DCN 1074

202

MILITARY VALUE DATA CALL
TECHNICAL CENTERS

Category	Tech Centers/Labs
Technical Center Site	NSWC Crane Division
Location/Address	Crane, IN

	Page
Mission	
1. Mission Statement	1
2. Joint Service Missions	1
Technical Functions	
3. Technical Functions Resource Allocations	5
Manpower	
4. Work Breakdown Structure	6
5. Technical Staff Qualifications	10
Facilities and Equipment	
6. Special Facilities/Equipment Resources	32
7. General Facilities/Equipment Resources	33
Location	
8. Geographic Location	46
Features and Capabilities	
9. Computational Facilities	53
10. Mobilization Responsibility and Capability	58
11. Range Resources	61
Quality of Life	
12. Military Housing	62
13. MWR Facilities	71
14. Base Family Support Facilities	73

MILITARY VALUE MEASURES

MISSION

1. **Mission Statement.** State the officially assigned mission of this activity and cite the reference document(s) that assigns the mission.

Provide engineering and industrial base support of weapon systems, subsystems, equipments, and components with principal emphasis on industrial and product engineering associated with surface warfare systems in the areas of electronics, ordnance, pyrotechnics, gun systems, microwave technology, small arms, and surface ship electronic warfare in-service engineering. Execute other responsibilities as assigned by the Commander, Naval Surface Warfare Center. OPNAV Notice 5450 Ser 09B22/1U510577 of 23 December 1991 assigns this mission.

As reported in BRAC95 Data Call #1, our mission is to provide **responsive engineering and industrial base support for weapons systems, subsystems and components**. In terms of skilled people, facilities, product knowledge, and the ability to integrate engineering with "hands on" industrial process, Crane provides the broadest, deepest and most advanced industrial base capability that the Navy has.

2. **Joint Service Missions.** State any officially assigned joint/lead service assignments missions and cite the document(s) that assigned them.

As reported in BRAC95 Data Call #1, the technical program at the Crane Division is managed and described in terms of seventeen Technical Capabilities (TC's) recognized by the Naval Surface Warfare Center. The following joint/lead service assignments are presented for the following TC's at the Crane site.

MICROELCTRONIC TECHNOLOGY TC

Crane is assigned as lead Navy activity for the ASSURANCE TECHNOLOGY JOINT EFFORT under the MICROELECTRONICS SUBAREA for PROJECT RELIANCE. This assignment is reflected in the current PROJECT RELIANCE REPORT.

MICROWAVE COMPONENTS TC

Crane is in partnership with Naval Research Laboratory, Defense Advanced Research Projects Agency, NASA, Rome Laboratory, Applied Physics Lab/Johns Hopkins University, Naval Surface Warfare Center Dahlgren Division, Army Research Laboratory and Wright Air Force Laboratory determining requirements for, overseeing, and measuring the effectiveness of Micro Wave Tube (MWT) R&D programs.

Crane is one of two Navy members of the Tri-service Vacuum Electronics Steering Committee and heads the Design for Low Cost Initiative support of the Vacuum Electronics sub sub panel under the Electronics Panel of Project Reliance.

Crane serves as a Navy member of the Working Group A of the DOD Advisory Group on Electron Devices supporting the sub sub panel of RF Components under Electronics Panel of Project Reliance.

Crane chairs a subcommittee for Working Group A of the Advisory Group on Electron Devices, chartered by the Office of the Under Secretary of Defense for Acquisition, to address the ability of the MWT industry to meet future DOD requirements and recommending DOD policy for procurement and management of MWTs.

The Cathode Life Test Facility is a joint Tri-Service/NASA effort established within the Crane Microwave Components TC providing capability for independent assessment of new thermionic cathodes developed by the DOD, NASA, and private industry. The jointness of this facility enables the maintenance of a repository of cathode technology supporting the MWT industrial base.

Crane is leading an Industry/DOD Tri-Service/NASA effort to establish a MWT Manufacturability Initiative to provide MWTs to meet future DOD requirements. Dual use impact in commercial arenas, such as communication and medical electronics, results from Crane's focus on cost-of-ownership driven MWT manufacturability efforts.

ELECTROCHEMICAL POWER SYSTEMS TC

Crane participated in the Aviation Battery Systems Standardization (AVBATTSS) subgroup interface to the Joint Aeronautical Commanders' Group (JACG). This was assigned by AVBATTSS Memorandum of Agreement of the JACG-Working Board of 1 April 1991.

Crane has the U.S. Army Missile Command battery cognizance assigned by Memorandum of Understanding, NWSCC Battery Quality Safety and Reliability Assessment for United States Army Missile Command Weapon System Batteries, 20 March 1990.

Crane has the FAA Battery Cognizance, Interagency Agreement Number DTFA01-94-Z-02031 between the Department of Transportation Federal Aviation Administration and Crane NAVSURFWARCENDIV.

SMALL ARMS TC

Crane plays an extensive teaming role in Tri-Service small arms programs, often through Memoranda of Agreement, Memoranda of Understanding, and Inter-Agency Agreements. As part of a joint Department of Defense program for small arms development (the Joint Services Small Arms Program, JSSAP), Crane participates with the Army and Air Force in research and development programs for advancing the state-of-the-art in small arms weapons, mounts and ammunition.

Crane represents the Navy on various JSSAP technical committees which oversee this program. Munitions Effectiveness Studies are conducted for the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG-ME) on Special Operations Forces targets.

Crane is a principal weapons developer for the United States Special Operations Command (SOCOM), serving as Program Manager for the Offensive Handgun Program (USSOCOM's first joint service developmental program) and the M4 Carbine Special Operations Modification (SOPMOD) program, and as Weapons Integration Manager for the MK V, Patrol Coastal and RIB Craft. Research and development, test and evaluation and asset tracking and serialization control is performed for the Marine Corps.

Small arms depot level maintenance and repair are performed for selected Army, Air Force, and Marine Corps assets under Depot Maintenance Interservice Agreements.

The Coast Guard Small Arms Facility is co-located with the facilities of this technical capability and is supported through acquisition, storage, and the sharing of equipment and ranges.

CONVENTIONAL AMMUNITION TC

Crane participates in a Joint Air Force/Navy Nonnuclear Munitions Surveillance/Quality Evaluation Test Program Plan for AGM-65A/B/D/E/F/G (MAVERICK) Weapons System 319 of 1 Mar 93.

Crane is assigned Single Manager for Conventional Ammunition according to DOD 5160.65M ,(Implementing Joint Conventional Ammunition Policies and Procedures) of Apr 89. Also, DOD Directive 5165.65, "Single Manager for Conventional Ammunition," 17 Nov 81, (Prescribes uniform procedures concerning the Single Manager for Conventional Ammunition and the Military Services (Army, Navy, Air Force and Marine Corps) in the execution of their assigned responsibilities in the conventional ammunition program).

Crane has a DMISA NAVSEA 92-02AFTG for the Sidewinder DSU-15 Target Detectors.

ELECTRO-OPTICS/NIGHT VISION TC

Crane is assigned as the Acquisition Engineering Agent and the Interim Designated Overhaul Point for the Special Operations Forces Laser Marker (SOFLAM). This man-portable laser marker/designator/rangefinder is a joint service (Navy-Army-Air Force-Marine Corps) program conducted by the United States Special Operations Command and managed by the Naval Sea Systems Command (NAVSEA). The reference is NAVSEA SEATASK 06Z93000140 of 1 Oct 1992 and NAVSEA letter 4790 OPR06ZL1 Ser 06Z/290 of 17 Aug 1993.

Crane is assigned as the interim depot for Image Intensifier Tube (IIT) Warranty Screening for Image Intensifier Night Vision Devices. The reference is Memorandum of Agreement (MOA) established 13 April 1993 between US Army Communications-Electronics Command (CECOM) and Crane Division, Naval Surface Warfare Center (NSWC).

Crane is assigned as the interim depot for Unserviceable IIT Screening for Image Intensifier Night Vision Devices. The reference is MOA established 13 April 1993 between US Army CECOM and Crane Division, NSWC.

RADAR ENGINEERING TC

The Radar Engineering Technical Capability is jointly testing/repairing solid state items for the Air Force AN/ALQ-122 and AN/ALQ-99 on DMISA NAVSEA93 02AFTG.

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Location/Address	Crane, IN

Page

Mission

1. Mission Statement 1
2. Joint Service Missions 1

Technical Functions

3. Technical Functions Resource Allocations 5

Manpower

4. Work Breakdown Structure 6
5. Technical Staff Qualifications 10

Facilities and Equipment

6. Special Facilities/Equipment Resources 32
7. General Facilities/Equipment Resources 33

Location

8. Geographic Location 46

Features and Capabilities

9. Computational Facilities 53
10. Mobilization Responsibility and Capability 58
11. Range Resources 61

Quality of Life

12. Military Housing 62
13. MWR Facilities 71
14. Base Family Support Facilities 73

15. Metropolitan Areas 74
16. VHA 75
17. Off-base Housing Rental and Purchase 76
18. Sea Intensive Ratings 79
19. Commute 80
20. Educational Opportunities 81
21. Employment Opportunities 85
22. Medical/Dental 86
23. Crime Rate 87

TAB A Technical Operations: Functional Support Area - Life Cycle Work Area Form

TAB B Facilities and Equipment: Facilities/Equipment Capability Form

TAB C Range Resources: Range Capability Form

Appendix A Functional Support Areas - Life Cycle Work Areas List

Appendix B Definitions for Functional Support Areas - Life Cycle Work Areas

TECHNICAL FUNCTIONS

3. **Technical Functions Resource Allocations.** Appendix A provides a list of numbered functional support areas that cover the spectrum of naval warfare and support operations. Additionally, Appendix A provides a list of numbered life-cycle work areas that cover the "cradle to grave" spectrum of Navy systems acquisition. Utilizing the two lists at Appendix A, each activity will break out its entire FY1993 technical program within any applicable intersections of these two defining schemes (for example, functional support area #5.2 - life cycle work area #3 will identify the activity's level of resources allocated to sensors and surveillance systems, radar systems in advanced development). Definitions for each functional support and life cycle work area are provided in Appendix B for reference.

a. Use the form at Tab A of this data call to provide data on work years and expenditures for FY1993 to support each applicable intersection of functional support areas and life cycle work areas. When necessary, estimate data to the best of your ability.

b. Similarly, use the Tab A forms to report separately on your detachments or sites that have not received this data call directly. This data may be consolidated when the detachments or sites perform work in the same area. When necessary, estimate data to the best of your ability.

MANPOWER

4. **Work Breakdown Structure.**

a. Use Table 4.1 (below) to provide data on the general support functions at your activity. Report data as of 31 March 1994. If you are collocated with one of your subordinate base keeper commands (i.e., a NAWS or NAS collocated with a NAWC Division), describe the differences in the functions of each and provide a separate Table 4.1 for the subordinate command. Include this command in the Table 4.1 submission for your Activity.

b. Similarly, use Table 4.2 (below) to provide general support function data for all your detachments or sites that did not receive this data call directly. Consolidate data from all of these detachments into one table (4.2). Provide a list of the detachments whose data is included in Table 4.2. For each identified detachment in this list, include its name, location, UIC, and number of civilian and military personnel onboard.

In addition, if any of your detachments or separate sites not receiving an individual data call have over 50 civilian personnel or own technical facilities, provide separately a description of the site, the functions performed there, photographs showing the facilities and state the reason for that site's existence and the necessity for it to be at that location.

c. Use Table 4.3 (below) to provide estimated data, for your activity only, to reflect the anticipated impact of previous BRAC decisions that have not yet been implemented. This data should provide the deltas from Table 4.1.

NOTES:

[1] Use the following definitions when providing data for the tables below:

Workyears: Consistent with those used in the preparation of inputs to the President's budget.

Contract Workyears: Actual or estimated workyears performed by support contractors with workyears defined consistent with the definition used in the President's budget.

Civilian Personnel Onboard: Full Time Permanent (FTP) employees.

[2] Any categories of personnel that are employed to support other Activities should be noted with the name of the additional Activity supported.

Table 4.1, General Support Resources for
(Activity:NSWC Crane Division, Crane, IN) (UIC: 00164)

Function	Space allocated (Gross SQFT)	Work Years	Civilian Persnel onboard	Contract Work Years	Military Personnel Onboard	
					Off	Enl
ADMINISTRATION						
Command (CO/XO/TD/etc.)	11,299	60.9	47	0.0	4	0
Comptroller	11,732	28.5	31	0.0	0	0
Admin	53,442	55.3	51	0.0	0	0
Human Resources	76,063	59.8	48	0.0	0	0
OPERATIONS SUPPORT						
Supply Management	47,022	308.2	271	0.0	1	2
Consolidated Computational Computer Support	22,068	65.0	72	64.4	0	0
Information Systems and Communications	15,591	55.4	50	45.0	0	1
Safety/OSH/Environmental	29,626	28.9	39	0.0	0	0
INFRASTRUCTURE						
Physical Security	25,195	97.1	77	0.0	0	0
Public Works/Staff Civil Engr	323,546	401.2	354	419.5	1	0
Fire Protection	16,692	45.6	37	0.0	0	0
Medical/Dental	13,534	13.2	11	0.0	1	6
Military Support	175,634	1.1	1	0.0	0	6
Air/Waterfront Operations	N/A	0.0	0	0.0	0	0
Other	0	0.0	0	0.0	0	0
TECHNICAL STAFF						
Technical Operations			2577	489.1	1	9
Totals	821,444	1220.2	3666	1018.0	8	24

Revised pg 202

Table 4.1, General Support Resources for
(Activity:NSWC Crane Division, Crane, IN) (UIC: 00164)

Function	Space allocated	Work Years	Civilian Persnel	Contract Work	Military Personnel Onboard	
					Off	Enl
ADMINISTRATION						
Command (CO/XO/TD/etc.)	11,299	60.9	47	0.0	4	0
Comptroller	11,732	28.5	31	0.0	0	0
Admin	53,442	55.3	51	0.0	0	0
Human Resources	76,063	59.8	48	0.0	0	0
OPERATIONS SUPPORT						
Supply Management	47,022	308.2	271	0.0	1	2
Consolidated Computational Computer Support	22,068	65.0	72	64.4	0	0
Information Systems and Communications	15,591	55.4	50	45.0	0	1
Safety/OSH/Environmental	29,626	28.9	39	0.0	0	0
INFRASTRUCTURE						
Physical Security	25,195	97.1	77	0.0	0	0
Public Works/Staff Civil Engr	323,546	401.2	354	419.5	1	0
Fire Protection	16,692	45.6	37	0.0	0	0
Medical/Dental	13,534	13.2	11	0.0	1	6
Military Support	175,634	1.1	1	0.0	0	6
Air/Waterfront Operations	N/A	0.0	0	0.0	0	0
Other	0	0.0	0	0.0	0	0
TECHNICAL STAFF						
Technical Operations			2577	489.1	1	9
Totals	821,444	1220.2	3666	1018.0	8	24

NOTE: DIRECT FUNDED WORKYEARS ARE INCLUDED IN THE WORKYEARS COLUMN FOR ADMIN, OPS SUPPORT AND INFRASTRUCTURE FUNCTIONS.

