the Department of Defense.

The work is performed by the Naval Air Propulsion Center, Naval Coastal Systems Center, Navy Personnel Research and Development Center, Naval Training Systems Center, Naval Medical Research and Development Command Laboratories, Naval Air Development Center, Naval Clothing and Textile Facility, David Taylor Research Center, Naval Civil Engineering Laboratory, Naval Surface Weapons Center, Naval Research Laboratory, and the Naval Ocean Systems Center.

PAYOFF/UTILIZATION:

The payoffs of the MPT portion of this Program Element are more effective recruitment, training, and retention of military personnel.

In FY 87, accomplishments included completion of test development of

information processing to predict on-the-job performance in selected Navy occupational ratings.

FUTURE DIRECTIONS:

Beyond FY 89, it is planned to: (a) complete development of a computerized authoring system for integration into the Computerized Executive Networking Survey System (CENSUS), (b) complete the evaluation of a sensor emulator for use in aviation on-board training systems, and (c) complete development of an Integrated Officer Selection System.

PROJECT OVERVIEW

		88	89
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PROJECT: RM33M20	MANPOWER AND PERSONNEL TECHNOLOGY	\$ 2.7M	\$ 2.8M
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA		

DoD ORGANIZATION: NAVY

RESPONSIBLE ORGANIZATION: NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

PROJECT SYNOPSIS:

The objective of this Subproject is to support effective recruitment and retention of military personnel.

In FY 88, it is planned to complete analyses and policy recommendations for new assignment and career development programs designed to increase the performance and retention rates of naval officers.

In FY 89, it is planned to complete development of long-range forecasting techniques to predict personnel loss and continuation rates.

This Subproject was transferred in FY 85 from Program Element 62763N, Project F63-521, to the current Program Element as part of the Personnel, Training and Simulation Technology Area.

PAYOFF/UTILIZATION:

The payoffs of this Subproject include improved recruitment and retention of military personnel.

In FY 87, accomplishments included completion of test development of information processing to predict on-the-job performance in selected Navy occupational ratings.

PROJECT OVERVIEW

		88	89
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PROJECT: RM33T23	EDUCATION AND TRAINING TECHNOLOGY	\$ 1.7M	\$ 1.8M
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Subproject is to support effective training of military personnel.

In FY 88, it is planned to complete the evaluation of artificial intelligence applications to a maintenance training course for the SH-3H helicopter.

In FY 89, it is planned to complete evaluation of embedded training technology for shipboard training and skill maintenance.

This Subproject was transferred in FY 85 from Program Element 62763N, Project F63-522, to the current Program Element as part of the Personnel, Training and Simulation Technology Area.

PAYOFF/UTILIZATION:

The payoffs of this Subproject include more effective training of military personnel.

In FY 86, accomplishments included completing the design of a prototype system for teaching generic problem solving skills.

PROJECT OVERVIEW

	88	89
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PROJECT: RM33T24	SIMULATION AND TRAINING \$ 3.0M	\$ 3.1M
	DEVICE TECHNOLOGY	
PE: 62233N	MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA	
DoD ORGANIZATION:	NAVY	
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER	

PROJECT SYNOPSIS:

The objective of this Subproject is to support effective training of military personnel through the development of training device simulation technology.

In FY 88, it is planned to complete the evaluation of techniques for converting photographic data to an Inverse Synthetic Aperture Radar (ISAR) database for training ISAR recognition skills.

In FY 89, it is planned to complete the feasibility demonstration of millimeter wave simulation techniques for tactical training.

This Subproject was transferred in FY 85 from Program Element 62757N, Project F57-526, to the current Program Element as part of the Personnel, Training and Simulation Technology Area.

PAYOFF/UTILIZATION:

The payoffs of this Subproject include more effective training of military personnel through the provision of advanced training simulation devices.

In FY 87, accomplishments included demonstrating the low-cost passive acoustic analysis trainer using the Navy Standard Desktop Computer.

PROGRAM ELEMENT OVERVIEW

PE: 62234N

SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS
TECHNOLOGY AREA

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 3.2M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 3.3M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to provide Navy systems developers with the resources and expertise to implement advanced concepts, specifically in the areas of man/machine interface, decision-making, and information transfer.

This Technology Area subsumes Human Factors Projects transferred from Program Element 62757N. Funding indicated includes only the MPT portion of this Program Element.

In FY 88, it is planned to: (a) complete development and evaluation of tracking and attack aid modules to improve airborne and surface ship ASW attack performance, (b) complete development and shipboard evaluation of intelligent decision-aiding technology with emphasis on air strike planning, and (c) initiate development of an advanced intelligent workstation for combat direction systems to improve the integration of Battle Force staffs and reduce command decision times.

In FY 89, it is planned to: (a) complete development of novel control and display concepts for semi-autonomous control of deep ocean search vehicles and remotely-controlled manipulators, (b) complete the integration of a voice recognition system into a prototype combat direction system to determine its ability to improve system effectiveness in a high-information environment, and (c) complete testing of the Aircrew Interface Module of an Intelligent Air Attack System to reduce pilot information overload during high-speed, low-altitude attacks.

RELATED ACTIVITIES:

To ensure coordination with other Navy development efforts, a variety of formal and informal means are used to promote communication at both working and management levels. The Navy interacts through planning sessions, working and review groups, joint symposia and related activities with the Army, Air Force, Defense Advanced Research Projects Agency, the Defense Intelligence Agency, the Central Intelligence Agency and NASA. The various topic managers coordinate with their appropriate counterparts in the Office of Under Secretary of Defense for Research and Engineering. There is no unnecessary duplication of effort within the Navy or the Department of Defense. This program works closely with the PE 62111N (AAW/ASUW Technology) and 62113N (Electronic Warfare Technology) to provide needed experimental sensor devices, power sources, and special processing chips. The materials efforts are closely coordinated with PE 62121N (Surface Ship Technology), 62122N (Aircraft Technology) and 62323N (Submarine Technology) provide an array of new structural materials to satisfy new mission requirements. Computer Technology is closely coordinated with PE 62232N (Command, Control and Communications Technology), 62111N, 62113N and 62314N (ASW Technology). A significant cooperative effort is being jointly pursued with PE 63792N (Advanced Technology Demonstration Concepts) to develop Ultra-Low Loss Fiber Optic cables for Anti-Submarine Warfare Applications.

The work is being performed at the Naval Civil Engineering Lab, David Taylor Research Center, Naval Air Development Center, Naval Air Propulsion Center, Naval Ocean Systems Center, Naval Research Lab, Naval Surface Weapons Center,

Naval Weapons Center, Naval Postgraduate School, US Naval Academy, Naval Avionics Center, Navy Personnel Research and Development Center, and Lawrence Livermore National Lab.

PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Program Element is the provision to Navy systems developers of resources and expertise in the areas of man/machine interface, decision-making, and information transfer, thus enabling improved system design with better utilization of the human component.

In FY 87, accomplishments included: (a) completion of a Battle Group Information Database for use in development of an electronic warfare command system and specialized curricula for warfare commanders, and (b) development of a prototype status-at-a-glance display to aid submarine approach officers in rapidly understanding the current tactical situation.

FUTURE DIRECTIONS:

Beyond FY 89, it is planned to: (a) complete development of improved human-computer interfaces to enhance the performance of surface ship combat direction systems, (b) complete development of operator performance measures for use in assessment of fleet ASW units and evaluation of fleet exercises, and (c) complete the identification and evaluation of improved command and control organizational structures.

PROJECT OVERVIEW

		88	89
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PROJECT: RM34H20	HUMAN FACTORS TECHNOLOGY	\$ 3.2M	\$ 3.3M
PE: 62234N	SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA		

DoD ORGANIZATION: NAVY

RESPONSIBLE ORGANIZATION: NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

PROJECT SYNOPSIS:

The objective of this Subproject is to provide Navy systems developers with the resources and expertise to implement advanced concepts, by addressing technological opportunities in man/machine interface, decision-making, and information transfer.

This Subproject subsumes efforts transferred from Program Element 62757N, under Projects F57-242 and F57-525.

In FY 88, it is planned to: (a) complete shipboard evaluation of intelligent decision aiding technology with emphasis on weapons allocation for air strike planning, and (b) complete development of engineering design aids to permit improved maintainability of electronic equipment.

In FY 89, it is planned to: (a) demonstrate an integrated Software Engineering Environment capability using Ada language system facilities, (b) complete laboratory evaluation of a decision support system to assist antisubmarine warfare tacticians in integrating information from multiple sources, and (c) complete development of threat display guidelines in an intelligent air attack system, to reduce pilot information overload during high-speed, low-altitude attacks.

PAYOFF/UTILIZATION:

The payoff of this Subproject is the provision to Navy systems developers of resources and expertise in the areas of man/machine interface, decision-making, and information transfer, thus enabling improved system design with better utilization of the human component.

In FY 87, accomplishments included: (a) completion of a Battle Group Information Database for use in development of an electronic warfare command system, and (b) development of a prototype status-at-a-glance display to aid submarine approach officers in rapidly understanding the current tactical situation.

PROGRAM ELEMENT OVERVIEW

PE: 63701N

HUMAN FACTORS ENGINEERING DEVELOPMENT

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 2.5M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 2.5M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objectives of this Program Element are to: (a) improve crew and workstation design and evaluation methods to reduce errors and increase effectiveness of operation, (b) establish target acquisition and weapon system standards for displays people can understand, (c) develop human performance assessment techniques for air combat maneuvering to increase the number of enemy planes shot down, (d) provide initial human factors support for new systems, and (e) improve the integration between ships and their crews. This program also develops and evaluates new techniques for system design and seeks to improve fleet readiness through human factors technology.

Navy ships, aircraft, weapons, sensors, and command and control systems must be maintained and operated by Navy personnel. This program promotes a better fit among the operator, the equipment, and the mission so that hardware systems will operate with fewer human-induced errors and with greater safety and maintainability.

The Department of Defense Human Factors Engineering Technical Advisory Group is the forum for coordinating related efforts to integrate the human component into military systems.

RELATED ACTIVITIES:

This program is coordinated with supporting technology in the Navy and in the other services: Human Factors Technology in PE 62234N, Systems Support Technology, Simulation Technology in PE 62233N, Mission Support Technology, PE 62716A, Human Factors in Military Systems, PE 63739A, Human Factors in Training and Operational Effectiveness, and PE 62202F, Aerospace Biotechnology. The DoD Human Factors Engineering Technical Advisory Group is the forum for coordinating related efforts to intergrate the human component into military systems.

The work is performed by the Naval Air Development Center, Navy Personnel Research and Development Center, Naval Aerospace Medical Research Laboratory, Naval Air Test Center, Naval Ocean Systems Center, Naval Sea Systems Command, Naval Training Equipment Center, Naval Weapons Center, and Pacific Missile Test Center.

PAYOFF/UTILIZATION:

The payoff of this Program Element is to assure a good fit among the operator, the equipment, and the mission in Navy systems. As a result, hardware systems operate more rapidly with fewer human-induced errors and with greater safety and maintainability. The development of these new human factors engineering technologies and their incorporation into the design of Navy systems will result in improved fleet performance.

FUTURE DIRECTIONS:

This Program Element will continue to ensure that appropriate human factors considerations are incorporated in the engineering design of Navy systems.

PROJECT OVERVIEW

		88	89
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PROJECT: R1771	SHIP HUMAN FACTORS ENGINEERING	\$ 1.7M	\$ 1.6M
PE: 63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to use Human Factors Engineering (HFE) more effectively in the weapon system acquisition process to improve the performance of operators, maintainers, and decision makers in using our increasingly complex and sophisticated ship systems being built by the Navy.

This Project responds to critical reports by the Government Accounting Office (GAO), the Defense Science Board, and the Naval Research Advisory Committee. The Project will develop and evaluate human factors and organizational system technology to deal with such problem areas as: (a) information management and decision making under time-critical conditions, (b) multi-sensor integration and display of task pertinent information in performance enhancing formats, (c) battle force information management and command effectiveness, (d) combat system design/engineering for improved operability, (e) shipboard and shorebased administration and decision support systems, and (f) computer authoring and delivery of technical information for maintenance support. Technologies are transitioned into use by the material acquisition community.

In FY 88, it is planned to: (a) evaluate a prototype information management decision support system, (b) develop and test sensor contact data management schemes, (c) develop preliminary design specs for a combat system console, (d) field test a portable computer-based maintenance aid, and (e) evaluate information displays for submarine approach officer position.

In FY 89, it is planned to: (a) develop display formats and specifications for combat system console, (b) demonstrate and field a computerized battle force information management database, (c) evaluate information displays for submarine approach officer position, and (d) prepare preliminary specs for computer-based maintenance aids.

PAYOFF/UTILIZATION:

The payoffs of this Project are solutions to man-machine interface problems (especially related to operator error and overload) in the increasingly sophisticated ship systems being built by the Navy, through increased and more effective use of human factors engineering techniques in weapon system acquisition.

In FY 87, accomplishments included: (a) developed simulation facility for human performance measurement in combat systems, (b) developed submarine combat commander model of decision processes for use in performance assessment and prediction, (c) identified critical man-machine design issues for combat systems, (d) established preliminary design base for combat system general purpose consoles, (e) conducted pilot testing of select computerized maintenance aids, and (f) developed and initiated verification of a battle group information management database.

PROJECT OVERVIEW

		88	89
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PROJECT: W0542	AIR HUMAN FACTORS	\$ 0.9M	\$ 0.9M
	ENGINEERING TECHNOLOGY		
PE: 63701N	HUMAN FACTORS ENGINEERING DEVELOPMENT		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL AIR DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to improve combat effectiveness and survivability through applications of man-machine integration methods in the design and update of airborne systems.

The primary goal of this effort is to improve Naval Air Warfare readiness through improved human factors technology, especially through: (a) an improved technology base necessary to make tradeoff decisions in complex man-machine systems, (b) enhanced human performance in aviation environments, and (c) reduced operator workload through improved information management and decision analytic techniques.

In FY 88, it is planned to: (a) continue development of real-time decision aid for Airborne Early Warning (AEW) Aircraft crews, (b) develop rapid prototyping tool for use with dynamic display evaluations, and (c) begin air combat optimum launch display development.

In FY 89, it is planned to: (a) begin field test of AEW real-time decision aid/initiate ASW real-time project, (b) employ rapid prototyping tool in new aircraft development/evaluation, and (c) develop prototype air combat optimum launch displays.

PAYOFF/UTILIZATION:

The payoff of this Project is improved aircrew performance in Naval aircraft systems for air combat and airborne command, control and communications. This will be accomplished by applying human factors engineering methods in the design and modification of airborne systems.

In FY 87, accomplishments included: (a) development of Air ASW Sonobuoy Pattern Planning Aid for P-3 Update IV, (b) reduced submarine search planning time and excessive buoy expenditure by one-third, and (c) development of rapid prototyping tool for cockpit static display evaluation.

PROGRAM ELEMENT OVERVIEW

PE: 63707N

MANPOWER AND PERSONNEL SYSTEMS

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 3.0M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 4.0M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to address the need to produce required levels of personnel readiness, without increasing the cost of manpower, by exploiting emergent technologies. Computer-based measurement techniques will be used to verify job classification measures in terms of performance on-the-job (vice training performance).

Recent advances in mathematical optimization, computer technology, and advanced measurement techniques permit significant improvements in the utilization of personnel resources. The application of computer technology and advanced mathematical programming codes to personnel assignment will enable the Navy to maximize job fill, fleet needs, and individual preferences without increasing the cost of rotating personnel. New forecasting methods will greatly improve the use of personnel resources (e.g., the PCS budget) that directly affect personnel readiness.

This effort responds to a Congressional mandate and DoD-wide joint-Service effort to establish and relate enlistment selection criteria to successful job performance.

While related in objective and approach to the research and development of the other Services, this Program Element is unique in that it is tailored to the organization and people of the Navy. To ensure that unnecessary duplication of work does not arise, extensive preliminary literature reviews are conducted, and liaison is maintained with the Office of the Under Secretary of Defense for Research and Engineering and with the Army and Air Force through program reviews, information exchanges, visits, and special briefings.

RELATED ACTIVITIES:

Related DoD work is being conducted under the following Program Elements: 61102A, Training, Personnel and Human Engineering; 61102F, Human Resources; 61153N, Behavior Sciences subelement 42; 62722A, Manpower, Personnel and Training; 62703F, Personnel Utilization Technology; Personnel and Training Technology in 62233N, Mission Support Technology; 63731A, Manpower and Personnel; 63732M, Marine Corps Advanced Manpower/Training System; and 64709N, Training and Personnel Systems Development. The work in PE 63707N, while often related in objective and approach to the above R&D of the other services, is unique in that it is tailored to the organization and people of the Department of Navy. To prevent unnecessary duplication, extensive preliminary literature reviews are conducted and liaison is maintained with the Office of the Under Secretary of Defense for Research and Engineering and with the Army and Air Force through program reviews, information exchanges, visits, and special briefings.

The work is performed by the Navy Personnel Research and Development Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include improved accession and utilization of people resources through better classification, skill level assignments, productivity, and retention.

Specific payoffs include: (a) improved forecasts of manpower requirements, (b) better job performance measures, leading to enhanced recruitment and classification standards for accession of higher quality enlistees, (c) more accurate assignment of personnel, (d) better management of the Navy's enlisted and officer personnel, (e) more timely and appropriate understanding and meeting of concerns of military and civilian personnel, and thus, improved performance and retention.

FUTURE DIRECTIONS:

The future plans for this Program Element are to continue and complete development of civilian and military personnel management and utilization improvement efforts, including: (a) job performance tests for major Navy occupations, analyses relating performance data to existing enlistment classification standards, and methods to implement job performance tests for Navy enlistment and classification systems, (b) a military/civilian trade-off model to allocate shore-based manpower authorizations, (c) a comprehensive supply planning system addressing enlisted recruiting demographics by regional area, (d) the Enlisted Personnel Assignment System, (e) the officer personnel assignment information and delivery system, and (f) systems to provide data and information to increase retention of Navy civilian personnel.

PROJECT OVERVIEW

		88	89
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PROJECT: R1770	MANPOWER AND PERSONNEL SYSTEMS	\$ 3.0M	\$ 4.0M
PE: 63707N	MANPOWER AND PERSONNEL SYSTEMS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to demonstrate the feasibility of using advances in computer technology, mathematical optimization, and measurement theory for: (a) making selection tests relevant to Navy jobs rather than Navy school performance, (b) optimizing the personnel assignment process to improve readiness and satisfaction of Navy needs and individual preferences without increases in the cost of rotating personnel, and (c) introducing better methods of force planning so that short-term readiness is not achieved at the expense of future personnel shortages and accelerated budgets.

This Project is divided into four major thrust areas: (a) Selection and Classification responds to a Congressional mandate and DoD-wide, joint-Service effort to relate enlistment selection criteria to successful job performance, (b) Personnel Assignment develops systems for optimal person-job matches based on cost, operational needs, and individual preferences using recent advances in mathematical optimization techniques, (c) Force Management determines how computer technologies and operations research techniques can improve personnel force planning and policy evaluation, with focus on the development of information delivery systems that allow force managers to rapidly and accurately evaluate alternative personnel plans to avoid cost errors and major readiness deficiencies, and (d) Career Development determines the sequence and type of jobs for military personnel careers that will maximize productivity and retention.

In FY 87, it is planned to: (a) develop a military/civilian trade-off model to allocate shore-based manpower in the most cost-effective manner, (b) implement the Manpower, Personnel and Training Assessment subsystem, (c) conduct a joint-Service analysis of relationships between entrance test scores and job-performance measures, (d) implement the Enlisted Personnel Assignment System to include eleven ratings in the administrative, deck, and supply communities, and expand the system to include "C" school trained personnel, (e) develop and implement strategies to increase the effectiveness of Family Service Centers, (f) complete a feasibility assessment and implementation plan for a computerized civilian survey system to provide rapid feedback to policy makers concerning policy changes impact on civilian work force, (g) expand officer retention forecasting model to include Restricted Line and Staff Communities, (h) investigate the feasibility of forecasting personnel inventories by various distributable strength categories (e.g., rating, paygrade, sea/shore, distributable, individuals, etc.), (i) install a new generation, computer-based Officer Manning Plan to provide an executable allocation plan for officer detailing, (j) design an enlisted Permanent Change of Station (PCS) Cost Management System to enhance management of PCS moves and associated costs, (k) initiate a longitudinal study of Hispanics and women in blue-collar jobs and investigate ethnic bias in the Office of Personnel Management clerk/typist test.

In FY 88, it is planned to: (a) complete and implement a support manpower trade-off feasibility assessment, (b) select enlisted job performance predictors, demonstrate usefulness of new predictors, and investigate generalizability of findings, (c) expand the Enlisted Personnel Assignment

System to include ratings with moderate numbers of Navy Enlisted Classifications (e.g., Machinist Mate and Boiler Technician), (d) design, develop and install an Officer Priority Requisition System to better balance officer assignments among Navy activities, (e) complete work on errors in EEO parity statistics and reasons for differential selection rates of Hispanic women, (f) implement a computerized civilian survey system in selected Navy civilian organizations and implement an enlisted version of the PCS Cost Management System, (g) develop estimation equations for enlisted nondistributable strength planning, and (h) implement an integrated data management system for forecasting active, reserve, enlisted, officer and civilian accessions through the year 2000.

In FY 89, it is planned to: (a) develop and implement a fleet support manpower forecasting system, (b) design and develop a prototype database that will contain job performance measures and prediction information, (c) complete the Enlisted Personnel Assignment System model development and implement for assignment of enlisted personnel, (d) develop personnel predictions for a computerized Civilian Survey System and evaluate the system, and complete investigation of Hispanics and women in blue-collar jobs and recommend appropriate interventions, (e) design, develop and implement officer PCS Cost Management System, (f) evaluate the Officer Personnel Assignment Nomination System prototype, finalize design and develop the operational software, (g) implement a prototype distribution inventory projection model, (h) complete the Enlisted Personnel Allocation and Nomination model development and implement it for assignment of enlisted personnel, and (i) develop long-range personnel supply projections (through the year 2000) of different categories of available civilian personnel interested in Navy military and civilian careers and determine the quality and quantity of those potential accessions.

PAYOFF/UTILIZATION:

The payoff of this Project is improved manpower utilization (i.e., requirements, recruitment and classification standards, assignment of personnel, management of personnel inventory, and increased retention and satisfaction of civilian and military personnel.

In FY 86, accomplishments included: (a) developing a manpower, personnel, and training assessment subsystem that compares manpower requirements with authorizations and personnel inventories by skill, function, and resource sponsor, thereby improving the manning of fleet support functions and enhancing fleet readiness, (b) expanding the Enlisted Personnel Assignment System to include "C" school trained personnel to effectively assign trained people to the fleet, (c) expanding the officer retention forecasting model to include Restricted Line and Staff Communities, and installing an Officer Personnel Information System in the Navy Military Personnel Command that will improve selectivity and assignment of officers, thereby enhancing warfighting capability, (d) administering prototype maintenance and operation "hands-on" tests in the Machinist Mate rating for a Congressionally-mandated effort to determine the relationship between job performance measures and the Armed Services Vocational Aptitude Battery, (e) developing and implementing communications and promotional strategies for Family Service Centers to determine the type of services needed to address concerns of service members and their families, (f) completing a feasibility assessment to develop a computerized civilian survey system to provide rapid feedback to policy makers concerning policy changes impacting on civilian workforce, and (g) administering a questionnaire to supervisors and managers concerning the Navy's EEO program and issues affecting women and minority employees.

PROGRAM ELEMENT OVERVIEW

PE: 63720N

EDUCATION AND TRAINING

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 5.1M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 6.2M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to respond directly to Congressional guidance and Department of Defense (DoD) directives to exploit emerging technologies to make Navy training more efficient and effective.

The project focuses on: (a) developing automated systems, (b) demonstrating artificial intelligence technologies, (c) testing the feasibility of automated aids, software tools, and general procedures, (d) addressing issues involving aggregate resource management and individual career training, and (e) testing the feasibility of using instructional technologies to compensate for projected deficiencies in recruit skills.

In FY 88/89, work will continue on the above efforts, taking the systems through conceptual development and feasibility demonstrations, initial testing, and possible development of prototypes of successful efforts.

RELATED ACTIVITIES:

Related DoD work in education and training R&D is being conducted under the following Program Elements: 62722A, Manpower, Personnel, and Training; 63743A, Education and Training; 61153N, Defense Research Sciences, Subelement 42; 62131N, Marine Corps Air-Ground Technology; 62233N, Mission Support Technology; and 64703N, Manpower, Personnel, Training, Simulation, and Human Factors. Although apparently similar in objective and general approach to the above PEs, the work in this PE is unique in that it is tied directly to the Department of Navy's mission and job requirements. To avoid duplication of effort, extensive use is made of literature reviews, including MATRIS, and liaison is maintained with the OSD and other military branches through formal PE reviews, information exchanges with industry and government agencies visits and special briefings.

The work is performed by the Navy Personnel Research and Development Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include cost containment and increased personnel combat readiness through the application of technology advances that increase the effectiveness of individual, team, Naval Reserve, maintenance, operator, and on-the-job training.

The effort will improve instruction by applying artificial intelligence and expert systems, some of which learn by monitoring performance (i.e., the system learns, expands its intelligence and expertise, and becomes a more effective teaching mechanism). Computer technology is combined with operations research methods to allow the Navy to manage training resources better, including major changes in the way training pipelines are managed over entire Navy careers.

FUTURE DIRECTIONS:

Beyond FY 89, work will continue to develop, test and evaluate technology applications to training. Although the work goes on, emerging systems and

NAVY/63/20N

other products will be transitioned immediately for engineering development (6.4) or, if ready, will be provided for immediate implementation.

PROJECT OVERVIEW

		88	89
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PROJECT: R1772	EDUCATION AND TRAINING	\$ 5.1M	\$ 6.2M
PE: 63720N	EDUCATION AND TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to determine and experimentally demonstrate in close coordination with intended Navy users (such as officer and enlisted schools, on-the-job trainers, and training policy makers) the feasibility of advances in artificial intelligence, cognitive science, computer and training technologies.

This Project includes four training technology areas: (a) Innovative Training Technology Applications determines to what extent advances in artificial intelligence (AI) and instructional, cognitive, and computer technologies can improve the instructional development and delivery processes. The focus is on development of authoring systems that will give subject matter experts the capability of designing, updating and producing standardized instructional materials of high quality tied directly to job performance requirements. (b) Artificial Intelligence Training (AIT) Initiatives provide concept demonstrations of a range of artificial intelligence technologies in Navy training environments. The focus of this effort is on complex, dynamic delivery systems using interactive, simulation-based instruction; some such systems are capable of learning by monitoring expert performance. Ship propulsion engineering is used as a technology demonstration context. (c) Training Evaluation Technology develops automated aids, software tools, and general procedures for developers of computer-based operator and maintenance performance tests. (d) Training Management Technology addresses issues involving both aggregate resource management and individual career training for both enlisted and officer training, shore-based and on-the-job.

In FY 88, it is planned to: (a) field a microcomputer training system for Navy intelligence officers, (b) extend computer-based outer air warfare battle management simulation to surface and subsurface warfare environments, (c) field test the outer air warfare battle management simulation trainer, and (d) begin initial implementation of version I of the automated instructional development system to support Navy instructional material requirements.

In FY 89, it is planned to: (a) develop training curriculum and delivery technologies to address the skill deficiencies of the future recruit population, (b) field test the surface and subsurface warfare battle management simulation trainer, (c) develop an advanced automated instructional development system, and (d) begin development of artificial intelligence tools to aid in maintenance training and instructional development.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) training will be made more adaptable to the changing nature of Navy jobs, (b) training quality will be improved in the classroom, on-the-job, and for the Reserves, and (c) the instructional development process will be simplified and standardized.

In FY 87, accomplishments included: (a) field testing of an automated

authoring system (a key component of the Computer Assisted Logistics Support system (CALS)), (b) development of a prototype computer-based outer air warfare battle management simulation, and (c) design of an enlisted training career support system.

PROGRAM ELEMENT OVERVIEW

PE: 63732M

ADVANCED MANPOWER/TRAINING SYSTEMS

DoD ORGANIZATION:

MC

FUNDING:

FY88 \$ 1.9M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 5.1M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of this Program Element is to provide the RDT&E funds for the advanced development of systems and equipment to improve the manpower and training readiness of the Fleet Marine Force.

This objective will be met by work in the following areas: (a) human resources management and forecasting, (b) training devices and simulators, (c) Marine Corps training resources development and analysis, and (d) Marine Corps professional military education.

In FY 88 and outyears, Projects C0074 and C0867 of this Program Element will be consolidated with funding in C1443, Training Devices and Simulators Product Improvement in Program Element 26626M, Marine Corps Command, Control, and Communications Systems (Operational Systems).

RELATED ACTIVITIES:

This program relates to all armed services human resources management and forecasting, providing Marine Corps unique requirements and participation in Congressionally directed joint-Service efforts.

Work is being performed by the Navy Personnel Research and Development Center.

PAYOFF/UTILIZATION:

The payoff of the Program Element will be enhanced Fleet Marine Force readiness due to improved manpower training, planning, and control.

Work under this Program Element will result in: (a) techniques and methods that advance the use and control of human resources in the Marine Corps, (b) development of training devices and simulators not developed in conjunction with a major end item, (c) methods and techniques to improve the effectiveness of training conducted throughout the Marine Corps, and (d) software enhancements to the instructional management system.

FUTURE DIRECTIONS:

Future directions for this Program Element include continued development of: (a) Officer Assignment Decision Support System, (b) enhancements to the Enlisted Planning System, (c) Enlisted Reserve Guarantee Model in support of the (d) Automated Recruit Management System, (e) Officer Planning and Utility System, (f) Performance Measurement Project, and (g) Computerized Adaptive Testing System.

Beyond FY 89, it is planned to model software for Marine Corps manpower planning in numerous discrete areas.

PROJECT OVERVIEW

		88	89
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PROJECT: C0073	HUMAN RESOURCES MANAGEMENT AND FORECASTING	\$ 1.9M	\$ 5.1M
PE: 63732M	ADVANCED MANPOWER/TRAINING SYSTEMS		
DoD ORGANIZATION:	MC		
RESPONSIBLE ORGANIZATION:	HEADQUARTERS, USMC		

PROJECT SYNOPSIS:

The objective of this Project is to develop systems and equipment to improve themanpower readiness of the Fleet Marine Force, and develop techniques and methods which advance the use and control of human resources in the Marine Corps.

This joint-Service Project will replace the Armed Services Vocational Aptitude Battery as the mental qualifier for Service selection and classification.

In FY 88, it is planned to continue development of: (a) the Marine Corps Officer Assignment Decision Support System, (b) the Real-time Automated Personnel Identification System, (c) the Officer Planning and Utility System, (d) the infantry portion of the Joint Job Performance Measurement Project, (e) the Joint Computerized Adaptive Testing System, (f) the Military Hardware/Manpower Integration System, (g) the Enlisted Planning System, (h) the Reserve Program Model, (i) the Qualified Military Interest Model, and (j) the Qualified Military Available in support of the Automated Recruit Management System. It is also planned to continue development of enhancements to the Marine Corps Enlisted Planning System, which supports validation and reestimation of parameters once the models are operational. This will assist in the development of an historical enlisted inventory and personnel flow database to support a series of manpower planning models.

PAYOFF/UTILIZATION:

The payoffs of this Project include advanced system development for human resources management and forecasting to improve Marine readiness.

In FY 87, accomplishments included continued development of: (a) a system analysis of the information requirements of USMC recruiting, and design of a prototype information system for field test, (b) the Marine Corps Officer Assignment Decision Support System, (c) the Real-time Automated Personnel Identification System, (d) the Officer Planning and Utility System, (e) the infantry portion of the Joint Job Performance Measurement Project, (f) the Joint Computerized Adaptive Testing System, (g) the Military Hardware/Manpower Integration System, (h) the Enlisted Planning System, (i) the Reserve Program Model, (j) the Qualified Military Interest Model, and (k) the Qualified Military Available in support of the Automated Recruit Management System.

PROGRAM ELEMENT OVERVIEW

PE: 63733N

SIMULATION AND TRAINING DEVICES

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 8.3M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 6.5M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to develop and demonstrate new capabilities in training technology and equipment.

The principal focus of this effort is on proof-of-concept, reduction of risk, and cost effectiveness in training device acquisition. Current technical areas include advanced simulation of visual and sensor systems, part-task/low-cost training alternatives and expert systems. This Project provides the main developmental links between exploratory development work in simulation, training device and human factors technologies, and first-article procurement in aviation, surface, and subsurface systems. It targets training deficiencies identified in Warfare Area Assessments, Fleet Research and Development Objectives, Operational Requirements, and Fleet endorsements.

In FY 84, Projects previously included in this Program Element were consolidated into a single Project (W1773) with six Subproject product areas to allow flexibility in structuring technology development to satisfy acquisition program needs. Subproject 62257N, Training Devices and Simulation, provides the principal technology base. Work is coordinated through a series of working groups, with: 62727A, Non-systems Training Devices Technology, 62205F, Training and Simulator Technology, 63216A, Synthetic Flight Simulator Development, 63227F, Advanced Simulator Technology, and Marine Corps elements 63732M and 64657M. Work directly supports 64703N, Personnel Training, Simulation and Human Factors, 64714N, Air Warfare Training Devices, and 64715N, Surface Warfare Training Devices. The success achieved from advanced development applications leads to prototype implementations or to first article procurement and to device acquisition.

RELATED ACTIVITIES:

PE 62257N, Subproject, Training Devices and Simulation, provides the principal technology base. Work is coordinated, through a series of working groups, with 62727A, Non-systems Training Devices Technology, 62205F, Training and Simulator Technology, 63216A, Synthetic Flight Simulator Development, 63227F, Advanced Simulator Technology, and Marine Corps Elements 63732M and 64557M. Work directly supports 64703N, Personnel Training, Simulation and Human Factors, 64714N, Air Warfare Training Devices, and 64715N, Surface Warfare Training Devices. The success achieved from development applications leads to prototype implementations or to first article procurement and to device acquisition.

The work is performed by the Naval Training Systems Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include new capabilities in simulation training technology and equipment, with principal focus on proof-of-concept, reduction of risk, and cost effectiveness in training device acquisition. It is estimated that Millions of dollars could be saved as a result of the work done under this Program Element.

FUTURE DIRECTIONS:

Work for this Program Element will continue in the areas of advanced simulation of visual and sensor systems, part-task/low-cost training alternatives, and expert systems.

PROJECT OVERVIEW

		88	89
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PROJECT: W1/73	SIMULATION AND TRAINING DEVICES	\$ 8.3M	\$ 6.5M
PE: 63733N	SIMULATION AND TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

PROJECT SYNOPSIS:

The objective of this multi-platform, technology demonstration effort is to demonstrate the potential of new technological advances for increasing operational effectiveness without involving major subsystem hardware development.

The effort addresses needs in all warfare areas, targeting training deficiencies identified in Warfare Area Assessments, Fleet R&D Objectives, Operational Requirements, and Fleet endorsements. The threat being addressed is the potential inability to meet the enemy's warfighting capability if our force is inadequately trained. This Project interfaces with all weapon system trainers that are to be operational in 1987-1991, and thus the products must be available for integration by this 1987-1991 time frame. Specific components to be developed under this study include visual and sensor simulation, improved software techniques for simulation, instructional systems methods, part-task trainer designs and artificial-intelligence-based trainer designs. A special characteristic of this Project is that it is the Navy's entire 6.3 effort in simulation and training devices. The Army and Air Force, as well as the Naval Sea Systems Command, support and track this multi-platform effort.