Revised PG

Direct Funded General Support Resources

ADMINISTRATION

FUNCTION	WORKYEARS
Command	2.7
Comptroller	2.5
Admin	3.2
Human Resources	3.5

OPERATIONS SUPPORT

FUNCTION	WORKYEARS
Supply Management	39.6
Consolidated Computational Computer Support	1.0
Information Systems and Communications	1.5
Safety/OSH/Environmental	7.0

INFRASTRUCTURE

FUNCTION	WORKYEARS
Physical Security	13.0
Public Works/Staff Civil Engr.	80.6
Fire Protection	1.6
Medical Dental	5.1
Military Support	16.3
TOTAL	177.6

NOTE: THESE WORKYEARS ARE INCLUDED IN THE WORKYEARS COLUMN REPORTED IN TABLE 4.1.

Table 4.2, General Support Resources for all Detachments
(Activity:NSWC Crane Division) (UIC: 00164)

Function	Space allocated (Gross SQFT)	Work Years	Civilian Persnel onboard	Contract Work Years	Military Personnel Onboard	
					Off	Enl
ADMINISTRATION						
Command (CO/ XO/ TD/etc.)	NA					
Comptroller						
Admin						
Human Resources						
OPERATIONS SUPPORT						
Supply Management						
Consolidated Computational Computer Support						
Information Systems and Communications						
Safety/OSH/Environmental						
INFRASTRUCTURE						
Physical Security						
Public Works/Staff Civil Engr						
Fire Protection						
Medical/Dental						
Military Support						
Air/Waterfront Operations						
Other						
TECHNICAL STAFF						
Technical Operations						
Totals						

Table 4.3, Previous BRAC Impact to General Support Resources for (Activity: NSWC Crane Division) (UIC: 00164)

Function	Space allocated (Gross SQFT)	Work Years	Civilian Persnel onboard	Contract Work Years	Military Personnel Onboard	
					Off	Enl
ADMINISTRATION						
Command (CO/XO/ TD/etc.)	NA					
Comptroller						
Admin						
Human Resources						
OPERATIONS SUPPORT						
Supply Management						
Consolidated Computational Computer Support						
Information Systems and Communications						
Safety/OSH/Environmental						
INFRASTRUCTURE						
Physical Security						
Public Works/Staff Civil Engr						
Fire Protection						
Medical/Dental						
Military Support						
Air/Waterfront Operations						
Other						
TECHNICAL STAFF						
Technical Operations						
Totals						

5. **Technical Staff Qualifications.**

a. Use Table 5.1 (below) to provide data on the civilian personnel allocated to Technical Operations having the educational and experience levels indicated in the table for your activity. Report data as of 31 March 1994. Similarly, use Table 5.2 (below) to provide data for all your separate detachments or sites that did not receive this data call directly. Consolidate data from all of these detachments into one table (5.2). Provide a list of the detachments whose data is included in Table 5.2.

Table 5.1, Technical Staff Education Level for
(Activity:NSWC Crane Division, Crane, IN) (UIC: 00164)

Highest Degree Attained	Years of Government and/or Military Service					
	Less than 3 Years	3-10 Years	11-15 Years	16-20 Years	More than 20 Years	Total
Grade School	0	5	4	2	11	22
High School	56	506	270	169	527	1528
B.A./B.S	14	508	120	54	194	890
M.A./M.S	1	49	17	11	43	121
Ph.D./ M.D.	0	5	6	0	5	16
Total	71	1073	417	236	775	2577

Table 5.2, Technical Staff Education Level for all Detachments
(Parent Activity: NSWC Crane Division) (UIC: 00164)

Highest Degree Attained	Years of Government and/or Military Service					
	Less than 3 Years	3-10 Years	11-15 Years	16-20 Years	More than 20 Years	Total
Grade School	NA					
High School						
B.A./B.S						
M.A./M.S						
Ph.D./ M.D.						
Total						

b. Use Table 5.3 (below) to provide data on the number of civilian personnel allocated to Technical Operations with graduate degrees and at least three years of applicable experience that have their highest degree in the fields indicated. Report data as of 31 March 1994. Similarly, use Table 5.4 (below) to provide data for all your separate detachments or sites that did not receive this data call directly. Consolidate data from all of these detachments into one table (5.4). Provide a list of the detachments whose data is included in Table 5.4

Table 5.3, Technical Staff Academic Fields for
(Activity:NSWC Crane Division, Crane, IN) (UIC: 00164)

Academic field	Number
Physics	3
Chemistry	12
Biology	0
Mathematics/Statistics/ Operations Research	16
Engineering	93
Medical	0
Dental	0
Computer Science	2
Social Science	0
Other Science	0
Non-Science	10
Total	136

Table 5.4, Technical Staff Academic Fields for all Detachments
(Parent Activity:NWSC Crane Division, Crane, IN (UIC: 00164)

Academic field	Number
Physics	NA
Chemistry	
Biology	
Mathematics/Statistics/ Operations Research	
Engineering	
Medical	
Dental	
Computer Science	
Social Science	
Other Science	
Non-Science	
Total	

c. Are there unique aspects of the activity's location that help or hinder in the hiring of qualified personnel?

Educational Support and Recruitment - Although Indiana is noted as a major producer and exporter of consumer and industrial electronic goods, **Crane Division has little local competition for people with technological skills.** The Division is centrally located with respect to some of the world's largest and most highly regarded schools of engineering. In addition, a number of nearby schools and universities offer two year Associate degrees in engineering technology.

Quality of Life - Crane Division is the largest employer of engineers in Southern Indiana. the quality of life, low cost of living (including cost of housing), and ease in getting to work lead to extremely low attrition rates. **Thus far there has been no need to offer recruitment or retention bonuses to either acquire or retain technical personnel.** The low cost of living is supported by the fact that we are covered under RUS (Rest of United States) insofar as locality pay is concerned.

Recruitment - There are a number of reputable engineering schools within a 100-150 mile radius of Crane, for example: Purdue University, the University of Evansville, Rose-Hulman Institute of Technology, the University of Cincinnati, IUPUI, and the University of Louisville. **We have had approximately 1,000 engineering applications in our files within the past two-three years.** In addition, there are a number of technical schools in the local areas which furnish a substantial supply of electronic, electrical, and mechanical engineering technicians. These technical programs include both two-year and four-year curricula.

d. List all articles written by the in-house technical staff that were published or accepted for publication in refereed journals since 1 January 1990.

1. S. Kosier, A. Wei, R. Schrimpf, W. Combs, D. Fleetwood, M. DeLaus, and R. Pease, "Bounding the Total-Dose Response of Modern Bipolar Transistors," IEEE Transactions on Nuclear Science, December 1994.

2. S. Kosier, A. Wei, R. Schrimpf, D. Fleetwood, M. DeLaus, R. Pease, and W. Combs, "Physically-Based Comparison of Hot-Carrier-Induced and Ionizing-Radiation-Induced Degradation in BJTs," under review for publication in IEEE Transactions on Electron Devices, December 1994.

3. R. Pease, S. Kosier, R. Schrimpf, W. Combs, M. DeLaus, and D. Fleetwood, "Correlation of Hot-Carrier Stress and Ionization-Induced Degradation in Bipolar Transistors," IEEE Transactions on Nuclear Science, December 1994.

4. C. F. Wheatley, J. L. Titus, and D. I. Burton, "Single Event Gate Rupture in Vertical Power MOSFETs; An Original Empirical Expression," IEEE Transactions on Nuclear Science, December 1994.

5. A. Wei, S. Kosier, R. Schrimpf, D. Fleetwood, and W. Combs, "Dose-Rate Effects on BJT Gain Degradation," under review for publication in Applied Physics Letters, December 1994.

6. T. Turflinger, M. Davey, and B. Mappes, "Single Event Effects in Analog-to-Digital Converters: Device Performance and System Impact," IEEE Transactions on Nuclear Science, December 1994.

7. R. Pease, S. Clark, P. Cole, J. Krieg, and J. Pickel, "Total Dose Response of Transconductance in MOSFETs at Low Temperature," 1993 RADECS, to be published in special issue of IEEE Transactions on Nuclear Science, June 1994.

8. M. Darwish, M. Shibib, M. Pinto, and J. Titus, "Single-Event Gate Rupture of Power DMOS Transistors," IEEE Transactions on Electron Devices, February 1994.

12. R. Nowlin, S. Kosier, R. Schrimpf, W. Combs, and D. Fleetwood, "Charge Separation in Bipolar Transistors," IEEE Transactions on Nuclear Science, December 1993.

13. M. DeLaus, D. Emily, B. Mappes, and R. Pease, "Converting a Bulk Radiation-Hardened BICMOS Technology into a Dielectrically Isolated Process," IEEE Transactions on Nuclear Science, December 1993.

14. R. Nowlin, D. Fleetwood, R. Schrimpf, R. Pease, and W. Combs, "Hardness Assurance and Testing Issues for Bipolar/BiCMOS Devices," IEEE Transactions on Nuclear Science, December 1993.

15. J. Brews, R. Schrimpf, K. Galloway, M. Allenspach, J. Titus, and C. Wheatley, "A

Conceptual Model of Single-Event Gate-Rupture in Power MOSFET's," IEEE Transactions on Nuclear Science, December 1993.

16. R. Pease, W. Combs, and S. Clark, "Long Term Ionization Response of Several BICMOS VLSIC Technologies," IEEE Transactions on Nuclear Science, June 1992.

17. R. Nowlin, E. Enlow, R. Schrimpf, and W. Combs, "Trends in the Total-Dose Response of Modern Bipolar Transistors," IEEE Transactions on Nuclear Science, December 1992.

18. J. Titus, G. Johnson, R. Schrimpf, and K. Galloway, "Single Event Burnout of Power Bipolar Junction Transistors," IEEE Transactions on Nuclear Science, December 1991.

19. E. Enlow and W. Combs, "Response of Advanced Bipolar Processes to Ionizing Radiation," IEEE Transactions on Nuclear Science, December 1991.

20. J. Babcock, J. Titus, R. Schrimpf, and K. Galloway, "Effects of Ionizing Radiation on the Noise Properties of DMOS Power Transistors," IEEE Transactions on Nuclear Science, December 1991.

21. P. Cole, S. Clark, and D. Butcher, "Total Dose and Transient Radiation Effects on a Tuneable Bandpass Filter Operating at Liquid Nitrogen Temperatures," Journal of Radiation Effects, Research and Engineering, December 1991.

22. E. Enlow and W. Combs, "Process Effects on the Ionizing Radiation Hardness of Trench Isolation," Journal of Radiation Effects, Research and Engineering, 1991.

23. T. Henderson, G. Grant, P. Sonnenburg, D. Sapach, and D. Emily, "Radiation-Hardened Electronics Thermomechanical Shock Testing on the DISKO ELM UGT, Journal of Radiation Effects, Research and Engineering, 1991 (Classified Preceedings).

24. J. Loyd, D. Emily, and T. Henderson, "Radiation Hardened Electronics Thermomechanical Shock Testing on the Mission CYBER Underground Test," Journal of Radiation Effects, Research and Engineering, 1990.

25. S. Clark, P. Cole, J. Krieg, and D. Butcher, "Total Dose Hardening of Cryogenic Analog CMOS," Journal of Radiation Effects, Research and Engineering, December 1990.

26. T. Turflinger and M. Davey, "Understanding Single Event Phenomena in Complex Analog and Digital Integrated Circuits," IEEE Transactions on Nuclear Science, December 1990.

27. J. Desko, M. Darwish, M. Dolly, C. Goodwin, W. Dawes, and J. Titus, "Radiation Hardening of a High Voltage IC Technology," IEEE Transactions on Nuclear Science, December 1990.

28. J. Cable and S. Clark, "Rapid Thermal Nitridation of Silicon Dioxide for Rad-Hard Cryogenic CMOS Applications," Journal of Radiation Effects, Research and Engineering, December 1989.

29. E. Enlow, R. Pease, W. Combs, and D. Platteter, "Total Dose Characterization of Trench Structures," Journal of Radiation Effects, Research and Engineering, December 1989.

30. S. Clark, J. Salzman, R. Keeney, and M. Baze, "Dose Rate Induced Latchup in Bipolar STL Technology," Journal of Radiation Effects, Research and Engineering, December 1989.