In FY 88, it is planned to: (a) complete design for the Helmet-Mounted Display's integration into F/A-18 training, (b) develop a flight simulation capability for engagement training, (c) complete program performance and interface design specifications for Battle Force Combat Systems Integrated Test and Training System, and complete computer program test plan.

In FY 89, it is planned to: (a) complete development of functional specifications for a deployable Hands-on Throttle and Stick Trainer for the F/A18, (b) complete system development of Radar Systems Integrated Test and Training, and (c) begin night attack simulation development effort for All-Weather Night Attack tactical aircraft trainers.

PAYOFF/UTILIZATION:

The payoffs of this Project include improvements in: (a) visual, motion, sensor, weapons fire, and maintenance simulation components and capabilities, (b) software techniques for simulation, and (c) instructional-systems methods, part-task trainer designs, and trainer designs based on artificial intelligence. Major improvements in capability to be achieved are reduced trainer acquisition risk, decreased simulation design costs, 40-60 percent reduction in life-cycle cost, and 10 percent reduction in operational system utilization costs.

In FY 87, accomplishments included: (a) completion of evaluation of Helmet-Mounted Display, (b) continued development of anti-submarine warfare (ASW) simulation, (c) completion of energy maneuverability display for Tactical Air Combat Training System, and (d) transitioned the Portable Aircraft Trainer to engineering development.

PROGRAM ELEMENT OVERVIEW

PE: 63739N NAVY LOGISTICS PRODUCTIVITY

DoD ORGANIZATION: NAVY

RESPONSIBLE ORGANIZATION: NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

FUNDING: FY88 \$ 1.0M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 1.5M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to improve the quality and productivity of Navy logistics organizations, such as shipyards, Naval Aviation Depots, and other shore-based maintenance activities, through designing, implementing, and evaluating a wide range of industrial management techniques employed by successful private-sector manufacturing companies and partially explored in previous Navy research and development projects.

Techniques considered in this effort include: (a) process-oriented quality control, (b) enriching and redesigning jobs, (c) maximizing utilization of new technology, (d) improved organization and individual measurement systems, (e) revised organization structures that promote communication and participation among all levels, and (f) development of improved information management and decision support systems. Since these techniques have not been applied in any comprehensive way to the Navy's repair/overhaul organizations, they first will be tailored to meet the unique characteristics of these organizations.

Some of the characteristics typical of Navy repair/overhaul organizations include a hybrid military-civilian management structure, outdated facilities and technology, lack of acceptable performance measurement systems, a repair/overhaul mission driven by Fleet operational needs, a highly structured and multi-layered organization structure, and a reward system that emphasizes caution over risk-taking. The process of implementing the various productivity improvement techniques will be based on a research-generated model of introducing and sustaining beneficial change in organizations.

Each Project in this Program will address different combinations of productivity-enhancing and will build successively on knowledge gained in previous demonstrations. This synergistic approach to Project integration will result in efficient use of Program funds and participating organization resources. Policies, procedures, and practices will be changed to facilitate full implementation across all Navy shipyards, air rework facilities, and intermediate maintenance activities.

RELATED ACTIVITIES:

Work to improve individual and group productivity has been undertaken in PEs 61153N, Defense Research Sciences, 61102A, Defense Research Sciences (Army), 62722A, Manpower, Personnel, and Training, 63731A, Manpower and Personnel and 62703F, Personnel Utilization Technology. Work units within PE 62233N and PE 63707N examined management practices and work measurement systems in depot repair facilities. Small groups of employees performing functions that varied from clerical to mechanical were exposed to experimental programs which increase individual and group productivity from 11-65. These results, in addition to other more contemporary approaches developed in an organizational systems context, are the basis for the advanced development undertaken in PE 63739N. Work done under a sub-project of this program to improve utilization of new technology will be used to support sub-projects under PE 63712N, Generic Logistics R&D, which are developing new technologies for rapidly manufacturing small batches of unstocked parts, and new integrated system diagnostic techniques.

The work is performed by the Navy Personnel Research and Development Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include improved quality and productivity of Navy maintenance and logistics systems, which will lead to lower costs and higher reliability and availability of Fleet weapon systems. This, in turn, means improved Fleet readiness and sustainability.

Work within Program Element 62233N and Program Element 63707N are related to this effort. In those efforts, management practices and work measurement systems in depot repair facilities were examined. Small groups of employees performing functions that varied from clerical to mechanical were exposed to experimental programs which increased individual and group productivity from 11 to 65 percent. These results, in addition to other more contemporary approaches developed in an organizational systems context, are the basis for the advanced development undertaken in Program Element 63739N. Work done under a sub-Project of this Program to improve utilization of new technology will be used to support sub-Projects under Program Element 63712N, Generic Logistics R&D, which are developing new technologies for rapidly manufacturing small batches of unstocked parts, and new integrated system diagnostic techniques.

FUTURE DIRECTIONS:

Beyond FY 90, it is planned to continue designing, evaluating, and implementing various productivity improvement techniques, using a research-generated model of introducing and sustaining beneficial change in organizations.

PROJECT OVERVIEW

		88	89
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PROJECT: T1885	NAVY LOGISTICS PRODUCTIVITY	\$ 0.6M	\$ 1.0M
PE: 63739N	NAVY LOGISTICS PRODUCTIVITY		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to design, develop, test, and evaluate new process control techniques for improving the quality and productivity of the repair and overhaul of Navy ships and aircraft.

These include: (a) monitoring processes to keep them in control rather than relying primarily on final product inspection, (b) training management and workers alike in simple statistical methods, (c) establishing alternative management structures and practices to deal with continuous quality improvement, and (d) a completely revised quality audit approach.

Quality control techniques have been successfully adopted in private-sector manufacturing organizations and in foreign countries, most notably Japan. Many U.S. organizations have been unsuccessful in their attempts to implement and sustain them. Although these failed attempts have often been attributed to cultural differences between U.S. and Japanese firms, this does not account for the successful implementations.

A greater understanding of the factors underlying success and failure is needed in order to make wide-scale Navy application of these techniques possible. This project will examine the organizational, psychological and technical factors responsible for facilitating or inhibiting the full utilization of these techniques in a Navy maintenance and support environment. Initial emphasis will be on tailoring and introducing the quality management technique known as statistical process control, which was successfully introduced in Japan after World War II by W. Edward Deming and is largely responsible for that country's present world leadership in quality and productivity growth.

The first phase of the Project is directed at improving the quality of aircraft engine overhauls in a Naval Air Rework Facility (NARF). Organization structures, policies, and responsibilities will be modified to tailor the technique to the NARF. Jobs of overhaul mechanics will be redesigned using the mechanics themselves as the principle source of information for the redesign effort. Criteria and measures of key quality variances will be identified and incorporated in a new decision support system which will be used to monitor process quality. An evaluation will be conducted to determine the most effective combination of organization, technical and human resource factors contributing to successful implementation of the new process control technique. Information resulting from this evaluation will be used to facilitate the transfer of the techniques to other product lines and functions at the demonstration site. Lessons learned about the process of introducing and sustaining these techniques will be applied to other NARFs.

In FY 88, it is planned to: (a) develop evaluation criteria and measures, and (b) collect baseline data on cost of quality.

In FY 89, it is planned to: (a) expand application of statistical process control throughout the test site, (b) develop and deliver advanced statistical process control training, (c) develop a process-oriented quality

audit plan, (d) collect data on cost savings and quality improvements, (e) analyze test data, and (f) report on progress and modify the implementation approach based on interim evaluation.

PAYOFF/UTILIZATION:

The payoffs of this Project are new process control techniques applied to Navy maintenance activities, which will lead to increased quality and productivity of the repair and overhaul of Navy ships and aircraft. This will offer increased product quality at much lower cost.

This Project was a new start in FY 86. In FY 86, accomplishments included:
(a) conducted site preparation - management orientation and indoctrination,
(b) conducted initial training on basic statistical methods, and (c) prepared pilot projects by selecting problems and applying process control techniques.

PROJECT OVERVIEW

		88	89
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PROJECT: T1886	NEW TECHNOLOGY	\$ 0.4M	\$ 0.5M
PE: 63739N	NAVY LOGISTICS PRODUCTIVITY		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to improve the process of identifying, applying, and evaluating new technology in Navy shore support activities.

This will be accomplished by: (a) developing and evaluating technology transfer and evaluation models, (b) identifying technology domains and boundary conditions related to application, (c) using technology transfer literature, case histories, and interventions to test models, concepts and specific techniques, (d) identifying and testing organizational, human resource and technological factors contributing to effective implementation and utilization, and (e) developing guidelines to identify emerging technologies, match them to problems, and implement and use the technologies effectively in operational settings.

A recent Congressional study concluded that technology utilization is less than 30 percent of capacity. This Project, accelerated to begin in FY 86, instead of FY 87, is in response to a Congressional request to conduct a three-year feasibility study of a concept to identify and apply state-of-the-art technology to critical repair, maintenance, and acquisition problems in DoD support functions.

In FY 88, it is planned to: (a) evaluate the university-based technology transfer center concept, (b) complete the demonstration of CLIP Probe technology development, and (c) evaluate technological solutions.

In FY 89, it is planned to: (a) select emerging diagnostic and manufacturing technologies for utilization demonstration, (b) develop an implementation and utilization demonstration plan, (c) select and prepare demonstration site(s), (d) identify evaluation criteria and measures, (e) collect baseline data, and (f) develop a full-scale operational utilization model for implementing emerging diagnostic and manufacturing technologies.

PAYOFF/UTILIZATION:

The payoff of this Project is more effective application of new technologies in Navy shore support activities, and thus increased productivity.

FY 87 accomplishments included: (a) investigation and determination of barriers and approaches to university-based technology transfer, and (b) assembly of components of CLIP (Combined Laser Inspection and Processing) Probe laboratory equipment.

PROGRAM ELEMENT OVERVIEW

PE: 64703N PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS

DoD ORGANIZATION: NAVY

FUNDING: FY88 \$ 1.0M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 1.0M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to develop systems that are both innovative and cost effective to help ensure Fleet readiness.

Computer-based manpower and personnel systems ensure Navy combat readiness by raising the overall quality of manpower accessed into the Navy and assigned to the Fleet. The Computerized Adaptive Testing system for the Armed Services Vocational Aptitude Battery (CAT-ASVAB) will be much more cost-effective than the existing paper-and-pencil methods. A simulation of personnel inventory flows is required to analyze and adjust enlisted rotation patterns to maintain Fleet readiness by optimizing short-term savings in Permanent Change of Station costs versus long-term savings in retention costs.

In FY 88, it is planned to: (a) develop a prototype sea/shore rotation management system, and (b) employ the score equating phase at several MEPS to equate CAT-ASVAB.

In FY 89, it is planned to: (a) conduct an Initial Operational Test and Evaluation (IOT&E) of CAT-ASVAB, and (b) develop, test, and evaluate rotation models for sample skills.

In FYs 88/89, it is planned to build on earlier work on both major efforts and proceed to full-scale implementation plans for the CAT and complete the development of sea/shore rotation models for enlisted ratings.

RELATED ACTIVITIES:

DoD work related to R1822 is being conducted under the following Program Elements: 62722A, Personnel and Training; 62233N, Mission Support Technology (Personnel and Training Technology); 62703F, Personnel Utilization Technology; 63731A, Manpower and Personnel; 63707N, Manpower and Personnel Systems; 63732M, Marine Corps Advanced Manpower Training Systems; and 63704F, Manpower and Personnel Systems Technology. Primary sources of training technology transition to this PE are Personnel and Training Technology in PE 62233N and PE 63720N, Education and Training. Joint Service Program Element 64722A, Education and Training Systems, synthesizes the efforts of all the Services related to CBI technology and will be a major contributor to engineering development of non-Navy developed technologies.

The work is performed by the Navy Personnel Research and Development Center.

PAYOFF/UTILIZATION:

The payoff of this Program Element is improvement in the overall quality of manpower accessed into the Navy and assigned to the Fleet.

The Computerized Adaptive Testing system for the Armed Services Vocational Aptitude Battery (CAT-ASVAB) will reduce administration time at Military Entrance Processing Stations, improve scoring accuracy, provide better security, and lend itself to quick, accurate, standardized revisions. This test-administration system will be far more cost-effective than the existing paper-and-pencil methods.

NAVY/64703N

FUTURE DIRECTIONS:

Beyond FY 89, it is planned to continue development and implementation efforts for the CAT-ASVAB.

PROJECT OVERVIEW

		88	89
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PROJECT: R1822	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS	\$ 1.0M	\$ 1.0M
PE: 64703N	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to develop and evaluate systems to enhance the Navy's capabilities in recruitment, selection, assignment, attrition, retention, and personnel utilization.

When instructional technologies successfully complete advanced development (6.3), they are prepared for generalized and standardized use throughout the Navy. This Project responds to Congressional and DoD requirements to increase the use of technology to increase training efficiency and effectiveness and to improve training software transportability.

In FY 88, it is planned to: (a) develop prototype sea/shore rotation management system, and (b) employ score equating phase at several MEPS to equate CAT-ASVAB with the paper-and-pencil ASVAB.

In FY 89, it is planned to: (a) conduct the Initial Operational Test and Evaluation (IOT&E) of CAT-ASVAB.

PAYOFF/UTILIZATION:

The payoff of this Project is improved combat readiness by raising the overall quality of manpower assigned to the Fleet.

In FY 87, accomplishments included: (a) a pretest of CAT-ASVAB in an operational setting, (b) enhanced the system and confirmed the feasibility of a CAT-ASVAB system, and (c) found the score equating phase of CAT-ASVAB operational.

PROGRAM ELEMENT OVERVIEW

PE: 64714N

AIR WARFARE TRAINING DEVICES

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 0.5M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 1.9M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of this Program Element is to provide a portable/deployable training device to meet Fleet-identified requirements for recurrent training of sensor operators.

Operator analysis and interpretation of both acoustic and radar imagery are highly perishable skills. Operator ability to perform these tasks is directly related to weapon system success. This effort responds to an operational requirement for a deployable training device (OR #034-05-87).

Projects under this Program Element will develop and procure: (a) an Operational Flight Trainer which offers safe flight training, lower training time, and lower capital investment in operational aircraft used for training, (b) a Weapons Tactics Trainer for mission training of the air tactical officer and the sensor operator, and (c) a full set of maintenance trainers to teach troubleshooting and repair of the aircraft.

PE 63733N, Training Device Technology, has provided advanced development effort for acoustic signal modeling for training devices. Small Business Innovative Research contractor is performing comparable technology demonstration for modeling inverse synthetic aperture radar images on training devices. W1878 will result in transition from a technology base effort to a prototype trainer to satisfy validated Fleet requirement. Contractor-funded and Independent Research and Development efforts on acoustic sensor simulation have substantially reduced the technical risks associated with this project.

In the FY 87 budget, this Program Element's only Project is planned Project W1878, ASW Table Top Trainer, Project W1112, SH-60B Trainer, was terminated.

RELATED ACTIVITIES:

PE 63733N, Training Device Technology, has provided advanced development effort for acoustic signal modeling for training devices. Small Business Innovative Research contractor is performing comparable technology demonstration for modeling inverse synthetic aperture radar images on training devices. W1878 will result in transition from a technology base effort to a prototype trainer to satisfy validated fleet requirement. Contractor funded and Independent Research and Development efforts on acoustic sensor simulation have substantially reduced the technical risks associated with this project.

The work is performed by the Naval Training Systems Center.

PAYOFF/UTILIZATION:

The payoffs for this Program Element include the provision of a training device that is the only training capability for the inverse synthetic aperture radar being installed on P-3, S-3, and A-6 aircraft.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: W1878	ASW TABLE TOP TRAINER	\$ 0.5M	\$ 1.9M
PE: 64714N	AIR WARFARE TRAINING DEVICES		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to upgrade the operational capability of Navy Anti-Submarine Warfare (ASW) aircraft by introducing improved acoustic and non-acoustic sensors.

The AN/UYS-1 Advanced Signal Processor and AN/APS-137 Radar will provide sensor commonality in primary air ASW weapon systems.

In FY 87, this project was deferred due to elimination of funds by Congressional action.

In FY 88, it is planned to make contract awards for full-scale development of both training device and associated sensor simulation courseware.

In FY 89 it is planned to continue the system development.

PAYOFF/UTILIZATION:

The payoffs of this Project include the upgrading of the operational capability of Navy ASW aircraft by the introduction of improved acoustic and non-acoustic sensors.

PROGRAM ELEMENT OVERVIEW

PE: 64715N

SURFACE WARFARE TRAINING

DoD ORGANIZATION:

NAVY

FUNDING:

FY88 \$ 16.8M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 18.8M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of this Program Element is to support the Chief of Naval Operations Surface Warfare Sponsor mission by improving readiness and training.

This Program Element was developed to satisfy the requirements of the Fleet and the Chief of Naval Education and Training for development of prototype surface warfare training devices to provide improved training, thereby improving operational readiness, efficiency, and safety while decreasing training time and cost. Specifically, this Program Element supports the development of prototype surface warfare training devices which are not developed as part of a parent weapon system development process or not characterized by emerging training device technology (and therefore included within Program Element 64703N, Training Device Prototype Development).

Program Element 64715N has four general areas of effort: (a) operator/team trainers in the area of electronic/acoustic surveillance in ASW (Anti-Submarine Warfare) operations for existing or planned operational equipment, (b) maintenance trainers for various electronic/acoustic devices and trainers in the operation of engine room equipment for existing and new development engineering equipment, (c) modification, update, consolidation, or replacement of existing training devices, and (d) other training problem areas which can benefit by the use of stimulation/simulation training device techniques.

In FY 88, it is planned to: (a) continue establishing baseline and commence contractual competitive procurement for the Surface TOMAHAWK Trainer, and negotiate the contract and award for prototype development, (b) complete trainer capability tests and trainer course validations, and begin Navy support of the LAMPS MK III/SQQ-89 Training System, (c) modify the Tactical Advanced Combat Direction Electronic Warfare (TACDEW) by fabricating and assembling the hardware and software for the system, and install and deliver the Environmental Generation and Control System (EGCS), (d) continue design development, conduct a sponsor design review, continue fabrication for Surface Tactical Trainer 14A12, develop baseline and specification for Trainer 20A66, and issue a Request for Proposal (RFP) to industry, (e) continue analysis of selected surface warfare training system/device issues, continue providing Instructional System Development support, program definition and investigation of contractor capabilities, and coordinate and distribute analysis results as required, and (f) award contract, begin the design of the Landing Craft Air Cushion Operation Trainer (LCAC), develop software, and continue the design, fabrication, and assembly of the trainer.

RELATED ACTIVITIES:

Program Elements 62233N (Mission Support Technology) and 63733N (Simulation and Training Devices) develop and demonstrate technology for application to this program.

The work is performed by the Naval Training Systems Center, Naval Undersea Systems Center, Naval Ocean Systems Center, and Naval Ocean R&D Activity.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved training, (b) reduced training costs, (c) safer training conditions, and (d) enhanced operational readiness.

The high cost of operational training exercises at sea continues to make it imperative to develop, improve, and make extensive use of alternative shipboard methods for individual and team training. Although they are complex and continuously evolving, these training systems will provide realistic training at a fraction of the cost of the same training at sea. They also expose the trainees to a broad range of scenarios that could not be carried out in live situations. The end product is an enhancement of operational readiness.

FUTURE DIRECTIONS:

In the outyears it is planned to: (a) complete fabrication, conduct acceptance testing, and schedule initial operational capability for the Surface TOMAHAWK Trainer, (b) install and deliver the TACDEW, and schedule the initial operating capability, (c) complete fabrication of Surface Tactical Trainer 14A12, deliver to site and begin training, (d) award contract for Surface Tactical Trainer 20A66, and make initial delivery to planned site, and (e) continue work on the installation and testing of the LCAC.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: S1126	SURFACE TOMAHAWK	\$ 4.4M	\$ 0.0M
PE: 64715N	SURFACE WARFARE TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to design, develop, fabricate and install TOMAHAWK surface missile operator/subteam trainers.

The device will train personnel in the total over-the-horizon combat (defense/offense) operations of this weapon system. Four suites of the device will provide operator training starting with simple 'knobology' and progressing through TOMAHAWK Weapons Control System subteam training. The operator consoles will consist of actual GFE-Operator Interactive Display Terminal (OIDT) consoles which provide the same controls and indicators for data entry, information display, system monitoring, and control of the OIDT as provided in the operational weapons system. Program functions and hardware reactions not present will be simulated in a simulation computer. Additionally, outside inputs such as satellite communication, OUTBOARD, ships navigation system and Link 11 inputs will be provided or simulated.

In FY 88 it is planned to procure long lead items.

In FY 89, it is planned to: (a) award the contract January 1989 for system design, and (b) procure additional GFE.

PAYOFF/UTILIZATION:

The payoffs of this Project include enhancement of the Navy's ability to train for battle, specifically, the ability to utilize the TOMAHAWK cruise missile in the anti-ship mode in both battle group and battle force operations.

FY 86 accomplishments included: (a) commencing the establishment of a functional baseline, and (b) contractual competitive procurement.

PROJECT OVERVIEW

	88	89
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PROJECT: S1140	TACTICAL ADVANCED COMBAT \$ 3.3M	\$ 2.5M
	DIRECTION ELECTRONIC WARFARE (TACDEW) MODIFICATIONS	
PE: 64715N	SURFACE WARFARE TRAINING	
DoD ORGANIZATION:	NAVY	
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER	

PROJECT SYNOPSIS:

The objective of this Project is to achieve a progressive redesign of the environment generation/control system and control systems of the Tactical Advanced Combat Direction and Electronic Warfare (TACDEW) device.

The TACDEW training complexes located at Fleet Combat Training Centers Atlantic and Pacific are a vital link in the training chain for integrated combat system team training. This training system will have a direct impact on the Navy's ability to train for battle, specifically, the Navy's capability for integrating combat systems and weapon system trainers in multi-threat/multi-team exercises for both battle group and battle force training which will represent actual operational situations in any area of the world. During the operational life of these complexes, numerous add-on capabilities have been incorporated and frequent changes have been made to the Master Simulation Program to maintain currency with fleet training requirements. This continued expansion of the complexes, coupled with obsolescence of the computer system originally installed in TACDEW, have negated the potential for further growth to accommodate training for emerging combat system capabilities identified through the Navy Training Plan process. The project will include: (a) replacement of the obsolescent computer system with modern computational capabilities, (b) redesign of the Master Simulation Program, (c) substitution of the Generic Radar Display System subsystem to provide capabilities representative of modern radar equipment, and (d) incorporation of a state-of-the-art problem control and evaluation subsystem. The modified TACDEW system will support combat system operational training at all required levels, including individual operator, subteam, and combat system through the year 2000.

In FY 88, it is planned to: (a) code/test/integrate the warfare functions software developed during FY 87, and (b) procure and integrate major items of hardware.

In FY 89, it is planned to: (a) complete Phase III development, (b) complete installation and delivery of the trainer (August 1989), and (c) schedule initial operating capability for November 1989.

PAYOFF/UTILIZATION:

The payoffs of this Project include improvement of the Navy's ability to train for battle, specifically, the Navy's capability for integrating combat systems and weapon system trainers in multi-threat/multi-team exercises for both battle group and battle force training which will represent actual operational situations in any area of the world.

In FY 87, accomplishments included: (a) completion of fabrication of the Environmental Generation and Control System (EGCS), and (b) completion of all necessary experimental work, and now ready for full-scale development.

PROJECT OVERVIEW

		88	89
		-----	-----
PROJECT: S1427	SURFACE TACTICAL TEAM TRAINER	\$ 5.5M	\$11.2M
PE: 64715N	SURFACE WARFARE TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to develop a generic training system which will replace obsolete/obsolescent devices to provide team procedural and tactical training/evaluation in a multi-threat environment for conventional and tactical data-equipped ships.

The first device to be developed, Device 14A12, will replace the obsolete devices currently used to provide Anti-Submarine Warfare (ASW) team training. The 14A12 will have the capability to exercise the essential procedures of an ASW engagement and will simulate current and future emerging passive and active sensors operating in a common ocean model. A natural progression of Device 14A12, Device 20A66, is planned to replace the ASW Coordinated Tactics Trainers, Devices X14A6 and 14A6, built in the 1960s. The 20A66 trainer will provide multiple platform/multi-threat procedural, tactical, and decision-making training for single units up to battle group size. Each trainer will be composed of multiple ship, submarine, and aircraft 'command centers' configured with multi-purpose equipment which will simulate the sensor, weapon, and communication capabilities of the platforms represented.

In FY 88, it is planned to: (a) continue 14A12 development with procurement and integration of system hardware, and (b) code, conduct module test, integrate, and conduct system testing.

In FY 89, it is planned to: (a) complete, deliver, and install Contractor Software/System testing by July 1989, and (b) commence development of the 20A66.

PAYOFF/UTILIZATION:

The payoff of this Project includes improvement of the Navy's ability to train for battle; specifically, the 14A12 and 20A66 will provide greater capability for existing and emergent surface combatants to conduct multi-platform ASW operations against submarine threats and also comply with the reduced OPTEMPO/Fuel constraints.

In FY 87, accomplishments included: (a) completed Hardware Design freeze, (b) completed Sponsor Review, and (c) completed Critical Design review for 14A12.

PROJECT OVERVIEW

		88	89
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PROJECT: S1436	SURFACE WARFARE TRAINING ANALYSIS	\$ 0.5M	\$ 1.5M
PE: 64715N	SURFACE WARFARE TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

PROJECT SYNOPSIS:

The objectives of this Project are: (a) to conduct front-end analysis of specific training problems to include definition of requirements/shortfalls, training objectives, and student loading, and (b) to identify alternate solutions with related cost/training effectiveness trade-offs.

The HARDMAN study continues to develop training requirements for the Surface Warfare Community by analyzing and identifying present and future training needs and manpower requirements for major system acquisitions. To respond to those requirements, individually tailored, detailed trainer/training systems selection procedures must be developed.

Instructional System Development (ISD) analysis methods are used to produce an appropriate functional specification for each trainer/training system. Some of these analyses are: (a) determination of specific training objectives, (b) determination of alternative solutions to the training needs/requirements, and (c) cost/training effectiveness studies. This effort extends beyond the HARDMAN program since functional specifications must be developed and tailored to individual training systems/devices before contracts are awarded. This front-end analysis effort includes those parts of the ISD methods used: (a) to tailor the device or system to specific training objectives, (b) to ensure inclusion of latest technology, and (c) to avoid "gold plating" by cost/training effectiveness trade-offs. Thus, the individual elements of the specific training system will most effectively reflect the requirements and needs identified by the HARDMAN program.

In FY 88, it is planned to conduct research and development of training support in shore-based and embedded training for Submarine Combar Systems Team Training. This project requires research and development on display and feedback for shore-based and embedded training, and to augment and modify intelligent targets developed for Device 21A43.

In FY 89, it is planned to continue analyses of training situations within the Surface Warfare Training System in order to define the performance characteristics of the training equipment needed to achieve the training objectives as derived by the previous analyses.

PAYOFF/UTILIZATION:

The payoffs of this Project include the identification of alternate solutions to specific training problems, with related cost/training effectiveness trade-offs, through conducting a front-end analysis of problems to include definition of requirements/shortfalls, training objectives, and student loading.

In FY 87, accomplishments included: (a) continued training analysis and Instructional System Development support, and (b) continued program definition and investigation of contractor capabilities.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: S1834	LANDING CRAFT AIR CUSHION (LCAC) OPERATOR TRAINER	\$ 3.1M	\$ 3.6M
PE: 64715N	SURFACE WARFARE TRAINING		
DoD ORGANIZATION:	NAVY		
RESPONSIBLE ORGANIZATION:	NAVAL TRAINING SYSTEMS CENTER		

PROJECT SYNOPSIS:

The objective of this Project is to provide an operator trainer for Landing Craft, Air Cushion (LCAC) vehicles. The LCAC Full Mission Trainer, Device 10G6, will provide LCAC crews (craftmaster, engineer, navigator, and group commander) training in the skills, procedures and techniques required to operate the LCAC. Training will include normal and emergency procedures and proficiency. This device will have direct impact upon the Navy's ability to train for battle; it affords more flexibility and more versatile training in preparing LCAC crews in all phases of craft operations and at a significant cost reduction over use of actual craft. Training exercises under instructor and computer software control will depict the operational characteristics of the LCAC and will provide a dynamic environment within which to learn the skills and maintain proficiency to safely operate and control the LCAC.

In FY 88, it is planned to: (a) continue and complete detailed hardware and software design, (b) procure the land mass and seascape for the visual simulation system, (d) procure the motion simulation system, and (e) fabricate the student station, including the simulated cabin of the LCAC craft design.

In FY 89, it is planned to: (a) continue development of FMT computer programs, (b) complete trainer hardware fabrication, (c) conduct critical design review, (d) achieve contractor acceptance of motion and visual systems from subcontractors, (e) install motion and visual systems on FMT, and (f) conduct hardware/software integration and testing at contractor's facility.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) development of a LCAC operation trainer that will provide LCAC crews (Craftmaster, Engineer, Navigator and Group Commander) training in the skills, procedures, and techniques required to operate the LCAC in its operational environment, and (b) enhanced ability of the Navy to train for battle, specifically, more flexible and versatile training in preparing LCAC crews in all phases of craft operations, and at a significant cost reduction (e.g., fuel, craft maintenance) over use of actual craft for training.

In FY 87, accomplishments included continued design, fabrication, and assembly of the trainer.

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04206	ONR	5.722	6.324	ET	6	PERSONNEL AND TRAINING
RR04208	ONR	2.497	2.759	MP	3	GROUP PSYCHOLOGY
RR04209	ONR	2.185	2.415	HF	4	ENGINEERING PSYCHOLOGY
		10.405	11.498			TOTAL IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	10.404	11.498

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CC31-521	NPRDC	0.246	0.287	MP	2	MANPOWER TECHNOLOGY
CC31-522	NPRDC	0.231	0.276	ET	4	TRAINING TECHNOLOGY
		0.478	0.564			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						0.477 0.563

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33M20	NPRDC	2.660	2.760	MP	2	MANPOWER AND PERSONNEL TECHNOLOGY
RM33T23	NPRDC	1.682	1.746	ET	6	EDUCATION AND TRAINING TECHNOLOGY
RM33T24	NTSC	3.005	3.118	ST	6	SIMULATION AND TRAINING DEVICE TECHNOLOGY
		7.348	7.625			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62233N :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						7.347 7.624

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62234N						SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA
RM34H20	NPRDC	3.214	3.333	HF	4	HUMAN FACTORS TECHNOLOGY
		3.214	3.333			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62234N :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						3.214
						FY89
						3.333

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63701N					HUMAN FACTORS ENGINEERING DEVELOPMENT
R1771	NPRDC	1.661	1.605 HF	4	SHIP HUMAN FACTORS ENGINEERING
W0542	NADC	0.872	0.849 HF	4	AIR HUMAN FACTORS ENGINEERING TECHNOLOGY
		----- 2.533	----- 2.454		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63701N :			FY88		FY89
THE PRESIDENT'S BUDGET, JANUARY 1988			----- 2.533		----- 2.454

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63707N						MANPOWER AND PERSONNEL SYSTEMS
R1770	NPRDC	3.038	3.976	MP	2	MANPOWER AND PERSONNEL SYSTEMS
		-----	-----			
		3.039	3.977			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63707N :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 3.038 3.976

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63720N						EDUCATION AND TRAINING
R1772	NPRDC	5.065	6.153	ET	6	EDUCATION AND TRAINING
		5.066	6.154			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63720N :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						5.065
						FY89
						6.153

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63732M						ADVANCED MANPOWER/TRAINING SYSTEMS
C0073	HQMC	1.861	5.106	MP	1A	HUMAN RESOURCES MANAGEMENT AND FORECASTING
		-----	-----			
		1.862	5.107			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63732M :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 1.861 5.106

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63733N					SIMULATION AND TRAINING DEVICES
W1773	NTSC	8.276	6.451 ST	6	SIMULATION AND TRAINING DEVICES
		-----	-----		
		8.276	6.452		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63733N :					FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988					----- 8.276 6.451

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(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63739N					NAVY LOGISTICS PRODUCTIVITY
T1885	NPRDC	0.577	0.976 HF	3	NAVY LOGISTICS PRODUCTIVITY
T1886	NPRDC	0.384	0.488 HF	3	NEW TECHNOLOGY
		0.962	1.464		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63739N :					FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988					0.961 1.464

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64703N						PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
R1822	NPRDC	0.978	1.025	MP	2	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
		----- 0.979	----- 1.025			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64703N :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 0.978 1.025

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64714N						AIR WARFARE TRAINING DEVICES
W1878	NTSC	0.500	1.919	ST	6	ASW TABLE TOP TRAINER
		0.501	1.919			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64714N :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						0.500
						FY89
						1.919

(CONTINUED)

(CONTINUATION)

III-B-1: LISTING OF NAVY PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715N						SURFACE WARFARE TRAINING
S1126	NTSC	4.427	0.044	ST	6	SURFACE TOMAHAWK
S1140	NTSC	3.324	2.484	ST	6	TACTICAL ADVANCED COMBAT DIRECTION ELECTRONIC WARFARE (TACDEW) MODIFICATIONS
S1427	NTSC	5.499	11.193	ST	6	SURFACE TACTICAL TEAM TRAINER
S1436	NTSC	0.474	1.451	ST	6	SURFACE WARFARE TRAINING ANALYSIS
S1834	NTSC	3.105	3.581	ST	6	LANDING CRAFT AIR CUSHION (LCAC) OPERATOR TRAINER
		----- 16.830	----- 18.753			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64715N :			FY88		FY89	
			-----		-----	
THE PRESIDENT'S BUDGET, JANUARY 1988			16.829		18.753	

III.C. AIR FORCE PROGRAM ELEMENT AND PROJECT SYNOPSES

PE	TITLE	PAGE
61102F	DEFENSE RESEARCH SCIENCES	III-C-1
62202F	HUMAN SYSTEMS TECHNOLOGY	III-C-16
62205F	PERSONNEL, TRAINING AND SIMULATION	III-C-21
63106F	LOGISTICS SYSTEMS TECHNOLOGY	III-C-40
63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY	III-C-48
63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY	III-C-62
63751F	TRAINING SYSTEMS TECHNOLOGY	III-C-69
64227F	FLIGHT SIMULATOR DEVELOPMENT	III-C-73

Table III-C-1: Listing of Projects - Lists projects for each AIR FORCE program element. Lists contain performing organization, funding, Congressional Category and goal information.

III-C-i

PROGRAM ELEMENT OVERVIEW

PE: 61102F

DEFENSE RESEARCH SCIENCES

DoD ORGANIZATION:

AF

FUNDING:

FY88 \$ 8.6M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 9.6M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objectives of the Manpower, Personnel and Training (MPT) portion of this Program Element are to: (a) improve selection of personnel for appropriate jobs on the basis of measured mental abilities and sensory-motor skills, (b) design equipment to optimally match human information processing characteristics, and (c) monitor human workload and performance.

This Science and Technology Base Program Element exclusively supports Air Force research efforts, comprised of in-house investigations in Air Force Laboratories and extramural activities in academia and industry. The Program Element funds broad-based scientific and engineering basic research dedicated to stimulating new ideas in areas pertinent to the Air Force mission: (a) aerospace structures and aerodynamics, (b) materials, propulsion and power, (c) electronics, (d) computer science, (e) directed energy and conventional weapons, (f) life sciences, and (g) terrestrial, atmospheric, and space sciences. The efforts contained in this program do not duplicate tasks conducted under the Strategic Defense Initiative, or under the University Research Initiative.