31. J. Titus, L. Jamiolkowski, and F. Wheatley, "Development of Cosmic Ray Hardened Power MOSFET's," IEEE Transactions on Nuclear Science, December 1989.

32. T. Turflinger and M. Davey, "Heavy Ion Test of Multi-Pass Analog-to-Digital Converter Architecture," IEEE Transactions on Nuclear Science, December 1989.

33. E. Enlow, W. Combs, R. Pease, and D. Platteter, "Total Dose Induced Hole Trapping in Trench Oxides," IEEE Transactions on Nuclear Science, December 1989.

38. M. Darwish, M. Dolly, C. Goodwin, and J. Titus, "Radiation Effects on Power Integrated Circuits," IEEE Transactions on Nuclear Science, December 1988.

39. D. Platteter and T. Cheek, "The Use of Multiple Oxygen Implants for Fabrication of Bipolar Silicon-on-Insulator Integrated Circuits," IEEE Transactions on Nuclear Science, December 1988.

40. Kevin Beasley, "An Overview of Navy Composite Developments for Thermal Management", Naval Engineers Journal, May'92.

41. Lawrence C. White, "Electronic Warfare Testing utilizing an improved AN/ULM-4 Test Range," Naval Engineers Journal, Nov'92.

42. Jeff Snow, "Rating Quality & Selecting suppliers Using Taguschi Loss Functions," Journal of Purchasing and Materials.

43. J.M. Snow, "Accuracy Requirements for Measurement Systems with Uniform and Normal Errors," Naval Engineers Journal.

44. "Reducing Aircraft Battery Maintenance Costs in the U.S. Navy, " IEEE Spectrum, 1992.

45. "Aircraft Battery Standardization," SAE Technical Paper Series 91159, 1991 SAE Aerospace Atlantic, 22-26 April 1991.

46. R. Ramesham, M.F. Rose, R.F. Askew, T. L. Bekker, J.A. Dayton, Jr., I.L. Krainsky,

G. Mearini, D. File, A. S. Gilmour, Jr. and V. Ayers, "Effect of Hydrogen on the Properties of Polycrystalline Diamond Thin Films," Published in the Journal of Surface & Coatings Technology, 1994

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47. "High Power Vented Nickel-Cadmium Cells Designed for Ultra-Low Maintenance," California State University - Long Beach 8th Annual Battery Conference, 1993.

48. "Lead-Acid Storage Batteries," Talking Shop, October 1993.

49. Harry Brown and Steve Hall, "NSWC Crane Aerospace Cell Test History," NASA Battery Worksho Proceedings 1993.

50. Bruce Moore, "Space Station Freedom NiH Cell Testing Program," NASA Battery Workshop Proceedings 1993.

51 Michael Roach, "MIL-HDBK-845," Military Handbook, Stand Power Supply Applications Handbook, 31 Dec 1992.

52. "Improved Control Technique for Fast Output Charging of a Boost DC-DC Converter," Proceedings of Power Conversion and Intelligent Motion (PCIM 93), October 1993.

53. "Listing of Military and Federal Battery Specifications for SHARP Task 1.5.1 Editions Three, Four & Five.

54. "All About Dry Cells," Tech Tips, March-April 1992.

55. Vaidevutis Alminauskas, "Charging Lead Acid Batteries with Unregulated Photovoltaic Panels," Eight Annual Battery Conference on Applications and Advances, California State University, Long Beach CA, 12-14 Jan 1993.

56. Contributing editor to "Handbook of Batteries," 2nd Edition, David Linden Editor, McGraw-Hill Book Company, New York.

57. "Sealed Nickel-Cadmium Cell Performance and Optimization of Battery Design," Ninth Annual Battery Conference on Applications and Advances.

58. Harlan Lewis and Larry Hammersley, "Material Sciences Characterization of a Thermal Battery," Long Beach 7th annual Battery Conference, 21-23 Jan'92.

59. Harlan, L. Lewis, LDEF Sattelite Lithium/Carbon Monofluoride Battery. Effects of Earth Orbital Environments on Material Properties, Long Beach 7th Annual Battery Conference, 21-23 Jan '92.

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1. "High Power Vented Nickel-Cadmium Cells Designed for Ultra-Low Maintenance," California State University - Long Beach 8th Annual Battery Conference, 1993.

2. "Lead-Acid Storage Batteries," Talking Shop, October 1993.

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63. Harlan L. Lewis and Vernon L. Hammersley, "Evaluation of Nickel Electrode Surface Properties as a Function of State-of-Charge," 18th International Power Sources Symposium, 18-21 April '93.

64. Harlan L. Lewis, "Characterization of Secondary Ag/Zn Separator Materials, "Naval Undersea Warfare Center, Keyport WA, 27-28 Aug '93.

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66. Harlan L. Lewis, "Analysis of Residual Charged Nickel in Cathodes from Secondary Ni Cells," 9th Annual Battery Conference, Long Beach CA, 11-13 Jan '94.

67. Harlan L. Lewis, "Characterization of Secondary Silver/Zinc Separator Material," Naval Undersea Warfare Center, Newport RI, 31 Jan - Feb '94.

68. Vernon L. Hammersley, "Correlation of Whole Plate Surface Area with plate Capacities for Silver and Zinc Plates," Proceedings of the Eighth Annual Battery Conference on Applications and Advances, California State University, Long Beach CA, 12-14 Jan '93.

69. Vernon L. Hammersley and Kevin Holloway, "Measurements on Field-Qualified 10,000 Amp-Hr lithium/Thionyl Chloride Submodules," Ninth Annual Battery Conference on applications and Advances, California State University, Long Beach CA, 11-13 Jan '94.

70. David Miller, "Safe and Environmentally Benigh Lithium Battery Testing," Earth Day Conference, Indian Head MD, 22 April 1993.

71. David Miller, "The Lithium Battery," ASNE Conference, Louisville KY, September 1992.

72. David Miller, "Emergency Disposal of Large Lithium Batteries," Lithium Battery Safety/Technical Working Group Conference, LABCOM, Ft. Monmouth JN, 19 Sept 1992.

73. David Miller, "Environmentally Benign Testing of Lithium Batteries," Lithium Battery Safety/Technical working Group Conference, San Diego CA, 24 Feb 1993.

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76. Harlan L. Lewis, "Materials Analysis of NiCd Space Qualified Cells from Life Cycle Testing," 25th IECEC Conference, Reno NV, 13-15 Aug 1990.

77. Harlan L. Lewis, "Materials Analysis of an Unusual Design Seawater Battery," 6th Annual Battery Conference on Applications and Advances, California State University, Long Beach CA, 15-17 Jan 1991.

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79. Harlan L. Lewis, "Reexamination of Nickel Cadmium Materials Analysis State," NASA Aerospace Battery Workshop, 29-31 Oct 1991.

80. D. File and Dr. J. Williams, "Proceedings of the Second Slip Ring Committee Sliding Contact Lubrication Workshop," 21 Apr 92.

81. D. File and Dr. J. Williams, "Proceedings of the Third Second Slip Ring Committee Sliding Contact Lubrication Workshop," (to be published Dec 94).

82. W. Combs and B. Eiche, "Radiation Effects on the AT&T CBIC Linear Bipolar Process," Proceedings of the IEEE Radiation Effects Data Workshop, July 1994.

83. M. DeLaus and W. Combs, "Total-Dose Results for he AD8001, a High-Performance Commercial Op-amp Fabricated in a Dielectrically Isolated Complementary Bipolar Process," Proceedings of the IEEE Radiation Effects Data Workshop, July 1994.

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101. J.M. Snow, J.S. Usher, and B.E. Stuckman, "On the Effectiveness of the Unit Sample Size for Standard Control Charts: ARL VS. AURAL," Quality and Reliability Engineering International.

102. Dr. John P. Maassen, "Integrated Vulnerability & Weaponeering Model," Ballistics '92 13th International Symposium, 1 Jun '92.

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108. Vaidevutis Alminauskas, "Performance Evaluation of Lead Acid Batteries for Use with Solar Panels," 23rd IEEE Photovoltaic Specialist conference, Louisville, KY, 10-14- May 1993.

109. Harlan L. Lewis, "Analysis of Fluoboric Acid for Free Fluoride Ion Content," 45th Pittsburgh Conference and Analytical Symposium, Chicago, IL, 25 Feb - 2 Mar 1994.

110. Vernon L. Hammersley, "Special Sample Cell for Determining Surface Area of Whole Battery Plates," Fall Meeting No. 182nd, The Electrochemical Society, Inc., Toronto, Ontario, Canada, Oct 11-16 1992.

111. Vernon L. Hammersley, "Krypton vs. Nitrogen in Surface Area Measurements of Silver-Zinc Battery Plates," Fall Meeting No. 184th, The Electrochemical Society, Inc., New Orleans, LA, 10-15 Oct 1993.

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112. "Measuring Surface Area of Whole Battery Plates using the ASAP 2000," The MicroReport, 3rd Quarter 1993, Vol. 4, No. 2, Published by Micromeritics, One Micro meritics Dr., Norcross, GA.

113. "Evaluation of a Type "D" Maintenance-Free Sealed Lead-Acid Cell for a Dipping Sonar Application, Rose-Hulman Institute of Technology Thesis, May 1993.

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115. Tim Bradley, Carl Lohkamp, Michael Walls, and Steven Norris, "Trial Dwight Infrared Countermeasures Effectiveness Tests (U)," Naval Intelligence Command navy Scientific and Technical Intelligence Review (NAVSTIR), NIC-2660P-004-92, November 1992.(Secret Document)

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120. Donald Hazelton and Bill Hubble, "Ground-to-Air Effectiveness Results from MJU-22/B Special (19C) Decoy flares," IRIS Conference May 1992.

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122. Gary Broxton, "MJU-29/B Kinematic Decoy Flare, DT-1 Tests," IRIS Conference May 1992.

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127. Carl Lohkamp, Tim Bradley, Michael Walls, James Brown and Phillip Goodpaster, "Effectiveness Testing of Foreign Decoy Flares From Foreign Aircraft," IRIS Conference April 1993.

128. T.L. Bekker, J.A. Dayton,Jr., A.S. Gilmour, Jr., I.L. Krainsky, M.F. Rose, R. Rameshan, D. File, and G. Mearini, "Observations of Secondary Electron Emission From Diamond Films," presented at the Tri-Service Cathode Conference, The Presidio, San Francisco, CA, 1992

129. E. F. Smith, III, Art Klein, Bill Reed, Rich Lysonski, John W. Agopovich, Ray Denton, "Screening Contact Materials for Low Speed Slip Ring Assemblies", Presented at 39th IEEE Conference on Electrical Contacts, Pittsburg, PA, 1993

130. C. Ackerman, H Lentz, W. Powers, Jr., T. Jones, A. Casuccio, C. Spangler, P. Fischione, D. File, G. Anderson, H. Breindel, B. Reed, "Automated Torque and Resistance Measurements of Sliding Electrical Contacts during Life Testing", Presented at 15th International Conference on Electrical Contacts, Montreal, Quebec, Canada, 1990

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f. Identify any Nobel laureates employed at this activity. None

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2. William S. Yee, Manager, Lockheed Missile and Space Company to the Naval Surface Warfare Center, Crane, IN dated 29 June 1993.

3. GEM Award for outstanding support to the Trident II D5 Program.

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1. John T. Mitchell, Rear Admiral, U.S. Navy, Director, Strategic Systems Programs to Richard J. Wilson dated 21 Oct 1992.

2. Letter of Appreciation for engineering leadership in heading the Naval Surface Warfare Center Crane Division, Sea Launched Ballistic Missile Technology Sear Team.

3. March 93 - Crane Division receives 1992 Department of Defense Standardization Program for Excellence, announced by the Office of the Assistant Secretary of Defense.

4. Navy Reliability, Maintainability, and Quality Assurance Award, 27 October 1992.

5. "Alan Berman Research Publication Award for 1990" given to Norris Caldwell February 1991 by the naval Research Lab, Washington, D.C.

6. Mar 1993 - Barry D. Hoover, Materials Engineer, GS-12, Code 60 Selected as NAVSEA Field Activity Engineer of the Year for 1992. Recognized for his expertise in the manufacturing of ceramic Multilayer Interconnect Boards for Navy Programs, and recognized by industry as a leader in the thick film technology area.

7. March 93 - Gary R. Nale, Supvy General Engineer, GM-15, Command Staff, received Superior Civilian Service Award, approved by Commander, NAVSEA.

8. May 1993 - Nyle Riegle, Employee Services Manager, GM-15, Code 06, chosen to receive the 1993 Administrative Federal Employee of the Year Award, sponsored by the Federal Executive Association of Indianapolis. Recognized for exceptional work performance and community service activities.

9. May 93 - James R. Wood, Laborer, WG-2, Code 30, received 1993 Federal Employee of the Year, sponsored by the Federal Executive Association of Louisville, in the Clerical Administrative category.

10. June 93 - William E. Smith also received the Jefferson Award sponsored by The American Institute for Public Service.

11. August 1993 - Received Certificates of Appreciation for 90 employees. Certifications were signed by Secretary of the Navy and given in recognition of significant contribution to the support of military mobilization, deployment, operations, and sustainment during Desert Shield - Desert Storm 1990-91.

i. List all patents awarded to the in-house technical staff members of this activity since 1 January 1990.

Patent	Case #	Title & Inventor(s)	Date
5,003,881	71633	Igniter for 2.75" Illuminating	May 1991
5,133,258	70637	Non-Propagating Holder and Package for Explosive Devices by Arthur O. Rock, Frank A. Niehaus, Ted A. Parker, Gennie F. Shrum and Charles E. Phillips	28 Jul 92

j. List all patents applied for by the in-house technical staff members of this activity since 1 January 1990.

Submitted	Titles & Inventor(s)	Date Submitted
Case # 75799	Electrically Initiated Multi-Chambered Flare Gun by David P. Armstrong, Robert E. Barker, Stanley J. Herold, Kelly J. Norris and Alan R. Schaefer	21 Sep 93
Case #75850	Decoy Flare by Stanley J. Herold and Alan R. Schaefer	20 Sep 93
Case #75800	Special Material Decoy by Stanley J. Herold and Alan R. Schaefer	17 Sep 93
Case #75757	Stabilized Rectilinear Infrared Countermeasure by David C. Littman, C. Douglas Howard, Thomas R. Limberger and Steven R. Norris	30 Aug 93
Case #75543	Kinematic Infrared Counter-measure by David C. Littman, Gary W. Broxton, Clyde E. Cain, Larry G. Killion, Michael G. Ringwald, C. Douglas Howard, Thomas R. Limberger, Donald E. LaGrange and Paul R. McCool	14 Jun 93

Case #75542	Miniaturized Safe and Arm Igniter for Decoy Flares by Dennis D. Deckard, Stanley J. Herold, Donald E. LaGrange, Dennis L. Mitchell, and David J. Mulinix	21 Jun 93
Case #75486	Tethered Rectilinear Infrared Countermeasure by David C. Littman, C. Douglas Howard, Thomas R. Limberger, Steven R. Norris and Donald E. LaGrange	21 May 93 * Rejected: Navy Interest
Case #75333	Dual Load Infrared Counter-measure by Gary W. Broxton, Jeffery R. Campbell and Carl W. Lohkamp	10 Mar 93 * Rejected: Navy Interest
Case #74231	Injection Loader Machine for Highly Viscous Materials by Tim Mahoney, Kirk Newman, Jim Gusack and George Sallade	23 Jul 93
Case #74018	Energy Absorption Device for Schock Loading by C. Douglas Howard, Donald E. LaGrange, David P. Beatty and David C. Littman	10 Oct 91

k. Identify any in-house staff that are members of the National Academy of Engineering. None

l. Identify any in-house staff that are members of the National Academy of Sciences. None

m. How many Cooperative Research and Development Agreements (CRDAs) have been signed by the activity since 1 January 1990?

(1) NAWC/CRANE/IU (60)
(2) NAWC/CRANE/PDES, INC
(3) Federal Foam Technologies, Inc/Crane (40)
(4) Microlithics Corp/Crane (60)
(5) Crane Division (NOSL)/IPI, Inc (NOSL)

n. What has been the activity's annual royalty income from CRDAs and patent licenses for each year since 1 January 1990? None

o. List and describe any major end item prototypes, either product or process technology, developed in-house by the activity that are currently in production and/or are currently in use by the U.S. Armed Forces or by industry. Cite a published reference that documents the work.

Electronics

Code 804 designed and produced 8 each AN/ULM-4 Electronic Countermeasures Test Sets currently being utilized worldwide at Shipboard Electronic Systems Evaluation Facility test ranges. The AN/ULM-4 Electronic countermeasures Test Sets are used as operational readiness certification test equipment for deployed Surface Electronic Warfare Systems. This work is documented in the November 1992 issue of the Naval Engineers Journal in the article titled "Electronic Warfare Testing Utilizing and Improved AN/ULM-4 Test Range."

Code 804 designed and produced 12 each Pulsed Traveling Wave Tube Band 4 RF Tray Modulators currently being utilized in AN/ULQ-13 Signal Simulator/Trainer Vans in Norfolk, Virginia and San Diego, California. This work is documented in AN/ULQ-13 Signal Simulator Technical Manual number 1301028.

Code 804 designed and produced two Field Change kits for the AN/SLA-10B Blanker Video-Mixer Group. To date, Code 804 has produced 200 Field Change 2 kits for the AN/SLA-10B which are currently in use on 200 United States Navy ships. To date, Code 804 has produced 20 Field Change 3 kits for the AN/SLA-10B which are currently in use on 14 United States Navy ships. Both of these Field Change kits are in active production at NSWCCD. This work is documented in AN/SLA-10B Technical Manual number DE400-AF-OMP-010/(V) SLA-10B, national stock number 091-LP-503-2800.

Long Life Vidicons for Mk 5 Trident (published in Contamination Control Proceedings)

Pressed and Sintered Thermoelectric Coolers for Long-Life in High Shock Environments (various NSWC Crane, Marlow Industries and Charles Stark Draper Laboratory reports)

Gun Mounts

Crane is responsible for caliber gun mounts from initial concept development through prototyping, testing, and fielding. Below is a listing of small caliber gun mounts that have been designed and fielded by Code 2022 since 1990. The outcome of the design efforts are documented in NAVSEA publication SW361-A0-MM0-010.

MOUNT	DESCRIPTION
MK 82 MOD 2	7.62mm M60 machine gun mount
MK 93 MOD 0/2	Dual mount for the .50 caliber M2HB machine gun and the 40mm MK 19/3 machine gun
MK 94 MOD 0	Lightweight mount for the .50 caliber M2HB machine gun
MK 95 MOD 0	Lightweight twin-gun mount for the .50 caliber M2HB machine gun
MK 123 MOD 0	lightweight ground tripod for medium machine gun mounts
M122A1	Lightweight ground tripod for medium machine gun mounts
MK 175 MOD 0	Universal gun mount adapter for the HMMWV vehicle

Pyrotechnics

Mk 138 Mod 0 Recall Signal documented by NWSCCR/RDTR-92/0022

Mk 6 Mod 0 Smoke Pot documented by NAD-CR-RDTR-204

Mk 6 Mod 5 Aircraft Smoke and Illumination Signal documented by NWSC RDTR 494

Mk 11 Illuminating Projectile Load documented by NWSC RDTN 111

Mk 18 Illuminating Projectile Load documented by NWSC RDTN 111

Mk 25 Mod 4 Marine Location Marker documented by NWSC RDA 3

Mk 33 Rocket Illumination Warhead documented by NAD CR RDTR 97

Mk 34 5-Inch Rocket RP Smoke Warhead documented by NWSC RDTR 399

Mk 58 Mod 1 Marine Location Marker documented by NSWC CR RDTR 64

Mk 66 Mod 1 Marine Smoke and Illumination Signal documented by Patent 4,335,656

Mk 67 2.75-Inch Rocket RP Smoke Warhead documented by NWSC RDTR 435

Mk 80 Hand Fired Signal documented by NWSC RDTR 273

Mk 99 Mod 3 Marine smoke and Illumination signal Documented by NWSC RDTR 259

Mk 115 Marine smoke and Illumination Signal documented by Patent 3,960,087

Mk 116 Marine Smoke and Illumination Signal documented by Patent 3,960,087

Mk 117 Mod 1 Marine Smoke and Illumination Signal documented by Patent 4,335,656

Mk 118 Mod 1 Marine smoke and Illumination signal documented by Patent 4,335,656

Mk 120 Marine Smoke and Illumination Signal documented by Patent 4,164,186

Mk 121 Marine Smoke and Illumination Signal documented by Patent 4,164,186

Mk 124 Marine Smoke and Illumination signal documented by Patent 3,908,550

MJU-2/B Decoy Flare documented by NWSC CR RDTR 2

MJU-8A/B Decoy Flare Documented by NAVAIR ECP 507-993

MJU-22/B Decoy Flare documented by NWSC RDTR 602

SM-875/ALE Simulator, Tactical Use, Flare documented by NWSC RDTR 601

Electrochemical Power Systems

No-Maintenance sealed lead-acid batteries for aircraft, the Commodore, Sept. 10 1981 and MIL-B8565

Improved nickel-cadmium battery vent caps, MS3510B

Aircraft vented nickel-cadmium batteries, MIL-B-81757

Aircraft battery relay control unit, MIl-B-85584

Aircraft digital voltmeters, MIL-V-85603

Standard Power Supply Program: A process and hardware implementation developed to stop the proliferation of custom and unique designed and to establish high reliability products for Fleet use. "Military Programs March On," Electronic Engineering Times, February 1994.

FACILITIES AND EQUIPMENT

6. **Special Facilities/Equipment Resources.** Include a copy of the form provided at Tab B of this data call for each facility and "major" piece of equipment located at this activity. Include information on separate detachments. The following definitions will apply:

Facilities - Will include such things as rocket firing bays, towing tanks, anechoic chambers, hypervelocity gun ranges, hyperbaric chambers, wind tunnels, simulation/emulation laboratories, etc. Include buildings that are integral to the facility/equipment. Do not include major outdoor ranges or land.

Also, describe modeling and simulation capabilities, hardware in-the-loop facilities and analysis or wargaming capabilities.

Equipment - Resources used to support the operation of the site with a replacement value of $500,000 or greater. Do not include land or buildings in this category. In reporting equipment, provide information to indicate the degree of portability of the equipment. Class 3 Personal Property items ("plant equipment" or "equipment in place") by definition are highly portable and can be moved easily. Some Class 2 Installed Equipment, such as Main-frame computers, test stands and small hyperbaric chambers, require more extensive utilities support and assembly of components, but can be relocated without damage to the facility or equipment, and therefore are considered "moveable" assets. Other Class 2 items are so large and/or integral to the facility that houses them that major demolition and construction would be required to relocate them, and therefore are considered "fixed" assets. Where appropriate, pieces of equipment can be aggregated for the purposes of completing Tab B.

The technical program within the Crane Division is described in terms of our principal areas of expertise in the following Technical Capabilities (TC). The TAB B and TAB C information is organized by these **complementary Technical Capabilities**. (There are five of the seventeen at the Louisville, Kentucky site).

1. ELECTRONIC WARFARE
3. MICROELECTRONIC TECHNOLOGY
4. ELECTRONIC MODULE TEST & REPAIR
5. MICROWAVE COMPONENTS
6. ELECTROCHEMICAL POWER SYSTEMS
7. ACOUSTIC SENSORS
9. SMALL ARMS
10. CONVENTIONAL AMMUNITION
11. PYROTECHNICS
15. NIGHT VISION/ELECTRO-OPTICS
16. MINE COUNTERMEASURES
17. RADAR ENGINEERING & INDUSTRIAL SUPPORT

7. **General Facilities.**

a. Is there any cash revenue generated by this activity? Example: Electricity generated at this activity and sold to the local community. If yes, describe.

FORESTRY MANAGEMENT PROGRAM: Beginning in FY95, the activity will generate approximately $650,000 annually from harvesting hardwood timber.

HUNTING AND FISHING PROGRAM: Approximately $42,500 is generated annually from receipts for hunting and fishing fees.

b. What MILCON projects are currently programmed to be completed by the end of FY1995? For each project provide:

(1) A description of the proposed facility with title and project number. Be sure to include the trailing alpha designator for BRACs-88, 91 and 93 realignment projects, i.e., P-xxxR, P-xxxS, P-xxxT .

(2) The functional support area(s) that the new facility will support. Refer to Appendix A.

(3) Identify installed equipment to be provided based on the threshold guidance of paragraph 6, page 12, of this data call.

(4) The additional square footage that this project will provide to the functional support area(s).

(5) The current working estimate (CWE) & planned beneficial occupancy date (BOD) of the project.

The following information is provided in response to questions 7.b.1 to 7.b.5 above:

P-246, ELECTRONICS COMMUNICATIONS/MAINTENANCE SHOP

1. The project will construct a 70,000 SF facility which will serve as a Model Depot for the screening and repair of military and commercial electronic modules and related hardware. The facility will be a permanent one-story, steel frame structure with pre-cast concrete walls; concrete floor and foundation. The state-of-the-art facility will have maintenance, repair and engineering lab spaces and will incorporate an Automated Storage and Retrieval System (ASRS) for repairables, repair parts and materials. Automatic Guided Vehicles will transport all materials in a closed loop from the ASRS to repair technicians. In addition, the Model Depot will incorporate a Sensitive Compartmented Information Facility for repair of highly classified modules. Final products are used in such systems as AN/UYK-7, 20, and 44 family of Standard Computers; AN/SQQ-14, 30, and 32 family of Mine Hunting Sonars, AN/SLQ-48 Mine Neutralization System and Signal Intelligence Equipment.

2. The facility will support the following functional support areas:

* 1.1 Undersea
* 1.3 Surface Ship
* 2.9 Fire Control
* 7.8 Intelligence Information Systems
* 9.1 Navy Strategic Systems

3. Installed equipment which meets the criteria as stated in Paragraph 6 of this data call is as follows:

* Automatic Storage and Retrieval System
* Rotary File
* Environmental Stress Screening (Requires special utilities)
* Secure Compartmental Information Facility (SCIF)

4. Additional square footage to be provided to each functional support area is as follows:

* 1.1 Undersea -- 1,000 SF
* 1.3 Surface Ship -- 4,000 SF
* 2.9 Fire Control -- 1,000 SF
* 7.8 Intelligence Information Systems -- 2,000 SF
* 9.1 Navy Strategic Systems -- 0 SF

5. The project is under construction with a construction completion date of 7/94 and a subsequent BOD of 9/94.

P-225, DEMIL TEST, EVALUATION AND ENGINEERING FACILITY

1. The project will construct a one story, 2,400 SF test facility and a remote reinforced concrete test cell. The facility is required for the development of safe and environmentally acceptable technologies for dismantling disposable Ammunition, Explosives and other Dangerous Articles (AEDA). Development and pilot plant scaled operations are carried out to establish methods for demilitarization. Naval activities worldwide generate large quantities of disposable AEDA on a continuous basis with only 40% of the energetic items in the current AEDA inventory having established demilitarization procedures. Demilitarization methods are being developed to comply with local and United States Environmental Protection Agency standards. Functional areas of the facility include a one pound explosive test cell, a remote 500 pound explosive processing cell, an ordnance handling area, and a demil furnace with the associated pollution control equipment.