Special areas of interest in FY88 include: (a) neural net computer architectures and processing, (b) nonlinear optics, (c) hypersonic flight, (d) high energy density propellants, (e) biotechnology for advanced aerospace materials, and (f) cognitive aspects of human performance.

Major new initiatives in FY89 include: (a) multifunctional wafer level union, (b) nonlinear interactive flow control and flight mechanics, (c) neurophysiology of sensory information processing, and (d) constituent mechanics of inhomogeneous materials.

The effort also enhances the Air Force research capability by improving the technological base in those areas crucial to the Air Force. Examples are: (a) support of a summer faculty and graduate student program wherein university researchers spend ten weeks during the summer working at an Air Force laboratory, (b) a resident research associateship and university resident research program wherein researchers can spend up to a year at an Air Force laboratory, and (c) several graduate assistantships and laboratory graduate fellowship programs in technology areas of critical interest to the Air Force.

In FY88, the initiative in Cognitive Aspects of Human Performance will reach full scale. The Armstrong Aerospace Medical Research Laboratory and the Air Force Human Resources Laboratory will begin collaborative research as part of this initiative, examining how humans allocate mental resources to perform complex tasks in which several things must be accomplished in the same time frame. The extramural part of the program will be expanded to examine fundamental aspects of thinking, problem-solving, judgement, and decision-making in conditions of uncertainty.

The vision research and auditory research programs will continue to study how sensory mechanisms allow humans to extract and analyze information from the environment and use that information to guide their actions.

RELATED ACTIVITIES:

Program coordination among government agencies is achieved through annual

interagency meetings and data exchange with the Army, Navy, National Science Foundation, Department of Energy, National Aeronautics and Space Administration (NASA), Federal Aviation Administration, Defense Advanced Research Projects Agency, Defense Nuclear Agency, and other Federal research activities. Other means of coordination include annual briefings to the Under Secretary of Defense for Research and Engineering, attendance at technical symposia and topical reviews covering research areas of common interest. Examples of coordinating and joint activities are: (a) a joint program in hypersonic aerodynamics is conducted in conjunction with the Navy and NASA, (b) cloud physics is being jointly funded with the Navy and the Army using a jointly funded facility, (c) a Joint Services Electronics Program supports relevant research at universities to solve military electronics problems, (d) an Interagency Working Group on Neuroscience coordinates efforts among federal agencies, and (e) mathematical sciences are coordinated through the Interagency Committee for Extramural Mathematics Programs. In addition, particularly effective coordination is accomplished on an informal basis among individual Air Force program managers and their counterparts in other agencies.

The Air Force basic research program is conducted in Air Force laboratories and under extramural grants and contracts with academic institutions and industry. The entire program is managed by the Air Force Office of Scientific Research. Research now underway includes in-house efforts at the Air Force Wright Aeronautical Laboratories, Air Force Armament Laboratory, Air Force Weapons Laboratory, Air Force Rocket Propulsion Laboratory, Air Force Geophysics Laboratory, Air Force Human Resources Laboratory, USAF School of Aerospace Medicine, Armstrong Aerospace Medical Research Laboratory, Frank J. Seiler Research Laboratory, USAF Academy, and the Rome Air Development Center.

The Human Resources Project of this Program Element provides the knowledge required to ensure that Air Force personnel can operate, maintain, and manage complex equipment systems in demanding environments.

PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Program Element is enhanced knowledge which can: (a) help in the development of new training devices, (b) improve the methods of assessment and prediction of human abilities for better selection and training, and (c) enhance the design of manned weapons systems.

Specific accomplishments for FY 86 include: (a) proposal of a new theory for the early stages of human visual processing, and (b) development of an innovative method to record and analyze electrical activity of the human brain.

Scientists in many disciplines are interested in early processing because it underlies the human ability to visually recognize everyday objects and because it can help the development of computer vision. Early processing includes the many transformations of retinal images occurring in sensory pathways to the brain and in the brain itself. This new theory is important because, among other features, it explains how early processing could generate perceived contours that define boundaries among objects, an essential step preceding recognition of the objects. Some contours are easily defined, e.g., large differences in brightness or color. Many important contours in an image, however, are more complex and cannot be described this way. The theory describes two mechanisms in early sensory processing that may explain the human ability to perceive simple and complex contours. It includes a mathematical model of neural circuits that can perform the necessary computations on an image. This research is stimulating interaction among neuroscientists, perceptual psychologists, and computer scientists concerned with visual processing and developing machines capable of recognizing images.

Recordings are made from as many as 60 electrodes around the scalp as subjects perform visual and motor tasks.

FUTURE DIRECTIONS:

Major thrusts for several years will continue in the areas of: (a) visual information processing, (b) development of new workload metrics based on researching new biocybernetics techniques, and (c) performance prediction based on systematic investigation of parameters of learning ability. Several reviews of contract and in-house work are held each year in the thrust areas. These are a valuable source of information exchange since representatives of other military services and agencies are invited to participate.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-A4	COGNITIVE SCIENCE	\$ 2.5M	\$ 2.8M
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE OFFICE OF SCIENTIFIC RESEARCH		

PROJECT SYNOPSIS:

The objective of this Task is to support basic research in cognitive science.

This research program will support basic theoretical and experimental work on human cognitive processing, including areas such as representation and utilization of perceptual knowledge, attention, memory representation, and the structure of knowledge. Both behavioral and biological approaches will be considered, and other topics may also be included as the program develops.

A portion of this new program will provide awards to scientists at the Air Force Human Resources Laboratory, where a large test facility has been built for research on human learning abilities. This unique facility includes 30 testing stations with microcomputers and associated equipment and a mainframe computer for reducing data. Several hundred new subjects are available for testing each week. A current research project is measuring individual differences in processing speed and working memory capacity to predict learning performance; however, many other studies are planned. Awards will support visits to this facility for collaborative research.

In the FY88 program the initiative in Cognitive Aspects of Human Performance will reach full size. Air Force equipment systems have become so complex and the flow of information in tactical situations so rapid that the operator's ability to process information, make appropriate decisions, and act quickly is overwhelmed, therefore, plans in FY88 include: (a) examine the ways in which skilled individuals, such as pilots, process information and make decisions under heavy workloads, (b) study the mechanisms of attention, multiple-task performance, and memory, (c) begin collaborative research between Armstrong Aerospace Medical Research Laboratory and Air Force Human Resources Laboratory as part of the initiative, (d) examine how humans allocate mental resources to perform complex tasks in which several things must be accomplished in the same time frame, and (e) expand the extramural part of this project to examine fundamental aspects of thinking, problem-solving, judgement, and decision-making in conditions of uncertainty.

Plans for the FY89 program include the continuation of the cognitive program, with strong commitment to both Air Force laboratory and university research.

PAYOFF/UTILIZATION:

The payoff of this Task will be improved understanding of human cognitive processing.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-A5	VISUAL INFORMATION PROCESSING	\$ 3.0M	\$ 3.3M
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE OFFICE OF SCIENTIFIC RESEARCH		

PROJECT SYNOPSIS:

The objective of this Task is to describe, quantitatively, the capabilities and limits of visual information processing in complex, dynamic environments.

Psychophysiological and neurophysiological procedures will be used to isolate and specify stimulus requirements, to discover underlying neural mechanisms, and to quantitatively describe human visual processing. Essential individual factors to be considered include spatial and temporal interactions, perception of patterns, and the effects on visual perception of memory, attention, expectations, the other senses, and eye movements. Formal analysis procedures will be used to develop models of the human visual system as it functions under real world conditions. Such mathematical descriptions of human visual processing will be adapted to develop nonbiological image understanding systems.

The FY88 program continues vision research efforts to study the mechanisms by which (a) humans recognize objects, (b) determine position and velocity of moving objects, and (c) guide their own movements through the environment. These studies, along with the auditory pattern recognition studies, will improve our understanding of human performance, and open new ways to design machines capable of recognizing images and responding to speech.

Plans for the FY89 program include the expansion of the vision research program to include neurophysiological research approaches in addition to the psychophysical studies currently supported. Although the sensory nervous system has been the subject of much research, most of that research has focused on the early stages of visual information processing, because these stages have been the easiest to study; however, it is now possible to study later states of visual processing, stages involved in the more complex aspects of perception, such as recognition of objects. These studies are now possible because: (a) more sophisticated techniques for recording the electrical activity of neurons exist, (b) advances in the understanding of the organization of the sensory nervous system, and (c) advances in the development of theories of information processing that can be tested by combining of neurophysiological and behavioral approaches to be far more powerful than either alone.

PAYOFF/UTILIZATION:

The payoff of this Task includes improved weapon systems design through the development of quantitative models of human vision.

Results suggest that specific visual-motor training procedures can measure the speed and accuracy of the operator's ability to detect, identify, and respond to visual information. Pilots trained by such procedures will have the advantage of recognizing the enemy much earlier than pilots who do not have this training. Specific findings include: (a) the discovery that the addition of texture to visual targets does not improve perception of motion-in-depth, i.e., the pilot's ability to compute direction in time to

impact with an oncoming object, and (b) evidence that pre-programmed habitual eye movement patterns are used to scan visual displays.

Humans quickly and easily learn to recognize the complex sensory patterns of vision, hearing and touch; therefore, a specific accomplishment in FY87 is the development of a new theory of pattern classification that may be used to improve the computer's much poorer ability to learn these sensory patterns. The new theory, the Adaptive Resonance Theory, can be used to design computers with some of the abilities of humans to recognize patterns. The theory is based on human and animal research spanning several decades, and is an important advance over previous models because it (a) has the ability to learn through experience without a teacher, (b) recognizes previously-learned patterns quickly without long memory searches, (c) distinguishes new patterns not previously seen, and (d) uses patterns already learned to form expectations of future events.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-A6	AUDITORY PATTERN RECOGNITION	\$ 1.4M	\$ 1.5M
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE OFFICE OF SCIENTIFIC RESEARCH		

PROJECT SYNOPSIS:

The objective of this Task is to develop quantitative models of the human sensory processes responsible for recognizing complex sounds.

Such models are expected to be useful for: (a) describing human performance in complex tasks, (b) providing the proper management of acoustic signals presented to human operators, (c) providing a rationale for tests used in audiology, and (d) guiding the development of algorithms to be used in machine recognition of speech. Psychophysical approaches will be heavily emphasized, although other approaches that provide converging evidence will be considered. The psychophysical approaches will include presentation of known complex sounds to human listeners and measurement of the accuracy or speed of identification, recognition, discrimination or audibility.

Emphasis will be placed on work that involves quantitative descriptions of these responses within the framework of models of sensory processing. Development and testing of such models is the objective of this approach. Models will be encouraged whose scope permits application to a wide variety of complex sounds and not to just a limited domain of complex sounds such as speech. Models will also be encouraged that address the interaction of sensory processing with memory processing. One goal is understanding ways that memory might cooperate in human sensory processing.

FY88 plans include the continuation of the program emphasis in auditory pattern recognition on the mechanisms by which humans recognize complex auditory patterns.

In FY89 the auditory research program will be expanded to include neurophysiological research approaches in addition to the psychophysical studies currently supported.

PAYOFF/UTILIZATION:

The payoffs of this Task include a better understanding of: (a) auditory aspects of human factors design, (b) intelligibility of sounds in noisy or data-compression environments, (c) individual differences in auditory performance, and (d) human cognitive performance and decision-making. Work will also provide a guide to the development of algorithms for machine recognition of speech.

Specific FY87 accomplishments include the development of a new computational model of speech processing, the Auditory-Perceptual Model. It has been found that computers designed to recognize speech have so far only a small fraction of human capabilities, as humans effortlessly handle the many different ways that a speech sound is affected by speaker identity, accent, and speaking rate. The new computational model of phoneme perception describes how computers might be designed to accurately recognize speech as strings of vowels and consonants. The model identifies complex features of the sound patterns of vowels and consonants that do not vary from speaker to speaker.

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This discovery should open a way to develop computers that do not have to be tuned to a single speakers voice.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-T1	LEARNING ABILITIES	\$ 0.9M	\$ 1.0M
	MEASUREMENT PROGRAM		
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Task is to develop a theory-based system of ability measurement that will account for individual differences in skill/knowledge acquisition rates and performance levels.

New techniques are needed for evaluating the fundamental parameters of processing speed, working memory capacity, and knowledge bases which determine individual learning and performance behaviors. Advances in cognitive psychology and other measurement devices make a breakthrough possible in ability measurement. Advances in ability measurement depend upon the availability of reliable and valid indicators of learning and performance proficiency. Basic research is needed to develop and test alternative ways of evaluating learning rates and performance capabilities.

Studies in the skill acquisition area will be conducted to identify and measure individual difference parameters relating to procedural and factual knowledge bases, working memory capacity, and information processing speed. A primary goal is to determine how such parameters interact to account for individual differences in learning and performance behaviors. Studies will be conducted to determine the role of processing speed to model learning and performance in high information flow environments.

A second area of research will identify and measure working memory capacity. The approach will be to model latencies and errors (memory failures) on tasks involving various combinations of memory storage and processing requirements. Additional research in skill acquisition will address individual differences in the attainment and maintenance of automaticity in the numerical, verbal, and spatial domains, and will support program and system analysis for development of specialized tests.

Research in performance assessment will try to determine how various measures of learning behavior can be combined into the most meaningful indicators of learning performance. Such performance scores will be modeled using knowledge, capacity, and processing speed parameters. In addition, the principles of artificial intelligence (AI) will be applied to develop intelligent tutors in the areas of programming and electronic troubleshooting. The goal of the research is to develop two seven-day courses which can be used to collect learning performance criteria to be modeled using ability parameters.

FY88 plans will examine individual differences to develop better tests of learning on aptitude tests. Air Force recruits are assigned to military occupational specialties partly on the basis of their scores on aptitude tests, and existing tests have limited power to predict aptitude for real-world jobs. Because of recent advances in our understanding of cognitive functions and through the use of computer terminals research in this field is now changing to allow adaptive testing of individuals rather than traditional paper and pencil tests.

This initiative supports research collaborations between leading university

scientists and the Air Force Human Resources Laboratory, at which a major computer facility for aptitude testing has been developed.

PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) provision of a theory-based system of ability measurement which will lead to an improved Air Force personnel selection and classification program, (b) development of new methods for evaluating individual differences in learning and performance that can be used for early validation of ability measures, and (c) provision of a model of the ways in which learned capabilities develop.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-T3	PERCEPTUAL AND COGNITIVE \$ 0.3M \$ 0.3M		
	DIMENSIONS OF PILOT		
	BEHAVIOR		
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Task are to: (a) establish the relationship between stimulus properties and their encoding by basic sensory mechanisms, and (b) determine the limits/capabilities of human visual attention and develop a predictive model of those effects.

Specific research will include: (a) measuring the interaction of stimulus size, location, spatial frequency and temporal frequency on the discrimination of visual motion effects, (b) measuring spatial summation effects in short wavelength receptor mechanisms and compare these effects with alternative theoretical predictions, (c) determining the directional sensitivity of short wavelength mechanisms utilizing a stimulus matching technique, and (d) comparing dynamic transformations in spatial contours in terms of their effects on perceptual constancies.

Additional research is planned to: (a) measure the speed of voluntary and involuntary attentional switches for highly practiced visual tasks, (b) determine to what extent improvements in voluntary attentional speed for single stimuli generalize to multiple stimuli and locations, (c) develop and refine an artificial intelligence-based model of visual attention, and (d) test predictions of the artificial intelligence model for fixation sequences in a visual scanning task.

PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) provision of basic information on sensory and perceptual processes which can affect the design of training systems for Air Force pilots, and (b) establishment of a basis for the prediction, measurement, and correction of attentional errors during the training of advanced cockpit piloting tasks.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-V1	ELECTROENCEPHALOGRAPHIC	\$ 0.3M	\$ 0.3M
	AND		
	MAGNETENCEPHALOGRAPHIC		
	INDICANTS OF COGNITIVE		
	FUNCTION		
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	ARMSTRONG AEROSPACE MEDICAL RESEARCH LABORATORY		

PROJECT SYNOPSIS:

The objective of this Task is to develop mapping of brain activity that can be demonstrated to be associated with cognitive processing.

Evoked brain activity, both steady state and transient, will be recorded to determine the origin(s) and information content of the brain activity responses. This research will be using a combined and complementary mix of electrophysiological, magnetophysiological, and behavioral measurements.

The evoked response to a target event embedded in a series of similar events is a larger, long latency positive component, which has been shown (through EEG recordings) to be largest over the parietal region of the brain. Magnetic recordings (MEG) will be obtained over a grid pattern, with recordings being used to identify the largest amplitude positions and positions that are 180 degrees out of phase. The location of the positions can be used to determine the location and depth of the source of activity. In order to use the MEG's localizing capability, two situations will be used: one will produce the P3a, the other will produce the P3b. In order to verify that each situation does produce the desired P3, simultaneous electrical recordings will be obtained. A grid system of recording will be used to map the temporal and occipital regions of the brain in order to determine the depth and location of the generation of these two different types of P3.

The steady state evoked response is a measure of the brain's cyclical response to a flickering light stimulus. If unpatterned flickering fields are used, four different frequency ranges of flickering stimuli can be identified that elicit relatively large brain responses. The back of the subject's head will be mapped while half-field stimuli flickering at one frequency is presented. This will be done for each of the three frequency ranges. The resulting contour map for each frequency range will be compared to determine the number and location of cortical generators.

PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) the purchase of new and sophisticated equipment for data collection, improvement of quality and quantity of that data, and improved ability to understand and record brain activities, (b) increased numbers of professional personnel to improve operations and maintenance, (c) improved methods to make the best use of available data to reduce subject exposure, (d) improved methods for isolating neural sources and procedures, (e) improved understanding of cognitive processes, (f) development of experiments to establish functional relationships between observable behavior and neurophysiological response, and (g) development of models of cognition.

A specific accomplishment in FY 86 included the development of an innovative

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method to record and analyze the electrical activity of the brain while the subject was performing visual and motor tasks.

PROJECT OVERVIEW

		88	89
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PROJECT: 2313-V2	BASIC VISION RESEARCH	\$ 0.3M	\$ 0.4M
PE: 61102F	DEFENSE RESEARCH SCIENCES		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	ARMSTRONG AEROSPACE MEDICAL RESEARCH LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Task are to: (a) develop a foveal and peripheral contrast response characteristics model, a model that can describe the contrast detection threshold and contrast sensation levels for objects of arbitrary shape and contrast anywhere in the visual field, (b) map the names by deriving areas on the CIE chromaticity diagram which correspond with specific, commonly used hue names, and (c) map Iso-Hue and Iso-Saturation by deriving lines of constant hue and constant saturation on the CIE chromaticity diagram.

Psychophysical experiments involving magnitude estimation and forced-choice threshold measurements will be conducted to quantify threshold detection and suprathreshold contrast perception for spatially limited patches of sine wave grating stimuli. Variation in size, spatial frequency, contrast, duration, and eccentricity of these stimuli should provide sufficient information to describe non-linear mechanisms responsible for contrast detection and perception over most of the visual field. A model will be developed from these data to account for both the non-linear suprathreshold response and the non-uniformity in distribution of spatial frequency sensitive mechanisms over the peripheral visual field. When fully developed, the model will allow predictions of both detection and perception for objects of arbitrary size and shape at arbitrary positions in the visual field.

In the Hue-Name mapping effort, the areas' boundaries will be defined probabilistically and will delineate, for example, the region of chromaticities which a color-normal observer will call "green" with 95 percent probability or greater, given specific viewing conditions. The major parameters to be explored include the desired confidence level, the luminance, shape, and area of the stimulus, and the background's color and area.

In the Iso-Hue and Iso-Saturation effort, approximately five hues and five levels of saturation will be studied. For each hue, the saturation will be varied and the subject will then make adjustments so as to hold the perceived hue constant. Similarly, for each saturation level, hue will be varied and the subject will make adjustments which hold the perceived saturation constant. These experiments will be replicated at luminances that encompass those which can be expected from airborne electronic displays.

PAYOFF/UTILIZATION:

The payoffs of this Task include: (a) provision of a tool for designing cockpit displays and instruments with desired visibility at any eccentricity in the visual field, (b) provision of a tool for evaluating visibility of eccentrically displayed imagery or instrumentation in existing cockpits and simulators, (c) provision of a sound empirical basis for selecting and specifying color tolerances for color-coding purposes, and (d) provision of fundamental data to help develop perceptually uniform color spaces and color-contrast metrics, which can be used to extend contemporary models of spatio temporal contrast perception to encompass chromatic contrast and

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predict pilot visual performance more accurately.

PROGRAM ELEMENT OVERVIEW

PE: 62202F

AEROSPACE BIOTECHNOLOGY

DoD ORGANIZATION:

AF

FUNDING:

FY88 \$ 10.9M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 11.9M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objectives of this Science and Technology program optimize human aspects of the man-machine interface.

Thrusts of this Science and Technology program are to: (a) improve human performance in weapon systems and operations by refining crew selection, maintenance, crew protection, and man-machine integration, (b) improve safety and protect Air Force personnel from radiation, chemical, and mechanical forces, (c) use our understanding of human factors to invent threats and countermeasures effective against Soviet weapon system operators, (d) develop chemical defense measures for air base operations, casualty care evacuation, and personal protective equipment, and (e) exploit and optimize man's utility in military space systems.

This Program also provides management and operational support for the three laboratories of the Human Systems Division.

Man is a key element in every military operation. Changing operational requirements, new technologies, and increasingly sophisticated and complex weaponry place continually greater demands on system operators and maintainers. Therefore, the Biotechnology Program explicitly addresses the utilization of man in accomplishing the various Air Force missions, and focuses on research and development which will result in the optimal utilization of Air Force personnel within a complex technological environment. The FY 89 direction for the Man-Machine Integration Technology Project has the potential for significantly enhancing our current capability in the area of man-machine interface using many different technologies, and is a critical part of the Air Force endeavor to improve the performance of our current and future weapon systems.

Aerospace Biotechnology is the core Air Force technology base program to optimize the role of the human operator in the design, development, and operation of increasingly complex and technologically sophisticated weapon systems. The Biotechnology Program is formally coordinated with the Army, the Navy, and the National Aeronautical and Space Administration through a variety of mechanisms, including the Joint-Service Aeromedical Research Panel and the Human Factors Engineering Technical Advisory Group.

The Biotechnology Program is conducted by the Human Systems Division, Brooks Air Force Base, Texas, and Wright-Patterson Air Force Base, Ohio.

RELATED ACTIVITIES:

The biotechnology program is formally coordinated with the Army, Navy, and the National Aeronautics and Space Administration through a variety of mechanisms, including the tri-Service Aeromedical Research Panel, and the Human Factors Engineering Technical Advisory Group. Where coordination is required on a daily basis, operating locations have been established with other organizations. These include Air Force positions with: HQ Army Medical R&D Command, Naval Medical Research Institute, and NASA. Related Program Elements include 62720A Environmental Quality Technology, 62777A Systems Health Hazard Prevention Technology, 62205F Training/Simulation Technology, 63227F Advanced Simulator Technology, 63231F Crew Systems Technology, 64703F Aeromedical Systems Development, 62204F Aerospace Avionics, 62702F Command,

Control, Communications, and 61102F Defense Research Sciences.

Related flight dynamics Program Elements include 62201F Aerospace Flight Dynamics, 63205F Flight Vehicle Technology, and 63245F Advanced Fighter Technology Integration.

Related Army non-medical Program Elements include 62622A Chemical and Smoke Technology, 63806A Chemical/Biological Defense, 63803A Chemical Systems Advanced Development, 63759A Chemical Biological Advanced Technology, 64803A Chemical Systems Engineering Development, 64806A Chemical Biological Radiological Defense Equipment Engineering Development, 65710A Joint Chemical Biological Point of Contact Test and Assessment, and 61102A Defense Research Sciences.

Related Army medical Program Elements include 62787A Medical Defense Against Chemical Warfare, 63751A Medical Defense Against Chemical Warfare, 64757A Medical Chemical Defense, 63002A Medical Defense Life Support Materiel, 64757A Medical Defense Life Support Materiel, 63002A Medical Defense Life Support Materiel, and 64757A Medical Defense Life Support Materiel.

Related Navy Program Elements are 62233N Mission Support Technology and 64506N Chemical Warfare Countermeasures.

The work will be conducted by the Human Systems Division through its three laboratories: the USAF School of Aerospace Medicine, the Harry G. Armstrong Aerospace Medical Research Laboratory, and the Air Force Human Resources Laboratory. The in-house portion of the program is centered on unique, complex, man-related experimental facilities at each of these laboratories. Such facilities are generally not available in the aerospace industry or academic institutions. The contract portion of the program complements the in-house efforts.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) the design of more effective weapon systems which capitalize on advanced human engineering concepts and techniques, (b) the development of technologies to assess human performance on space flights, (c) the development of command, control and communications (C3) simulation systems for interactive testing, (d) the development of advanced display and simulation technology for tactical aircraft systems, and (e) the development of systems to maximize human operator efficiency.

FUTURE DIRECTIONS:

Future directions of this Program Element include continued efforts to develop technologies to determine utilization capabilities and opportunities of man in space and to direct research toward a broader application in the areas of aircraft survivability assessment and the design of effective manned weapon systems.

Long-range goals for the MPT portion of this Program Element include the development of dynamic models to predict operator stress limits and performance effectiveness, the development of design criteria and mission planning guides to reduce operator overload and optimize man-machine integration, and the design and development of integrated display/control systems for airborne and aerospace missions.

PROJECT OVERVIEW

		88	89
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PROJECT: 06MD	HUMAN SYSTEMS DIVISION	\$ 3.6M	\$ 4.0M
	LABORATORY OPERATIONS		
PE: 62202F	AEROSPACE BIOTECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

PROJECT SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Project is to provide the resources to conduct MPT in-house research and development activities of the Human Systems Division research laboratories.

The laboratories are designed to specifically define man's limits with regard to adaptability, survivability, and performance capabilities within his operational environment. The Project includes pay and related costs for civilian employees, travel, transportation, rent, communications, utilities, lab supplies and equipment, and other related materials and services needed by specialized scientific teams using complex, unique research facilities and devices to conduct biotechnology research and exploratory development. This Project also funds salary, travel and equipment for personnel at the Aeronautical Systems Division to provide procurement support to the Human Systems Division.

Funding indicated includes only the MPT portion of this Project. The FY 87 increase resulted from the combination of funds specifically directed for the Installation Restoration Program, and a civilian pay raise. The FY 88 increase resulted from a combination of a reduction in the Federal Employees Retirement System and an increase for the Installation Restoration Program. The FY 89 decrease accommodates decreases in Air Force Total Obligation Authority.

PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Project includes the provision of resources to enable the in-house MPT research and development activities of the Human Systems Division and its laboratories to be conducted.

This Project allows and facilitates the research efforts of the Aerospace Biotechnology Program (the core Air Force technology base program) to optimize the role of the human operator in the design, development, and operation of increasingly complex and technologically sophisticated weapon systems.

PROJECT OVERVIEW

		88	89
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PROJECT: 6893	MANNED WEAPON SYSTEMS	\$ 1.4M	\$ 1.4M
	EFFECTIVENESS		
PE: 62202F	AEROSPACE BIOTECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

PROJECT SYNOPSIS:

The objective of this Project is to develop techniques to deceive the operators of enemy air-to-ground and ground-to-air systems.

Visual camouflage, optical countermeasures and techniques to fool infrared and radar sensors are developed, simulated in the lab, and field tested. A variety of studies of human visual capacities are also performed. Measurement of enemy antiaircraft operator performance is accomplished with simulation and flight test. Blue forces countermeasures are being developed and transitioned. The need for motion in both engineering and training simulation is being explored, including the modeling of visual/motion effects on operator performance.

In FY 88, it is planned to: (a) include the development of an enhanced, optically-based, passive terrain avoidance system for use when the radar emissions typically associated with terrain-avoidance devices may be counterproductive to mission accomplishment, (b) continue field tests of visual deception techniques to improve airbase survivability, and (c) study the effects of microgravity on visual performance in cooperation with the German Aerospace Research Establishment as part of the continuing research into the effect of prolonged space missions on visual functions.

In FY 89, it is planned to: (a) continue visual studies, and (b) initiate a man-in-the-loop strategic threat adversary system simulation.

In FY's 88 and 89, efforts will continue to specify: (a) high payoff roles for military personnel in space, including a definitive assessment of a person's space-to-ground visual capability, and (b) the technical basis and evaluation criteria for target masking and camouflage techniques based on human visual and cognitive processing.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved survivability against enemy threat systems, (b) validated criteria for simulator design, and (c) increased knowledge of manned threat system capabilities and vulnerabilities.

In FY 87, accomplishments included: (a) a successful demonstration of flight testing of an airfield visual deception system, including such techniques as decoys to complicate both target acquisition and ordnance delivery by enemy aircraft, (b) quantification of the effects of attack aircraft tactics on enemy system and aircraft operator visual tracking performance, and (c) quantification of Blue Force crew performance in the optical acquisition and tracking of air-to-ground and air-to-air targets, for use when radar tracking is ineffective or undesirable.

PROJECT OVERVIEW

		88	89
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PROJECT: 7184	MAN-MACHINE INTEGRATION TECHNOLOGY	\$ 5.9M	\$ 6.4M
PE: 62202F	AEROSPACE BIOTECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	HSD		

PROJECT SYNOPSIS:

The objective of this Project is to develop procedures and technologies to maximize the efficiency and effectiveness of the human operator interface with electronic/mechanical systems.

This Project will develop basic information on the perceptual, cognitive and response characteristics of human operators within mission-specific scenarios to use as design point data for system control and display development, and develop standardized methodologies to assess changes in weapon system performance due to optimized man-machine coupling.

In FY 88, it is planned to produce: (a) a B-1P defensive system display design, (b) a prototype human engineering workstation incorporating practical artificial intelligence to optimize test and analysis formats for each study, and (c) online analysis system for crew station ergonomics for the more rapid assessment of workload.

In FY 89, it is planned to complete a virtual terminal for fighter battle simulation and a brassboard wide field-of-view Super Cockpit display system which will form a test system for many of the concepts currently envisioned for that portion of the Super Cockpit relating to visual interfacing.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) the improvement of weapon system performance by optimizing man-machine coupling, and (b) the development of methodologies and technologies to maximize the efficiency, and effectiveness of the human operator interfacing with Air Force systems.

In FY 87, accomplishments included: (a) design of a B-52 crew station with night vision system compatibility, (b) design of the parameters for the new Command, Control and Communications workstation for the North American Air Defense Command, and (c) publication of the Handbook of Perception and Human Performance which provides guidance on all facets of the technology involved in man-machine interfaces.

PROGRAM ELEMENT OVERVIEW

PE: 62205F

PERSONNEL, TRAINING, AND SIMULATION

DoD ORGANIZATION:

AF

FUNDING:

FY88 \$ 32.0M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 34.3M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element (PE) is to improve operational readiness through more effective training, selection, assignment, and retention of personnel, and increased weapon system supportability.

A major research area concerning flight simulation uses various simulation devices at the Training Effectiveness Research Facility at Williams AFB, Arizona. These devices are used to conduct research to develop innovative methods for flight simulator training, to define simulator training effectiveness requirements, and to develop innovative techniques for training tactics used in air-to-ground and air-to-air combat.

Other research areas develop improved individual and unit training methods, instructional and learning strategies, and training design and evaluation technologies. Specific technical programs include development and demonstration of: (a) personnel testing procedures, (b) methods to determine Air Force job requirements, (c) processes for matching individuals to jobs, (d) models and strategies to improve retention, (e) the means to measure and evaluate performance in order to link enlistment standards to on-the-job performance, (f) models for integrating manpower, personnel, and training decisions, (g) computer modeling to address fundamental training management issues, (h) tools for computer-based training, (i) maintenance training simulators, and (j) artificial intelligence applications to training.

Another major research area concerns the logistics support of weapon systems and improvements that can be made by specifying the interactions between the human elements of the logistics and maintenance systems, and the associated characteristics of weapon systems.

Formal agreements exist which specify support to be provided by the Air Force Human Resources Laboratory (AFHRL) and other agencies, including cooperative agreements with the Navy and Army on work related to such efforts as: (a) visual display and advanced computer image generation technology development, (b) flying training research and development, (c) the development of flight training schedules using Advanced Instructional System software, (d) simulator research and development, (e) development of a computerized instructional system, and (f) research on command and control systems.

In FYs 88/89, work under this Program Element will include: (a) continued provision for part of the management and support of the Air Force Human Resources Laboratory (AFHRL), (b) enhancements in instructional strategies and training delivery, which will result in improved methods for individual and unit training that is both job relevant and cost effective, (c) application of new methods and devices to flying training and aircrew performance assessment, with an emphasis on increased flying proficiency and improved transition to combat aircraft, (d) support for the operation, maintenance, and modification of simulation equipment and software that is the foundation for research on training effectiveness and flight simulator engineering R&D, (e) development of new technologies to improve the logistics support of Air Force combat operations, (f) development of technology and application programs to determine training requirements, analyze wartime job requirements and performance standards, determination of training requirements, identification and modeling of the impacts of automation on command and control (C2) operators, analysis of combat decision making, and

development of new technology for training devices, (g) development of efficient and effective simulation hardware technology for future aircrew training systems, (h) development of personnel qualification and aptitude tests, job specification standards, and manpower and personnel models, and (i) development of methodologies for assessing individual performance on the job and for predicting effective job performance.

The Projects under this PE are consolidated from PE 62205F and PE 62703F.

RELATED ACTIVITIES:

Related Program Elements are: 61102F, Defense Research Sciences; 62202F, Human Systems Technology; 62204F, Aerospace Avionics; 62702F, Command, Control, and Communications; 62763N, Personnel and Training Technology; 63707N, Manpower Control Systems Development; 62717A, Human Performance Effectiveness and Simulation; 63106F, Logistics Systems Technology; 63227F, Manpower, Personnel, Training, and Simulation Technology; 63231F, Crew Systems Technology; 64227F, Flight Simulator Development; 62757N, Human Factors and Simulation Technology; 63733N, Training Devices Technology; 63720N, Education and Training; 62722A, Manpower, Personnel, and Training; 62727A, Non-System Training Devices Technology; and 63216A, Synthetic Flight Simulators. The Air Force Human Resources Laboratory has formal agreements with: the Army Program Manager for Training Devices, for visual display and advanced computer image generation technology development; Tactical Air Command for flying training R&D and to help develop flight training schedules using Advanced Instructional System software; Aeronautical Systems Division, to coordinate simulator research and development with the Deputy for Simulators; Air Force Wright Aeronautical Laboratories, for development of computer-aided design technology; the Army and Navy, to share development of a computerized instruction system; and with the Armstrong Aerospace Medical Research Laboratory and Rome Air Development Center, to share research products related to command and control systems. The Navy has liaison office with the Laboratory's Operations Training Division. Air Force efforts directed toward improvement of the Armed Services Vocational Aptitude Battery and the production of new forms of that test are directed, in part, by a tri-Service steering committee of General Officers. In addition, personal contacts, meetings, and formal contacts, such as the DoD Technical Advisory Groups, provide coordination between specific focal points for research and development efforts. Close coordination within the Air Force user community is also ensured by annual research and development coordination meetings between the Air Force Human Resources Laboratory, the Aeronautical Systems Division and the major commands (Tactical Air Command, Strategic Air Command, Military Airlift Command, Air Training Command). Efforts across all Services to develop job performance measures are coordinated by a working group monitored by the Office of the Assistant Secretary of Defense for Force Management and Personnel.