2. The facility will support the following functional support areas:

* 2.1 Gun Systems
* 2.2 Guided Missiles
* 2.3 Free Fall Weapons
* 2.7 Explosives
* 2.9 Fire Control
* 2.10 Wpn Data Links
* 2.11 Wpn Fuzing
* 2.12 Propulsion
* 2.13 Other Ordnance
* 2.14 EOD
* 5.1 Sonar Systems
* 5.5 Ocean Surveillance
* 8.2 Countermeasures
* 9.1 Navy Strategic Systems

3. Installed equipment which meets the criteria as stated in Paragraph 6, Page 13 of this data call is as follows:

* 500 pound Explosive Test Cell equipment including:
  - 20" Band Saw
  - 18' Power Hack Saw
  - 18" Core Drill and Disassembly Machine with 40" drills

* 1 pound Explosive Test Cell equipment including:
  - Small Core Drill
  - Punch Press

* Incinerator with associated Pollution Control Equipment

4. Additional square footage is provided equally to each of the following functional support areas:

* 2.1 Gun Systems
* 2.2 Guided Missiles
* 2.3 Free Fall Weapons
* 2.7 Explosives
* 2.9 Fire Control
* 2.10 Wpn Data Links
* 2.11 Wpn Fuzing
* 2.12 Propulsion
* 2.13 Other Ordnance
* 2.14 EOD
* 5.1 Sonar Systems
* 5.5 Ocean Surveillance
* 8.2 Countermeasures
* 9.1 Navy Strategic Systems

5. The project is under construction with a construction completion date of 7/94 and a subsequent BOD of 9/94.

P-266, ELECTRONIC COUNTERMEASURES SYSTEMS CENTER

1. The project will provide a 72,000 SF facility to house the functions associated with the reliability and performance testing, engineering life cycle support and analysis, repair, alignment , calibration, upgrade and logistic support of the AN/SLQ-32 (V) Electronic Countermeasures Weapon System. The facility will be a permanent, two-story, steel-frame structure with reinforced concrete floors and foundation and concrete tilt-up exterior walls. Interior functional areas are included for test, development, maintenance, repair and overhaul; an anechoic chamber; shipping, receiving, storage and staging areas; computer-aided drafting/design and automated data processing areas; technical library; secured strong room, receiving dock and bay.

2. The functional support area to be supported by the facility is:

* 8.3 Electronic Warfare.

3. Installed equipment to be provided which meets the criteria as stated in Paragraph 6 of this data call includes:

* Anechoic Chamber positioner and control system with an estimated value of $1.0 M. Although the positioner and control system could be relocated, it would require extensive utility support.

4. Additional square footage to be provided to each functional support area is as follows:

* 8.3 Electronic Warfare -- 37,000 SF

5. The CWE is $7.465 M with a construction completion of 9/95 and a subsequent BOD of 11/95.

c. What MILCON projects are currently programmed to be executed/completed after FY1995? For each project provide:

(1) A description of the proposed facility with title and project number.

(2) The functional support area(s) the new facility will support.

(3) The identified installed equipment to be provided based on the threshold guidance of paragraph 6, page 12, of this data call.

(4) The additional square footage this project will provide to the functional support area(s).

(5) CWE & planned BOD.

The following information is provided in response to questions 7.c.1 to 7.c.5 above:

P-262, MICROWAVE COMPONENTS CENTER

1. The project will construct a 44,300 SF addition to Building 3168 to provide life-cycle management support of high-value microwave components such as high-power microwave tubes, modules and assemblies of the AEGIS Weapon System and related major electronic countermeasure, fire control and radar systems in support of the DDG-51 Class AEGIS Destroyer. The facility will be a permanent, one-story steel-frame structure with reinforced concrete floor and foundation and masonry walls. Interior spaces will be configured to provide high power microwave tube electrical and environmental test and evaluation areas; tube failure analysis and repair area; electromagnetic interference screened test rooms; a high bay test area to accommodate large antenna systems; test, maintenance and repair areas for various microwave components and modules, office space; ancillary storage areas, receiving dock and bay.

2. The new facility will support the following functional support areas:

* 5.2 Sensors and Surveillance Systems--Radar Systems
* 8.3 Defense Systems--Electronic Warfare Systems

3. Installed equipment to be provided which meets the criteria as stated in Paragraph 6, this data call includes:

* Anechoic chamber on seismic isolated block for near-field antenna measurements.

* High-purity, non-conductive cooling water system. (Required to support other test equipment provided by the customer).

4. Additional square footage to support the identified functional support areas as follows:

* 5.2 Sensors and Surv. Systems--Radar Systems-- 30,000 SF
* 8.3 Defense Systems--Electronic Warfare Systems --14,000 SF

5. The CWE for the project is $5.0 M with a BOD of 12/95.

P-283 T, RECHARGEABLE BATTERY EVALUATION FACILITY

1. The project will construct a 26,500 SF facility to accommodate work transitioning from Mare Island Naval Shipyard to NSWC Crane as a result of the 1993 Base Realignment and Closure process. The facility will be used to perform engineering evaluation, data analysis, battery testing, failure analysis, specification review, qualification testing, along with quality conformance evaluation and investigation of alternative power sources in support of the SSN-688 Class, SSBN-726 Class, SEAWOLF, New Attack Submarine, Deep Submergence and Deep Submergence Rescue Vehicles. The facility will be a permanent, one-story, steel frame structure with concrete floor and foundation, precast concrete panel walls. Functional areas to be included are battery evaluation areas, battery staging/storage areas, acid containment, spent acid/lead pretreatment capability, acid mixing areas, battery charging stations, failure analysis lab, shipping and receiving dock, fabrication area and administrative areas.

2. The facility will support the following functional support areas:

* 1.1 Undersea
* 1.3 Surface Ship
* 1.5 Ground Vehicles
* 4.2 Coastal/Special Warfare Support
* 5.3 Special Sensors
* 6.1 Submarine Navigation Systems
* 6.3 Surface Ship Navigation Systems
* 10.8 Other Subsidiary Systems or Components

3. Installed equipment which meets the criteria as stated in Paragraph 6 of this data call are:

* Silver Battery Test System--includes computer plus 6 test stations

* Shipboard Battery Test System--includes computer plus 14 test stations

* AN/WSN 1/3 Navigation Battery Test System -- includes computer plus 15 test stations

* Mare Island Main Propulsion Battery Test System--includes computer plus 24 test stations and associated sensor systems

* Tactical Remote Sensor System Test Station

* Forklift Battery Charging/Repair System

4. Additional square footage to be provided by the facility is:

* 1.1 Undersea--20,000 SF

5. The CWE for the project is $3.4 M with an anticipated BOD of 1/96.

P-278, ORDNANCE ENVIRONMENTAL TEST FACILITY

1. The project will construct a three structure complex comprising a total of 29,389 SF in which to perform the environmental and surveillance testing and evaluation of numerous explosive devices used in defense of Navy ships and installations against enemy ship, shore and aircraft targets; demolition materials used by SEAL Teams, Underwater Demolition Teams, Explosive Ordnance Disposal Teams and all Special Operating Forces of the Armed Services; expendable countermeasures used in defense of Naval Surface Platforms; pyrotechnic devices and various safe/arming, firing and fuze devices. The three structure complex is comprised of 1) a 17,052 SF permanent, one-story explosives environmental test building with reinforced concrete walls, floor, foundation and roof; 2) a 2,153 SF reinforced concrete high explosives remote test cell; and 3) a 10,184 SF permanent, one-story steel frame operations support building with reinforced concrete floor and foundation and masonry exterior walls.

2. The functional support areas supported by the facility are as follows:

* 2.1 Gun Systems
* 2.2 Guided Missiles
* 2.3 Free Fall Weapons
* 2.7 Explosives
* 2.9 Fire Control
* 2.10 Weapon Data Links
* 2.11 Weapon Fuzing
* 2.12 Weapon Propulsion
* 2.13 Other Ordnance
* 2.14 EOD
* 5.1 Sonar Systems
* 5.5 Ocean Surveillance
* 8.2 Countermeasures
* 9.1 Navy Strategic Systems

3. When aggregated, the following equipment meets the criteria as stated in Paragraph 6 of this data call. The total replacement value of the equipment is $5.5 M. While the number of items appears extensive, it should be noted that these items cannot be separated individually and the mission of ordnance environmental testing be completed.

* 7 Electrodynamic Vibration Systems from 7500 to 40000 force pounds that have the capability of Sine, Random and SRS

* 3 Impact Shock Machines that includes one lightweight ship shock

* 30 Temperature and Humidity Chambers

* 2 Temperature and Humidity & Altitude Chambers

* 1 Sunshine & Rain Chamber

* 1 Sand & Dust Chamber

* 2 Salt Spray Chambers

* 2 Jolt Machines

* 2 Jumble Machines

4. The additional square footage to be acquired is 11,787 SF and equally supports all the functional support areas listed below:

* 2.1 Gun Systems
* 2.2 Guided Missiles
* 2.3 Free Fall Weapons
* 2.7 Explosives
* 2.9 Fire Control
* 2.10 Weapon Data Links
* 2.11 Weapon Fuzing
* 2.12 Weapon Propulsion
* 2.13 Other Ordnance
* 2.14 EOD
* 5.1 Sonar Systems
* 5.5 Ocean Surveillance
* 8.2 Countermeasures
* 9.1 Navy Strategic Systems

5. The CWE for the project is $8.4 M with an expected BOD of 12/96.

P-265, ELECTRO-OPTICS CENTER

1. The project will provide a 65,000 SF facility to perform the pre-shipment certification, stock surveillance testing, maintenance, repair, overhaul and refurbishment of Electro-Optic and Night Vision equipments used by all Navy surface combatants as well as other platforms within the Navy and Department of Defense operations. The facility will also be used for the evaluation, development and improvement of maintenance technologies for those equipments and systems. The primary facility will be a permanent, two-story steel frame structure with insulated concrete masonry and brick walls. Interior functional areas required include: a passive observation tower; laser test and demonstration ranges; a Class 100,000 clean room; test, maintenance, repair, overhaul and refurbishment areas; dark rooms, collimation rooms; radioactive sources handling rooms; small machining area, chemical and battery storage rooms; environmental test area; calibration and engineering labs; computer area; shipping, receiving, storage and staging areas and engineering space.

2. The new facility will support the following functional support areas:

* 4.1 Landing Force Equipment and Systems
* 4.2 Coastal/Special Warfare Support
* 5.3 Special Sensors
* 10.6.3 Crew Equipment and Life Support--Surface Ship

3. There is no installed equipment which meets the criteria as stated in Paragraph 6 of this data call.

4. The facility will provide additional square footage in each functional support area as follows:

* 4.1 8,844 SF
* 4.2 6,007 SF
* 5.3 21,897 SF
* 10.6.3 9,300 SF

5. The CWE is the programmed amount of $8.0 M. Should the project be awarded in FY 98 as identified in the CNO's Sponsors Program Proposal, the BOD would be estimated at 12/99.

P-268, RADAR MAINTENANCE FACILITY

1. The project will construct a 58,000 SF facility in which to perform Depot maintenance, component engineering, and Acquisition Engineering Agent (AEA) functions associated with all version of Navy air search, surface search/surveillance and surface navigational radar systems in support of all classes of FFG, DDG, CG, CGN, CV and CVN surface combatants as well as the AOE, LCC, LHA and LHD auxiliaries. The facility will be a permanent two-story, steel frame structure with exterior metal siding; reinforced concrete floor and foundation. Interior functional areas to be provided include: an industrial high-bay area, mechanical components test and repair lab, an electronic components test and repair lab, land based high power test beds, a network analyzer room, a Class C clean room; computer, document control, shipping/receiving/staging areas and offices.

2. The Functional Support Area to be supported by the facility is:

* 5.2 Sensors/Surveillance Systems

3. Installed equipment which meets the criteria as stated in Paragraph 6 of this data call is as follows:

When aggregated, the following radar and/or antenna systems meet the criteria, as they require special built-in utilities (air dryer, 400 Hz Power, Chilled and Pure water) in order to be functional:

AN/SPS-48C
AN/SPS-40
AN/SPS-67
AN/SPS-64
AN/SPS-9I
AN/SPS-48E (requires only the 400 Hz power)

4. Additional square footage to be provided by the facility is:

* 5.2 Sensors/Surveillance Systems--32,010 SF

5. The CWE is the programmed amount of $6.3 M. Should the project be awarded in FY 99 as identified in the CNO's Sponsors Program Proposal, the BOD would be estimated at 9/00.

d. What is the distance (in miles) to the nearest military airfield and/or pier not located at your site? Describe. Assume all previous BRAC closures have been executed.

The nearest military airfield is Hulman Airfield, Terre Haute, Indiana located 52 miles from Crane, Indiana. Hulman Airfield is home of the 181st Fighter Group,/Air Force Reserve. It has two (2) runways, 9,000 ft. each and can accommodate any aircraft in the inventory with the exception of the B-52. There are cables/barriers on both ends of the runways. Although civilian airlines share the runways, civilian air traffic is minimal.

e. How many certified magazines, used for the storage of explosives, does this activity own or control? What is the total explosive weight storage capacity?

The activity has 1,679 certified magazines with an explosive weight storage capacity of 158,745.5 tons of Class 1 Division 1 material.

LOCATION

8. **Geographic Location.**

a. Is there an imperative in facility, function or synergy that requires the installation/base/facility to be in its present location? If yes, describe.

Our mission is to provide responsive engineering and industrial base support for weapons systems, subsystems and components. In Crane's midwestern location, we have combined skilled people, unique and capable facilities, product knowledge, and the ability to integrate engineering with "hands on" industrial processes, to provide the broadest, deepest and most advanced industrial base capability in the Navy.