The work is performed by the Air Force Human Resources Laboratory (AFHRL). Four laboratory divisions support this Program Element: Manpower and Personnel Division, Logistics and Human Factors Division, Operations Training Division, and Training Systems Division. An operating location of the Training Systems Division is collocated with the Air Training Command Technical Training Center.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) development of improved flight simulator hardware which will improve training and reduce training costs, (b) design and development of better simulators for maintenance training, which will reduce training costs by eliminating the need for expensive operational equipment, (c) design and development of computer-based instructional technologies for technical and flight training, (d) development of improved courseware, training delivery options, training aids, and related products, (e) development of technology and programs to train, assess and aid command and control (C2) operators, especially in combat-related activities, (f) development of new training technologies and logistics support methods which are expected to increase the productivity of Air Force personnel,

improve the cost-effectiveness of technical and flight training, and result in enhanced operational readiness, (g) development of methods to ensure that the best qualified individuals are recruited, selected, classified, and assigned, and (h) development of improved measurement techniques for assessing individual performance on the job and for predicting job performance, thereby enhancing individual performance and unit effectiveness at all organizational levels.

FUTURE DIRECTIONS:

Future work under this Program Element will continue to focus on the design, development and evaluation of new technologies in: (a) aircrew training research, (b) improved individual and unit training methods, (c) instructional and learning strategies, (d) training design and evaluation technologies, and (e) logistics support of weapons systems.

Specific efforts for FY 90 and beyond include: (a) development of a variable acuity visual system and incorporation into the F-15 simulator network, and (b) continued development of job performance measures.

PROJECT OVERVIEW

		88	89
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PROJECT: 06HT-ET	LABORATORY SUPPORT	\$ 3.0M	\$ 3.4M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas, to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

PROJECT OVERVIEW

		88	89
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PROJECT: 06HT-HF	LABORATORY SUPPORT	\$ 1.7M	\$ 1.5M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

PROJECT OVERVIEW

		88	89
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PROJECT: 06HT-MP	LABORATORY SUPPORT	\$ 2.3M	\$ 1.8M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

PROJECT OVERVIEW

		88	89
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PROJECT: 06HT-ST	LABORATORY SUPPORT	\$ 3.3M	\$ 3.5M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to provide for part of the operation of the Air Force Human Resources Laboratory (AFHRL) at Brooks Air Force Base, Texas, including pay and related costs of civilian scientists and support personnel, travel, transportation, rent, communications, maintenance, procurement of supplies and equipment, and contractor support services.

It also funds civilian salaries, travel, and supplies for personnel at the Aeronautical Systems Division (ASD), Wright-Patterson AFB, Ohio, who provide procurement support to AFHRL. The laboratory performs research and development in manpower and force management, weapon systems logistics, maintenance and technical training, and air combat tactics and flying training in support of immediate or potential needs of Air Force operational systems.

This Project supports and complements all Projects within Program Element 62205F.

PAYOFF/UTILIZATION:

The payoff of this Project includes enabling the many and varied research tasks of AFHRL at Brooks Air Force Base, Texas to be accomplished by handling the support functions of the lab such as travel, transportation, communications, maintenance, procurement of supplies and equipment, etc.

PROJECT OVERVIEW

		88	89
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PROJECT: 1121	TECHNICAL TRAINING	\$ 2.0M	\$ 2.3M
	DEVELOPMENT		
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to enhance and develop training technologies that will result in improved methods for individual skills development and better job performance through enhanced individual and unit training.

Primary areas of interest include: (a) using computers to investigate and measure job performance, (b) developing computer-based training (CBT) delivery, management, and evaluation systems, and (c) investigating and demonstrating artificial intelligence (AI) applications for training.

In FY 88, it is planned to: (a) conduct research to create effective computer-based training (CBT) development and evaluation tools to make CBT a more effective delivery media and decrease the costly front-end CBT investment for trainers, (b) complete a demonstration of online, computer-based job performance tests for an Air Force specialty, (c) continue development efforts on the intelligent tutorial system and the use of natural language (speech) processing to enhance the human-computer interface, and (d) begin efforts to determine the feasibility and effectiveness of using intelligent tutorial systems to increase learning and job competency.

In FY 89, it is planned to: (a) in a joint-Service effort, complete development of software tools for use by courseware authors (designed for use by subject matter experts without the need for extensive training or background in instructional design or computer programming) in developing intelligent training systems, with specific demonstrations to take place in space operations training at the Undergraduate Space Training School, (b) field test the computerized job performance measurement system developed in FY 88 and evaluate its potential for further development in Air Force specialties, and (c) develop an intelligent instructional design for the space environment.

PAYOFF/UTILIZATION:

The payoffs of this Project are improved individual skills development and job performance through development of training technology to enhance individual and unit training.

Efforts to improve training delivery, development, and effectiveness must be maintained to stay abreast of Air Force training requirements and ensure that training produced is cost-effective and mission-relevant.

In FY 87, accomplishments included: (a) rehosted ISS to a minicomputer, (b) added videodisk and compact Computer Managed Instruction (CMI) capabilities, and (c) completed online and offline user training materials. A joint effort with the Army Research Institute and the Naval Training Systems Center completed development of a prototype student knowledge base system. Continued development of an intelligent tutoring system, based on a previously developed intelligent maintenance aid.

PROJECT OVERVIEW

		88	89
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PROJECT: 1123	FLYING TRAINING DEVELOPMENT	\$ 2.8M	\$ 3.5M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to provide extensive training to ensure the combat readiness and survivability of Air Force aircrews in an effective and efficient manner.

In FY 88-94, Project 1123 contains six major thrusts directed towards achieving the goal of improved Air Force training. The Total Training System Design effort addresses the entire spectrum of aircrew training required by a major weapon system to determine the best ways of managing and delivering instruction, as well as assessing the value of the training program.

In FY 88, it is planned to: (a) produce specifications for system design and guidelines for computer-aided training management (the Performance Measurement effort is fundamental to all research and development activities and this program will generate validated scoring algorithms for A-10, F-15, and F-16 air-to-air and air-to-surface combat, which will also be usable in both the Weapons System Trainer (WST) and the aircrafts' Air Combat Instrumented Range), and (b) continue development on an artificial intelligence model of pilot knowledge structures to be used in improving air combat decision-making strategies (the Multi-ship Instructional Support System effort will use modular software to allow centralized control of simulator training in the tactical arena, with concentration on optimizing the computer/operator interface to effectively manage this complex environment and minimize necessary operator training. In FY 88/89, the Visual/Sensor effort will explore the training effectiveness of display features for simulation, using the advanced image generation and display hardware developed in PE 63227F, Personnel, Training, and Simulation (studies to be completed in FY 88 define the criteria for simulator display resolution and the level of detail for air-to-air and air-to-ground simulated tactical targets. Research in FY 88/89 will investigate brightness/contrast/resolution tradeoffs, scene content, color requirements, thermal modeling for infrared, terrain accuracy specifications for real beam radar, and database density requirements for synthetic aperture radar.

In FY 89, the Electronic Combat Training effort will begin to develop a modular threat simulation system for broad-based application to all Air Force training devices, as well as produce a systematic investment strategy for electronic combat training. The investment strategy will establish a framework for training media selection and skill/task requirements for electronic combat. The Special Function Trainer effort will use prototype part-task trainers on-site at MAJCOM operating locations to demonstrate the ability of such devices to offload WSTs and aircraft with low-cost, but high-value practice. This effort will result in establishing device design guidelines for MAJCOM training programs and offers the potential to reduce instructor workload through computer assisted and managed instruction.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) reduced costs for all types of flying training, (b) improved ability to effectively train aircrew personnel, (c) new instructional methods, techniques, and devices for training and assessing pilot and navigator performance at both undergraduate and combat crew levels, (d) increased student and aircrew proficiency, (e) increased survivability and mission effectiveness, (f) development of effective visual simulation requirements, (g) improved use of simulators, and h) improved simulator displays.

In FY 86, accomplishments included: (a) increased efforts on simulator training effectiveness requirements using the advanced image generation and display hardware developed in Program Element 63227F, (b) testing of advanced radar and other sensor simulation system displays for aircrew training, (c) development of a simulator instructor/operator station (IOS) design guide which will be used to develop multi-cockpit IOS design guides and modular IOS software, (d) evaluation of special-function part-task trainers for electronic combat for integration into a Tactical Air Command Training program, and (e) completion of a behavioral performance measurement system design for use with the F-15.

PROJECT OVERVIEW

		88	89
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PROJECT: 1192	ADVANCED SIMULATION FOR PILOT TRAINING	\$ 5.5M	\$ 6.1M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to support the operation, maintenance and modification of simulation equipment used for training effectiveness and simulator engineering research and development.

This includes dome, dodecahedron, and helmet-mounted visual displays, computer image generation systems, and related research equipment. These simulation systems support most research conducted under Project 1123, Flying Training Development, and Project 6114, Flight Simulator Technology, as well as research conducted under Program Element (PE) 63227F, Advanced Simulator Technology, and thus provide the primary simulation capabilities for implementing, demonstrating, and testing training technology and simulation hardware developments. These capabilities are also used for demonstrating and testing engineering and training simulation technology advances developed under related Aeronautical Systems Division and joint-Service Program Elements. Research and development efforts supported by this Project are discussed in more detail under Projects 1123 and 6114.

In FY 88/89, support will continue for the operation and maintenance of all major simulator systems, including the Advanced Visual Technology System image generator (Project 2363, PE63227F). Simulation support for related research projects will also continue, including training effectiveness and transfer of training studies, visual and sensor systems requirements studies, and tactical combat mission simulation studies.

PAYOFF/UTILIZATION:

The payoffs of this Project include the advancement of simulation concepts and technology, particularly in regard to the ASPT, the Combat Mission Trainer, and the Advanced Visual Technology System.

These and related devices are central to research and development work of other Projects, and thus play a vital role in advancing the state of training systems in general and contributing to knowledge on transfer of training and the generalizability of skill acquisition. These are significant training issues across the Services, as cost-effectiveness and training efficacy become increasingly important in a technologically sophisticated military environment.

In FY 87, accomplishments included: (a) continued installation/integration of a new basic-side (nonvisual) control computer with much higher processing rates, capable of matching the characteristics of current state-of-the-art tactical aircraft (permitting dual cockpit simulation with full sensor capability, coupled with the out-the-window visual imagery), (b) began development of a functionally distributed parallel microprocessing capability, (c) completed enhancements to the existing F-16A instructor/operator station to allow improved instructor/operator and student/pilot interaction, and (d) continued hardware integration and software development for the new basic-side (nonvisual) control computer (to

AF/62205F

be completed in FY 88).

PROJECT OVERVIEW

		88	89
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PROJECT: 1710	LOGISTICS AND	\$ 3.8M	\$ 3.5M
	MAINTENANCE TECHNOLOGY		
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop technologies to improve the logistics support of Air Force combat operations.

In FY 88, efforts will begin to develop a computer "super" model to assess theater-wide combat logistics system resources and requirements, using an operation model as a core. Planning, logistics assessment, and susceptibility models will be used as modules to provide more realistic computation of wartime logistics capabilities. Another new start will evaluate the use of advanced graphic techniques to integrate reliability and maintainability information into computer-aided design.

In FY 89, planned efforts include: (a) an advanced modeling program that will eventually result in a highly effective method to model unit capability through discrete-event simulations, (b) development of decision aids for the acquisition logistics process, and (c) completion of a model for forecasting wartime logistics requirements and collection of historical combat data to validate the model.

PAYOFF/UTILIZATION:

The payoffs of this Project are to develop technologies for improving the logistics support of Air Force combat units. Acquisition of weapon systems that are logistically supportable, sustainable, and cost-effective is being emphasized by all levels of the Air Force and DoD. Military systems must be durable, easily maintained/repared in the field, and require little or no support equipment.

In FY 87, accomplishments included: (a) identification of trade-offs in personnel, job aids, and support equipment to minimize the manpower and equipment necessary to conduct aircraft maintenance in disperse locations, (b) refined a computer graphics model of maintenance technician physical characteristics (reach, grip, hand motions, etc.), for use in designing human factors into equipment, and interfaced it with a commercial computer-aided design package for transition to government and industry users, and (c) continuing analysis and testing to determine the ability of personnel to complete maintenance tasks while wearing chemical/biological warfare protective clothing (to be completed in FY 88).

PROJECT OVERVIEW

		88	89
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PROJECT: 3017	COMMAND AND CONTROL TRAINING	\$ 1.4M	\$ 2.1M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are to develop command and control (C2) technology and application programs to: (a) determine training requirements, (b) analyze wartime job requirements and performance standards, (c) identify and model the effects of automation on C2 operators, (d) analyze combat decision making, and (e) develop advanced technology training devices.

Combat readiness of personnel assigned to man tactical C2 systems is directly related to their ability to operate smoothly and efficiently in a rapidly changing tactical environment. The failure of C2 systems is often due to inadequate attention being placed on personnel training requirements and other human factors considerations during the design and development phases of new systems. There is a recognized need for improvements in C2 training for Tactical Air Force Battle staff personnel.

Until FY 85, the efforts in this Project were a part of and funded under Project 1121, Technical Training Development. Since this work is being conducted at a separate Air Force Human Resources Laboratory (AFHRL) division, and since C2 battle staff training is significantly different from maintenance and general technical training, a new Project was needed. This Project meets the need for improvements in C2 training for Tactical Air Force Battle staff personnel.

In FY 88, it is planned to: (a) develop knowledge-based training system concepts for combat operations functions, (b) test expert system based task analytic collection devices, (c) develop prototype microcomputer-based training devices for C2 in-house, and (d) begin initial design work for embedded training programs in RADC developed decision aids.

In FY 89, plans include to: (a) begin work on the information/decision analysis for a functionally distributed tactical C2 architecture in development at the RADC, (b) begin exploratory work on a microcomputer-based desktop trainer for ground-based operators of space-based systems, (c) complete validation/verification of C2 system designers' work station at various locations to assess automation impacts, (d) test the prototype knowledge-based training system for tactical combat operations, and (e) demonstrate simulation methods for evaluating the impact of automation on manual C2 processes.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) an improved ability to analyze wartime job requirements and performance standards, (b) a determination of training requirements for command and control (C2) operators, (c) identification and modeling of the effects of automation on operators, (d) an analysis of combat decision making, and (e) development of advanced technology training devices. It is anticipated that this technology development effort will also identify many research issues for further investigation, particularly in training and evaluation technology. These

programs will result in a higher probability that the air battle managers who operate these tactical C2 systems will know their combat jobs and that new tactical C2 systems will support this performance.

In FY 87, accomplishments included: (a) development of a prototype special simulation device for training combat mission planners, (b) development and testing of an automated method for ongoing dynamic update of a worldwide command and control training requirements baseline, (c) exploration of computer-aided concepts to provide more precise threat avoidance information for mission planning, (d) began work on methods to simulate the impact of automating previously manual command and control functions, (e) completed a preliminary training technology requirements study for AFSPACECOM, (f) provided task data on descriptive expert performance at the 712th Air Support Operations Center (ASC), (g) provided human factors consultation and support on SDI to both ESD and ASOC, and (h) provided human factors consultation and support on SDI to both ESD and NRL.

PROJECT OVERVIEW

		88	89
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PROJECT: 6114	FLIGHT SIMULATOR TECHNOLOGY	\$ 1.6M	\$ 2.2M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop efficient and effective simulation hardware technology for future training systems to provide sufficient mission realism for aircrew training and weapon system exercise and assessment.

In FY 87, it is planned to continue: (a) upgrading the Advanced Visual Technology System (AVTS) infrared image capability through feature texturing, (b) further exploration on the feasibility of using a low-cost image generation architecture for producing a simulated real-beam radar scene from a common Defense Mapping Agency compressed database, and (c) working on component technology in support of low cost networked simulators.

In FY 88, it is planned to complete a small dome visual display system, which exploits an opportunity to apply variable-acuity display technology to Fighter Lead-In Training. In addition to meeting a TAC need for simulation in this area, it will also provide training effectiveness data for other simulation applications. Emphasis will be on visual systems comprised of electro-optical displays and microprocessor-based computer image generators. This work will continue through FY 89.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved quality and cost-effectiveness of training through determination of what types of simulator technology are most effective for specific training requirements, (b) simulation techniques which capitalize on human characteristics to provide cost-effective training devices, and (c) development of system definitions for future fully-capable, complex combat mission trainers for the tactical Air Force.

In FY 87, efforts continued on exploring the feasibility of using low-cost image generation architecture for producing a simulated real beam radar scene from Defense Mapping Agency compressed databases.

PROJECT OVERVIEW

		88	89
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PROJECT: 7719	FORCE ACQUISITION AND DISTRIBUTION SYSTEM	\$ 3.6M	\$ 3.2M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are research and development of personnel qualification and aptitude tests, job specification standards, and manpower and personnel models in order to provide the Air Force with methods to ensure that the Air Force recruits, selects, classifies, and assigns the best qualified individuals.

Experimental test batteries will be developed in areas such as attention sharing, eye-hand coordination, information overload, self-confidence, and others.

As the DoD Executive Agent for the Armed Services Vocational Aptitude Battery (ASVAB), which is used by all the Services for selection and classification of enlisted members, the Air Force must provide the technology base for revising and updating this test.

In FY 88, it is planned to: (a) implement three new additions of the ASVAB, (b) continue work to improve selection and classification methods through basic skills assessment research, MPTIS-related efforts, and testing research validation, (c) determine task demands in air combat, identify characteristics of successful fighter pilots, and validate specialized tests for classification of fighter attack-reconnaissance pilots, (d) develop a methodology for determining the value or cost of replacement of trained and experienced personnel, which is in direct response to the FY 1984 Authorization Bill language which directs the DoD to fund the development of models and procedures to enhance retention of personnel. The primary benefit of this costing methodology will be the establishment of the relative value of Air Force personnel with different levels and types of skills. This will enable Air Force managers and planners to respond in a more informed manner to dwindling manpower pools, decreased retention, budgetary constraints, and policy decisions.

In FY 89, it is planned to: (a) provide new, alternate, or replacement forms of tests to be used in the Air Force, as well as the other Services, and DoD sponsored high school testing programs, (b) develop valid measures of fighter aircrew performance and in-depth analyses of task/information processing demands, (c) provide, through research into the determination of valid entry level standards for specialties, information and technology in the basic skills requirements of Air Force jobs and functional skills (which will transition to the 6.3 basic skills project to develop basic job skills training packages), and (d) completion of a final evaluation of the EURO-NATO Joint Jet Pilot Training Program.

This Project transferred from Program Element 62703F at the end of FY 87.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved selection techniques, (b) improved matching of Air Force personnel to jobs which most closely relate to

their aptitudes, interests, and skills, with resultant benefits for both the Air Force and its personnel, (c) enhanced combat readiness by ensuring that Air Force personnel have the skills necessary to perform successfully in peacetime and combat, (d) improved air-combat performance, (e) improved pilot selection and specialized assignment placement, (f) reduced pilot training attrition, resulting in significant savings, and (g) establishment of the relative value of Air Force personnel with different levels and types of skills, thereby enabling Air Force managers and planners to respond in a more informed manner to dwindling manpower pools, decreased retention, budgetary constraints, and policy decisions.

In FY 87, accomplishments included: (a) continued research to improve selection of pilot trainees and the subsequent assignment of pilots to specialized training (preliminary data indicate this research will lead to reduced pilot training attrition to achieve significant savings), (b) continued to consolidate ongoing job requirements and modeling research, and initiated new products to develop a manpower, personnel and training integration system (MPTIS) which will provide tools (e.g., models and databases to support system design), develop personnel and training pipeline and retraining requirements for fielding new weapon systems, and integrate the MPTIS decision process into existing systems, and (c) continued exploratory development on the Air Force Officer Qualifying Test (AFOQT) and the ASVAB.

PROJECT OVERVIEW

		88	89
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PROJECT: 7734	FORCE MANAGEMENT SYSTEM	\$ 1.1M	\$ 1.3M
PE: 62205F	PERSONNEL, TRAINING, AND SIMULATION		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are to: (a) provide research for developing a Training Decision System (TDS) for answering questions such as when and where personnel should be trained and on what tasks, and (b) develop methodologies for assessing individual performance on the job and identifying predictors of effective performance.

The TDS includes a more comprehensive and better unified database and decision modeling technologies than have been available for estimating the training cost, resources, and capacities associated with optional patterns of training and personnel utilization.

This Project is closely tied to a Congressional mandate to link selection procedures and enlistment standards to on-the-job performance measures. It involves development of on-the-job performance measures against which selection devices, such as the Armed Services Vocational Aptitude Battery, are to be validated. The Congressional direction to link enlistment standards to the on-the-job performance measures has resulted in close monitoring of this effort by the Office of the Assistant Secretary of Defense for Force Management and Personnel (OASD/FM&P).

In FY 88, plans include using the TDS to simulate and project consequences of user specified utilization and training options and to develop optional training designs.

In FY 89, it is planned to: (a) apply software to four AF specialties (AFS) for system refinement and validation, (b) begin to explore the automation of data collection and the application of training decision-making technology to such problems as AFS consolidation and training requirements for new weapon systems, (c) initiate work in training evaluation, in order to develop training requirements definition, and training content and method selection upon job performance based data. Studies will explore and identify links between existing AF management information systems and objective measures of job performance. Work will continue in support of the development of a transitionable job performance measurement system through FY 92.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) enhanced individual performance and unit effectiveness at all organizational levels through the use of improved performance measurement techniques and the linking of enlistment standards and selection procedures to these measures, (b) a Training Decision System to answer questions regarding personnel training, and (c) the development of optimal training designs through integration of data from task analysis, training cost studies, and policy development models.

In FY 87, accomplishments included: (a) continued job performance measurement efforts to study global/general supervisory ratings and task-level ratings as effective job performance measures, and (b) TDS integrated data from task analysis, training cost studies, and policy development models.

PROGRAM ELEMENT OVERVIEW

PE: 63106F

LOGISTICS SYSTEMS TECHNOLOGY

DoD ORGANIZATION:

AF

FUNDING:

FY88 \$ 9.6M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 13.9M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to develop, demonstrate, and validate information system technologies that will: (a) enable individual technicians to do a much wider range of maintenance tasks with the help of highly portable electronic job aids, (b) allow weapon system designers to "see" maintenance implications as they create system designs on computer terminals, (c) make essential weapon system design and system support information immediately available from multi-computer information networks, (d) rapidly determine the best balance of conflicting logistics, manufacturing, and performance requirements to design more sustainable and mission-suitable weapon systems, and (e) integrate combat experience into wartime logistics planning and capability assessment models.

The Air Force needs to improve the maintainability, combat supportability and reliability of Air Force weapon systems. DoD Defense Guidance, OSD funding initiatives, and the R&M 2000 Action Plan, endorsed by the Air Force Secretary and Chief of Staff, have emphasized this need.

In FY 88: (a) in MLCAD, development will continue on a generic artificial intelligence format for integrating new supportability techniques into the electronic design work station and MLCAD will be expanded to include a computerized anthropometric model incorporating size, strength, and mobility of Air Force maintenance technicians, (b) draft specifications and processes for incorporating MLCAD into contract requirements and using it to conduct design reviews will be developed, and (c) the IDS program will continue design and development efforts in preparation for demonstrations and testing.

In FY 89: (a) development will begin on a prototype Unified Life Cycle Engineering (ULCE) work station, along with the necessary models and software to integrate MLCAD and producibility models with standard performance engineering analyses, (b) further MLCAD enhancements will be developed to incorporate new knowledge about the effects of operating conditions (such as temperature, humidity, etc.) on components and their interconnections in various configurations, and (c) the IDS system will begin the prototype demonstration of the capability to integrate all the necessary data for structural design and logistics planning through distributed information networks comprised of many already installed computers of different design and manufacture.

The Israeli Air Force has agreed to provide classified combat logistics data on several aircraft to AFHRL for development of a combat database and analysis system.

Project 2744, Unified Database for Acquisition Logistics, was integrated with Project 2940, Computer Technology for Systems Design and Maintenance, in FY 87. Project 3203, Integrated Maintenance Information System Diagnostic Tests, was integrated with Project 2950, Integrated Maintenance Information System, in FY 87.

RELATED ACTIVITIES:

Continuing and close coordination among the Army, Navy, Air Force, other Department of Defense, National Aeronautics and Space Administration (NASA) and industrial organizations is done to eliminate redundancy in logistics

research and development. Projects are coordinated with: NASA's Integrated Program for Aerospace Design and with the Department of Defense Manufacturing Technology Advisory Group through membership on their Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) subcommittee; the Joint Logistics Commanders' Joint Policy Coordinating Group for Logistics Research, Development, Test & Evaluation subpanels for Automated Technical Information, and Reliability and Maintainability in Computer Aided Design; and The National Security Industrial Association, Logistics Management Committee, CAD Working Group. CAD efforts are also coordinated with the Integrated Computer Aided Manufacturing Program of PE 78011F. Technology to implement the DoD Computer-Aided Logistics Support (CALS) initiative is closely coordinated with all aspects of the CALS effort, including PE 63736D, Computer Aided Logistics Support. Technology input to PE 63106F comes from related program elements: 62201F, Aerospace Flight Dynamics; 62202F, Human Systems Technology; 62205F, Training and Simulation Technology; 62702F, Command, Control and Communications; 63253F, Advanced Integration Avionics; and 63751F, Training Systems Technology. Technology outputs are provided to 64740F, Computer Resource Management Technology; 78011F, Manufacturing Technology; 63742A, Advanced Electronic Devices; and others.

The work of this Program Element is managed by the Air Force Human Resources Laboratory, through their Logistics and Human Factors Division, with direct support from the Air Force Flight Dynamics Laboratory. Many development tasks require multi-laboratory efforts with specific laboratory involvements varying from one year to the next.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include information systems and technology designed to: (a) accurately predict how many people and parts must be provided when tactical aircraft are deployed in wartime conditions, (b) permit fewer people to perform a wider range of maintenance tasks in the deployed tactical environment of the future, (c) develop computer-aided design methodology to be used in weapon system designs from the outset, thereby reducing expensive and time-consuming redesigns and modifications, and producing more supportable and operationally ready weapon systems, (d) develop user-friendly decision aids necessary to integrate relevant performance, supportability, and producibility factors to wisely choose among system design alternatives, (e) facilitate exchange of technical information between the Air Force and prime contractors, and (f) allow the replacement of the current, manual, paper-based system for logistics support analysis data with automated electronic data processing capability.

In FY 86: (a) a Government-University-Industry MLCAD cooperative working group was established with the Institute for Defense Analysis as administrator, (b) a critical technical milestone of the IDS system was successfully accomplished with the demonstration of rapid access, through a single terminal and information control system, of all the essential engineering databases for a major structural repair and modification, (c) the primary contractor, Rockwell International, and a government-industry advisory group identified the key requirements and elements of an IDS-type system, and (d) the development of UDB software was completed.

FUTURE DIRECTIONS:

Work continuing past FY 89 emphasizes design, development and testing of the IDS prototype software and MLCAD techniques. The IDS results will provide the Air Force with the capability to access digital contractor engineering databases and to transfer data between design, manufacturing and logistics functions. These integration efforts will be completed in FY 92. Demonstrations of ULCE technology will continue through FY 94. Field demonstrations of the Integrated Maintenance Information System (IMIS) hardware, software, system architecture and equipment interfaces will culminate with transition into the Very High Speed Integrated Circuits (VHSIC) and advanced modular architecture insertion program in the early 1990s, and will become the standard for the Air Force Advanced Order System

AF/63106F

(ATOS). ATOS, together with IMIS, will permit rapid electronic updates of weapon system technical orders, thus eliminating time-consuming manual posting of technical order changes.

PROJECT OVERVIEW

		88	89
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PROJECT: 2745	LOGISTICS FOR COMBAT	\$ 0.1M	\$ 0.1M
	READINESS MAINTENANCE		
PE: 63106F	LOGISTICS SYSTEMS TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to: (a) identify factors that drive demands for maintenance in combat by analyzing actual wartime data, (b) develop analytical methods that will generate valid inputs for predictive models to accurately determine resources needed under wartime conditions, and (c) develop databases derived from actual combat experience.

The Air Force needs to accurately predict how many people and parts must be provided when tactical aircraft are deployed in wartime conditions. At present there are no satisfactory analytical tools or procedures to determine the changes in demand for aircraft maintenance from peacetime to wartime. Aircraft battle damage and intense operational use of weapons delivery systems and electronic warfare systems create wartime demands for skills and levels of maintenance activity which are not seen in peacetime. Studies of wartime data from recent conflicts show that extrapolation from peacetime experience does not give realistic results.

In FY 88, work will begin to develop combat capability assessment and readiness planning methodologies which will address the benefits of new maintenance aids and the impact of the realignment of maintenance career fields. The methodologies will include new requirement prediction techniques, and methods for determining small unit manning requirements. Also, the transition of combat databases and analysis software to the DoD Survivability Vulnerability Information Analysis Center will be completed.

In FY 89, it is planned to: (a) test these new methodologies in the field at the small unit level, (b) begin to develop decision aids to provide wing level staffs with logistics information vital to successful wartime operations, and (c) begin planning for a field test integrating new combat maintenance capabilities with the previously realigned maintenance career fields.

PAYOFF/UTILIZATION:

The payoffs of this Project include databases derived from combat experience and analytical methods that will: (a) generate valid inputs for predictive models to accurately determine resources needed under wartime and peacetime conditions, and (b) develop recommendations for realignment of maintenance career fields which will permit fewer, less-specialized technicians to support dispersed, high-surge operations in combat.

In FY 87, recommendations were developed for realignment of maintenance career fields. This realignment, made possible by the new maintenance aids being developed under Project 2950, Integrated Maintenance Information System, will permit fewer, less-specialized technicians to support dispersed, high surge operations in combat.

PROJECT OVERVIEW

		88	89
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PROJECT: 2940	COMPUTER TECHNOLOGY FOR	\$ 6.4M	\$ 8.3M
	SYSTEMS DESIGN AND		
	MAINTENANCE		
PE: 63106F	LOGISTICS SYSTEMS TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are to develop, demonstrate, validate, and specify computer technology to improve weapon system design and supportability so that the characteristics of reliability, maintainability, and testability are an integral part of Air Force systems.

The Project consists of three parallel, interrelated tasks: (a) developing the capability to apply decision aids, including expert systems, to design for supportability, (b) developing the capability to electronically access all weapon systems engineering data throughout the lifetime of the weapon, and (c) developing and testing an automated, interactive database for logistics support analysis data. These tasks will result in consistent specifications and standards needed for rapid electronic interchange of technical information.

The first task, Maintenance and Logistics in Computer-Aided Design (MLCAD), will develop computer-aided design methods to enable contractors to more effectively incorporate reliability, maintainability, and testability into weapon systems design from the outset. This task will also develop decision aids, in support of the Air Force's Unified Life Cycle Engineering (ULCE) initiative, which will allow designers and logisticians to evaluate trade-offs and allocate requirements in a consistent information architecture analysis structure, throughout the total design and acquisition process.

The second task, Integrated Design Support (IDS) System, will provide specifications, standards, and software to enable the Air Force to electronically access contractors' weapon system technical information databases, and to facilitate exchange of technical information between prime contractors, subcontractors and the Air Force. This task defines the specific engineering database required by the Air Force and develops the software architecture needed for interactive communication of digitized engineering data.

The third task, the Unified Data Base (U 3), will provide current logistics planning data and accurate field operational experience on weapon system performance to both government and contractor engineers.

In FY 88, it is planned to: (a) continue the development of a generic artificial intelligence format for integrating new supportability techniques into the electronic design work station for MLCAD, (b) expand MLCAD to include a computerized anthropometric model incorporating size, strength, and mobility of Air Force maintenance technicians (this model, developed jointly under Program Elements 62205F, Training and Simulation Technology, and 62202F, Aerospace Biotechnology, will provide visual simulation of maintenance and component access problems directly to system designers on their CAD terminals), (c) make additional MLCAD enhancements to begin to allow designers to compare the time required for maintenance tasks on alternative weapon system designs (given the ability to consider accessibility and related human factors during initial design trade-offs,

engineers will be able to design weapon systems that people can quickly and easily maintain in the field), (d) develop draft specifications and processes for incorporating MLCAD into contract requirements and using it to conduct design reviews, and (e) continue design and development efforts in the IDS task to prepare for future demonstrations and testing.

In FY 89, it is planned to: (a) expand the human modeling for maintainability to include dynamic simulation of maintenance time, and full integration into the design trade-off process, (b) develop jointly, with the Army, an integrated design workstation for electronic and mechanical components, which will allow engineers to design systems right, for maintainability, the first time, (c) the RAMCAD project will begin to provide the nucleus technology for the long-term multi-laboratory work in integrating design, logistics, support, and producibility disciplines into the computer-aided design Unified Life Cycle Engineering concept, (d) IDS will initiate a test of the information modeling methodology in an Air Logistics Center, to demonstrate the capability for sharing the same engineering data through a common data management system, and (e) begin work to develop new automated techniques so that the underlying analysis can be accomplished faster and at lower cost.

In FY 90, testing, verification, and validation of prototype RAMCAD software will be the basis for specification and standards development for use Air Force-wide.

PAYOFF/UTILIZATION:

The payoffs of this Project include consistent specifications and standards for rapid electronic interchange of technical information, achieved through 3 interrelated efforts: (a) Maintenance and Logistics in Computer-Aided Design (MLCAD), (b) the Integrated Design Support (IDS) System, and (c) the Unified Data Base (UDB).

MLCAD will: (a) reduce expensive and time-consuming redesigns and modifications, (b) allow engineers to design reliable systems right the first time, and (c) support the Air Force's Unified Life Cycle Engineering (ULCE) initiative.

The IDS System will provide research and development support for the automation and integration of digital product definition information.

The UDB will, for the first time, allow the replacement of the current, manual, paper-based system for logistics support analysis data with automated electronic data processing capability.

In FY 87, accomplishments included: (a) testing and development of new RAMCAD techniques through their application to F-15E support equipment and procedures for munitions loading within the cramped space constraints of a hardened aircraft shelter, (b) awarded a contract for integrating various electronic reliability design techniques into a single model, to be accessed through a computer-aided electronic design workstation, (c) the IDS program began a major technical advance to integrate databases on multiple types of computers using B-1B aircraft structural component data as a test case, and (d) the UDB completed validation, verification, documentation, and entered certification for DOD-wide use.

PROJECT OVERVIEW

		88	89
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PROJECT: 2950	INTEGRATED MAINTENANCE INFORMATION SYSTEM	\$ 3.1M	\$ 5.5M
PE: 63106F	LOGISTICS SYSTEMS TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop IMIS, an Integrated Maintenance Information System.

IMIS will be a complete system for providing the maintenance technician on the flight line with automated maintenance instructions and fault diagnostic aids through a single, portable computer display. The user-friendly, stand-alone IMIS portable computer will allow maintenance technicians to work interactively with built-in test capabilities of the weapon system. IMIS's rapid automatic interrogation of supply status and automatic reporting with artificially intelligent analysis will allow managers to quickly pinpoint deficiencies in supply or maintenance procedures or training.