<u>REMOTE LOCATION</u> - Crane Division is set in the rolling hills of southwestern Indiana. Although it is conveniently located with respect to major urban areas, with good access to rail, highway, and air transportation, Crane Division offers a virtually crime-free rural setting with numerous opportunities for outdoor recreation. **The cost of living in southern Indiana is among the lowest in the nation.** Not coincidentally, many Navy military people remain in the Crane area after retirement for just these reasons.

With nearly **100 square miles** inside its boundaries, Crane has the space to locate several unique facilities within a single organization with **significant unused area remaining for growth.**

Environmental Compliance - From an environmental standpoint, the geographic location of this facility is key to its successful operation and the continuation of missions which other facilities are being forced to close. Crane Division is remote, with little encroachment from residential or private industry. **The facility occupies land which, due to the topography and soil types, is of little value for farming, residential development, or private industry.**

EPA Region V and the Indiana Department of Environmental Management work well with the people and operations at Crane. Furthermore, the communities surrounding the Division are extremely supportive of the facility and its programs. **In other words, there is almost no antagonistic opposition from the public or regulators to environmental permits and related activities**. This favorable relationship is extraordinary among Department of Defense facilities.

Crane Division is also located in an attainment area for criteria pollutants under paragraph 107 of the Clean Air Act. **The nearly 64,000 acres which the base occupies provide an excellent natural laboratory in which to conduct studies to determine and monitor the impacts and risks to the environment associated with mission activities.** A considerable amount of money has been spent doing environmental assessment and installing monitoring equipment (e.g. over 400 groundwater monitoring wells). All of this combines to allow a wide diversity of operations rarely available anywhere else. **The location of Crane Division ideally situates it for different types of test, demolition, and firing ranges, as well as manufacturing and munitions storage.**

Mission Execution - With a superficial review, Crane Division's midwestern location may be seen as a disadvantage to the Navy, simply because the Navy equates to coastal properties. However, **providing the Navy with superior electronic and mechanical products, must by no means be a coastal activity.** In fact, many features of a weapons system or sensor can only be evaluated to the full extent of the specification during unique remote site product testing. The following are five examples.

1. 1000 Yard Outdoor Firing Range - Removal from high density population centers allows for the testing of small arms weapons, mounts and ammunition without restrictions based on noise pollution requirements. Also, **this location reduces security risks due to infiltration or threat of urban riot.**

2. Low Background Radiation - As an ordnance storage and control facility, radio frequency radiators are controlled internally, enabling testing that requires low background noise (large acreage and remote rural area with no large commercial radiators).

3. High Level Radiation Testing - This remote geographic location, with its low population density, has reduced FCC requirements and regulations for radiation of energy. Our "Blue Sky" facility, located in a valley and directed straight into space (thus the facility name "Blue Sky") has a restricted fly zone that provides the free space that high power microwave radiation testing requires. The valley location, surrounded by large indeciduous trees, minimizes outside interference and blocks horizontal radiation. In addition, large available acreage allows adaptability for all DoD antenna range requirements.

4. Night Vision - An additional advantage of the rural location of this facility is the ability to test and evaluate Night Vision and Electro-Optic devices and systems **under true "natural" light conditions** at the outdoor test range. As no urban areas are near the facility, no urban "back lighting" of the sky is present to adversely affect simulated operational conditions.

5. Hydroacoustic Test - The remote location makes possible extremely quiet hydroacoustic testing. These facilities are unique from the standpoint they are Navy owned and operated. This gives complete control over physical security. For example, this eliminates problems such as coordination with Coast Guard and/or municipal authorities concerning safety issues relating to humans and marine mammals as well as other environmental issues. Another advantage is that test and evaluation activities can be controlled and executed with **no interference from civil marine traffic** unlike test facilities in densely populated coastal areas. The result is effective execution of test processes with minimal cost due to the avoidance of down time and **freedom from excessive public relations complications.**

<u>SYNERGIES OF CO-LOCATION</u> - Many of the functions performed at the Crane Division, Naval Surface Warfare Center **require access to other facilities and capabilities co-located on the base** in order to accomplish their missions. These facilities/capabilities include:

- Environmental simulation facilities such as humidity, temperature cycling, vibration, shock, altitude, sun/rain, sand/dust, salt spray, jolt, and jumble;
- X-ray facilities including real-time capability;

- Ordnance materials analysis lab;
- Circuit card engineering and repair support;
- Mounting platforms and brackets;
- System interface testing;
- Battery engineering and test support;
- Failure Analysis of components;
- Documentation Control;
- Acquisition (contracting) of repair parts, complete equipment, and support materials and equipment;
- Automated material handling facility for storage of material for staging/repair/issue;
- Video tape generation/editing and Graphic Arts;
- Firing Ranges and Range Support for Lasers and/or Weapon Sights/Fire Control Testing;
- Equipment Calibration Support;
- Defense Reutilization and Marketing Office for recycling and disposal of test and analysis samples.

The synergy generated due to the co-location of program management, engineering, logistics, and repair personnel, facilities and equipment is immeasurable. Virtually any conceivable service or support requirement can be obtained "in-house." Crane has developed the ability to manage, acquire, assess, test, evaluate, maintain, repair (intermediate and depot level) and provide engineering and field support for components, equipment and systems. By obtaining required support from other Technical Capabilities and organizations within the Division, **internal duplication of capabilities is avoided** and utilization of facilities, equipment and expertise is optimized for efficiency. Complications such as contracting delays, non-uniform testing, excessive material shipping and handling efforts and expense and redundant coordination costs are also avoided. Costs are minimized and capabilities are enhanced by broadening of application and increased usage. The following offer two examples of co-located program engineering/logistic and/or management functions.

Hydroacoustics - The Sonobuoy Life Cycle Engineering/Logistics Facility has been built over the past 30 years and has evolved as acoustic sensors have become more sophisticated and capable. Many facets of these evaluations (i.e. electronics, environmental, hydroacoustics, and magnetic) constitute an in-line process. **These evaluations must be performed in a particular order and within limited time frames.** This test capability was developed to accomplished this function. Many of the facilities of this capability are fixed assets. These include the Glendora Lake Facility and 1,000,000 lb. anechoic test tanks.

Conventional Ammunition Engineering - The Crane Division is a unique Navy activity in that significant Single Manager for Conventional Ammunition (SMCA) production is performed by CAAA, the Army tenant, located at Crane. **Fifty-eight percent of CAAA's ordnance magazine storage (1.9 million square feet) contains Navy/Marine Corps Ammunition assets.** Co-location of the Program Management and engineering functions with a major DOD ammunition production, storage, maintenance and disposal activity provides rapid response capability throughout the life cycle to major regional conflicts such as Operation Desert Shield/Desert Storm.

An additional relevant advantage of this site is its storage capacity. This has been imperative since **many systems no longer receive any form of original manufacturer support.** Vast quantities of decommissioned material is retained here and serves as a source of supply for critical/obsolete material requirements.

EDUCATIONAL SUPPORT and RECRUITMENT - Although Indiana is noted as a major producer and exporter of consumer and industrial electronic goods, **Crane Division has little local competition for people with skills in electronics**. The Division is centrally located with respect to some of the world's largest and most highly regarded schools of engineering. In addition, a number of nearby schools and universities offer two year Associate degrees in electronics.

Quality of Life - Crane Division is the largest employer of engineers in Southern Indiana. The low cost of living (including cost of housing) at both sites, ample/free parking, and ease in getting to work result in extremely low attrition rates. **Thus far there has been no need to offer recruitment or retention bonuses to either acquire or retain technical personnel.** The low cost of living is supported by the fact that we are covered under RUS (Rest of United States) insofar as locality pay is concerned.

Recruitment - There are a number of reputable engineering schools within a 100-150 mile radius of Crane: Purdue University, the University of Evansville, Rose-Hulman Institute of Technology, the University of Cincinnati, IUPUI, and the University of Louisville. **We have had approximately 1,000 engineering applications in our files within the past two-three years.** In addition, there are a number of technical schools in the local areas which furnish a substantial supply of electronic, electrical, and mechanical engineering technicians. These technical programs include both two-year and four-year curricula.

Cooperative Education - Crane's centralized location also makes it a prime contender for Co-operative education students. **In recent years the Crane Division has had one of the largest Co-op programs in Navy.** Upon graduation 60-80% of the students accept permanent job offers with the Activity.

Future Industrial Base - Crane Division, Naval Surface Warfare Center, the Naval Air Warfare Center Indianapolis, and Indiana University-Purdue University at Indianapolis have evolved a unique partnership to create the **Electronics Manufacturing Productivity Facility**, centrally located in Indianapolis, Indiana. This state-of-the-art facility teams with industry, academia, and the Navy to provide training, workshops, and technical consultation for a wide variety of electronic manufacturing and repair needs.

TRANSPORTATION - Crane Division's geographic location enhances support to the fleet through **ready access to corridors of transportation**.

Volume - The shipment volume at the Crane Division for FY93 was 27,059 Navy fleet shipments and 4,047 Ordnance Government Bill of Lading (GBL's). **Crane Division utilizes the automated Conus Freight Management Field Module** (CFM-FM) system to process shipments and to provide compatibility with Military Traffic Management Command for routings, GBL generation, and carrier performance data.

Access to Air - Located just five miles from downtown Louisville and minutes from the Louisville site of the Crane Division is Standiford field. It is serviced by 18 different airlines with over 100 flights per day. According to the Airports Association Council International, **Standiford field is the 10th largest air cargo airport in the world and the fifth largest within the U.S.** A $400 million dollar expansion to add parallel runways is now underway.

Standiford field is the national air-freight Hub site for United Parcel Service's (UPS). **All shipments with UPS come through this Hub site**. UPS has a sorting capacity of 160,000 packages or documents per hour supported by over 86 flights per day. **UPS serves over 180 countries and territories.** Services offered include; Next-day, Second-Day, Comprehensive logistics capabilities, and On-Site customs clearance.

Located approximately 80 miles north of the Crane site is Indianapolis International Airport. **This airport ranks 11th in the U.S. for cargo shipments**. A Federal Express hub, U.S. Postal Service Eagle Air hub, and United Airlines' $800 million dollar air maintenance hub are located here. **It is also the home of the Greater Indianapolis Foreign Trade Zone.**

Access to Rail - Crane site of the Naval Surface Warfare Center has **over 150 miles of railroad track** providing access to the facility's storage areas. This track accommodates the 89-foot flat cars used when shipping Milvans and Seavans. Crane Site is serviced by the Soo Line which interconnects at Chicago, Kansas City, and Louisville. **The Louisville area is served by five rail lines:** the Soo Line, CSX Transportation, Conrail, Norfolk Southern Corp., and the Paducah & Louisville. Cities within two days rail travel from Louisville include; Atlanta, Chicago, Memphis, Minneapolis, and St. Louis. **Average rail time to east and west coast locations are six and ten days, respectively.** CSX's main north and south line runs through nearby Evansville, Indiana.

Access to Waterways - Between the Crane and Louisville sites is the Ohio River, **the major waterway to Cincinnati, Pittsburgh, St. Louis, Memphis, New Orleans and the Gulf of Mexico seaports**. The Louisville and Jefferson County Riverport Authority, the Clark Maritime Center (part of the Indiana port system), and numerous private facilities provide state-of-the-art trans-loading capabilities. Clark Maritime in Jeffersonville, Indiana covers 830 acres and offers storage, towing and fleeting, barge cleaning and repair, switching, and heavy lifting up to 450 tons. **Ports are also available in Evansville,Indiana and the Great Lakes area.**

Louisville's Foreign Trade Zone, with customs clearance, is located within the Jefferson Riverport International's 1,600 acres and **offers benefits to those involved in overseas markets.**

Access to Highways - The City of Louisville is served by three major interstate highways: I-64, I-65, and I-71. The Indianapolis area, just north of the Crane site, is a hub for four major interstate highways: I-70, I-74, I-65, and I-69. A proposed extension of I-69 south to I-64 is scheduled to begin construction in 1996. **This southern extension is slated to pass within a mile of the Crane site.** When completed, I-69 will link the Great Lakes and Canada with the Mexico and the rest of Central and South America. The current plan will link such cities as Evansville, Indiana, Memphis, Tennessee, Shreveport, Louisiana, and Houston, Texas.

This region is serviced by over 40 motor carriers, including most of the major freight companies. **These carriers can provide service to all 48 contiguous states, as well as Canada and Mexico, without interchange,** allowing Crane Division the opportunity to have carriers pickup additional freight as trucks pass through the area. **Due to the number of major carriers and shipping volume, the trucking rates in the Crane Division area are very competitive.**

Access to Suppliers - Crane Division is located within 500 miles of nearly 50 percent of the U.S. consumer markets and within 650 miles of 65 percent of the population of the United States. Because of the Crane site's shipping volume, two transportation companies, Baggett Transportation and Boyle Transportation, have Terminals just outside Crane's boundaries. They offer quick service for "hot" emergency shipments. After material is loaded, **trucks deliver to the East coast in 12 hours and to the West coast in 36-48 hours.**

b. What is the importance of the present location relative to customers supported?