In FY 88, it is planned to: (a) develop software for the IMIS portable maintenance aid to be field tested in FY 89 with the interactive diagnostics on an F-16 electronic subsystem, which will lead to a joint test the Navy on an F/A-18 electronic subsystem in FY 90, (b) award a major an advanced voice-controllable miniaturized IMIS maintenance aid which will include a supply and reporting interface, simulation capability for training in the field, and full system integration of diagnostics for Very High Speed Integrated Circuits (VHSIC) and modular electronics architecture (this increased diagnostics capability will permit the maintenance technician to readily assess the condition of modern, modular, fault tolerant, reprogrammable, redundant electronic circuitry and determine if a partially degraded system can continue to support combat missions without downtime for repairs), and (c) continue developing and evaluating technologies such as display screens with low power requirements and voice recognition, applicable to rugged, portable, computerized maintenance aids.

In FY 89, it is planned to: (a) develop an advanced IMIS that will include a supply and reporting interface, simulation capability for training in the field, and full system integration of diagnostics for Very High Speed Integrated Circuits and modular electronics architectures (this will permit the maintenance technicians to readily assess the condition of modern, modular, fault tolerant, reprogrammable, redundant electronic circuitry, so the technicians will be able to determine whether a partially degraded system can continue to support combat missions without downtime for repairs, and (b) continue development and evaluation of technologies, such as display screens with low power requirements and voice recognition, applicable to rugged, portable, computerized maintenance aids.

In FY 90, initial IMIS results will be available for use by the Advanced Tactical Fighter (ATF) and Joint STARS programs. Field demonstrations of the hardware, software, system architecture, and equipment interfaces will culminate with transition into the Very High Speed Integrated Circuit and advanced modular architecture insertion programs and will become the standard for the Air Force Automated Technical Order System.

PAYOFF/UTILIZATION:

The payoff of this Project is: a user-friendly, stand-alone portable computer display which is a complete system for maintenance fault diagnosis and automated maintenance instructions, that will: (a) permit fewer people to perform a wider range of maintenance tasks in the deployed tactical environment of the future, and (b) allow managers to quickly pinpoint deficiencies in supply or maintenance procedures or training.

Additional products of this effort include specifications, joint-Service coordinated standards, and automatic authoring systems which will aid in preparing maintenance and diagnostic instructions for electronic screen display.

In FY 87, accomplishments included: (a) development and testing of a relational authoring approach which creates electronic technical orders in the form of relational databases which require less computer storage space than fixed pages, and which allow screen displays to be tailored to the skill of an individual technician, (b) extensive diagnostic analysis and generic diagnostic system design for mechanical, hydraulic and electronic subsystems using flight data from advanced designs such as the X-29 experimental fighter, and (c) independent Navy verification of the IMIS technician data display concepts at Naval and Marine Air Stations, which now form the basis for developing common specifications for all three Services.

PROGRAM ELEMENT OVERVIEW

PE: 63227F PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY

DoD ORGANIZATION: AF

FUNDING: FY88 \$ 8.5M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 8.0M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to increase the Air Force's readiness and effectiveness by providing cost-effective solutions to problems of training, personnel acquisition and job assignment, manpower management, and human performance in weapon systems.

This Program Element includes efforts to develop: (a) technologies for selecting, classifying, and assigning quality men and women for Air Force jobs, (b) advanced technical training systems to increase the efficiency and productivity of Air Force personnel, (c) technologies to estimate manpower, personnel and training requirements for weapon system design trade-off decisions and to enhance supportability of new weapon systems, and (d) technologies to improve aircrew combat skills training.

This Program Element includes the Air Force portion of funding for the tri-Service Defense Training and Performance Data Center in Orlando, Florida.

A special emphasis of this work is to develop and demonstrate improved flight simulator visual image generation and visual display technologies to provide more adequate visual scenes for combat mission training, a low-cost, highly transportable, combat mission trainer for use at the squadron level, and the technology to link numerous trainers at dispersed locations, to enable realistic, large-scale, joint-Service combat training exercises.

Technology development efforts also support in-aircraft combat training through the development of the Air combat assessment and debriefing system (ACADS), similar to that provided at the instrumented combat ranges, which will provide significant improvements in home base pilot training and performance.

This Program Element also responds to Congressional and Department of Defense (DoD) mandates to update and validate tests that screen and classify military recruits, including the advanced development of the Armed Services Vocational Aptitude Battery (ASVAB), the DoD selection and classification instrument for all enlisted applicants for the Armed Forces. Air Force efforts to improve the ASVAB and produce new forms of the ASVAB are directed, in part, by a joint-Service steering committee of General Officers. Similarly, efforts to develop computerized testing techniques, for eventual use at Military Enlistment Processing Stations, are coordinated with the other Services. Air Force responsibilities lie principally in developing test items suitable for computer implementation.

Increased complexity of Air Force systems and rapidly changing technology requires development and application of advanced training system technologies for maintenance and support personnel to ensure success in combat operations. Efforts will focus on applications of computers and artificial intelligence to training, performance measurement and job aiding, including development of intelligent computer-assisted training and low-cost, stand-alone training devices to support tactical, strategic, and space-related missions.

A special emphasis of this program is to develop and demonstrate improved flight simulator visual image generation and visual display technologies to provide more adequate scenes for combat mission training, a low-cost, highly transportable, combat mission trainer for use at squadron level, and the

technology to link numerous trainers at dispersed locations, to enable realistic, large-scale, joint-Service combat training exercises. Technology development efforts also support in-aircraft combat training through the development of an air combat assessment and debriefing system, similar to that provided at the instrumented combat ranges, which will provide significant improvements in home base pilot training and performance.

This consolidated Program Element, 63227F, consists of all Projects (except 3057, PE 63751F) formerly from Program Elements 63227F, 63704F, and 63751F. Consolidation of these formerly separate, but related, Program Elements has been accomplished to meet Congressional direction to reduce the number of Program Elements.

RELATED ACTIVITIES:

Related Program Elements: 61102F, Defense Research Sciences; 62201F, Aerospace Flight Dynamics; 62202F, Aerospace Biotechnology; 62204F, Aerospace Avionics; 62205F, Personnel, Training, and Simulation; 63252F, Advanced Integration Avionics; 63259F, Cartographic Applications; 63751F, Training Systems Technology; 64227F, Flight Simulator Development; 62717A, Human Performance Effectiveness and Simulation; 63216A, Synthetic Flight Simulators; 63731A, Manpower and Personnel; 63738A, Non-System Device Development; 62757N, Human Factors and Simulation Technology; 62763N, Personnel and Training Technology; 63707N, Manpower Control Systems Development; 63720N, Education and Training; and 63733N, Training Device Technology. Air Force efforts directed toward improvement of the Armed Services Vocational Aptitude Battery (ASVAB) and the production of new forms of that test are directed, in part, by a joint-Service steering committee of General Officers. Similarly, efforts concerned with the development of computerized testing techniques, for eventual implementation at Military Enlistment Processing Stations, are coordinated with the other Services. Air Force responsibilities lie principally in the development of test items suitable for computer implementation. Efforts across all Services to develop job performance measures are coordinated by a working group monitored by the Office of the Assistant Secretary of Defense for Force, Management and Personnel. Close coordination is maintained both at the working level and by laboratory management with other Services. Exchange of proposed statements of work for contractual efforts, wide dissemination of technical reports, and attendance at symposia and meetings ensure that work conducted within this Program Element benefits from and does not duplicate, work conducted by the other Service laboratories. There is a continuing interface and close coordination among Army, Navy, and Air Force on training simulation. The Air Force Human Resources Laboratory (AFHRL), as the Air Force Systems Command focal point for training simulation technology, closely monitors all significant research and development being conducted by other Department of Defense, National Aeronautics and Space Administration, and industrial organizations in order to prevent duplication of effort. Close coordination within the Air Force user community is also accomplished by annual research and development coordination meetings between AFHRL, the Aeronautical Systems Division, and the Major Commands.

This program is managed by three divisions of the Air Force Human Resources Laboratory: The Manpower and Personnel Division, Operations Training Division, and the Training Systems Division. The Operations Training Division has an operating location at Davis-Monthan in support of Project 3056, and the Training Systems Division has an operating location at Bergstrom AFB in support of Project 2557.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) improved aircraft simulation image generation and display systems, (b) improved tests for selecting, classifying, and assigning quality personnel to jobs, (c) improved technical training systems to increase the efficiency and productivity of personnel, and (d) improved estimations of manpower, personnel, and training requirements for improved weapon system design and support.

Development of improved display technologies will provide more adequate visual scenes for combat mission training. Development of the combat mission trainer (CMT) will enable realistic, large-scale, joint-Service combat training exercises.

Development of ACADS will provide performance feedback similar to that provided at the instrumented combat ranges for all combat training profiles, without the restrictions or costs associated with the ranges.

Development and validation of selection and classification tests such as the ASVAB will lead to more accurate selection and classification of individuals and will ensure an improved match of individual aptitudes and job requirements.

FUTURE DIRECTIONS:

In the future, complex, multisensor, multicockpit, combat mission training flight simulators will be developed. These will then be refined into lower cost preproduction prototypes for use in operational training.

PROJECT OVERVIEW

		88	89
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PROJECT: 2363	ADVANCED VISUAL TECHNOLOGY SYSTEM	\$ 1.1M	\$ 1.1M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop technology to advance the state-of-the-art in visual simulation technology and demonstrate the utility of this technology for critical Tactical Air Force (TAF) training requirements.

The Advanced Visual Technology System (AVTS) represents a two-pronged approach toward this objective. One effort has developed an advanced 10-channel computer image generation (CIG) system with enhanced scene detail and complexity. Another effort will develop an advanced prototype, wide FOV, high-resolution, and high-brightness visual display. These capabilities are needed to enable detection and identification of tactical size targets at ranges sufficient for realistic training.

The combination of the advanced CIG and visual display systems will produce a research simulator which will be adequate to demonstrate and define behaviorally the TAF simulator design requirements. Some simulator visual design issues to be evaluated on both training and cost effectiveness are: edge and circle feature density and utilization, texturing, point feature density, object spacing and use, general database complexity and data requirements, maximum range for cue generation, shadows and brightness gradients, planar versus non-planar terrain, edge smoothing, area of interest implementation (for fine detail), display persistence, geometric distortion, inter-channel mismatch, and disparities between visual displays and other cockpit displays (e.g., sensor, radar, etc.).

In FY 88/89, training effectiveness issues to be investigated are : (a) simulator fidelity questions (such as the required field-of-view, display resolution, image brightness and image contrast), (b) image generator scene content, (c) gaming area database accuracy requirements, (d) target model fidelity requirements, and (e) the most effective use of color in flight simulator training.

The Advanced Visual Technology System (AVTS) image generator and the Fiber-Optics Helmet-Mounted Display (FOHMD) have been transferred to Project 2743, Aircrew Combat Mission Enhancement (ACME), for integration into the ACME testbed complex.

By FY 89, installation and integration of the FFOV dome will be completed, and training effectiveness evaluations will begin in FY 90.

PAYOFF/UTILIZATION:

The payoffs of this Project include advanced visual display technologies and capabilities to meet the very demanding simulator training requirements of the TAF.

This Project previously contained work on the demonstration and evaluation of an eye-slaved, high-resolution image inset capability for the fiber-optic,

helmet-mounted display (FOHMD), as well as refinements to make the FOHMD lighter and stronger. It also developed and evaluated an advanced computer-image generation (CIG) system for the Advanced Simulator for Pilot Training (ASPT).

In FY 87, accomplishments were: (a) equipping the limited field-of-view dome display system with an F-16A cockpit to produce a flight simulator for evaluating the training effectiveness of current technology, (b) the development of the next generation full field-of-view dome visual display system, a \$4.5 million, three-year project, jointly funded by the Aeronautical Systems Division (Project 2325, PE 64227F). The object of this new development is to exploit current head-tracking techniques to project a high resolution area of interest inset wherever the pilot is looking within the dome. This will provide high detail scenes to the pilot which are suitable for both air-to-air and air-to-ground combat simulation, without generating false cues to target location, as occurs with target tracking insets. The modular design will allow for incorporation of eye-tracking when that technology matures. Installation and integration of the dome will be completed by FY 89, with training effectiveness evaluation beginning in FY 90.

PROJECT OVERVIEW

		88	89
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PROJECT: 2364	TRAINING AND PERFORMANCE DATA CENTER	\$ 0.4M	\$ 1.0M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to provide the annual Air Force portion of the funding for the joint-Service, Defense Training and Performance Data Center (TPDC), formerly the Defense Training Data and Analysis Center (TDAC).

TPDC was established in FY 84 by the direction of the Office of the Secretary of Defense (OSD), as a result of the 1983 OSD Steering Committee on Training and Training Technology. TPDC is the OSD focal point for training technology and management information and will collect available training data to design, analyze, and integrate training data based in support of the entire Department of Defense training community.

PAYOFF/UTILIZATION:

The payoff of this Project is improved collection and availability of training data in the Department of Defense training community.

In FY 87, accomplishments included: (a) development of a key wording system, using artificial intelligence techniques, which allows the user more rapid entry and access to training related data, (b) development of a concept for a training information decision system that integrates several large data files and produces occupational data files for personal computer applications, and (c) support of data collection and system maintenance efforts of the USAF's Advanced On-The-Job Training System (AOTS) R&D program (Project 2557, PE 63227F).

In FY 88/89 this project supports seven major products: (a) Performance Measurement, (b) Task Database, (c) Applied Instructional Technology, (d) Collective Unit Training, (e) Occupation Database, (f) Footprint/Crosswalk (the USAF has direct sponsor involvement in the development of data and tools for occupations, applied technology, and support for weapon system training in the Crosswalk Project), (g) Operational Equipment Training System, and (h) continued support of the AOTS Program.

PROJECT OVERVIEW

		88	89
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PROJECT: 2557	ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)	\$ 2.1M	\$ 1.2M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are to develop, implement and test a prototype state-of-the-art training system that integrates and effectively manages, evaluates, and automates job site training.

Approximately 70 percent of Air Force technical training is accomplished by on-the-job training (OJT). More than 50 percent of all enlisted members of the Air Force are undergoing OJT at any one time. However, the system has not been significantly changed since its inception almost 40 years ago. Currently, OJT is labor-intensive, limited by excessive administrative burdens, and is not responsive enough to unique job-site training requirements.

The Advanced On-the-Job Training System (AOTS) will be implemented and demonstrated for four Air Force specialties at Bergstrom AFB, TX in cooperation with Tactical Air Command (TAC). This program complements other Air Force maintenance and logistics automation initiatives.

In FY 88, efforts will focus on the integration of the AOTS subsystems, as well as the requirements associated with maintenance, reliability, logistics, and transition of the system. During the fourth quarter of FY 88, the operational test and evaluation (OT&E) will begin.

In FY 89, the OT&E will be completed and the prototype system will be transferred to the Tactical Air Command. Throughout AOTS development, incremental products will be provided to HQ USAF for evaluation and implementation Air Force-wide.

This Project was transferred from PE 63751F at the end of FY 87.

PAYOFF/UTILIZATION:

The payoffs of this Project include increased on-the-job (OJT) effectiveness and training quality, thereby increasing individual and unit productivity and readiness in peacetime and combat capability in wartime.

In FY 87, accomplishments included: (a) completion of the major portion of development for AOTS subsystems, identification of training requirements, and assessment of job/task data, and (b) development of master task lists for four Air Force skill specialties and a methodology for third party performance evaluation, including criteria for task evaluation.

PROJECT OVERVIEW

		88	89
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PROJECT: 2743	AIRCREW COMBAT MISSION ENHANCEMENT (ACME)	\$ 3.8M	\$ 3.2M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to advance tactical flight simulation by demonstrating and evaluating technologies for realistic tactical combat mission training and combat mission planning and mission rehearsal.

These demonstrations and evaluations will help define simulator requirements to meet critical Tactical Air Force (TAF) needs. The basic approach requires the development of a Situational Awareness Training Research System (SATRS) which will serve as the primary tool for tactical aircrew training R&D and as a testbed for evaluating the impact of ACME components on aircrew performance. This effort has primarily used surplus simulation subcomponents from the Boeing B-52 Weapon System Trainer and visual display systems already at the Air Force Human Resources Laboratory, Operations Training Division (AFHRL/OT).

Advanced microprocessor and digital communication technologies will be incorporated into the design of all SATRS components. The SATRS required to support this situational awareness training R&D will be developed at three levels of capability: (a) Level I (FY 88-90) will refine and integrate previously developed components, including two F-16 cockpits, two wide field-of-view fiber-optic helmet-mounted displays (FOHMDs), and the Advanced Visual Technology System (Project 2363) to provide a basic two-ship F-16 capability. This two-ship capability will support training R&D involving the basic tactical element. An upgraded FOHMD with increased field-of-view and an eye-tracker will be completed in FY 88 and demonstrated in FY 89 as part of the SATRS, (b) Level II (FY 89-91) will develop two additional cockpits and integrate them with two Project 2362 developed dome displays; a local area network; an elementary command and control capability; additional threat and sensor systems; and six manned combat stations to allow four-ship training R&D in a multibogey environment, and (c) Level III (FY 89-93) will develop a long distance network standard and evaluate the potential of using long distance networking in aircrew training.

Beginning in FY 89, a Tri-Service flight simulation networking effort will be initiated with the Army Research Institute, the Army's PM-TRADE, and the Naval Training Systems Center to identify protocol requirements for long distance networking of dissimilar simulators.

Beginning in FY 93, R&D efforts will be initiated to determine the effectiveness of various mission planning and mission rehearsal approaches on mission success using the SATRS as a testbed.

PAYOFF/UTILIZATION:

The payoff of this Project involves the advancement of flight simulation concepts through the development of advanced training technologies for tactical aircraft, using multisensor, multicockpit combat mission simulators with advanced display capabilities.

This application of advanced simulator technologies at both training center and operational unit levels will lead to improved sustained aircrew readiness. It will significantly extend the range of training tasks that can be successfully accomplished in simulators.

In FY 85, the helmet-mounted display work was transferred from this Project to Project 2363 to consolidate all of the display-related efforts. In FY 87, this effort was transferred back to Project 2743 for further development.

In FY 87, accomplishments included analysis of tactical training needs, engineering feasibility, and system requirements. These analyses indicated that ACME should focus its initial efforts on developing and evaluating simulator and training technologies which will lead to improved situational awareness and combat effectiveness in the multibogey tactical environment.

PROJECT OVERVIEW

		88	89
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PROJECT: 2922	PERSONNEL ASSESSMENT SYSTEMS	\$ 0.5M	\$ 0.5M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objectives of this Project are to: (a) provide technology to enable the Air Force to meet its manpower needs for combat readiness and sustainability, (b) develop systems to provide management information on individual job performance and requirements, (c) use task-level measures of on-the-job performance to develop criterion measures to validate selection, classification and promotion tests and assess training effectiveness (as mandated by Congress), and (d) revise tests such as the Air Force Officer Qualifying Test (AFOQT) and the Armed Services Vocational Aptitude Battery (ASVAB).

As the DoD Executive Agent for ASVAB development, the Air Force must update and revise the ASVAB to ensure that it meets the needs of all the Services.

In FY 88, it is planned to: (a) analyze the job performance data collected on three job specialties: Air Traffic Controller, Avionic Communications Specialist, and Ground Radio Operator, (b) develop, test and analyze job performance measures for four additional specialties, and (c) continue developing new prototypes for both the enlisted and officer selection test batteries. Future efforts will explore possible computer-based, computer adaptive approaches to officer selection and classification. Development, evaluation, refinement, and application of performance measures will also continue, as well as their validation/evaluation and cost-benefit analyses.

In FY 89, a new system for selecting pilots for fighter/attack/reconnaissance or multi-engine heavy aircraft will be delivered for field use. Also, job performance measures will be developed for eight additional specialties.

This Project was transferred from PE 63704F at the end of FY 87.

PAYOFF/UTILIZATION:

The payoff of this Project is technology to enable the Air Force to meet its manpower needs for combat readiness and sustainability and to measure individual job performance through: (a) replacement of test batteries, thus avoiding obsolescence and test compromise, and incorporation of improvements identified in ongoing service test research programs, (b) continuation of test revisions (e.g., ASVAB) and validation against performance measures, as mandated by Congress, and (c) development of measures for validation of enlisted selection and promotion tests to reduce the risk of civilian class-action suits against the government, resulting in potential cost avoidance of approximately \$2.5 Million per year.

In FY 87, accomplishments included: (a) testing of job performance measures for three Air Force specialties: Air Traffic Controller, Avionic Communications Specialist, and Ground Radio Operator, with analyses of these data to be completed in FY 88, and (b) testing of job performance measures for four additional Air Force specialties: Personnel, Life Support, Aerospace Ground Equipment, and Precision Measuring Equipment, with analyses

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of these data to be completed in FY 88.

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PROJECT OVERVIEW

		88	89
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PROJECT: 2949	BASIC JOB SKILLS	\$ 0.6M	\$ 0.9M
	ASSESSMENT AND		
	ENHANCEMENT		
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop and demonstrate an adaptive training system focusing on the basic functional and enabling job skills (the core knowledge content, such as literacy, arithmetic computation, dial and map reading) and associated thinking processes that enable early technical proficiency and thus bring the first-term airman to a functional level faster.

Of particular interest are the skills required in work places heavily influenced by technology. This training system, incorporating data collected in Program Element 62205F on the intellectual requirements of various jobs and work places.

Another effort within this Project will provide a top-down, structured approach to system redesign and reprogramming to make the Comprehensive Occupational Data Analysis Programs (CODAP) system more efficient, easier to maintain, and more user-friendly. CODAP, the primary operational Air Force occupational analysis tool, is rapidly becoming antiquated and difficult to maintain.

In FY 88, software development for the occupational measurement system will be completed. Work will begin on the development of training modules for 26 Air Force specialties, and specifications for training effectiveness evaluation and validation will be completed. Comprehensive training implementation plans will also be completed.

In FY 89, development of a basic job skills extended job family trainer for eight Air Force Specialties will be completed and tested. Operational test and evaluation of the prototype occupational measurement system will begin.

This Project was transferred from PE 63704F at the end of FY 87.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) a reduction in the number of marginal performers, and (b) reduced overall on-the-job training time. Savings from reduced attrition could reach as much as \$10 Million per year.

Air Force decision makers will be provided with scientifically valid, job-oriented, measurement and training, to ensure that airmen possess the basic job knowledge and skills needed to perform and progress satisfactorily during the first term of enlistment.

The original CODAP system has resulted in an estimated cost avoidance of over \$3 Million per year since its implementation in FY 68. Benefits of the updated CODAP include: (a) state-of-the-art analytical, statistical, and reporting procedures, (b) techniques for longitudinal analyses of job content, (c) techniques for developing more job-related enlisted promotion tests, and (d) techniques for matching weapon system acquisition tasks with

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related personnel skill requirements.

In FY 87, accomplishments included initiation of a series of advanced development tasks to develop a prototype occupational measurement system with advanced task and job clustering capabilities, and automated job type procedures.

PROJECT OVERVIEW

		88	89
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PROJECT: 2951	TRAINING DECISIONS SYSTEM	\$ 0.1M	\$ 0.2M
PE: 63227F	PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop a computer-based system which will help optimize training decisions for Air Force specialties. It will establish the basis for management decisions on what to train, where to train, and when to train.

Because of the scope of Air Force technical training, many decisions with major impacts on training are made, to some extent independently and at different times, by management units responsible for different parts of the training and personnel systems. Coordinating such efforts is complex, and relevant data are not always available at key decision points when they are needed. For example, the content of resident technical school training is largely determined by predefined budgets; whatever content is not covered in the school is left to on-the-job training (OJT), without systematic appraisal of long-term costs or unit capacities for an increased loan on OJT resources.

In FY 88, it is planned to: (a) complete design specifications, and (b) continue advanced development of the TDS.

This Project was transferred from PE 63704F at the end of FY 87.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) reduced training costs, (b) improved allocations of training content and resources, (c) demonstrably better alignment of training content with job task requirements, and (d) reduced training workload on operational Air Force units. When operational, projected total savings plus cost avoidance are expected to be very high.

In FY 85, accomplishments included development of initial specifications for the advanced TDS, detailing the transition stages, operational resource requirements, and recommended delivery schedules, organizational lines of authority, and technical functions of the operating subsystems.

PROGRAM ELEMENT OVERVIEW

PE: 63231F CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY

DoD ORGANIZATION: AF

FUNDING: FY88 \$ 6.2M (FY89 PRESIDENT'S BUDGET)
 FY89 \$ 6.5M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of the Manpower, Personnel and Training (MPT) portion of this Program Element is to provide advanced development and demonstration of concepts to protect and extend the performance of the crew member in the hazardous aerospace environment.

Weapons system development has reached the point where the operator may become the limiting factor in total system performance and mission success. The performance envelope of the weapons system, extreme aerospace environments, and combat threats can exceed the protective capabilities of life support systems, limiting operations and placing severe physical demands on the operator. Information available concerning the status of the weapons system and mission is so complex and fluid that it can exceed the operator's ability to perceive, decide, and act upon the information. Modern aircraft tactics and mission scenarios continually place the operator in environments from which there is low probability of successfully ejecting in an emergency. Work under this Program Element will demonstrate the capability to operate and escape at the extremes of the performance envelope and will develop a methodology to maximize decision-making by the system operator. The program focus is on the crew member in the cockpit or crew station but logically extends to other air and ground personnel conducting mission-essential operations and support. Recently incorporated efforts on chemical warfare defense ensure integrated consideration of this serious threat to the spectrum of aerospace operations. Supporting many system development programs and over fifteen formal Statements of Need on specific requirements from Headquarters Air Force and Major Commands, the emphasis of this Science and Technology effort remains on total personnel protection and improved performance of human-centered systems to support mission accomplishment.

These technology development programs have evolved out of exploratory development with Program Element 62202F, Human Systems Technology, and represent a key link to the demonstration of technologies prior to full-scale development through Program Element 64706F, Life Support Systems, Program Element 64703F, Aeromedical/Chemical Defense Systems, or engineering program offices. Products are provided to Aeronautical Systems Division (ASD), Human Systems Division (HSD), Electronic Systems Division, Space Division, and other organizations in accordance with well-coordinated, signed technology transition agreements. Life support activities are included in ASD's Ten-Year Life Support Master Development Plan and are coordinated through the Tri-Service RDT&E Steering Group reporting to the Joint Logistics Commanders. Military space crew activities are coordinated with other services or agencies and with the National Aeronautics and Space Administration through joint participation in the Air Force Scientific Advisory Board and the Space Technology Interdependency Group, consultation on requirements, and cooperative research covered by memoranda of agreement. Laser protection technology is coordinated through the Tri-Service Laser Hardened Materials and Structures Group, chaired by Office of the Under Secretary of Defense for Research and Engineering. Man-machine integration activities are coordinated through a Tri-Service Initiative Panel chartered by the Joint Directors of Laboratories and chaired by the Cockpit Automation Technology (Project 2829) Program Office and the HSD/ASD crew station working group. Joint planning and participation in steering groups assure compatible phasing of total weapon system development goals.

Projects 2830 (Advanced Life Support Systems) and 2868 (Crew Escape Systems Technology), though still under this Program Element, are no longer considered to be within the Manpower, Personnel and Training Research and Development area. Project 2992 (Space Crew Enhancement), formerly under Program Element 63365F (Space Biotechnology), has been transferred to this effort in FY 86.

In FY 88, it is planned to: (a) produce a fully-developed design process for CAT, a computer-aided system for real-time testing of new design concepts, and a fighter cockpit specification, (b) evaluate space suit modification contract, and (c) conduct aircraft tests of the visual acquisition and tracking system.

In FY 89, it is planned to: (a) continue system demonstration on the CAT, (b) demonstrate the visual acquisition tracking system and evaluate its utility in space operations, (c) continue to develop specifications and subsystems for military space suits, and (d) continue to incorporate crew station design criteria and advanced control/display technologies into required military-unique systems.

RELATED ACTIVITIES:

Projects have evolved from exploratory development in PE 62202F, Human Systems Technology, and represent a key link in the demonstration of technologies prior to full-scale development through PE 64706F, Life Support Systems; PE 64703F, Aeromedical/Chemical Defense Systems, or engineering program offices. Products are provided to Aeronautical Systems Division (ASD), Aerospace Medical Division, Electronic Systems Division, Space Division, and other organizations in accordance with well-coordinated, signed technology transition agreements. Joint planning and participation in steering groups assure compatible phasing of total weapon system development goals. The Army is DoD lead agency for Chemical Warfare Defense, and only efforts that have specific Air Force relevance or that can be done more economically using Air Force expertise are included in this project. Areas with multiservice application are identified in a Joint Service Research, Development, and Acquisition Plan for inclusion in the Army's overall chemical defense research program. Medical chemical defense efforts are further coordinated through the Armed Services Biomedical Research, Evaluation and Management Committee.

The program is conducted by the Aerospace Medical Division, Directorate of System Acquisition with assistance from its laboratories, the USAF School of Aerospace Medicine and Air Force Human Resources Laboratory and the Armstrong Aerospace Medical Research Laboratory, and through memoranda of agreement with other laboratories, divisions, and commands.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include advances in crew systems technology which will increase aircrew performance and protection in the hazardous aerospace environment.

Maximizing the decision-making ability and performance of, and sustaining and protecting, pilots and aircrews is vital for maintaining a combat-effective aeronautical force. The inability of the system operator to sufficiently perceive, decide, and act upon information and many other mental and physical demands may diminish aircrew performance, endanger aircrew safety, or decrease survivability. These limit, or preclude the successful use of, a pilot's tactical skills in combat situations and, ultimately, the potential for combat mission success. Work under this Program Element will result in the reduction or elimination of such threats and limits.

FUTURE DIRECTIONS:

Future work under this Program Element will lead to further development of needed tools and methodologies to extend air/aerospace crews' performance in

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hazardous and complex combat scenarios. The development and evaluation of advanced life support equipment, escape systems technology, and aircrew performance-extending technology, will continue towards the goal of assuring maximal air and aerospace crew survivability and combat mission success.

PROJECT OVERVIEW

		88	89
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PROJECT: 2829	COCKPIT AUTOMATION TECHNOLOGY (CAT)	\$ 5.5M	\$ 5.5M
PE: 63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AEROSPACE MEDICAL DIVISION		

PROJECT SYNOPSIS:

The objective of this Project is to develop and verify the necessary quantitative tools and procedures to permit the extensive application of human factors principles early in the development cycle of manned aerospace vehicles.

Currently, there is no structured process for allocating functions between the airborne crew members and the automated systems, the crew complement, the appropriate display of information for crew members, and solutions to control workload. This program aims to reduce system program costs and risks currently associated with numerous cockpit engineering change proposals and retrofits by setting up a coordinated weapon system design process which permits quantifiable trade-offs between airframe, avionics, and cockpit design in advance of full-scale development decisions and which provides insight into the consequences of potential subsequent modifications to avionics and weaponry. Resultant military standards, design handbooks and computer-assisted procedures will be available to the military services, NASA and contractors.

In FY 88, it is planned to: (a) complete Phase II, which will produce a fully developed design process, a computer-aided system for real-time testing of new design concepts, and a representative fighter aircraft cockpit specification, (b) perform analytical and part-task simulations to test measures of effectiveness for the designed cockpit, (c) conduct full-mission ground-based simulations, with participation by Air Force crews, to verify the design process while demonstrating adequacy of the representative cockpit design, (d) use a reconfigurable breadboard cockpit simulator for gathering empirical design data, and (e) begin work on concepts and quantitative methods for further design validation through the potential comparison of simulator results to crew/cockpit in-flight performance.

In FY 89, it is planned to: (a) continue Phase III, system demonstration, as the CAT design process is refined based on part-task and part-mission simulator tests, (b) revise and fully document software analysis programs into proposed automation design guides, (c) interface the breadboard cockpit simulator with the computer-aided design support system, and configure a full-mission simulator for validation testing, (d) begin transition training for DoD system acquisition personnel to use the developed process, and (e) hold design reviews for data acquisition hardware appropriate for in-flight measurements to support the design process.

In accordance with signed agreements, CAT products and the fighter cockpit specification are provided to the Advanced Tactical Fighter System Program Office for ATF development, as well as the Aeronautical Systems Division Engineering for incorporation into the Air Force cockpit qualification process. A technology bonus has been the CAT mission scenarios, which have already been applied by more than twenty other joint-Service and government development programs.

PAYOFF/UTILIZATION:

The payoffs of this Project include the publication and distribution of military standards, design handbooks, and extensive computer-assisted procedures to the military services, National Aeronautics and Space Administration (NASA), and contractor for use early in the design process to determine the cost-effective design of aircrew training needs.

The early application of this crew system design process will reduce system program costs and risks associated with engineering change proposals and retrofits stemming from the limited design insight available from currently used techniques. For the first time, a coordinated weapon system design process which permits trade-offs between airframe, avionics, and cockpit design will be possible in advance of Full-Scale Development (FSD) decisions. It will also provide insight into the adequacy of the design after potential downstream avionics and weaponry modifications.

In FY 87, accomplishments included conducting a toxicological analysis of chemical agent training simulants. Preliminary results indicate that chloropentoflourobenzene has very low toxicity. Identified a persistent chemical agent training simulant. In the area of ground crew cooling systems, it was determined that air cooling is as good or better than liquid cooling. Completed the laboratory work and a transition plan for the concept of intermittent cooling. Developed two breadboard Chemical Vapor Cockpit Sensors. However, sensitivity goals were not achieved, and it was decided to return this technology to the 6.2 level of development. Also completed work on the molecular sieves and cockpit filtration systems.

PROJECT OVERVIEW

		88	89
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PROJECT: 2992	SPACE CREW ENHANCEMENT (SPACE)	\$ 0.7M	\$ 1.0M
PE: 63231F	CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AEROSPACE MEDICAL DIVISION		

PROJECT SYNOPSIS:

The objective of this Project is to address man-machine integration and crew protection systems needed to exploit or enhance man's ability to support traditional military missions from space.

This effort supports the Air Force policy to ensure that unique capabilities derived from man in space are used to enhance existing and future missions in the interests of national security objectives. To ensure effectiveness of military space-related systems, whether ground-based or space-based, human engineering concepts must be employed to optimize performance of the integrated man-machine system. This program will help define man's potential roles in military space systems, as well as quantify the trade-offs of manned versus unmanned space systems to support tasks such as logistics and surveillance. It will demonstrate concepts and technologies to ensure life support, crew performance, and crew protection in the complex and potentially hazardous environment unique to military space systems. A specific area of near-term interest includes technologies to support and enhance crew effectiveness in the development and deployment of a transatmospheric vehicle, which has potentially different launch and egress response times, flight durations, acceleration profiles, and performance characteristics, or operator workload and task requirements than the space shuttle.

In FY 88, it is planned to: (a) evaluate transition products from the initial space suit modification contract, as concept studies are conducted for further modifications, (b) conduct initial aircraft tests of the visual acquisition tracking system, and (c) begin work on military-unique features of helmet-mounted displays for presenting logistics data to space-suited crew members during extravehicular activity.

In FY 89, it is planned to: (a) demonstrate the visual acquisition tracking system, which will lead to an evaluation of its utility in space operations, (b) continue to develop specifications and subsystems for military space suits, to include provisions for shorter egress times, improved logistics supportability, advanced in-helmet displays and increased radiation protection, (c) continue to incorporate crew station design criteria and advanced control/display technologies into required military-unique systems, and (d) ensure clear definition of user requirements and well-coordinated product transitions.

This Project was transferred from Program Element 63365F (Space Biotechnology) to Program Element 63231F (Crew Systems Technology) in FY 86.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) a definition of man's potential roles in military space systems, including his ability to successfully perform projected military missions, (b) an analysis of the trade-offs of manned versus unmanned space systems, (c) technologies, in the near term, to support and enhance crew effectiveness in the development and deployment of a

transatmospheric vehicle with potential different launch and egress response times, flight durations, acceleration profiles, performance characteristics, and operator workload and task requirements than the space shuttle, and (d) in the long term, the design of effective future systems, optimally utilizing man's abilities, and of subsystems to protect man and further extend the system's capabilities.