<u>CENTRAL LOCATION</u> - Our primary customers are the military users of the products we design, prototype, service and repair. Those customers are located world-wide. On-site assistance is required with many of the equipments and systems supported by Crane personnel, and is currently being provided or has recently been provided in **Southwest Asia, Alaska, Cuba, Africa, Central America, Hawaii, Japan, Taiwan, and numerous CONUS locations for Navy, Army, Marine Corp, Special Operations Forces and Foreign Military customers.**

And service to the Fleet means a close relationship with Original Equipment Manufacturers. They too are located in the North, South, East and West and all are relatively more accessible from our mid-continent location. For example, 75 percent of ammunition component and end item production by both industry and government is within 750 miles (38 percent within 500 miles) of Crane Division, **allowing almost same-day response to resolve on-site production related problems.** The maintenance of product expertise is the only means available to **assure safe, reliable and effective ammunition to satisfy Fleet requirements.**

Not only are our customers and DOD manufactures dispersed, but piece part suppliers are located throughout the country. Again, travel to their locations or delivery of their products to us is also made with greater ease. **This results in lower average time and costs for personnel travel and material shipments.**

Once a product is ready to field, Crane Division's central geographic location makes travel to the pier at either coast or the Gulf of Mexico relatively equally convenient. For delivering products to the Fleet, Crane Division has convenient access to two major air cargo terminals, transcontinental rail lines, and the Interstate Highway System. For rapid response and material tracking Crane is **fully connected to global data networks.**

The advantages of being centrally located to the Fleet, the major DOD manufactures, and the component suppliers bring people and material together fast. When combined with the on-site synergistic relationship of engineering, logistics and management previously discussed, Crane **delivers** products to any area of the world where the Fleet is deployed. We are a maintenance and engineering resource that **provides superior cost controlled services and project them throughout the country or the world with similar ease.**

FEATURES AND CAPABILITIES

9. Computational Facilities.

a. Describe the general and special computational capabilities at this site. Include super computing, parallel computing, distributed computing and networking. Include high-speed data transfer, fiber optic links, microwave links, network interconnectivity and video teleconferencing capabilities. Do not discuss desktops and laptops except as they relate to networking.

Crane Division uses several of major computer systems for tasks ranging from routine administrative functions to logistics and high level engineering functions.

DIVISION-WIDE NETWORKING

NETWORK AND EXTERNAL CONNECTIVITY

Connectivity for over 4000 hosts, work stations and printers is provided through the use of a Division-wide Broadband network. This network supports security and training and transparently links the networks for Division-wide integration of computer systems. This network utilizes three network communication channels, several video channels, and a dedicated high speed T1 communication line. The interconnection throughout the Division provides access to networks including **INTERNET, DDN, NAVSUP Network, DLA Network, and TECNET**.

Other dedicated lines allow access to services and networks including **NAVNET, DDN, Internet, ICPNET, Splicenet, Defense Civilian Personnel Data System (DCPDS) and Defense Civilian Payroll System (DCPS)**. Additionally, the **access to the Streamlined Automated Logistics Transmission System (SALTS), provides an electronic link to the fleet and most Naval installations.**

Located at both Crane and Louisville sites are **video teleconferencing facilities**. Both facilities are capable of point to point conferences with other sites connected to the Defense Commercial Telecommunications Network (DCTN) or the Sprint commercial network.

Centralized computing provides the Division with central control of requisition processing, time and labor charges and certifications, Project Management, travel order processing, visitor authorization and personnel actions.

File sharing, printing, electronic mail and scheduling capabilities, including connectivity to Internet mail services, are provided by several microcomputer based file servers and minicomputer hosts. Additionally, information on personnel regulations, hazardous materials, and material specifications and suppliers is provided by a **CD-ROM server**. An **electronic bulletin board system** is being established to provide information on various close-in weapons systems. This system will be connected to the LAN, the Defense Data Network (DDN), and to bulletin board networks at other DOD activities through a **satellite link**.

LOGISTICS AND HIGH LEVEL ENGINEERING FUNCTIONS

ELECTRONIC MODULE TEST AND REPAIR

Computational facilities for Electronic Module Test and Repair include the following:

1. Crane Division has developed **three-dimensional engineering models for mechanical and electrical product design, production of phototools for printed circuit card manufacture, and production of master engineering drawings.** The master drawings are used in support of refurbishment, procurement and manufacture of ordnance parts.

2. The internally developed **Model Depot Facility** is in the final phases of construction and will be complete in July 1994. **This 70,500 square foot state-of-the-art Paperless Automated Depot was designed for screening, evaluation, and repair of both military and commercial electronic modules and related hardware.**

Repair technicians are connected via a **fiber optic network** to a central computer system which will provide automated repairables induction, traveler, financial data, parts retrieval, drawings, procedures, and inventory status information. The Model Depot will incorporate an Automated Storage and Retrieval System (ASRS) for repairables, repair parts, and materials. Automatic Guided Vehicles will transport materials from the ASRS to repair technicians.

Because this facility will also be interconnected Division Office Mail system, managers located in the Model Depot will have virtually instantaneous electronic communication with local and external customers worldwide via Internet and the Defense Data Network.

MICROELECTRONICS TECHNOLOGY

The Microelectronics Capability has the following computational facilities:

1. **Minicomputer based printed circuit board development system** with schematic capture and printed circuit board layout, and automatic computer testing facilities such as digital printed circuit board testers and a hybrid circuit board tester. Complex microprocessors and associated interfacing circuitry can be emulated with digital and analog simulators in conjunction with a hardware modeler. Additional testing capabilities are provided by using work stations to control test instruments.

2. Materials, Construction and Failure Analysis Facility and the Semiconductor Radiation Effects Facility are linked by a distributed computing network utilizing a **VAX file server**. The network's primary purpose is to record and analyze technical data generated by the two facilities.

3. The Open Systems Engineering Facility maintains a completely instrumented **fiber optic network** for evaluating networking hardware and software. The network implements the industry standard Fiber Distributed Data Interconnect (FDDI) networking protocol. The network provides diagnostics and analysis of FDDI performance as a function of network traffic and loading.

4. The Electronic Design Concepts and Simulation Facility maintains a sophisticated **network of distributed workstations** to support design and simulation of electronic functions. Functions performed using the network include design conversion, design verification, design documentation, and circuit and system-wide simulation.

MANAGEMENT AND DISTRIBUTION OF NAVAL DRAWINGS
Computational facilities used for the Management and Distribution of Naval Drawings include the following:

1. The **Navy Engineering Drawing Asset Locator System (NEDALS)**, is a computer-based index of engineering data providing locator and ordering capabilities for engineering drawings of Navy weapon systems. This service provides data and updates to the Military Engineering Drawing Asset Locator System (MEDALS).

2. The **Joint Engineering Data Management Information and Control System (JEDMICS)** is a digital imaging system for the acquisition, storage, management, and distribution of engineering technical data and other published material related to the operation and maintenance of ships, aircraft, and weapons systems. JEDMICS is hosted on a distributed computer system made up of an Index Data Host, multiple slave servers, workstations, and input and output devices.

MINE COUNTERMEASURES
Computational resources used for Integrated Logistics Support (ILS) include the following:

1. Authorized Instructional Materials System (AIMS) - The **AIMS** is installed on Sun-OS workstations and is used to develop training material in MIL-STD-1379 format.

2. Logistics Support Analysis (LSA) Records - The Mine Countermeasures Department complies with one of the Navy's newest initiatives, which is developing engineering and logistics data in compliance with Continuous Acquisition and Life Cycle Support (CALS).

3. TIGER 9 - The application of the TIGER 9 program is to predict the Reliability, Maintainability, and Availability (RM&A) performance of complex systems.

4. TDR/ICAPS Programs - The Mine Countermeasures Department is at the cutting edge with its implementation of the Interactive Computer-Aided Provisioning System (ICAPS) PC program in 1990.

5. Logistics Planning and Requirements Simplification System (LOGPARS) - LOGPARS is an Army developed program endorsed by the Joint Logistics Commanders for use across all DOD activities. It has been upgraded by NAVSEA to form NAVSEA LOGPARS, tailored to shipboard weapons systems.

RADAR ENGINEERING

The Radar Engineering and Industrial Support Technical Capability has the following computational facilities:

1. **Computer Aided Design (CAD)** software has been modified to analyze the monopulse, sector, planar pattern and transmissibility in the design of antennas for the customer. This unique software will display data, principal plant patterns, distribute and contour plots, and views/plots at any step or scan angle that the customer requests.

2. An **audio visual graphics workstation** is used to generate "electronic technical repair procedures". This allows video taping of any "special" process that is performed (such as laser welding, component soldering, etc.).

3. **Computer Aided Design of Monolithic Microwave Integrated Circuits has full microwave and millimeter wave design capability.**

4. **Gateways** allow personnel to communicate electronically via E-Mail, transfer files and telefax data to/from sponsors over network personal computers.

5. A **CD ROM publishing system** is utilized in writing large volumes of data on compact disks. The stored CDs consume a fraction of the space required by reel-to-reel tapes and are less sensitive to aging.

CONVENTIONAL AMMUNITION ENGINEERING

Conventional Ammunition Engineering is responsible for the following computational facility:

1. Crane Division is responsible for the design, development, testing, installation and support for the **Ordnance Management System (OMS),**
Fleet Optical Scanning Ammunition Marking System (FOSAMS) and
Standardized Conventional Ammunition Automated Inventory Record (SCAAIR) system.

The OMS is installed at 10 Navy activities, FOSAMS at 140 Fleet and other major claimant afloat and ashore sites worldwide, and SCAAIR at over 900 Fleet and other major claimant afloat and ashore sites worldwide.

NEW INITIATIVES

The following are examples of several new initiatives in the area of computational facilities in process at Crane Division:

1. Flexible Computer Integrated Manufacturing (FCIM). The Division is the primary Navy and Joint/DOD testbed for developing, verifying, and applying new and emerging technology and processes to all phases of FCIM. This Division is leading DOD in becoming the first fully automated, full spectrum Product Engineering Facility. FCIM is a major DOD initiative with the goal of reducing lead time and cost to provide spare parts and repairables to operating forces by fully automating and standardizing (internationally) as many processes as possible within the lead time cycle. As a recognized leader in FCIM, Crane Division is one of seven original FCIM sites designated by DOD, and one of two designated for mechanical parts.

2. A **real-time shop floor control system** is being tested prior to deployment DOD wide. FCIM is supported via the Crane Division LAN, connecting such services as **Computer-Aided Tool Design (CATD), Computer Aided Manufacturing (CAM), Computer Aided Process Planning (CAPP), Rapid Acquisition of Manufactured Parts (RAMP), and the Parts Digitization System (PARDS).**

3. Electronic Data Interchange (EDI). EDI is used for the acquisition of manufactured mechanical and electrical parts. EDI is a DOD initiative intended to alleviate extensive administrative lead times in the acquisition process. EDI uses a standard format to transmit Requests for Quotes, Response to Quote, transmittal of technical documentation, funding documents, and shipping information.

10. **Mobilization Responsibility and Capability.**

a. Describe any mobilization responsibility officially assigned to this site. Cite the document assigning the responsibility. **Naval Sea Systems Command Logistics Support Mobilization Plan (NAVSEA LSMP) OPR 0341B of 8 Nov 91.**

(1) What functional support area(s) does this responsibility support? Refer to Appendix A for the list of functional support areas? **All applicable to Naval Sea Systems Command**

(2) What portion of the work years and dollars, as reported in each applicable functional support area reported in Tab A, are spent solely on maintaining your activity's readiness to execute the mobilization responsibilities? **None**

(3) How many additional personnel (military & civilian) would be assigned to your activity as part of the mobilization responsibility? Include separately any contractor assets that would be added. **198 military and 594 civilians**

b. Does your activity have adequate facilities to support your mobilization responsibilities? (yes/no) **Yes, with exception of onsite berthing. Quarters would be obtained in the local communities.**

(1) If yes, is any space assigned for the sole purpose of maintaining mobilization readiness? (yes/no) If yes, list the square footage assigned. **No.**

(2) If no, what repairs, renovations and/or additions are required to provide adequate facilities? What is the estimated cost of this work? **None**

(3) Are there any restrictions that would prevent work (noted in paragraph 10.b.(2) above) from taking place (i.e., AICUZ, environmental constraints, HERO, etc.)? If yes, describe. **None**

c. Describe any production facilities that would be activated in case of a future contingency.

As reported in BRAC95 data call #1, our mission is to provide **responsive engineering and industrial base support for weapons systems, subsystems and components**. In terms of skilled people, facilities, product knowledge, and the ability to integrate engineering with "hands on" industrial processes, Crane provides the **broadest, deepest and most advanced industrial base capability that the Navy has**. All the resources are in place that would be necessary to produce virtually any product in any required form or volume. This capability is not duplicated elsewhere.

Hundreds of examples of the use of the Crane production facilities can be cited. A few are:

CASE TITLE: Night Vision/Electro-optic to Support Desert Storm

During Desert Shield/Desert Storm, and more recently during Operation Restore Hope, **NSWC Crane provided surge capability to rapidly field, install and maintain various NV/EO and Chemical Warfare Detection equipment.** Additionally, direct support in theater was provided to the Navy and Marine Corps to maintain the operational readiness of many critical equipments. **To this day, NSWC Crane maintains a presence in the Persian Gulf**, providing field services to install, remove, troubleshoot and maintain the Navy Mast Mounted Sight, a multi-sensor system with thermal imager and low-light level TV sensor for navigation, surveillance, and detection of surface mines, **24 hours a day in all weather conditions.**

CASE TITLE: Modification of An/ALQ-99 Band 2 Transmitters to Support Desert Storm

Modifications to the ALQ-99 were required to support unique requirements of the Desert Storm theater. **The work needed to be completed in one month or less.** Crane modified 20 Band 2 transmitters within the one month period. In addition, Crane worked with an equipment contractor to integrate an ALT-40 transmitter into an ALQ-99 pod to cover a hostile Band 3 threat. **The jamming performance of the EA-6B during Desert Storm was instrumental in preventing casualties during the extensive bombing runs.**

CASE TITLE: OK-542/BQ Thinline Handling Equipment

The OK-542/BQ is a electro-mechanical system used to deploy and retrieve Sonar towed arrays for the Trident submarines. The contractor for this system defaulted on the production contract, and the program manager was left with deployment schedule not achievable if a second contract needed to be negotiated. **NSWC/CD in essence took over the contract, the inherited assets and production schedule from the prime contractor.** The prime contractor and his subcontractors were disappointed with this solution, expecting a re-negotiation of the existing contract. NSWC/CD upgraded the technical data package (one

reason for contract problems was the continuous incorporation of major engineering changes during production) and proceeded to build the production units.