In FY 87, accomplishments included: (a) defined human performance and design criteria applicable to hypervelocity and transatmospheric type vehicles, (b) developed prototype pressure suit modifications and conducted initial testing, (c) coordinated with NASA on heads-up displays and established an advisory role for the program, (d) continued coordination with the Air Force Geophysics Laboratory on their modeling capability for differential charge buildup on space suits in the polar latitudes, and (e) coordinated user requirements and technology transition with the Space Command, Space Division, and the National Aerospace Plane Program Office for the Space-borne Direct View Optical System (SPADVOS). SPADVOS has been deemed the number one priority by the DoD Military Man-in-Space Experiment Prioritization Panel. The SPADVOS system has gone through extensive design and modification, and has been successfully tested on an airborne platform.

PROGRAM ELEMENT OVERVIEW

PE: 63751F

TRAINING SYSTEMS TECHNOLOGY

DoD ORGANIZATION:

AF

FUNDING:

FY88 \$ 0.3M (FY89 PRESIDENT'S BUDGET)

FY89 \$ 0.5M (FY89 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to develop cost-effective advanced technical training systems to increase the efficiency and productivity of Air Force personnel.

The Air Force must continuously train large numbers of new and experienced personnel in a wide variety of skills to operate and maintain increasingly complex weapons and support systems. This places increasing demands on the training community for both formal school and on-the-job training (OJT).

Work under this Program Element will develop systems specifications for the Intelligent Computer-Assisted Training (ICAT) system for application to various training environments, which will reduce training workload and increase training effectiveness, without the need for increased manpower for training. These training devices will be especially amenable to high-flow career fields, high-technology environments, and the complex training requirements anticipated for space related technologies.

Projects 2362, 2557, and 3056 under this Program Element transferred to PE 63227F at the end of FY 87. Due to an administrative error, Project 3057 has not yet been transferred, but will be consolidated in PE 63227F beginning in FY 90.

RELATED ACTIVITIES:

Related Air Force Program Elements are 61102F, Defense Research Sciences; 62205F, Personnel, Training and Simulation; 63227F, Personnel, Training, and Simulation Technology; and 63106F, Logistics Systems Technology. Related Navy and Army Program Elements are 62757N, Human Factors and Simulation Technology; 63701N, Human Factors Engineering Development; 63720N, Education and Training; 63743A, Education and Training. The Air Force Human Resources Laboratory closely monitors all significant research and development being conducted by other Department of Defense, National Aeronautics and Space Administration, and industrial organizations. Exchange of proposed statements of work for contractual efforts, wide dissemination of technical reports, and attendance at symposia and meetings ensure that work conducted within this Program Element benefits from and does not duplicate work conducted by the other Service laboratories. Close coordination within the Air Force user community is also accomplished by annual research and development coordination meetings between the Laboratories, the Aeronautical Systems Divisions, and the Major Commands.

The program is managed by the Air Force Human Resources Laboratory through the Training Systems Division (AFHRL/ID).

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) reduced training workload, (b) increased effectiveness of instructional simulations, and (c) increased training performance without the need for increased manpower for training.

This methodology will be especially amenable to high-flow career fields, high technology environments, and the complex training requirements anticipated

for space related technologies.

FUTURE DIRECTIONS:

In FY 90, full-scale development of the Intelligent Computer-Assisted Training (ICAT) system will begin, with demonstrations and evaluations beginning in FY 91.

PROJECT OVERVIEW

		88	89
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PROJECT: 3057	INTELLIGENT COMPUTER-ASSISTED TRAINING	\$ 0.3M	\$ 0.5M
PE: 63751F	TRAINING SYSTEMS TECHNOLOGY		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	AIR FORCE HUMAN RESOURCES LABORATORY		

PROJECT SYNOPSIS:

The objective of this Project is to develop systems specifications for Intelligent Computer-Assisted Training (ICAT) in various training applications where payoff promises to be high, and to identify technology demonstrations for these applications.

ICAT differs from current conventional computer-assisted instruction in that the "intelligent" system makes judgments about what the student knows and how well he or she is progressing. It tests those judgments, and it provides appropriate instruction or assistance automatically, i.e., without the need for human instructor intervention. In effect, the training system acts as a tutor, not just a training delivery device.

Rapidly changing technology and the increasing complexity of weapon systems are vastly increasing Air Force training requirements while training resources remain relatively fixed. This requires the Air Force to rely more heavily upon on-the-job training and more efficient methods of training, such as computer-based training. This is especially true in areas that require high levels of training, such as space shuttle launch and control, space vehicle tracking, and space operations. This FY 88 new start project will develop systems specifications for Intelligent Computer-Assisted Training (ICAT) in various training applications where payoff promises to be high, and identify technology demonstrations for these applications. ICAT differs from current conventional computer-assisted instruction in that this "intelligent" system makes judgments about what the student knows and how well he/she is progressing, tests those judgments, and provides appropriate instruction or assistance automatically, without the need for human instructor intervention. In effect, the training system acts as a tutor, not just a training delivery device. When completed, this project will provide field demonstrations of intelligent computer-assisted training applications and guidelines for expanded use.

In FY 88 this Program, which was designed to capitalize on the advances in intelligent computer-aided instruction and personal computer engineering, will focus on cost effective, efficient delivery of training. Phase I will consist of a comprehensive review evaluation of state-of-the-art intelligent computer-assisted training technology and the computer hardware required for training development and delivery.

In FY 89, Phase II will consist of initial software design and development of specifications for the prototype testbed. The design will include development of interactive design tools for course developers, and modeling to allow for adaptation of training delivery for multiple instructional environments, differences in student ability, differences in instructional presentation, and automated expertise capturing systems.

This project was scheduled to transfer to PE 63227F at the end of FY87, but due to administrative error it has not yet been transferred; however, plans are to consolidate it in FY 90.

PAYOFF/UTILIZATION:

The payoff of this Project is the reduction of training workload, an increase in the effectiveness of instructional simulations, and an increase in training performance, without the need for increased manpower for training.

When completed, this program will provide field demonstrations of intelligent computer-assisted training applications and guidelines for expanded use. This moderately high-risk, five-year program is designed to capitalize on the advances in intelligent computer-aided instruction and personal computer engineering. It will focus on cost effective, efficient delivery of training.

PROGRAM ELEMENT OVERVIEW

PE: 64227F

FLIGHT SIMULATOR DEVELOPMENT

DoD ORGANIZATION:

AF

FUNDING:

FY88 \$ 56.8M (FY89 PRESIDENT'S BUDGET)
FY89 \$ 72.8M (FY89 PRESIDENT'S BUDGET)-----
PE SYNOPSIS:

The objective of this Program Element is to provide for engineering development of aircrew flight simulator techniques and training devices.

This Program Element funds efforts to: (a) adapt flight simulation technology developed in the laboratories and industry for satisfying current training requirements, and (b) develop prototype training devices. Prototype training devices and subsystems developed under this Program Element will be evaluated for training effectiveness and supportability prior to follow-on production decisions and/or acquisition.

The FY 85 Budget was the first in which flight simulator programs were consolidated into this Program Element to enhance control and visibility within the Air Force, the Office of the Secretary of Defense (OSD), and Congress.

The Deputy for Simulators, Wright-Patterson Air Force Base, Ohio, is the in-house organization responsible for the majority of this Program Element. This Program Element (PE) relies heavily on the Air Force Human Resources Laboratory science and technology programs, including PE 62205F, Training and Simulation Technology, PE 63277F, Advanced Simulator Development, and PE 63751F, Innovations in Education and Training.

In FYs 87-89, work under this Program Element will include: (a) engineering development of training system technology techniques and preproduction of first article training devices to satisfy current and future training technologies, (b) updates to training systems to maintain and improve their supportability and effectiveness, (c) development of the GBU-15 Part Task Trainer, which is a low cost, ground-based device for training F-4E and F-111F Weapon System Operators in the GBU-15 and AGM-130 precision guided munitions, (d) development of the Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) simulator, (e) development of the LANTIRN Part Task Trainer, which will train pilots in LANTIRN (F-16, F-15E) switchology, modes of operation, and F-15E avionics, (f) development of a standard DoD digital database that uses Defense Mapping Agency data for displays for aircrew training, (g) development of training devices for B-1B crew members, (h) efforts in modular simulator design in order to deliver simulators to the field concurrently with the aircraft, (i) development of the KC-135 Operational Flight Trainer, which will accurately simulate the total aircraft flight envelope and meet Strategic Air Command's requirements for annual instrument evaluations, (j) development of the Advanced Training System, which will provide information presentation, demonstration, drill and practice, evaluation, feedback, and remedial training, (k) development of the Advanced Tactical Fighter training system, which will meet Manpower, Personnel and Training needs to support operations personnel assigned to the weapon system, and (l) development of the C-17 Aircrew training system, which will supply initial and continuation training for C-17 crew members.

RELATED ACTIVITIES:

Technologies from inter- and intraservice coordination of science and technology and the Air Force Human Resources Laboratory (AFHRL) science and technology programs provide support to this Program Element. Specific programs include: PE 62205F, Personnel, Training and Simulation Technology,

and PE 63277F, Personnel and Training Simulation Technology.

The work is conducted by the Deputy for Training Systems, who is responsible for the majority of work performed in this element. Ogden Air Logistics Center manages the modification to the F-4E/G and C-135 simulators. AFHRL is responsible for the F-15/F-16 Simulator for Air-to-Air Combat (SAAC).

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: (a) lower costs of training and greater training safety, efficiency, and effectiveness through adaptation of flight simulation technology to today's complex aircraft (e.g., the F-4, F-15E, F-16, C-17, KC-135, C-130, and B-1B), (b) improved supportability and effectiveness of flight simulators in the field, (c) improved training for F-4E and F-111F Weapon System Operators on the electro-optical/infrared mission specifics, (d) reduced costs and improved deliverability of simulators through simulator modularity design and development of a Standard DoD simulator database that uses Defense Mapping Agency data for displays for aircrew training, (e) improved reliability and maintainability of both existing and planned flight simulators, (f) elimination of training deficiencies through provision of the Advanced Training System, and (g) improved support for operations personnel assigned to the Advanced Tactical Fighter (ATF) through the development of the ATF training system.

FUTURE DIRECTIONS:

This is a continuing Program Element for the development of aircrew flight simulator techniques and training devices.

Specific future efforts for FY 90 and beyond include: (a) attaining full operational status for the C-130 Aircrew Training System, (b) demonstration and validation of Modular Simulator Design, (c) integration of the LANTIRN with the F-16 Operational Flight Trainer, (d) exercising of production options for the remaining KC-135 Operational Flight Trainers, and (d) activation of the first site for the C-17 Aircrew Training System in FY 91, activation of the final site in FY 99, and contract termination in FY 2003.

PROJECT OVERVIEW

		88	89
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PROJECT: 2325	SIMULATOR DEVELOPMENT	\$ 5.3M	\$ 3.4M
	ACTIVITIES		
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to provide for the engineering development of training systems technology techniques and preproduction or first article training devices to satisfy current training requirements. It also: (a) addresses identified deficiencies in training capabilities, (b) improves concurrency between aircraft and flight simulators, and (c) reduces life cycle costs.

Approximately 40 unique tasks are being accomplished within this Project, including such efforts as: (a) radar sensor database development, (b) evaluation of the Synthetic Aperture Radar simulation application, (c) completion of engineering development and evaluation of a helmet-mounted visual display, (d) development of an authoring system for Computer-based Instructional Systems (CBI), (e) development of a generic trainer and other similar small part-task trainers as required, and (f) three promising applications to satisfy the requirement for a full field-of-view display system.

In FY 88, planned efforts include: (a) assessments of artificial intelligence (AI) for Instructor Operator Station (IOS) and CBI, (b) continued development of multi-cockpit IOS and initiation of multi-station IOS development, (c) continued evaluation of infrared and electronic combat simulation, and (d) beginning development of an embedded training prototype program for training/cost trade-offs analysis.

In FY 89, planned efforts are to: (a) continue AI research for IOS in support of complex tactical missions, (b) continue development of an embedded training prototype maintainability and reliability database, (c) complete the full field-of-view visual system, (d) address a tactical simulator prototype for air-to-air/air-to-ground combat environments, and (e) begin development of a low cost image generator for sensor simulation.

Work tasks within this Project are based on Category II through IV cost estimates. It complies with Office of Secretary of Defense guidelines as follows: (a) provides data that will be used as generic building blocks in the development of new training devices, (b) develops sensor simulation for generic infrared and visual systems, and (c) is the only Project that addresses these requirements, and test and specification development, with an extensive framework developed for front-end analysis. The emphasis is on generic development for use on all simulator programs to reduce acquisition and life cycle costs, reduce acquisition time, and improve reliability, maintainability, and availability.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) lower costs and improved training effectiveness through the adaptation of flight simulation technology to today's complex aircraft, and (b) the flexibility to address generic technical problems to a wide range of simulator requirements and acquisition

programs (i.e., database development, instructional systems, sensor simulation development, visual simulation development, handling qualities/training effectiveness, support, and configuration management).

In FY 87, accomplishments included: (a) continued development/evaluation of a user friendly authoring language for Computer-Based Instructional Systems (CBI), (b) a study of visual sensor commonality, (c) evaluation of state-of-the-art visual display systems for engineering acquisition specifications, and (d) evaluation of an embedded training concept for future programs.

PROJECT OVERVIEW

		88	89
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PROJECT: 2769	SIMULATOR UPDATE DEVELOPMENT	\$ 6.5M	\$ 3.7M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to update training systems to maintain and improve their supportability and effectiveness.

As flight simulator systems age and technology changes, these systems become increasing costly and difficult to support, typically due to non-availability of analog and first generation digital spare parts. Updates to these systems include: (a) digitization and upgrade of the C-135 Operational Flight Trainer (OFT), (b) development of a C-130 Aircrew Training System (ATS), and (c) replacement of the logistically unsupportable terrain model board visual system on the UPT-IFS (Undergraduate Pilot Trainer-Instrument Flight Simulator) with a computer generated image visual system.

In FY 88, it is planned to: (a) procure three visual systems to complete the UPT-IFS replacement, and (b) have the contractor begin phasing in the ATS to replace Air Force simulator maintenance and instructor personnel.

The C-130 ATS develops the courseware, scheduling management, and evaluation tools needed to integrate current facilities, training devices, and operational equipment into a state-of-the-art training system. The system includes: (a) proficiency-based syllabus development, (b) automated daily scheduling of students, instructor pilots, aircraft and simulators, emphasizing the most needed training, (c) automated record keeping and evaluation, (d) computer-based instruction, and (e) structuring of the program to allow the Air Force Systems Command to conduct generically based research and development studies. The contractor will guarantee fully-qualified students in all aircrew positions.

In FY 89, development will be completed and the prototype training system fielded.

In FY90, the C-130 ATS will be fully operational.

This Project complies with OSD guidelines because it is an ongoing Project that will address the development of Total Contract Training for C-130 crews using best commercial practices.

PAYOFF/UTILIZATION:

The payoffs of this Project include improved supportability and effectiveness of light simulators in the field.

Specific accomplishments in FY87 included: (a) completion of fabrication and testing of the T-5 electronic warfare simulator upgrade, (b) conducted design reviews and completed prototype fabrication, (c) began in-plant testing for the computer replacement for the F-4 Operational Flight Trainer (OFT), and (d) exercised production options for the UPT-IFS visual system.

PROJECT OVERVIEW

		88	89
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PROJECT: 2851	STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM	\$ 2.4M	\$ 1.2M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this joint development Project, initiated through the Joint Logistics Commanders, is to develop a standard DoD digital database that uses Defense Mapping Agency (DMA) data displays for aircrew training (c.g., visual, radar, infrared).

This transformed database will be provided as government furnished equipment (GFE) to simulator manufacturers, eliminating the cost associated with the current approach of developing a unique system for each simulator program that requires sensor simulation.

In FYs 88/89, it is planned to perform test, evaluation, and implementation of this program.

Plans for FY89 include complete program development (Task 5).

This Project complies with OSD guidelines by developing standard database and transformation programs for the application of generic sensor simulation on all training devices to reduce acquisition and life cycle costs.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) elimination of problems and expenses associated with the proliferation of unique transformation programs and periodic updates (due to specification and requirements changes) by developing a Defense Mapping Agency (DMA) database for transformation programs, (b) assistance in achieving transportability (e.g., transportable databases between trainers), and (c) reduced costs for future systems.

In FY 85, the first and second tasks (requirements evaluation and cost/benefit analysis) were completed. Also completed were: (a) task three, a transformation efficiency study, and (b) task four, a database requirements definition, which defines both database content and format requirements and the database generation concept.

In FY87 task five, program development, began with the contract award and with plans for completion in FY89.

PROJECT OVERVIEW

		88	89
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PROJECT: 2901	B-1B WEAPON SYSTEM TRAINER (WST)	\$ 5.0M	\$ 5.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to develop the training system that the Strategic Air Command requires to meet the training needs of all B-1B crew members.

Required training tasks include mission rehearsal training for takeoff and landing, navigation, air refueling, threat analysis/countermeasures, low level penetration, weapons delivery, and emergency procedures. Emphasis will be placed on training tasks that cannot be accomplished in the aircraft and on integrated crew training. These tasks include those related to flight safety, emergency procedures, emergency war order rehearsal, and others for which a suitable training environment does not exist.

The acquisition strategy involves two phases. In Phase I, the Air Force selected two contractors to complete the design through the Preliminary Design Review (PDR), at which point a single contractor was selected to complete the procurement in Phase II.

A total of five Weapon System Trainers (WSTs), each of which simulates all four crew positions, and two Mission Trainers (MTs), each of which simulates the offensive and defensive positions, and six Cockpit Procedures Trainers (CPTs), each of which simulates all four crew positions, were procured. In the WST and the CPT, crews can be trained in either an integrated or independent mode. Trainers will be capable of providing emergency war order mission rehearsal.

In FY 88, it is planned to: (a) deliver the prototype WST, and (b) deliver the first three production units.

In FY 89, it is planned to: (a) deliver Mission Trainers 1 and 2, and (b) WST production unit 4, and (c) award a contract to incorporate aircraft driven changes in the training system in order to keep the aircraft and simulator in the same configuration.

Because this Project was begun prior to FY 86, OSD guidelines do not apply.

PAYOFF/UTILIZATION:

The payoff of this Project includes the development of a training system to meet the training needs of all B-1B crew members. The training system will emphasize integrated crew training and training tasks that cannot be accomplished in an aircraft, such as flight safety, emergency procedures, and emergency war rehearsal.

In FY 86, accomplishments included: (a) completion of initial development, fabrication, and hardware/software integration of the prototype WST, (b) commencement of in-plant testing, and (c) exercising of the production option for Lot II (two WSTs and two MTs).

AF/64227F

In FY87 five CPT's were delivered to the field.

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PROJECT OVERVIEW

		88	89
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PROJECT: 2968	MODULAR SIMULATOR DESIGN	\$ 2.0M	\$ 2.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to assess, develop, and implement a modular systems design approach to the development of simulators.

A strong requirement exists to use a modular systems design approach to: (a) reduce simulator life cycle cost, (b) reduce development lead time, (c) improve the Air Force's ability to deliver simulators to the field concurrently with the aircraft (and to keep the configuration current with the system in the field and to update simulators as new and different sensors are needed for training), and (d) to increase the competitive contractor base.

This Joint Logistics Commanders (JLC)-sponsored program consists of three phases and is an attempt to make the pieces of a training device as interchangeable between systems as possible. Phase I was a Request for Information (RFI) from the simulator industry to assess, from an industry perspective, the feasibility of modular simulators, e.g., the advantages, disadvantages, cost, and potential impact on technology. Phase II was a competitive effort between two contractors to identify the tools needed to implement modularity, and to develop a suggested specification, statement of work, and implementing strategy. Analysis of these phases will lead to Phase III, development and validation, on an existing device, of the standards and tools necessary to achieve a modular simulator.

In FY 88, it is planned to complete basic design and definition (in time to support the Advanced Tactical Fighter Aircrew Training System). In FY88-FY89, the modular design and definition will lay the foundation for the demonstration and validation phase.

This Project complies with OSD guidelines by reducing acquisition and life cycle costs by development of standard interfaces between simulator pieces using best commercial practices.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) reduced simulator life cycle cost, (b) reduced development lead time, (c) improved ability to deliver simulators to the field concurrently with the aircraft (and to keep the configuration current with the system in the field), and (d) an increased competitive contractor base, through a modular systems design approach to simulators.

In FY 85, the evaluation of Phase II was accomplished. This was a joint-Service, JLC-sponsored effort to analyze the contractors' approaches and to select, combine, and/or modify the approach to Phase II, given the technical, cost, and supportability considerations identified in the first two phases.

Accomplishments for FY 86 included developing the Request for Proposal and releasing it for Phase III.

In FY87 the contract was awarded.

PROJECT OVERVIEW

		88	89
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PROJECT: 2997	GBU-15 PART TASK TRAINER	\$ 1.4M	\$ 0.0M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to develop the GBU-15 Part Task Trainer, a low cost, ground-based device for training F-4E and F-111F Weapon System Operators (WSOs) to use the GBU-15 Precision Guided Munition (PGM).

Many of the primary skills required by aircrews cannot be routinely practiced in the aircraft due to operational constraints, signal radiation restrictions, and the high cost of training with live PGMs. The current Tactical Air Forces (TAF) simulators cannot train operators on the electro-optical/infrared mission specifics, and the costs to integrate this capability into the existing devices are prohibitive. The GBU-15 Part Task Trainer (PTT) will provide training in target acquisition and recognition, and in operation and guidance of target impact, and it will give WSOs the chance for hands-on systems operation during initial qualification training. It will also help maintain skill levels of qualified aircrews while saving valuable sorties and munitions resources.

A total of four (one development and three production) GBU-15 PTTs will be procured. Each will consist of a student station for the WSO, a limited instructor station, computational system, and an image generation system to provide the simulated video, visual environment effects, and required gaming area.

Plans for FY88 include exercising the option to produce follow-on units.

Plans for FY89 include: (a) deployment of the production trainers, and (b) exercising the Contract Logistics Support options for each unit.

This is a category III estimate. This Project complies with OSD guidelines because the Part Task Trainer is being developed to satisfy the training requirement instead of a full mission trainer or a weapon system trainer.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved training for F-4E, F-15E, and F-111F Weapon System Operators in the employment of GBU-15 Precision Guided Munition, (b) better maintenance of skill levels of qualified aircrews, and (c) savings of sorties and munitions resources.

In June 82, the Tactical Air Force Statement of Need 301-82 was produced. In February 83, the requirement for the effort was validated.

In FY 86, accomplishments included: (a) contract award, and (b) exercising the development option for AGM-130.

In FY87 completed the majority of the development effort (fabrication of the student, instructor, computational, and image-generated subsystems).

PROJECT OVERVIEW

		88	89
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PROJECT: 2998	LANTIRN SIMULATOR	\$ 9.2M	\$ 3.1M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to develop a "core" LANTIRN simulator which, when integrated with an Operational Flight Trainer (OFT), provides a range of training to fully indoctrinate pilots in LANTIRN usage.

Tactical Air Command (TAC) needs a safe, efficient means of training the LANTIRN mission in the high threat, adverse weather, heavily task loaded environment simulating combat. The complexity and inherent danger of operating the LANTIRN system requires part task trainers (Project 2999, LANTIRN Part Task Trainer) for initial switchology training and F-16 and A-10 Operational Flight Trainers (OFTs) with LANTIRN simulation capability for full mission training.

The "core" LANTIRN simulator will include a computer image generation (CIG) system for the navigation pod and a higher resolution simulation capability for target recognition and weapons delivery tasks. An F-15E, F-16, and A-10 configured Part Task Trainer will be developed for switchology, modology, and symbology training at the combat crew training squadron.

In FY88, it is planned to: (a) begin integration of hardware and software, (b) conduct in-plant tests and government qualification tests, and (c) begin integration of the LANTIRN simulator with the F-16 OFT.

Plans for FY89 include completion of integration of the LANTIRN with the F-16 OFT.

In FY90 plans are scheduled for delivery of the first unit. This will be one of the first concurrent deliveries of a training system with the parent weapon system.

OSD guidelines do not apply as the project was initiated prior to FY86.

PAYOFF/UTILIZATION:

The payoff of this Project includes safe, efficient training for aircrews to accomplish the LANTIRN mission in the high threat, real-time, heavily-loaded task environment that is encountered when employing the LANTIRN system.

In FY 84, accomplishments included: (a) development of an interim device for training A-10 and F-16 aircrews until the LANTIRN core device is fielded (results of effectiveness studies conducted on this device will be input to the core system), and (b) initiation of an industry survey of emerging technologies to assess the best method of training aircrews in employment of infrared based weapon systems.

In FY 86, accomplishments included award of a development contract.

In FY87 accomplishments included: (a) completion of initial design, (b) completion of hardware subsystems fabrication, software development, and (c) the exercise of production options for four F-16 LANTIRN simulators.

PROJECT OVERVIEW

		88	89
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PROJECT: 2999	LANTIRN PART TASK TRAINER	\$ 5.9M	\$ 0.5M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to develop LANTIRN Part Task Trainers to effectively train pilots in LANTIRN (F-16, F-15E) switchology, modes of operation, symbology and F-15E avionics.

The complexity of the LANTIRN system and inherent danger of operating close to the ground in the night and adverse weather requires initial training that enhances safety and speeds understanding of the system operation. LANTIRN Part Task Trainers (PPTs) will effectively train pilots in LANTIRN (F-16, F-15E) in switchology, modes of operation and F-15E avionics. These training devices will provide (a) an accurate representation of the aircraft cockpit, including (b) all functional controls and switch responses, and (c) aircrews with familiarization training that will provide the lead in training for the more complex and dynamic LANTIRN simulation (Project 2998).

In FY88, production options will be exercised.

OSD guidelines do not apply, as this Project was initiated prior to FY86.

PAYOFF/UTILIZATION:

The payoff of this Project includes safe, efficient training for aircrews to accomplish the LANTIRN mission in the high threat, real-time, heavily loaded task environment that is encountered when employing the LANTIRN system.

In FY86, (a) completed source selection activities, (b) awarded contract, and (c) began initial development for the F-15E PPT.

In FY87, exercised the option to begin F-16 PPT development.

PROJECT OVERVIEW

		88	89
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PROJECT: 3000	KC-135 OPERATIONAL FLIGHT TRAINER	\$ 3.6M	\$ 0.9M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to refurbish and update the outdated MB-26 procedures trainers to train the Strategic Air Command KC-135 crews.

The devices are expensive to maintain, almost always out of commission, and are unrealistic. In July 1981, the Aircraft Safety and Operations Review Board, after investigating several KC-135 accidents, highlighted the need for new simulators, particularly for engine out and emergency procedures training.

The KC-135 Operational Flight Trainer (OFT) will simulate the pilot and copilot stations, and incorporate an on-board instructor's station, and a computer image-generated visual system for takeoff/landing and engine out training. The OFT will also accurately simulate the total aircraft flight envelope and will meet SAC requirements for annual instrument evaluations. A total of 18 trainers will be optioned for upgrade to the KC-135 OFT configuration (approximately eight in the KC-135A configuration, and ten in the KC-135R).

In FY 88, it is planned to conduct contractor in-plant testing and government qualification testing, followed by shipment to the field for final acceptance testing. Also in FY 88 through FY 90, production options for the remaining devices will be exercised.

This is a Category I cost estimate. Because this Project began prior to FY86, OSD guidelines do not apply.

PAYOFF/UTILIZATION:

The payoffs of this Project include: (a) improved training for KC-135 crews, particularly addressing engine out and emergency procedures training, (b) more realistic training through replacement of devices presently used that do not fully represent current aircraft configuration, and (c) cost savings, resulting from replacement of outdated analog technology that is expensive to maintain and achieves very low availability rates.

In FY 86, accomplishments included start of the initial design and development of the KC-135R flight station, aerodynamics, student stations, instructor station, and computational system.

In FY 87 accomplishments included: (a) collected flight data, (b) completed the initial design, (c) began hardware and software integration, and (d) exercised the options for development of the KC-135A configuration and five production units.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: 3105	F-15E WEAPON SYSTEM TRAINER (WST)	\$ 0.2M	\$ 6.2M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to develop the F-15E Weapon System Trainer (WST) to train both pilot and weapon system officers.

The Tactical Air Forces (TAF) requirement for a fighter that can conduct interdiction bombing as well as air-to-air missions must be supported by an aircrew training system that is capable of training all mission aspects. The F-15E WST will train both pilot and weapon system officers, and will include Low Altitude Navigation and Targeting Infrared System for Night (LANTIRN) simulation. The trainers will be a modification to the F-15 Operational Flight Trainer, being manufactured by Goodyear Aerospace Corporation. Six WSTs will be procured.

The FY 85 Budget was the first in which flight simulator programs, including this Project, were consolidated into Program Element 64227F.

In FY 88, it is planned to: (a) accomplish combined government/contractor testing, and (b) deliver the first trainer.

In FY 89, it is planned to: (a) exercise production option for unit 3, and (b) award contract to incorporate aircraft driven changes in the training system.

Because this Project was begun prior to FY 86, OSD guidelines do not apply.

PAYOFF/UTILIZATION:

The payoff for this Project includes improved training of all mission aspects (including interdiction bombing and air-to-air missions) for Tactical Air Force F-15 pilots and weapon system officers.

In FY 85, (a) awarded development contract for the Weapon System Trainer (WST), and (b) released the Request for Proposal for production of the first WST with priced options.

In FY 87, specific accomplishments include: (a) completed basic design as well as fabrication of cabling assemblies, (b) awarded production contract, (c) continued detailed design of flight station, instructor station, computational system and LANTIRN simulation, (d) completed hardware/software integration and contractor in-plant tests, and (e) exercised production option for unit 2.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: 3135	ADVANCED TRAINING SYSTEM	\$ 2.2M	\$ 3.4M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to provide a computer-based training system, the Advanced Training System (ATS), to alleviate various training deficiencies.

Changes to the Air Force training environment have resulted in increased training workload at the Air Training Command (ATC) Technical Training Centers. Greater equipment complexities have meant greater student instructional needs. While training requirements have increased, the number of experienced instructors has decreased. ATC is therefore increasingly unable to conduct remedial or individualized instruction. This results in: (a) a greater number of personnel in the training pipeline, (b) increased attrition, (c) lower achievement, and (d) ultimately, reduced operational readiness.

The ATS is a three-phased program. Phase I was a contracted concept explanation and validation effort that was completed in September 1984 and was funded and managed by ATC. Phase II develops the prototype system for two courses at one ATC Technical Training Center. Phase III acquires systems for the other four centers.

ATS will provide information presentation, demonstration, drill and practice, evaluation, feedback, and remedial training. Its main goals are to free instructors for: (a) remedial instruction, (b) training complex tasks, (c) promoting efficient training methods, and (d) providing rapid course updating.

The ATS program responds to the Defense Science Board 1982 Summer Study on Technical Training which recommended improvements to the Air Force's training approach.

In FY 88, it is planned to: (a) award the development contract, and (b) conduct the initial computer hardware selection. Also in FY 88 through FY 89, plans include: (a) complete development, and (b) exercise production contract options.

Because this Project was begun prior to FY 86, OSD guidelines do not apply.

PAYOFF/UTILIZATION:

The payoffs for this Project include: (a) a remedial training capability, (b) more effective instruction, (c) decreased training time, (d) more effective use of instructors, (e) earlier detection of problems, (f) reduced student washbacks and eliminations, (g) cost savings, and (h) flexibility under surge.

Efforts in FY 85 included: (a) drafting of system specifications for Phase II, and (b) the selection of the development site and courses.

Efforts in FY 86 included award of the development contract.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: 3143	ADVANCED TACTICAL FIGHTER (ATF)	\$ 1.9M	\$ 4.9M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to develop the Advanced Tactical Fighter (ATF) Training System to meet Manpower, Personnel and Training (MPT) needs to support operations personnel assigned to the weapon system.

The required training tasks include initial, continuation, upgrade, on-the-job training, and mission qualification levels which emphasize new job requirements. The Front-End Analysis (FEA) process will define all training requirements and integrate these findings into an ATF Total Training System. The defined training system will account for all operational, maintenance, and support personnel required by the weapon system and will integrate all MPT aspects of each job description and skill level to ensure full mission support.

The FEA is broken down into two activities. In Step 1, the prime weapon system contractors were required to accomplish an FEA concurrently with their weapon system design task. This process results in a description of a total training system to include impact of new technologies, as well as a definition and a functional description of all system elements. Step 2 will require an independent FEA specialist to integrate all of the individual contractor data, analyze the user training requirements, and present to the Air Force recommendations and alternatives for implementing, supporting, and operating the total system.

By late FY 88 or early FY 89, all ATF Training System FEA data will be analyzed and presented to the Air Force for implementation.

This Project complies with OSD guidelines by early consideration of training requirements to effect concurrent delivery in the most cost-effective manner.

PAYOFF/UTILIZATION:

The payoff for this Project will be the provision of an Advanced Tactical Fighter (ATF) Training System which will account for all personnel needed by the weapon system and will integrate all Manpower, Personnel, and Training aspects of each job description and skill level to ensure full mission support.

Accomplishments for FY 86 included start, and completion, of the ATF Demonstration/Validation Source Selection.

In FY 87 accomplishments included: (a) contract awarded, and (b) completed midterm review of each ATF contractor. The FEA process required for the total ATF training system definition will be implemented through an independent FEA contractor.

PROJECT OVERVIEW

		88	89
		----	----
PROJECT: 3282	C-17 AIRCREW TRAINING SYSTEM	\$11.3M	\$38.5M
PE: 64227F	FLIGHT SIMULATOR DEVELOPMENT		
DoD ORGANIZATION:	AF		
RESPONSIBLE ORGANIZATION:	DEPUTY FOR TRAINING SYSTEMS		

PROJECT SYNOPSIS:

The objective of this Project is to design a C-17 Aircrew Training System (ATS) to meet the needs of the Military Airlift Command (MAC) and the Air Reserve Forces in supplying the initial and continuation training for C-17 crew members.

Training will be totally contractor administered and supported, with MAC evaluating the final product--a fully qualified aircrew member. There will be a main facility for initial through instructor training, learning centers at four main operating bases for continuation training, and two sites for the training of Guard and Reserve personnel. Emphasis will be on integrated crew training and training tasks that cannot be accomplished in aircraft, including those related to safety of flight, emergency procedures, and others for which a suitable flight training environment does not exist. The training system will be developed concurrently with the aircraft design effort, allowing a training system to be available at the formation of the first operational squadron.

Acquisition of the actual C-17 ATS has been divided into two phases to sustain competition as long as possible. Phase I was a full and open competition to determine which company has the best capability to field and support an ATS. Three contractors were chosen to provide detailed functional designs of their total systems. Phase II will begin after the selection of one of these contractors to complete the final design, development, testing, deployment, activation, and operation and support of the training system.

In FY 88, it is planned to downselect from the contractors to one to develop and produce the training system consisting of courseware and ground based instruction, full logistics support, total system management and operation, thus guaranteeing student throughput and instruction quality. The number and types of devices are not yet final, but estimates were arrived at by comparing the anticipated C-17 student throughput with that on the C-5 ATS contract. The estimate was formally accomplished in June 1986 and is currently being reviewed. Because data does not exist for the cost of a trained student (although the student is the final product), the estimate assumed that a reasonable and reliable cost estimate for an ATS could be arrived at by predicting the types and numbers of devices to be used by the contractor. Because of this approach, it is a Category IV cost estimate.

In FY 89, it is planned to: (a) continue to develop and produce a training system through preliminary design, critical design, and the beginning of hardware/software integration, and (b) define configuration control procedures, update management, course syllabus, and overall system management.

This Project complies with OSD guidelines through early consideration of training needs with the parent weapon system, and development of a training system using best commercial practices.

Beyond FY 89 plans include: (a) continuation of development portion of the

C-17 ATS with deployment and the first site activation in June 1991, (b) provide annual production options to activate and support successive ATS sites, (c) activate the final site in FY 99, and (d) terminate the contract in FY 2003.

PAYOFF/UTILIZATION:

The payoff of this Project will be improved continuation training and mission/upgrade training for C-17 crew members through the development of a centralized training facility and development of learning centers at each of four operational wings and two reserve sites.

In FY 86, completed an aircrew evaluation standard.

In FY 87, contracts for Phase I were awarded to three contractors.

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
62202F					AEROSPACE BIOTECHNOLOGY
06MD	HSD	3.633	4.039 HF	4	HUMAN SYSTEMS DIVISION LABORATORY OPERATIONS
6893	HSD	1.417	1.417 HF	4	MANNED WEAPON SYSTEMS EFFECTIVENESS
7184	HSD	5.855	6.440 HF	4	MAN-MACHINE INTEGRATION TECHNOLOGY
		-----	-----		
		10.906	11.897		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62202F :			FY88	FY89	
			-----	-----	
THE PRESIDENT'S BUDGET, JANUARY 1988			10.905	11.896	

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-ET	AFHRL	2.966	3.368	ET	V A R	LABORATORY SUPPORT
06HT-HF	AFHRL	1.738	1.531	HF	V A R	LABORATORY SUPPORT
06HT-MP	AFHRL	2.251	1.837	MP	V A R	LABORATORY SUPPORT
06HT-ST	AFHRL	3.273	3.471	ST	V A R	LABORATORY SUPPORT
1121	AFHRL	2.031	2.322	ET	6	TECHNICAL TRAINING DEVELOPMENT
1123	AFHRL	2.824	3.480	ET	6	FLYING TRAINING DEVELOPMENT
1192	AFHRL	5.525	6.049	ST	6	ADVANCED SIMULATION FOR PILOT TRAINING
1710	AFHRL	3.776	3.504	HF	4	LOGISTICS AND MAINTENANCE TECHNOLOGY
3C17	AFHRL	1.385	2.093	ET	6	COMMAND AND CONTROL TRAINING
6114	AFHRL	1.547	2.156	ST	6	FLIGHT SIMULATOR TECHNOLOGY
7719	AFHRL	3.549	3.150	MP	2	FORCE ACQUISITION AND DISTRIBUTION SYSTEM
7734	AFHRL	1.136	1.300	MP	3	FORCE MANAGEMENT SYSTEM
		----- 32.002	----- 34.262			TOTAL IN PE

(CONTINUED)

(CONTINUATION WITHIN PE 62205F)

III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :					FY88	FY89
					-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988					32.000	34.261

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63106F						LOGISTICS SYSTEMS TECHNOLOGY
2745	AFHRL	0.075	0.075	HF	4A	LOGISTICS FOR COMBAT READINESS MAINTENANCE
2940	AFHRL	6.444	8.310	HF	4D	COMPUTER TECHNOLOGY FOR SYSTEMS DESIGN AND MAINTENANCE
2950	AFHRL	3.055	5.460	HF	4D	INTEGRATED MAINTENANCE INFORMATION SYSTEM
		-----	-----			
		9.575	13.845			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63106F :						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						-----
						9.574

						13.845

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2363	AFHRL	1.060	1.048	ST	6	ADVANCED VISUAL TECHNOLOGY SYSTEM
2364	AFHRL	0.380	1.000	ET	6	TRAINING AND PERFORMANCE DATA CENTER
2557	AFHRL	2.101	1.225	ST	6	ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
2743	AFHRL	3.783	3.213	ST	6	AIRCREW COMBAT MISSION ENHANCEMENT (ACME)
2922	AFHRL	0.501	0.486	MP	2	PERSONNEL ASSESSMENT SYSTEMS
2949	AFHRL	0.550	0.871	ET	6	BASIC JOB SKILLS ASSESSMENT AND ENHANCEMENT
2951	AFHRL	0.106	0.200	ET	6	TRAINING DECISIONS SYSTEM
		8.481	8.043			TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						8.481 8.043

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63231F					CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY
2829	AMD	5.540	5.528 HF	4	COCKPIT AUTOMATION TECHNOLOGY (CAT)
2992	AMD	0.660	1.008 HF	4	SPACE CREW ENHANCEMENT (SPACE)
		----- 6.201	----- 6.536		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63231F :					
					FY88 FY89
					----- THE PRESIDENT'S BUDGET, JANUARY 1988 6.200 6.536

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
63751F					TRAINING SYSTEMS TECHNOLOGY
3057	AFHRL	0.276	0.471 ST 6		INTELLIGENT COMPUTER-ASSISTED TRAINING
		----- 0.277	----- 0.471		TOTAL IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63751F :					
	THE PRESIDENT'S BUDGET, JANUARY 1988				

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III-C-1: LISTING OF AIR FORCE PROJECTS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
2325	TS SPO	5.278	3.386	ST	6	SIMULATOR DEVELOPMENT ACTIVITIES
2769	TS SPO	6.500	3.726	ST	6	SIMULATOR UPDATE DEVELOPMENT
2851	TS SPO	2.405	1.207	ST	6	STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM
2901	TS SPO	5.000	5.000	ST	6	B-1B WEAPON SYSTEM TRAINER (WST)
2968	TS SPO	2.000	2.025	ST	6	MODULAR SIMULATOR DESIGN
2997	TS SPO	1.350	0.000	ST	6	GBU-15 PART TASK TRAINER
2998	TS SPO	9.214	3.051	ST	6	LANTIRN SIMULATOR
2999	TS SPO	5.917	0.486	ST	6	LANTIRN PART TASK TRAINER
3000	TS SPO	3.586	0.900	ST	6	KC-135 OPERATIONAL FLIGHT TRAINER
3105	TS SPO	0.196	6.233	ST	6	F-15E WEAPON SYSTEM TRAINER (WST)
3135	TS SPO	2.154	3.432	ET	6	ADVANCED TRAINING SYSTEM
3143	TS SPO	1.900	4.849	ET	6	ADVANCED TACTICAL FIGHTER (ATF)
3282	TS SPO	11.278	38.505	ET	6	C-17 AIRCREW TRAINING SYSTEM
		----- 56.778	----- 72.801			TOTAL IN PE

(CONTINUED)

III-C-1: LISTING OF AIR FORCE PROJECTS

TOTAL FUNDING IN PROGRAM ELEMENT 64227F :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	56.778	72.800

IV. OVERALL SYNOPSES AND PROJECT LISTINGS

IV.A. CONGRESSIONAL CATEGORY SYNOPSSES AND LISTINGS

	CONGRESSIONAL CATEGORY	PAGE
	-----	-----
ARMY	Education and Training	IV-A-1
	Human Factors	IV-A-2
	Manpower and Personnel	IV-A-3
	Simulation and Training Devices	IV-A-4
NAVY	Education and Training	IV-A-5
	Human Factors	IV-A-6
	Manpower and Personnel	IV-A-7
	Simulation and Training Devices	IV-A-8
AIR FORCE	Education and Training	IV-A-9
	Human Factors	IV-A-10
	Manpower and Personnel	IV-A-11
	Simulation and Training Devices	IV-A-12

Tables of project listings by Congressional Category follow each Congressional Category synopsis.

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING
DoD ORGANIZATION: ARMY
CONTRIBUTING
PROGRAM ELEMENTS: 61102A DEFENSE RESEARCH SCIENCES
62785A MANPOWER, PERSONNEL, AND TRAINING
TECHNOLOGY
63007A HUMAN FACTORS, PERSONNEL AND
TRAINING ADVANCED TECHNOLOGY
64722A EDUCATION AND TRAINING SYSTEMS
DEVELOPMENT

SYNOPSIS:

This work focuses on developing and evaluating improved, cost-effective education and training applications for areas such as combat arms readiness and maintenance, and pilot and leadership training for the Active Army and the Reserve Component. Work will expand the applications of artificial intelligence, computers, and other electronic technology for training individual, crew/team, and unit collective skills.

The Army needs to provide job skills training and compensatory training for educationally disadvantaged personnel. Training literacy skills, to tailor training to the maintain critical skills between Reserve Component training sessions. Specific job areas for attention include small arms training, navigation training, armor, aviation, supply maintenance, and logistics skill training.

Since the Army typically operates in units, it must know how people behave in organizations, how to evaluate group/unit performance and cohesion, and how to measure group improvement. Realistic battalion combat training is analyzed to determine the most effective methods for providing group performance feedback. Research will develop computer-based war games and simulators for company-level units to provide operationally realistic, inexpensive combined arms training.

Special attention is provided for combat service support training for battlefield maintenance tasks to assess and repair battle damage under difficult conditions, and to develop training programs for unconventional warfare.

At least three training products will be developed for use by more than one Service: (a) PEAM, a Portable Electronic Aid for Maintenance, (b) CHIP, the Computerized Hand-held Instructional Prototype, and (c) TRIADS, the Tri-Service Instructional Application Delivery System. Other efforts will establish a national manpower inventory to enable the Army to identify enlistee training needs more precisely.

IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

61102A						DEFENSE RESEARCH SCIENCES
B74F-ET	ARI	0.939	0.804		3	UNIT PERFORMANCE
	TOTAL:	0.940	0.805			(EDUCATION AND TRAINING IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
	<u> </u>	<u> </u>
THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

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IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ET	ARI	0.839	1.149	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A791-ET	ARI	0.976	1.694	6		MANPOWER, PERSONNEL AND TRAINING
TOTAL:		1.816	2.844	(EDUCATION AND TRAINING IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						
						FY88
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						13.977
						16.120

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IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A794	ARI	6.913	7.605	6		EDUCATION AND TRAINING
	TOTAL:	6.914	7.606			(EDUCATION AND TRAINING IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						28.486
						FY89
						30.544

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IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64722A						EDUCATION AND TRAINING SYSTEMS DEVELOPMENT
D750	ARI	5.396	6.872	6		EDUCATION AND TRAINING SYSTEMS DEVELOPMENT
	TOTAL:	5.397	6.873			(EDUCATION AND TRAINING IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 64722A :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						5.396
						FY89
						6.872

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: HUMAN FACTORS
DoD ORGANIZATION: ARMY
CONTRIBUTING PROGRAM ELEMENTS:
61102A DEFENSE RESEARCH SCIENCES
62716A HUMAN FACTORS ENGINEERING TECHNOLOGY
62785A MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
63007A HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

SYNOPSIS:

A principal objective of Army work in Human Factors is to ensure the operability, maintainability, sustainability, and survivability of systems in various stages of development and deployment. These systems can increase potential battlefield effectiveness, but they are often sophisticated and require complex skills, heavy operator workload, quick reactions, and confident and accurate decisions to operate and maintain.

Engineering options must be considered during the entire developmental cycle to balance the demands with projected availability of personnel who have appropriate skills. Some human operator competencies can be enhanced by task allocation methods or by system design. A major objective is to develop and evaluate methods to identify human factors, manpower, personnel, and training (HMPT) requirements early in system design. This includes methods to integrate new equipment into units in the field and embedding training in the design of new systems.

Research will use soldier performance data to: (a) develop better engineering design principles, (b) learn about the capabilities and limitations of men and women to improve performance predictions with equipment in field conditions, (c) apply the data throughout the Army materiel development process, (d) provide design guidance for all types of equipment that is worn, operated, or maintained by soldiers, and (e) determine which tasks are best performed by humans, which are best performed by robots and other hardware, and how to combine these components.

The Human Factors area investigates soldier-computer interfaces in systems such as C3I (Command, Control, Communications and Intelligence) systems. Other efforts in this area will exploit technology to support logistics systems analysis, ammunition supply systems, robotics, computer automation, and artificial intelligence as they relate to increased productivity.

IV-A-1 : LISTING OF ARMY IN EDUCATION AND TRAINING

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

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(CONTINUATION)

IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
62716A					HUMAN FACTORS ENGINEERING TECHNOLOGY
A1QL	HEL	6.038	7.212	V A R	ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)
AH70	HEL	8.522	7.859	4	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT
TOTAL:		14.561	15.071	(HUMAN FACTORS IN PE)	
TOTAL FUNDING IN PROGRAM ELEMENT 62716A :				FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988				14.560	15.071

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IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-HF	ARI	1.888	1.293	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A790-HF	ARI	2.257	1.939	4		HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
TOTAL:		----- 4.146	----- 3.233	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						13.977

						16.120

(CONTINUED)

(CONTINUATION)

IV-A-2 : LISTING OF ARMY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A793	ARI	6.315	7.805	4		HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS
TOTAL:		6.316	7.806	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
					FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988					28.486	30.544

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL
DoD ORGANIZATION: ARMY
CONTRIBUTING
PROGRAM ELEMENTS: 61102A DEFENSE RESEARCH SCIENCES
62785A MANPOWER, PERSONNEL, AND TRAINING
TECHNOLOGY
63007A HUMAN FACTORS, PERSONNEL AND
TRAINING ADVANCED TECHNOLOGY

SYNOPSIS:

The Army and the other Services will continue to share a dwindling supply of young adults while meeting demands for high technology skills to operate and maintain many complex weapon systems. The Army must effectively recruit, select, assign, utilize, and retain adequate numbers, and is pursuing a strategy that can ensure that the most advanced tools for doing so are in the hands leaders.

This research provides a scientific basis for the later development of: (a) improved, computer-based selection and assignment tests, especially procedures to link soldier selection to job performance, (b) methods to examine new variables such as pre-service experiences, (c) methods to assign recruits to jobs that capitalize on their aptitudes and vocational interests, (d) programs to develop cohesive units and leaders needed to assure combat readiness, (e) methods to increase satisfaction and identification with, and commitment to, Army life, (f) methods to research the effects of the family on soldier retention, (g) methods to increase enlistment and reenlistment rates and reduce attrition rates of highly qualified soldiers, (h) techniques to examine and improve Army civilian personnel performance and management, and (i) methods to determine aggregated future manpower requirements in view of new systems and force structures in the battlefield of the future.

Basic research work will investigate how decision-makers function in computer-driven, high-stress, problem-solving situations. Efforts will help develop computerized aids for problem-solving, planning, and decision-making to overcome these situational difficulties.

Some recent accomplishments include research on what motivates enlistment, and how the leader and the unit environment affect individual soldier performance. New methods were developed for predicting job performance, and a database was established for tracking men and women who enlisted and did not enlist, and their reasons for doing so. Work continues on systems such as HARDMAN (hardware vs. manpower) and MIST (Man Integrated Systems Technology) to help predict or determine manpower, personnel, and training requirements of developing systems and to correlate these needs with available resources.

IV-A-3 : LISTING OF ARMY IN MANPOWER AND PERSONNEL

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

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(CONTINUATION)

IV-A-3 : LISTING OF ARMY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-MP	ARI	2.028	2.872	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A791-MP	ARI	2.452	4.295	2		MANPOWER, PERSONNEL AND TRAINING
TOTAL:		4.481	7.168	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						13.977
						FY89
						16.120

(CONTINUED)

(CONTINUATION)

IV-A-3 : LISTING OF ARMY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A792	ARI	10.022	8.545	2		MANPOWER AND PERSONNEL
	TOTAL:	10.023	8.545			(MANPOWER AND PERSONNEL IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
						FY88
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						28.486
						30.544

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES

DoD ORGANIZATION: ARMY

CONTRIBUTING
PROGRAM ELEMENTS:

- 61102A DEFENSE RESEARCH SCIENCES
- 62727A NON-SYSTEM TRAINING DEVICES
(NSTD) TECHNOLOGY
- 62785A MANPOWER, PERSONNEL, AND TRAINING
TECHNOLOGY
- 63003A AVIATION ADVANCED TECHNOLOGY
- 63007A HUMAN FACTORS, PERSONNEL AND
TRAINING ADVANCED TECHNOLOGY
- 63738A NON-SYSTEM TRAINING DEVICES
(NSTD) ADVANCED DEVELOPMENT
- 64715A NON-SYSTEM TRAINING DEVICES
(NSTD) ENGINEERING DEVELOPMENT
- 64801A AVIATION ENGINEERING DEVELOPMENT

SYNOPSIS:

The key objective for the Army's research on simulation and training devices is combat readiness. Work focuses on high-fidelity devices which simulate realistic combat scenarios, yet remain relatively low in cost and lower in complexity than previous simulators.

A major requirement is to develop devices that apply new techniques and technologies in artificial intelligence, computer-aided instruction, and robotic computers to accelerate learning, increase attention and increase mental and physical peak performance to sustain troops in combat. Army embedded training and combined arms training efforts will also be advanced.

Work continues on developing techniques such as videodisks and laser-based weapon simulation for improved war game battle simulations, and for the development of technology for multi-purpose training devices.

The aim of simulation development is to improve pilot training and safety while reducing costs and supporting helicopter engineering development. Basic research includes investigating the nature of knowledge representation and transfer, the effects of expertise in complex task domains, and major objective is to continue research developing improved training systems such as: (a) low-cost flight simulators, (b) armor and anti-armor, artillery and infantry training, (c) training devices that tie together battlefield weapon systems, mobility, and command, control, communications, and intelligence, and (d) systems that provide full mission training capability in a combat environment. These training systems will provide effective, low-cost tactical training for both Active Army and Reserve Components, for both maintenance and combat service support personnel.

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ST	ARI	1.609	1.149	V A R		ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A790-ST	ARI	1.928	1.728	6		HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
TOTAL:		3.538	2.878	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :					FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988					13.977	16.120

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62727A						NON-SYSTEM TRAINING DEVICES (NSTD) TECHNOLOGY
A230	PMTRADE	4.011	3.429	6		NON-SYSTEM TRAINING DEVICES
	TOTAL:	4.012	3.430			(SIMULATION AND TRAINING DEVICES IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62727A :						
THE PRESIDENT'S BUDGET, JANUARY 1988		4.011	3.429			

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(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63003A						AVIATION ADVANCED TECHNOLOGY
DB34	AVSCOM	3.358	4.035	6		ROTORCRAFT SYSTEM INTEGRATION SIMULATOR (RSIS)
DB39	PMTRADE	1.723	1.344	6		FLIGHT SIMULATOR COMPONENTS
TOTAL:		5.082	5.379			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63003A :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	5.081	5.379

(CONTINUED)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

(CONTINUED)

(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63738A						NON-SYSTEM TRAINING DEVICES (NSTD) ADVANCED DEVELOPMENT
D335	PMTRADE	0.000	0.860	6		COMMUNICATIVE NON-SYSTEM TRAINING DEVICES (NSTD)
TOTAL:		0.000	0.861	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63738A :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

(CONTINUED)

(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715A						NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING DEVELOPMENT
D241	PMTRADE	17.752	13.251	6		NON-SYSTEM TRAINING DEVICES - COMBINED ARMS
D573	PMTRADE	6.993	6.539	6B		PMTRADE AND NTSC SUPPORT
	TOTAL:	24.746	19.791			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 64715A :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	24.745	19.790

(CONTINUED)

(CONTINUATION)

IV-A-4 : LISTING OF ARMY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64801A						AVIATION ENGINEERING DEVELOPMENT
D275	PMTRADE	0.000	4.389		6D	SYNTHETIC FLIGHT TRAINING SYSTEMS
DE70	PMTRADE	7.864	2.785		6D	AVIATION NON-SYSTEM TRAINING DEVICES
	TOTAL:	7.865	7.175			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 64801A :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	7.864	7.174

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING

DoD ORGANIZATION: NAVY

CONTRIBUTING
PROGRAM ELEMENTS:

- 61153N DEFENSE RESEARCH SCIENCES,
SUBELEMENT 42: BEHAVIORAL AND
ORGANIZATIONAL SCIENCES
- 62131M MARINE CORPS LANDING FORCE
TECHNOLOGY
- 62233N MISSION SUPPORT TECHNOLOGY:
PERSONNEL, TRAINING AND
SIMULATION TECHNOLOGY AREA
- 63720M EDUCATION AND TRAINING
- 63732M ADVANCED MANPOWER/TRAINING SYSTEMS

SYNOPSIS:

The objective of the Navy effort in Education and Training is to support effective training of military personnel through advancement of training technology, development of training standards, and improvement of procedures for matching training to job requirements.

The major areas of activity for this effort include the systems, cognitive processes, automated instruction in formal schools, basic skills enhancement, individual and group performance measurement, individual and team training, Naval Reserve training, on-the-job training, weapon system operator/maintainer training, training materials development, resource management, Enlisted Personnel Individualized Career System (EPICS), leadership criteria development, recruit/post-recruit training personnel attrition, enhancement of generic problem-solving ability among Naval Officers, and development of training standards for collective tasks performed by combat service support groups.

The benefits of this effort include the following: (a) solution of many training problems in the Navy through the introduction of more individualized, automated, and simulator-based instruction, better training standards for all unit levels, and improved less manpower-intensive procedures for matching training to job requirements, (b) deferred and reduced shore-based training for first-term enlistees, with on-job effectiveness maintained through EPICS, (b) reduced costs of preparing instructional materials for critical programs through use of authoring instructional materials, (d) more lower-cost practice of critical skills through advanced computer-aided instruction, (e) reduced training time, improved student motivation, and increased ability to perform critical tasks through functional context training, (f) improved decision-making about the use of computer-based training technology, (g) reduced scheduling inefficiencies and improved training outcomes through training resource management, and (h) improved performance in multi-ship, multi-threat warfare through team training instructional system development.

IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04206	ONR	5.722	6.324		6	PERSONNEL AND TRAINING
	TOTAL:	5.723	6.325	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	10.404	11.498

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(CONTINUATION)

IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CC31-522	NPRDC	0.231	0.276	4		TRAINING TECHNOLOGY
	TOTAL:	0.231	0.277			(EDUCATION AND TRAINING IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						
						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						0.477

						FY89

						0.563

(CONTINUED)

(CONTINUATION)

IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33T23	NPRDC	1.682	1.746	6		EDUCATION AND TRAINING TECHNOLOGY
TOTAL:		1.683	1.747	(EDUCATION AND TRAINING IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 62233N :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	7.347	7.624

(CONTINUED)

(CONTINUATION)

IV-A-5 : LISTING OF NAVY IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

63720N						EDUCATION AND TRAINING
R1772	NPRDC	5.065	6.153	6		EDUCATION AND TRAINING
	TOTAL:	5.066	6.154	(EDUCATION AND TRAINING IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63720N :						
					FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988					5.065	6.153

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: HUMAN FACTORS
DoD ORGANIZATION: NAVY
CONTRIBUTING
PROGRAM ELEMENTS: 61153N DEFENSE RESEARCH SCIENCES,
SUBELEMENT 42: BEHAVIORAL AND
ORGANIZATIONAL SCIENCES
62234N SYSTEMS SUPPORT TECHNOLOGY: HUMAN
FACTORS TECHNOLOGY AREA
63701N HUMAN FACTORS ENGINEERING
DEVELOPMENT
63739N NAVY LOGISTICS PRODUCTIVITY

SYNOPSIS:

The objectives of the Navy effort in Human Factors are to: (a) develop enhanced group decision-making procedures through research in decision making, perception, and human-computer interaction, (b) develop technology to manage and present information for rapid and accurate assimilation, (c) develop a systems-oriented human performance database, the methods to define human functional capabilities, and the interface requirements in the context of aviation systems and missions, (d) provide Navy systems developers with the resources and expertise to implement advanced concepts, (e) improve combat effectiveness and survivability through applications of man-machine integration methods in the design and updating of airborne systems, (f) design, develop, test, and evaluate new process control techniques for improving the quality and productivity of the repair and overhaul of Navy ships and aircraft, (g) improve the process of identifying, applying, and evaluating new technology in Navy shore support activities, and (h) develop and utilize more human factors engineering (HFE) techniques to help solve man-machine interface problems.

Developmental efforts include: (a) systematic knowledge/technology bases and appropriate assessment methods for matching performance capabilities to system requirements, (b) adaptive interactive displays, expert systems, and computer-based aids for enhanced decision making, (c) improved systems design in combat/engineering systems, shipboard administration and logistical data processing, and electronic maintenance and troubleshooting, (d) quality control and productivity in the repair and overhaul of ships and aircraft, and (e) identification and application of state-of-the-art technology to critical repair, maintenance, and acquisition problems in support functions.

IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04209	ONR	2.185	2.415		4	ENGINEERING PSYCHOLOGY
	TOTAL:	2.185	2.415			(HUMAN FACTORS IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	10.404	11.498

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(CONTINUATION)

IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62234N						SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA
RM34H20	NPRDC	3.214	3.333	4		HUMAN FACTORS TECHNOLOGY
	TOTAL:	3.214	3.333			(HUMAN FACTORS IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62234N :						
						FY88 FY89

						THE PRESIDENT'S BUDGET, JANUARY 1988 3.214 3.333

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(CONTINUATION)

IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63701N						HUMAN FACTORS ENGINEERING DEVELOPMENT
R1771	NPRDC	1.661	1.605	4		SHIP HUMAN FACTORS ENGINEERING
W0542	NADC	0.872	0.849	4		AIR HUMAN FACTORS ENGINEERING TECHNOLOGY
TOTAL:		2.533	2.454	(HUMAN FACTORS IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 63701N :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	2.533	2.454

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(CONTINUATION)

IV-A-6 : LISTING OF NAVY IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63739N						NAVY LOGISTICS PRODUCTIVITY
T1885	NPRDC	0.577	0.976	3		NAVY LOGISTICS PRODUCTIVITY
T1886	NPRDC	0.384	0.488	3		NEW TECHNOLOGY
	TOTAL:	0.962	1.464			(HUMAN FACTORS IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63739N :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	0.961	1.464

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL

DoD ORGANIZATION: NAVY

CONTRIBUTING
PROGRAM ELEMENTS:

- 61153N DEFENSE RESEARCH SCIENCES,
SUBELEMENT 42: BEHAVIORAL AND
ORGANIZATIONAL SCIENCES
- 62131M MARINE CORPS LANDING FORCE
TECHNOLOGY
- 62233N MISSION SUPPORT TECHNOLOGY:
PERSONNEL, TRAINING AND
SIMULATION TECHNOLOGY AREA
- 63707N MANPOWER AND PERSONNEL SYSTEMS
- 63732M ADVANCED MANPOWER/TRAINING SYSTEMS
- 64703N PERSONNEL, TRAINING, SIMULATION,
AND HUMAN FACTORS

SYNOPSIS:

The objectives of the Navy effort in Manpower and Personnel are to: (a) increase understanding of the psychological and organizational variables that determine the performance of individuals, groups, teams, and units, (b) develop and evaluate systems to improve manpower requirements determination and personnel utilization, and (c) develop managerial and statistical concepts and techniques that will lead to more cost-effective personnel management.

The major areas of activity for this effort include development of: (a) theories and models of small, task-oriented team performance, (b) a computerized adaptive testing (CAT) system to replace the Armed Services Vocational Aptitude Battery (ASVAB) for selection and classification, (c) a neuro-electric and neuro-magnetic recording capability as part of the biopsychometric measurement project, (d) user-friendly techniques to summarize and synthesize data to enhance manpower decision making and improve force management capabilities at reduced data management costs, (e) a methodology for developing reliable, valid, and useable job proficiency testing for Marine Corps enlisted personnel, (f) methods for improving the Navy selection/assignment process, recruiting techniques, retention of high-quality personnel, and personnel motivation and productivity, (g) enlistment selection criteria which is related to successful job performance, and (h) technology to increase training efficiency and effectiveness, and to improve training software transportability.

The benefit of the Navy efforts in this area will be improved personnel utilization and increased readiness through increased the ability to respond to a wide variety of manpower/personnel issues.

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04208	ONR	2.497	2.759		3	GROUP PSYCHOLOGY
	TOTAL:	2.497	2.760			(MANPOWER AND PERSONNEL IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61153N :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	10.404	11.498

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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CC31-521	NPRDC	0.246	0.287	2		MANPOWER TECHNOLOGY
	TOTAL:	0.247	0.287			(MANPOWER AND PERSONNEL IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						0.477
						FY89
						0.563

(CONTINUED)

(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33M20	NPRDC	2.660	2.760	2		MANPOWER AND PERSONNEL TECHNOLOGY
	TOTAL:	2.661	2.760			(MANPOWER AND PERSONNEL IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62233N :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						7.347
						FY89
						7.624

(CONTINUED)

(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63707N						MANPOWER AND PERSONNEL SYSTEMS
R1770	NPRDC	3.038	3.976	2		MANPOWER AND PERSONNEL SYSTEMS
	TOTAL:	3.039	3.977	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63707N :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						3.038 3.976

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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63732M						ADVANCED MANPOWER/TRAINING SYSTEMS
C0073	HQMC	1.861	5.106	1A		HUMAN RESOURCES MANAGEMENT AND FORECASTING
TOTAL:		1.862	5.107	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63732M :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						1.861
						FY89
						5.106

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(CONTINUATION)

IV-A-7 : LISTING OF NAVY IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64703N						PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
R1822	NPRDC	0.978	1.025	2		PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
TOTAL:		0.979	1.025	(MANPOWER AND PERSONNEL IN PE)		

TOTAL FUNDING IN PROGRAM ELEMENT 64703N :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	0.978	1.025

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES
DoD ORGANIZATION: NAVY
CONTRIBUTING
PROGRAM ELEMENTS: 62233N MISSION SUPPORT TECHNOLOGY:
PERSONNEL, TRAINING AND
SIMULATION TECHNOLOGY AREA
63732M ADVANCED MANPOWER/TRAINING SYSTEMS
63733N SIMULATION AND TRAINING DEVICES
64714N AIR WARFARE TRAINING DEVICES
64715N SURFACE WARFARE TRAINING

SYNOPSIS:

The objectives of the Navy effort in Simulation and Training Devices are to: (a) develop technology to improve the training effectiveness of existing Navy simulators and training devices, and to lower their costs, (b) develop new trainers for weapon system training, flight training, and maintenance training, (c) upgrade the operational capability of Navy ASW aircraft with improved acoustic and non-acoustic sensors, (d) develop a training system for specialized ships, (e) develop a generic training system to replace obsolete/obsolescent devices for team tactical training, and (f) conduct front-end analysis of specific training problems by defining requirements/shortfalls, training objectives, and student loading, and identifying alternate solutions with related cost/training effectiveness tradeoffs.

Developmental efforts include: (a) a prototype automated system to facilitate transfer of knowledge from a subject matter expert to an intelligent training system, (b) visual and sensor simulation for AI-based trainer designs, (c) realistic battle group-level training for senior Naval officers and their staffs, (d) a training device to provide individual and team training, (e) a training system to provide training in equipment operation, data acquisition/interpretation, and utilization in tactical combat exercises, (f) two trainers to meet the increasing need to train AIC and ASAC personnel, (g) a trainer for dynamic team training in skills essential to qualify enlisted ratings assigned to Combat Information Centers (CICs), (h) a modification of the TACDEW system to provide more modern radar capabilities, and incorporate a state-of-the-art problem control and evaluation subsystem, (i) training devices to replace the obsolete devices currently used to provide ASW team training, (j) operator/team trainers in electronic/acoustic surveillance in ASW operations, maintenance trainers for various electronic/acoustic devices and trainers, and other stimulation/simulation training device techniques, and (k) training requirements, through the HARDMAN study, for the Surface Warfare Community, and individually tailored, detailed trainer/training systems selection procedures.

IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION
RM33T24	NTSC	3.005	3.118		6	SIMULATION AND TRAINING DEVICE TECHNOLOGY
	TOTAL:	3.006	3.118			(SIMULATION AND TRAINING DEVICES IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 62233N :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	7.347	7.624

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(CONTINUATION)

IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63733N						SIMULATION AND TRAINING DEVICES
W1773	NTSC	8.276	6.451	6		SIMULATION AND TRAINING DEVICES
TOTAL:		8.276	6.452	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63733N :						
						FY88
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						8.276
						6.451

(CONTINUED)

(CONTINUATION)

IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

64714N						AIR WARFARE TRAINING DEVICES
W1878	NTSC	0.500	1.919	6		ASW TABLE TOP TRAINER
	TOTAL:	0.501	1.919	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 64714N :						
						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						0.500

						FY89

						1.919

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IV-A-8 : LISTING OF NAVY IN SIMULATION AND TRAINING DEVICES

TOTAL FUNDING IN PROGRAM ELEMENT 64715N :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	16.829	18.753

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: EDUCATION & TRAINING
DoD ORGANIZATION: AIR FORCE
CONTRIBUTING
PROGRAM ELEMENTS: 62205F PERSONNEL, TRAINING, AND
SIMULATION
63227F PERSONNEL, TRAINING, AND
SIMULATION TECHNOLOGY
64227F FLIGHT SIMULATOR DEVELOPMENT

SYNOPSIS:

The objectives within this area include the: (a) development of flight simulator hardware which will improve training and reduce training costs, (b) design and development of better simulators for maintenance training to eliminate the need for expensive operational equipment, (c) design and development of computer-based instructional technologies for technical and flight training, (d) development of improved courseware, training delivery options, training aids, and related products, (e) development of technology and programs to train, assess and aid command and control operators, especially in combat-related activities, and (f) development of new training technologies and logistics support methods which are expected to increase the productivity of Air Force personnel, improve the cost-effectiveness of technical and flight training, and result in enhanced operational readiness.

Recently completed accomplishments include: (a) development and testing of Air Force officer and enlisted specialty performance measurement technology, (b) initiating validation of the high school version of the Armed Services Vocational Aptitude Battery (ASVAB), (c) completion of the 'improved user-friendly Comprehensive Occupational Data Analysis Program (CODAP) software system, (d) development of instructional modules for identified job prerequisites, (e) development of specifications for evaluation of training effectiveness, and (f) development of initial specifications for the advanced Training Decision System (TDS).

Future efforts will continue to focus on the design, development and evaluation of new technologies for training personnel in technical areas such as maintenance, command and control, and flight training. Software and hardware developments in the areas of training, training management and aircraft logistics support will be pursued to provide enhanced training capabilities, improved C2 and C3 systems, and resulting benefits to overall personnel utilization and productivity.

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	32.000	34.261

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(CONTINUATION)

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2364	AFHRL	0.380	1.000	6		TRAINING AND PERFORMANCE DATA CENTER
2949	AFHRL	0.550	0.871	6		BASIC JOB SKILLS ASSESSMENT AND ENHANCEMENT
2951	AFHRL	0.106	0.200	6		TRAINING DECISIONS SYSTEM
	TOTAL:	1.036	2.072			(EDUCATION AND TRAINING IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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(CONTINUATION)

IV-A-9 : LISTING OF AF IN EDUCATION AND TRAINING

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
3135	TS SPO	2.154	3.432	6		ADVANCED TRAINING SYSTEM
3143	TS SPO	1.900	4.849	6		ADVANCED TACTICAL FIGHTER (ATF)
3282	TS SPO	11.278	38.505	6		C-17 AIRCREW TRAINING SYSTEM
TOTAL:		15.333	46.787	(EDUCATION AND TRAINING IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 64227F :						
						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						56.778 72.800

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: HUMAN FACTORS
DoD ORGANIZATION: AIR FORCE
CONTRIBUTING
PROGRAM ELEMENTS: 61102F DEFENSE RESEARCH SCIENCES
62202F AEROSPACE BIOTECHNOLOGY
62205F PERSONNEL, TRAINING, AND
SIMULATION
63106F LOGISTICS SYSTEMS TECHNOLOGY
63231F CREW SYSTEMS AND PERSONNEL
PROTECTION TECHNOLOGY

SYNOPSIS:

The overall goal of the Air Force efforts in Human Factors is support of the planning, design and procurement of new aerospace systems. The main criteria for systems design are operability and maintainability, with concern also focused on survivability in hostile combat environments.

The basic assumption is that systems can be designed to be compatible with human capabilities and limitations. Objectives are to: (a) improve selection of personnel for appropriate jobs on the basis of measured mental abilities and sensory-motor skills, (b) design equipment to optimally match human workload and performance, (c) improve human performance in weapon systems and operations by refining crew selection, (d) establish threat characterization and integration into military space systems, (e) provide advanced development and demonstration of concepts to extend the performance of the crewman in the aerospace environment, (f) respond to the requirements of optimally integrating man into future military space systems, and (g) develop better training technologies to increase efficiency and productivity of Air Force personnel.

Recently completed accomplishments include: (a) theoretical and experimental work on human performance that explains performance in terms of allocation of a fixed processing resource among two or more competing tasks, (b) empirically tested evidence for a theory of visual discrimination, (c) initial design efforts for a multi-sensor, multi-cockpit combat mission training capability, and (d) efforts to analyze existing NASA and DoD programs for impact on military space crew members.

Efforts will continue in the areas of: (a) visual information processing, (b) development of new workload metrics, (c) performance prediction based on systematic investigation of parameters of learning ability, (d) development of dynamic models to predict operator stress limits and performance effectiveness, (e) development of design criteria and mission planning guides to reduce operator overload and optimize man-machine integration, (f) design and development of integrated display/control systems for airborne and aerospace missions, (g) development of needed tools and methodologies to extend air/aerospace (h) development of human factors performance definitions and design criteria applicable to demonstration of military crew stations for advanced aerospace systems, and (i) pursue improvements and cost savings in training and management of personnel i.e., simulation technology and computer technology.

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

TOTAL FUNDING IN PROGRAM ELEMENT 61102F :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	8.634	9.549

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IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62202F						AEROSPACE BIOTECHNOLOGY
06MD	HSD	3.633	4.039	4		HUMAN SYSTEMS DIVISION LABORATORY OPERATIONS
6893	HSD	1.417	1.417	4		MANNED WEAPON SYSTEMS EFFECTIVENESS
7184	HSD	5.855	6.440	4		MAN-MACHINE INTEGRATION TECHNOLOGY
TOTAL:		10.906	11.897	(HUMAN FACTORS IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 62202F :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-HF	AFHRL	1.738	1.531	V A R		LABORATORY SUPPORT
1710	AFHRL	3.776	3.504	4		LOGISTICS AND MAINTENANCE TECHNOLOGY
	TOTAL:	5.515	5.036			(HUMAN FACTORS IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						32.000 34.261

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63106F						LOGISTICS SYSTEMS TECHNOLOGY
2745	AFHRL	0.075	0.075	4A		LOGISTICS FOR COMBAT READINESS MAINTENANCE
2940	AFHRL	6.444	8.310	4D		COMPUTER TECHNOLOGY FOR SYSTEMS DESIGN AND MAINTENANCE
2950	AFHRL	3.055	5.460	4D		INTEGRATED MAINTENANCE INFORMATION SYSTEM
	TOTAL:	9.575	13.845			(HUMAN FACTORS IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63106F :						
						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						9.574

						FY89

						13.845

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(CONTINUATION)

IV-A-10 : LISTING OF AF IN HUMAN FACTORS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63231F						CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY
2829	AMD	5.540	5 528	4		COCKPIT AUTOMATION TECHNOLOGY (CAT)
2992	AMD	0.660	1.008	4		SPACE CREW ENHANCEMENT (SPACE)
	TOTAL:	6.201	6.536			(HUMAN FACTORS IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63231F :						FY88
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						6.200
						6.536

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: MANPOWER & PERSONNEL
DoD ORGANIZATION: AIR FORCE
CONTRIBUTING
PROGRAM ELEMENTS: 61102F DEFENSE RESEARCH SCIENCES
 62205F PERSONNEL, TRAINING, AND
 SIMULATION
 63227F PERSONNEL, TRAINING, AND
 SIMULATION TECHNOLOGY

SYNOPSIS:

The objective of work in the Manpower and Personnel area is to incorporate two interrelated streams of research designed to address the problems involved in acquiring and maintaining a quality force by developing the technology to enhance selection, assignment, training and retention of that force.

The Air Force efforts require a continuing supply of high-quality personnel who can operate and maintain sophisticated weapon and support systems. To this end, research efforts intend to: (a) develop and validate personnel testing procedures, (b) determine and measure specific requirements for Air Force jobs, (c) improve the process for matching individuals to jobs, (d) develop models and strategies to improve retention, (e) develop comprehensive skills management and reenlistment/career assignment programs, (f) measure and evaluate job performance and link enlistment standards to on-the-job performance, and (g) automate procedures to address fundamental training management issues.

Recent accomplishments include: (a) an integrated pilot selection system using perceptual and psychomotor measures, (b) completion of development of ninth and tenth grade norms for the Armed Services Vocational Aptitude Battery (ASVAB), (c) implementation of a new edition of the Air Force Officer Qualifying Test (AFOQT) and of a field-tested officer training school selection system, (d) completion of a model to select candidates for medical school scholarships and a database tracking system to provide long-term validity of the selection policy, and (e) completion of a model to determine both pre- and post-enlistment factors influencing career interests and actual separation or retention behavior.

Research efforts will continue to: (a) revise the AFOQT and subsets of the ASVAB, (b) develop, demonstrate and evaluate computer systems for use in selection and classification, (c) detail assessment of job specifications and skill requirements, (d) evaluate a variety of personnel assignment algorithms, and (e) improve and implement training decision systems.

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
61102F						DEFENSE RESEARCH SCIENCES
2313-T1	AFHRL	0.864	0.955		2	LEARNING ABILITIES MEASUREMENT PROGRAM
	TOTAL:	0.865	0.956			(MANPOWER AND PERSONNEL IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 61102F :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	8.634	9.549

(CONTINUED)

(CONTINUATION)

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M) CAT	GOAL	PE/PROJECT TITLES
62205F					PERSONNEL, TRAINING, AND SIMULATION
06HT-MP	AFHRL	2.251	1.837	V A R	LABORATORY SUPPORT
7719	AFHRL	3.549	3.150	2	FORCE ACQUISITION AND DISTRIBUTION SYSTEM
7734	AFHRL	1.136	1.300	3	FORCE MANAGEMENT SYSTEM
	TOTAL:	6.937	6.288		(MANPOWER AND PERSONNEL IN PE)

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	32.000	34.261

(CONTINUED)

IV-A-11 : LISTING OF AF IN MANPOWER AND PERSONNEL

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2922	AFHRL	0.501	0.486	2		PERSONNEL ASSESSMENT SYSTEMS
	TOTAL:	----- 0.502	----- 0.487	(MANPOWER AND PERSONNEL IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						
						FY88 ----- 8.481
						FY89 ----- 8.043
THE PRESIDENT'S BUDGET, JANUARY 1988						

CONGRESSIONAL CATEGORY SYNOPSIS

CONGRESSIONAL CATEGORY: SIMULATION & TRAINING DEVICES
DoD ORGANIZATION: AIR FORCE
CONTRIBUTING
PROGRAM ELEMENTS: 62205F PERSONNEL, TRAINING, AND
SIMULATION
63227F PERSONNEL, TRAINING, AND
SIMULATION TECHNOLOGY
63751F TRAINING SYSTEMS TECHNOLOGY
64227F FLIGHT SIMULATOR DEVELOPMENT

SYNOPSIS:

The main objective in the Simulation and Training Devices area is the continuing development of aircrew flight simulator techniques and training devices. This work explores technologies such as computer image generation, holography, digital imaging, radar simulation, embedded training concepts, and infrared systems. Some visual simulation objectives include better image definition, color representation, and image dynamics, development of full field of view displays, and the accurate representation of special sensors.

While much of the focus is on pilot and navigator training, particularly in training and retraining of combat skills, attention is also being given to command and control and maintenance functions. Research efforts intend to: (a) upgrade trainers and simulators to provide greater realism and to improve the concurrency between changing aircraft features and flight simulators, (b) reduce life cycle costs, (c) integrate a variety of hardware and software systems, (d) improve the instructional features of equipment, (e) develop multi-task as well as part-task trainers, (f) develop computer-based systems for authoring of training, information presentation, drill and practice, testing and evaluation, and training management, (g) develop databases, including transportable databases, for simulation programs, (h) develop continuation training and mission/upgrade training, (i) develop integrated crew training, (j) develop simulated video, environmental effects and gaming scenarios, and (k) simulate day, night, under-the-weather conditions for training pilots and navigators.

Recent achievements within this category include the development of an operational flight trainer which provides a training environment for the EF-111 mission, including the capability of simulating the central European radar environment and all aircraft flight profiles.

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	32.000	34.261

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(CONTINUATION)

IV-A 12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2363	AFHRL	1.060	1.048	6		ADVANCED VISUAL TECHNOLOGY SYSTEM
2557	AFHRL	2.101	1.225	6		ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
2743	AFHRL	3.783	3.213	6		AIRCREW COMBAT MISSION ENHANCEMENT (ACME)
TOTAL:		6.945	5.487			(SIMULATION AND TRAINING DEVICES IN PE)
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						FY89
						8.481
						8.043

(CONTINUED)

(CONTINUATION)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

63751F						TRAINING SYSTEMS TECHNOLOGY
3057	AFHRL	0.276	0.471	6		INTELLIGENT COMPUTER-ASSISTED TRAINING
	TOTAL:	----- 0.277	----- 0.471	(SIMULATION AND TRAINING DEVICES IN PE)		
TOTAL FUNDING IN PROGRAM ELEMENT 63751F :						
						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						0.276

						FY89

						0.471

(CONTINUED)

(CONTINUATION)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
2325	TS SP0	5.278	3.386	6		SIMULATOR DEVELOPMENT ACTIVITIES
2769	TS SP0	6.500	3.726	6		SIMULATOR UPDATE DEVELOPMENT
2851	TS SP0	2.405	1.207	6		STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM
2901	TS SP0	5.000	5.000	6		B-1B WEAPON SYSTEM TRAINER (WST)
2968	TS SP0	2.000	2.025	6		MODULAR SIMULATOR DESIGN
2997	TS SP0	1.350	0.000	6		GBU-15 PART TASK TRAINER
2998	TS SP0	9.214	3.051	6		LANTIRN SIMULATOR
2999	TS SP0	5.917	0.486	6		LANTIRN PART TASK TRAINER
3000	TS SP0	3.586	0.900	6		KC-135 OPERATIONAL FLIGHT TRAINER
3105	TS SP0	0.196	6.233	6		F-15E WEAPON SYSTEM TRAINER (WST)
TOTAL:		41.446	26.014			(SIMULATION AND TRAINING DEVICES IN PE)

(CONTINUED)

(CONTINUATION WITHIN PE 64227F)

IV-A-12 : LISTING OF AF IN SIMULATION AND TRAINING DEVICES

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

TOTAL FUNDING IN PROGRAM ELEMENT 64227F :			FY88		FY89	
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THE PRESIDENT'S BUDGET, JANUARY 1988			56.778		72.800	

IV.B. MANPOWER, PERSONNEL AND TRAINING PROGRAM
GOAL LISTINGS

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GOAL LISTINGS
(continued)

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IV-B-1 : LISTING OF NAVY IN GOAL 1 -- MANAGEMENT TRADE-OFFS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
63732M						ADVANCED MANPOWER/TRAINING SYSTEMS
C0073	HQMC	1.861	5.106	MP	1A	HUMAN RESOURCES MANAGEMENT AND FORECASTING
		-----	-----			
		1.862	5.107			TOTAL GOAL 1 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63732M :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	1.861	5.106

IV-B-2 : LISTING OF ARMY IN GOAL 2 -- ACCESSION AND RETENTION

62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A791-MP	ARI	2.452	4.295	MP	2	MANPOWER, PERSONNEL AND TRAINING
		-----	-----			
		2.453	4.296	TOTAL GOAL 2 IN PE		

TOTAL FUNDING IN PROGRAM ELEMENT 62785A :	FY88	FY89
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THE PRESIDENT'S BUDGET, JANUARY 1988	13.977	16.120

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(CONTINUATION)

IV-B-2 : LISTING OF ARMY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A792	ARI	10.022	8.545	MP	2	MANPOWER AND PERSONNEL
		-----	-----			
		10.023	8.545			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
						FY88 FY89
						----- -----
THE PRESIDENT'S BUDGET, JANUARY 1988						28.486 30.544

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(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CC31-521	NPRDC	0.246	0.287	MP	2	MANPOWER TECHNOLOGY
		0.247	0.287			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						
						FY88
THE PRESIDENT'S BUDGET, JANUARY 1988						0.477
						FY89
						0.563

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(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA
RM33M20	NPRDC	2.660	2.760	MP	2	MANPOWER AND PERSONNEL TECHNOLOGY
		-----	-----			
		2.661	2.760			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62233N :						
						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 7.347 7.624

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IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63707N						MANPOWER AND PERSONNEL SYSTEMS
R1770	NPRDC	3.038	3.976	MP	2	MANPOWER AND PERSONNEL SYSTEMS
		-----	-----			
		3.039	3.977			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63707N :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 3.038 3.976

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(CONTINUATION)

IV-B-2 : LISTING OF NAVY IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
64703N						PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
R1822	NPRDC	0.978	1.025	MP	2	PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS
		-----	-----			
		0.979	1.025			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64703N :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 0.978 1.025

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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61102F						DEFENSE RESEARCH SCIENCES
2313-T1	AFHRL	0.864	0.955	MP	2	LEARNING ABILITIES MEASUREMENT PROGRAM
		0.865	0.956			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61102F :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						8.634 9.549

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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
7719	AFHRL	3.549	3.150	MP	2	FORCE ACQUISITION AND DISTRIBUTION SYSTEM
		-----	-----			
		3.549	3.151			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 32.000 34.261

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(CONTINUATION)

IV-B-2 : LISTING OF AF IN GOAL 2 -- ACCESSION AND RETENTION

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2922	AFHRL	0.501	0.486	MP	2	PERSONNEL ASSESSMENT SYSTEMS
		-----	-----			
		0.502	0.487			TOTAL GOAL 2 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						8.481

						FY89
						8.043

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

61102A						DEFENSE RESEARCH SCIENCES
B74F-ET	ARI	0.939	0.804	ET	3	UNIT PERFORMANCE
		-----	-----			
		0.940	0.805			TOTAL GOAL 3 IN PE

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(CONTINUATION)

IV-B-3 : LISTING OF NAVY IN GOAL 3 -- UNIT PRODUCTIVITY

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04208	ONR	2.497	2.759	MP	3	GROUP PSYCHOLOGY
		2.497	2.760			TOTAL GOAL 3 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61153N :						
						FY88
						FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						10.404
						11.498

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(CONTINUATION)

IV-B-3 : LISTING OF NAVY IN GOAL 3 -- UNIT PRODUCTIVITY

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63739N						NAVY LOGISTICS PRODUCTIVITY
T1885	NPRDC	0.577	0.976	HF	3	NAVY LOGISTICS PRODUCTIVITY
T1886	NPRDC	0.384	0.488	HF	3	NEW TECHNOLOGY
		0.962	1.464			TOTAL GOAL 3 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63739N :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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(CONTINUATION)

IV-B-3 : LISTING OF AF IN GOAL 3 -- UNIT PRODUCTIVITY

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

62205F						PERSONNEL, TRAINING, AND SIMULATION
7734	AFHRL	1.136	1.300	MP	3	FORCE MANAGEMENT SYSTEM
		-----	-----			
		1.137	1.301	TOTAL GOAL 3 IN PE		
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :			FY88		FY89	
			-----		-----	
THE PRESIDENT'S BUDGET, JANUARY 1988			32.000		34.261	

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

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(CONTINUATION)

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
62716A						HUMAN FACTORS ENGINEERING TECHNOLOGY
AH70	HEL	8.522	7.859	HF	4	HUMAN FACTORS ENGINEERING SYSTEM DEVELOPMENT
		8.523	7.860			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62716A :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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(CONTINUATION)

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A790-HF	ARI	2.257	1.939	HF	4	HUMAN PERFORMANCE EFFECTIVENESS AND SIMULATION
		-----	-----			
		2.257	1.939			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 13.977 16.120

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(CONTINUATION)

IV-B-4 : LISTING OF ARMY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63007A						HUMAN FACTORS, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY
A793	ARI	6.315	7.805	HF	4	HUMAN FACTORS IN TRAINING AND OPERATIONAL EFFECTIVENESS
		-----	-----			
		6.316	7.806			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63007A :						
						FY88 FY89
						----- -----
						THE PRESIDENT'S BUDGET, JANUARY 1988 28.486 30.544

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(CONTINUATION)

IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RR04209	ONR	2.185	2.415	HF	4	ENGINEERING PSYCHOLOGY
		-----	-----			
		2.185	2.415			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61153N :						
						FY88 FY89
						----- -----
THE PRESIDENT'S BUDGET, JANUARY 1988						10.404 11.498

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(CONTINUATION)

IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

62131M						MARINE CORPS LANDING FORCE TECHNOLOGY
CC31-522	NPRDC	0.231	0.276	ET	4	TRAINING TECHNOLOGY
		-----	-----			
		0.231	0.277			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62131M :						
						FY88 FY89
						----- -----
						THE PRESIDENT'S BUDGET, JANUARY 1988 0.477 0.563

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(CONTINUATION)

IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62234N						SYSTEMS SUPPORT TECHNOLOGY: HUMAN FACTORS TECHNOLOGY AREA
RM34H20	NPRDC	3.214	3.333	HF	4	HUMAN FACTORS TECHNOLOGY
		3.214	3.333			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 62234N :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	3.214	3.333

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IV-B-4 : LISTING OF NAVY IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

TOTAL FUNDING IN PROGRAM ELEMENT 63701N :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	2.533	2.454

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IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61102F						DEFENSE RESEARCH SCIENCES
2313-A4	AFOSR	2.504	2.769	HF	4	COGNITIVE SCIENCE
2313-A5	AFOSR	3.022	3.342	HF	4	VISUAL INFORMATION PROCESSING
2313-A6	AFOSR	1.382	1.528	HF	4	AUDITORY PATTERN RECOGNITION
2313-T3	AFHRL	0.259	0.286	HF	4	PERCEPTUAL AND COGNITIVE DIMENSIONS OF PILOT BEHAVIOR
2313-V1	AAMRL	0.259	0.287	HF	4	ELECTROENCEPHALOGRAPHIC AND MAGNETENCEPHALOGRAPHIC INDICANTS OF COGNITIVE FUNCTION
2313-V2	AAMRL	0.345	0.382	HF	4	BASIC VISION RESEARCH
		7.771	8.594			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61102F :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

TOTAL FUNDING IN PROGRAM ELEMENT 62202F :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	10.905	11.896

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(CONTINUATION)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62205F						PERSONNEL, TRAINING, AND SIMULATION
1710	AFHRL	3.776	3.504	HF	4	LOGISTICS AND MAINTENANCE TECHNOLOGY
		-----	-----			
		3.776	3.504			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						----- 32.000 34.261

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(CONTINUATION)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63106F						LOGISTICS SYSTEMS TECHNOLOGY
2745	AFHRL	0.075	0.075	HF	4A	LOGISTICS FOR COMBAT READINESS MAINTENANCE
2940	AFHRL	6.444	8.310	HF	4D	COMPUTER TECHNOLOGY FOR SYSTEMS DESIGN AND MAINTENANCE
2950	AFHRL	3.055	5.460	HF	4D	INTEGRATED MAINTENANCE INFORMATION SYSTEM
		9.575	13.845			TOTAL GOAL 4 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63106F :	FY88	FY89
THE PRESIDENT'S BUDGET, JANUARY 1988	9.574	13.845

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(CONTINUATION)

IV-B-4 : LISTING OF AF IN GOAL 4 -- DESIGNING FOR SYSTEM READINESS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 (\$M)	CONG CAT	GOAL	PE/PROJECT TITLES
63231F						CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY
2829	AMD	5.540	5.528	HF	4	COCKPIT AUTOMATION TECHNOLOGY (CAT)
2992	AMD	0.660	1.008	HF	4	SPACE CREW ENHANCEMENT (SPACE)
		-----	-----			
		6.201	6.536			TOTAL GOAL 4 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63231F :						
						FY88

						FY89

						THE PRESIDENT'S BUDGET, JANUARY 1988
						6.200
						6.536

IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

61102A				DEFENSE RESEARCH SCIENCES	
B74F-ST	ARI	1.109	1.310	ST 6	SKILL BUILDING TECHNOLOGIES
		-----	-----		
		1.109	1.311	TOTAL GOAL 6 IN PE	

TOTAL FUNDING IN PROGRAM ELEMENT 61102A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	7.026	7.369

(CONTINUED)

IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

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IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 62785A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	13.977	16.120

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(CONTINUATION)

IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

63003A						AVIATION ADVANCED TECHNOLOGY
DB34	AVSCOM	3.358	4.035	ST	6	ROTORCRAFT SYSTEM INTEGRATION SIMULATOR (RSIS)
DB39	PMTRADE	1.723	1.344	ST	6	FLIGHT SIMULATOR COMPONENTS
		-----	-----			
		5.082	5.379			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63003A :						
						FY88 FY89

THE PRESIDENT'S BUDGET, JANUARY 1988						5.081 5.379

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IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 63007A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	28.486	30.544

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IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

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IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64715A						NON-SYSTEM TRAINING DEVICES (NSTD) ENGINEERING DEVELOPMENT
D241	PMTRADE	17.752	13.251	ST	6	NON-SYSTEM TRAINING DEVICES - COMBINED ARMS
D573	PMTRADE	6.993	6.539	ST	68	PMTRADE AND NTSC SUPPORT
		24.746	19.791			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64715A :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

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IV-B-5 : LISTING OF ARMY IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 64801A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	7.864	7.174

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(CONTINUATION)

IV-B-5 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
61153N						DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: BEHAVIORAL AND ORGANIZATIONAL SCIENCES
RRO4206	ONR	5.722	6.324	ET	6	PERSONNEL AND TRAINING
		5.723	6.325			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 61153N :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

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(CONTINUATION)

IV-B-5 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
62233N						MISSION SUPPORT TECHNOLOGY: PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY AREA
RM33T23	NPRDC	1.682	1.746	ET	6	EDUCATION AND TRAINING TECHNOLOGY
RM33T24	N-SC	3.005	3.118	ST	6	SIMULATION AND TRAINING DEVICE TECHNOLOGY
		4.688	4.865	TOTAL GOAL 6 IN PE		
TOTAL FUNDING IN PROGRAM ELEMENT 62233N :						
THE PRESIDENT'S BUDGET, JANUARY 1988						

(CONTINUED)

IV-B-5 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

(CONTINUED)

IV-B-5 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

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(CONTINUATION)

IV-B-5 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64714N						AIR WARFARE TRAINING DEVICES
W1878	NTSC	0.500	1.919	ST	6	ASW TABLE TOP TRAINER
		0.501	1.919			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 64714N :						
THE PRESIDENT'S BUDGET, JANUARY 1988		0.500	1.919			

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IV-B-5 : LISTING OF NAVY IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 64715N :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	16.829	18.753

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IV-B-5 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

TOTAL FUNDING IN PROGRAM ELEMENT 62205F :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	32.000	34.261

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(CONTINUATION)

IV-B-5 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63227F						PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY
2363	AFHRL	1.060	1.048	ST	6	ADVANCED VISUAL TECHNOLOGY SYSTEM
2364	AFHRL	0.380	1.000	ET	6	TRAINING AND PERFORMANCE DATA CENTER
2557	AFHRL	2.101	1.225	ST	6	ADVANCED ON-THE-JOB TRAINING SYSTEM (AOTS)
2743	AFHRL	3.783	3.213	ST	6	AIRCREW COMBAT MISSION ENHANCEMENT (ACME)
2949	AFHRL	0.550	0.871	ET	6	BASIC JOB SKILLS ASSESSMENT AND ENHANCEMENT
2951	AFHRL	0.106	0.200	ET	6	TRAINING DECISIONS SYSTEM
		7.981	7.558			TOTAL GOAL 6 IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 63227F :						FY88 FY89
THE PRESIDENT'S BUDGET, JANUARY 1988						8.481 8.043

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(CONTINUATION)

IV-B-5 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
63751F						TRAINING SYSTEMS TECHNOLOGY
3057	AFHRL	0.276	0.471	ST	6	INTELLIGENT COMPUTER-ASSISTED TRAINING
		-----	-----			
		0.277	0.471			TOTAL GOAL 6 IN PE

TOTAL FUNDING IN PROGRAM ELEMENT 63751F :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	0.276	0.471

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(CONTINUATION)

IV-B-5 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES
64227F						FLIGHT SIMULATOR DEVELOPMENT
2325	TS SP0	5.278	3.386	ST	6	SIMULATOR DEVELOPMENT ACTIVITIES
2769	TS SP0	6.500	3.726	ST	6	SIMULATOR UPDATE DEVELOPMENT
2851	TS SP0	2.405	1.207	ST	6	STANDARD DEPARTMENT OF DEFENSE (DOD) SIMULATOR DATA BASE/COMMON TRANSFORMATION PROGRAM
2901	TS SP0	5.000	5.000	ST	6	B-1B WEAPON SYSTEM TRAINER (WST)
2968	TS SP0	2.000	2.025	ST	6	MODULAR SIMULATOR DESIGN
2997	TS SP0	1.350	0.000	ST	6	GBU-15 PART TASK TRAINER
2998	TS SP0	9.214	3.051	ST	6	LANTIRN SIMULATOR
2999	TS SP0	5.917	0.486	ST	6	LANTIRN PART TASK TRAINER
3000	TS SP0	3.586	0.900	ST	6	KC-135 OPERATIONAL FLIGHT TRAINER
3105	TS SP0	0.196	6.233	ST	6	F-15E WEAPON SYSTEM TRAINER (WST)
3135	TS SP0	2.154	3.432	ET	6	ADVANCED TRAINING SYSTEM
3143	TS SP0	1.900	4.849	ET	6	ADVANCED TACTICAL FIGHTER (ATF)
3282	TS SP0	11.278	38.505	ET	6	C-17 AIRCREW TRAINING SYSTEM
		----- 56.778	----- 72.801	TOTAL GOAL 6 IN PE		

(CONTINUED)

IV-B-5 : LISTING OF AF IN GOAL 6 -- TRAINING SYSTEMS

	PERFORMING	FY88	FY89 CONG			
PE/PROJECT	ORGANIZ.	(\$M)	(\$M) CAT	GOAL	PE/PROJECT TITLES	
TOTAL FUNDING IN PROGRAM ELEMENT 64227F :					FY88	FY89
					-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988					56.778	72.800

IV-B-6 : LISTING OF ARMY IN GOAL VAR--VARIOUS GOAL AREAS

62716A						HUMAN FACTORS ENGINEERING TECHNOLOGY
AIQL	HEL	6.038	7.212	HF	V A R	ADMINISTRATION AND MANAGEMENT - HUMAN ENGINEERING LAB (HEL)
		-----	-----			
		6.039	7.213	TOTAL GOAL VAR IN PE		

TOTAL FUNDING IN PROGRAM ELEMENT 62716A :	FY88	FY89
	-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988	14.560	15.071

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF ARMY IN GOAL VAR--VARIOUS GOAL AREAS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

62785A						MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY
A2AL-ET	ARI	0.839	1.149	ET	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-HF	ARI	1.888	1.293	HF	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-MP	ARI	2.028	2.872	MP	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
A2AL-ST	ARI	1.609	1.149	ST	V A R	ADMINISTRATION AND MANAGEMENT - ARMY RESEARCH INSTITUTE (ARI)
		-----	-----			
		6.365	6.464			TOTAL GOAL VAR IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62785A :						FY88

THE PRESIDENT'S BUDGET, JANUARY 1988						13.977

						FY89

						16.120

(CONTINUED)

(CONTINUATION)

IV-B-6 : LISTING OF AF IN GOAL VAR--VARIOUS GOAL AREAS

PE/PROJECT	PERFORMING ORGANIZ.	FY88 (\$M)	FY89 CONG (\$M)	CAT	GOAL	PE/PROJECT TITLES

62205F						PERSONNEL, TRAINING, AND SIMULATION
06HT-ET	AFHRL	2.966	3.368	ET	V A R	LABORATORY SUPPORT
06HT-HF	AFHRL	1.738	1.531	HF	V A R	LABORATORY SUPPORT
06HT-MP	AFHRL	2.251	1.837	MP	V A R	LABORATORY SUPPORT
06HT-ST	AFHRL	3.273	3.471	ST	V A R	LABORATORY SUPPORT
		-----	-----			
		10.228	10.207			TOTAL GOAL VAR IN PE
TOTAL FUNDING IN PROGRAM ELEMENT 62205F :					FY88	FY89
					-----	-----
THE PRESIDENT'S BUDGET, JANUARY 1988					32.000	34.261

VI. APPENDIXES

APPENDIX A
CONGRESSIONAL CATEGORIES

ET EDUCATION AND TRAINING

ET1 -- Education and Training (6.1)
ET2 -- Curriculum Development
ET3 -- Methods and Media
ET4 -- Management Systems
ET5 -- Effectiveness Evaluation
ET6 -- Technology Transfer
ET7 -- Special Applications

HF HUMAN FACTORS

HF1 -- Human Factors (6.1)
HF2 -- Human Related Studies
HF3 -- Human-Machine Related Studies
HF4 -- Human-Machine-Mission Related Studies

MP MANPOWER AND PERSONNEL

MP1 -- Manpower and Personnel (6.1)
MP2 -- Occupational Requirements and Structures
MP3 -- Resources Management
MP4 -- Recruitment, Accession and Placement
MP5 -- Career Development
MP6 -- Productivity and Effectiveness
MP7 -- Civilian and Military Workforce Development

ST SIMULATION AND TRAINING DEVICES

ST1 -- Visual Simulation Technology (6.1)
ST2 -- Force/Motion Cue Simulation Technology
ST3 -- Sensor Simulation Technology
ST4 -- Instructional Features
ST5 -- Maintenance Training Simulation
ST6 -- Weapons Fire Simulation
ST7 -- Specialized Training Devices

APPENDIX B

MANPOWER, PERSONNEL AND TRAINING GOALS AND SUB-GOALS

1. Management Trade-offs
 - A. Manpower Models and Trade-Offs
 - B. Compensation Issues
 - C. Career Issues
 - D. Reserve Issues
 - E. Military-Civilian Issues
 - F. Organizational Issues
 - G. Mobilization Issues
 - H. Equal Opportunity Issues
 - I. National Trends
 - J. Presidential and Congressional Issues
 - K. Studies with Foreign Affairs/Policy Implications
2. Accession and Retention
 - A. Forecasting of Supply
 - B. Skills and Specialties
 - C. Recruiting System Issues
 - D. Selection and Classification
 - E. Reserve Manpower
3. Unit Productivity
 - A. Measurement/Prediction of Individual and Unit
 - B. Enhancement of Individual and Unit
 - C. Effectiveness/Analysis and Trade-offs of Methods and Processes
4. Designing for System Readiness
 - A. Front-end Analytical Techniques
 - B. Human Capabilities and Design Criteria
 - C. Techniques/Methods for Improved Operability
 - D. Techniques/Methods for Improved Maintainability
 - E. Test, Evaluation and Effectiveness Measurement Methods

(continued on next page)

GOALS AND SUB-GOALS
(continued)

- 5. Improved Sustainability
 - A. Maintaining Individual and Unit Capabilities
 - B. Improved Logistical Support
 - C. Deficiency Measurement and Improvement
 - D. Improved Technical Documentation
 - E. Wartime Factors of Special Concern
 - F. Routine Effectiveness Issues
 - G. Combat Effectiveness Issues

- 6. Training Systems
 - A. Management Trade-offs
 - B. Acquisition Issues
 - C. Utilization Issues
 - D. Cost-Effectiveness Issues
 - E. Design and Analytical Issues and Methods
 - F. Improved Instructional Strategies
 - G. Critical Technologies
 - H. Support System Issues

Various

APPENDIX C

PROJECTS TO BE COMPLETED IN FY88 (BY SERVICE)

PE	PROJ	FY88(\$M)	TITLE

AIR FORCE			
	2997	1.350	GBU-15 PART TASK TRAINER

		1.350	TOTAL FOR AIR FORCE

PROJECTS TO BE COMPLETED IN FY88
(BY CONGRESSIONAL CATEGORY)

PE	PROJ	FY88(\$M)	TITLE

SIMULATION AND TRAINING DEVICES			

AF	2997	1.350	GBU-15 PART TASK TRAINER

		1.350	TOTAL FOR SIMULATION AND TRAINING DEVICES

APPENDIX D

PROJECTS TO BE INITIATED IN FY89 (BY SERVICE)

PE	PROJ	FY89(\$M)	TITLE

ARMY			

	D335	0.860	COMMUNICATIVE NON-SYSTEM TRAINING DEVICES (NSTD)
	D275	4.389	SYNTHETIC FLIGHT TRAINING SYSTEMS

		5.249	TOTAL FOR ARMY

PROJECTS TO BE INITIATED IN FY89
(BY CONGRESSIONAL CATEGORY)

PE	PROJ	FY89(\$M)	TITLE

SIMULATION AND TRAINING DEVICES			

ARMY	D335	0.860	COMMUNICATIVE NON-SYSTEM TRAINING DEVICES (NSTD)
ARMY	D275	4.389	SYNTHETIC FLIGHT TRAINING SYSTEMS

		5.249	TOTAL FOR SIMULATION AND TRAINING DEVICES

APPENDIX E

RELEVANT POLICY-LEVEL MEMORANDA

17 AUG 1978 Manpower and Logistics Concerns for New Major Systems
No Date Increased Emphasis on Training and Personnel Systems Technologies
23 JAN 1979 Establishment of DoD Technology Advisory/Coordination Groups
10 OCT 1979 Application of Emerging Training and Personnel Systems Technologies
19 OCT 1979 Coordination of People-Related R&D
30 OCT 1979 Simulation and Training Devices Technology
26 NOV 1979 Increasing Demands for Personnel and Training R&D
11 DEC 1979 Navy Manpower, Personnel and Training Research, Development and Studies Program (MPT RD&S)
29 JAN 1981 Effectiveness of U.S. Forces Can Be Increased Through Improved Weapon System Design
12 FEB 1981 The Research and Development Information System (RDIS)
26 AUG 1981 Contractor Incentives to Improve Reliability and Support
18 DEC 1981 Guidelines For Assessing Whether Human Factors Were Considered In The Weapon Systems Acquisition Process
02 MAR 1982 Personal Microprocessor-Based Job Aids
25 FEB 1983 Defense Science Board (DSB) Summer Study on Training and Training Technology
11 JUL 1984 Memorandum of Agreement: Defense Training Data and Analysis Center (TDAC)
05 OCT 1984 Training Simulator and Device Guidelines
03 JUN 1986 Defense Training Data and Analysis Center (TDAC) Review
01 MAR 1988 Letter of Agreement; Defense Training Performance Data Center (TDAC) and Army, Navy, Air Force under Office of the Secretary of Defense control