CASE TITLE: AN/WQC-2A Communication Sonar Production

The contractor responsible for producing the WQC-2A system went into bankruptcy, leaving the Navy without a source for new systems builds. To re-compete the production would have cause a deployment schedule delay. NSWC/CD was tasked to complete the production. **Because of the quick response of a organic organization capable of electronic system production, the WQC-2A deployment schedules were met despite the bankruptcy of the prime contractor.**

CASE TITLE: Turtleback Launch Pods

Cables for the Countermeasure Set used in conjunction with the Turtleback Launch Pods on the 688 Class submarines were needed very quickly to meet installation schedules. **The program office contacted Crane because of its experience in the fabrication of special cables to meet unique requirements.** Since the expertise and facilities were already in existence, Crane personnel were able to begin work within a few days. **Crane was able to help the program office meet its installation schedules for the Pod at an attractive cost.**

d. Is your activity used as a Reserve Unit mobilization and/or training site? **Yes**

11. **Range Resources.** Include a copy of the form provided at Tab C of this data call for each range located at this activity or operated by this activity. Also, report ranges at detachments and sites not receiving a separate data call. The following definition of a range will apply:

Range - An instrumented or non-instrumented area that utilizes air, land, and/or water space to support test and evaluation, measurements, training and data collection functions, but is not enclosed within a building.

QUALITY OF LIFE

12. **Military Housing**

(a) Family Housing:

(1) Do you have mandatory assignment to on-base housing? (circle) yes **no**

(2) For military family housing in your locale provide the following information:

Type of Quarters	Number of Bedrooms	Total number of units	Number Adequate	Number Substandard	Number Inadequate
Officer	4+	8	8	0	0
Officer	3	5	5	0	0
Officer	1 or 2	0	0	0	0
Enlisted	4+	2	2	0	0
Enlisted	3	11	11	0	0
Enlisted	1 or 2	5	5	0	0
Mobile Homes		0	0	0	0
Mobile Home lots		0	0	0	0

(3) In accordance with NAVFACINST 11010.44E, an inadequate facility cannot be made adequate for its present use through "economically justifiable means". For all the categories above where inadequate facilities are identified provide the following information:

Facility type/code:
What makes it inadequate?
What use is being made of the facility?
What is the cost to upgrade the facility to substandard?
What other use could be made of the facility and at what cost?
Current improvement plans and programmed funding:
Has this facility condition resulted in C3 or C4 designation on your BASEREP?

(4) Complete the following table for the military housing waiting list.

Pay Grade	Number of Bedrooms	Number on List[1]	Average Wait
O-6/7/8/9	1	0	
	2	0	
	3	0	
	4+	0	
O-4/5	1	0	
	2	0	
	3	0	
	4+	1	8 months
O-1/2/3/CWO	1	0	
	2	0	
	3	1	8 months
	4+	0	
E7-E9	1	0	
	2	0	
	3	2	14 months
	4+	1	12 months
E1-E6	1	0	
	2	10	18 months
	3	0	
	4+	0	

[1]As of 31 March 1994.

(5) What do you consider to be the top five factors driving the demand for base housing? Does it vary by grade category? If so provide details.

	Top Five Factors Driving the Demand for Base Housing
1	Availability of suitable rental housing
2	Cost of rental housing
3	Cost of utilities
4	Distance from base of available rental housing
5	Amount of BAQ/HA

(6) What percent of your family housing units have all the amenities required by "The Facility Planning & Design Guide" (Military Handbook 1190 & Military Handbook 1035 Family Housing)? None

(7) Provide the utilization rate for family housing for FY 1993.

Type of Quarters	Utilization Rate
Adequate	97%
Substandard	0%
Inadequate	0%

(8) As of 31 March 1994, have you experienced much of a change since FY 1993? If so, why? If occupancy is under 98% (or vacancy over 2%), is there a reason?
Vacancy rate more than 2% because of the transition time between incoming and outgoing occupants and to allow time for minor maintenance and repair projects.

(b) BEQ:

(1) Provide the utilization rate for BEQs for FY 1993.

NOTE: Permanent Party Utilization 100%
Transient Utilization 78%

Type of Quarters	Utilization Rate
Adequate	89.13%
Substandard	0%
Inadequate	0%

(2) As of 31 March 1994, have you experienced much of a change since FY 1993? If so, why? If occupancy is under 95% (or vacancy over 5%), is there a reason?

Utilization vacancy due to influx of reserve detachments.

(3) Calculate the Average on Board (AOB) for geographic bachelors as follows: Zero

$$\textbf{AOB} = \frac{\textbf{(\# Geographic Bachelors x average number of days in barracks)}}{\textbf{365}}$$

(4) Indicate in the following chart the percentage of geographic bachelors (GB) by category of reasons for family separation. Provide comments as necessary.

Reason for Separation from Family	Number of GB	Percent of GB	Comments
Family Commitments (children in school, financial, etc.)	0	0	N/A
Spouse Employment (non-military)	0	0	N/A
Other	0	0	N/A
TOTAL	0	100	

(5) How many geographic bachelors do not live on base? Zero

(c) BOQ:

(1) Provide the utilization rate for BOQs for FY 1993.

Type of Quarters	Utilization Rate
Adequate	85%
Substandard	0%
Inadequate	0%

(2) As of 31 March 1994, have you experienced much of a change since FY 1993? If so, why? If occupancy is under 95% (or vacancy over 5%), is there a reason?

Utilization of BOQ rooms low due to transient personnel reporting in large numbers, forcing many out of town with non-availability numbers.

(3) Calculate the Average on Board (AOB) for geographic bachelors as follows: Zero

$$\textbf{AOB} = \frac{\textbf{(\# Geographic Bachelors x average number of days in barracks)}}{\textbf{365}}$$

(4) Indicate in the following chart the percentage of geographic bachelors (GB) by category of reasons for family separation. Provide comments as necessary.

Reason for Separation from Family	Number of GB	Percent of GB	Comments
Family Commitments (children in school, financial, etc.)	0	0	N/A
Spouse Employment (non-military)	0	0	N/A
Other	0	0	N/A
TOTAL	0	100	

(5) How many geographic bachelors do not live on base? Zero

(d) BOQ/BEQ Housing and Messing.

(1) Provide data on the BOQs and BEQs assigned to your current plant account. The desired unit of measure for this capacity is people housed. Use CCN to differentiate between pay grades, i.e., E1-E4, E5-E6, E7-E9, CWO-O2, O3 and above.

Facility Type, Bldg. # & CCN	Total No. of Beds	Total No. of Rooms	Adequate		Substandard		Inadequate	
			Beds	Sq Ft	Beds	Sq Ft	Beds	Sq Ft
2682/721-12	26	19	26	8051	0	0	0	0
Qtrs ZZ/724-12	1	2	1	378	0	0	0	0
12/724-11	2	3	2	905	0	0	0	0
2681/724-11	15	15	15	6767	0	0	0	0
2682/721-13	5	5	5	697	0	0	0	0
2681/724-12	3	9	3	0	0	0	0	0

(2) In accordance with NAVFACINST 11010.44E, an inadequate facility cannot be made adequate for its present use through "economically justifiable means". For all the categories above where inadequate facilities are identified provide the following information:

a. FACILITY TYPE/CODE:
b. WHAT MAKES IT INADEQUATE?
c. WHAT USE IS BEING MADE OF THE FACILITY?
d. WHAT IS THE COST TO UPGRADE THE FACILITY TO SUBSTANDARD?
e. WHAT OTHER USE COULD BE MADE OF THE FACILITY AND AT WHAT COST?
f. CURRENT IMPROVEMENT PLANS AND PROGRAMMED FUNDING:
g. HAS THIS FACILITY CONDITION RESULTED IN C3 OR C4 DESIGNATION ON YOUR BASEREP?

(3) Provide data on the BOQs and BEQs projected to be assigned to your plant account in FY 1997. The desired unit of measure for this capacity is people housed. Use CCN to differentiate between pay grades, i.e., E1-E4, E5-E6, E7-E9, CWO-O2, O3 and above.

Facility Type, Bldg. # & CCN	Total No. of Beds	Total No. of Rooms	Adequate		Substandard		Inadequate	
			Beds	Sq Ft	Beds	Sq Ft	Beds	Sq Ft
2682/721-12	26	19	26	8051	0	0	0	0
Qtrs ZZ/724-12	1	2	1	378	0	0	0	0
12/724-11	2	3	2	905	0	0	0	0
2681/724-11	15	15	15	6767	0	0	0	0
2682/721-13	5	5	5	697	0	0	0	0
2681/724-12	3	9	3	0	0	0	0	0

(4) In accordance with NAVFACINST 11010.44E, an inadequate facility cannot be made adequate for its present use through "economically justifiable means". For all the categories above where inadequate facilities are identified provide the following information:

a. FACILITY TYPE/CODE:
b. WHAT MAKES IT INADEQUATE?
c. WHAT USE IS BEING MADE OF THE FACILITY?
d. WHAT IS THE COST TO UPGRADE THE FACILITY TO SUBSTANDARD?
e. WHAT OTHER USE COULD BE MADE OF THE FACILITY AND AT WHAT COST?
f. CURRENT IMPROVEMENT PLANS AND PROGRAMMED FUNDING:
g. HAS THIS FACILITY CONDITION RESULTED IN C3 OR C4 DESIGNATION ON YOUR BASEREP?

(5) Provide data on the messing facilities assigned to your current plant account.

Facility Type, CCN and Bldg. #	Total Sq. Ft.	Adequate		Substandard		Inadequate		Avg # Noon Meals Served
		Seats	Sq Ft	Seats	Sq Ft	Seats	Sq Ft	
*1909/740-67	8139	210	8139	0	0	0	0	100

*Consolidated Mess

(6) In accordance with NAVFACINST 11010.44E, an inadequate facility cannot be made adequate for its present use through "economically justifiable means". For all the categories above where inadequate facilities are identified provide the following information:

a. FACILITY TYPE/CODE:
b. WHAT MAKES IT INADEQUATE?
c. WHAT USE IS BEING MADE OF THE FACILITY?
d. WHAT IS THE COST TO UPGRADE THE FACILITY TO SUBSTANDARD?
e. WHAT OTHER USE COULD BE MADE OF THE FACILITY AND AT WHAT COST?
f. CURRENT IMPROVEMENT PLANS AND PROGRAMMED FUNDING:
g. HAS THIS FACILITY CONDITION RESULTED IN C3 OR C4 DESIGNATION ON YOUR BASEREP?

(7) Provide data on the messing facilities projected to be assigned to your plant account in FY 1997.

Facility Type, CCN and Bldg. #	Total Sq. Ft.	Adequate		Substandard		Inadequate		Avg # Noon Meals Served
		Seats	Sq Ft	Seats	Sq Ft	Seats	Sq Ft	
*1909/740-67	8139	210	8139	0	0	0	0	100

*Consolidated Mess

(8) In accordance with NAVFACINST 11010.44E, an inadequate facility cannot be made adequate for its present use through "economically justifiable means". For all the categories above where inadequate facilities are identified provide the following information:

a. FACILITY TYPE/CODE:
b. WHAT MAKES IT INADEQUATE?
c. WHAT USE IS BEING MADE OF THE FACILITY?
d. WHAT IS THE COST TO UPGRADE THE FACILITY TO SUBSTANDARD?
e. WHAT OTHER USE COULD BE MADE OF THE FACILITY AND AT WHAT COST?
f. CURRENT IMPROVEMENT PLANS AND PROGRAMMED FUNDING:
g. HAS THIS FACILITY CONDITION RESULTED IN C3 OR C4 DESIGNATION ON YOUR BASEREP?

13. **MWR Facilities.** For on-base MWR facilities[10] available, complete the following table for each separate location. For off-base government owned or leased recreation facilities indicate distance from base. If there are any facilities not listed, include them at the bottom of the table.

LOCATION NSWC Crane Division, Crane, IN **DISTANCE 0**

Facility	Unit of Measure	Total	Profitable (Y,N,N/A)
Auto Hobby	Indoor Bays	0	N/A
	Outdoor Bays	0	N/A
Arts/Crafts	SF	3020	N/A
Wood Hobby	SF	0	0
Bowling	Lanes	4	YES
Enlisted Club	SF	8139	NO
Officer's Club	SF	*	NO
Library	SF	3000	N/A
Library	Books	5000	N/A
Theater	Seats	122	NO
ITT	SF	20	YES
Museum/Memorial	SF	0	0
Pool (indoor)	Lanes	0	0
Pool (outdoor)	SF	1674	N/A
Beach	LF	0	0
Swimming Ponds	Each	0	0
Tennis CT	Each	3	N/A

*Consolidated Mess

[10]Spaces designed for a particular use. A single building might contain several facilities, each of which should be listed separately.

Facility	Unit of Measure	Total	Profitable (Y,N,N/A)
Volleyball CT (outdoor)	Each	2	YES
Basketball CT (outdoor)	Each	1	N/A
Racquetball CT	Each	1	N/A
Golf Course	Holes	9	YES
Driving Range	Tee Boxes	20	YES
Gymnasium	SF	19079	YES
Fitness Center	SF	*	YES
Marina	Berths	6	YES
Stables	Stalls	0	N/A
Softball Fld	Each	1	YES
Football Fld	Each	1	**
Soccer Fld	Each	1	**
Youth Center	SF	0	N/A
Track	Each	1	**
Sauna	Each	2	N/A
Sailing	Acres	800	N/A
Hiking/Nature Trails	Miles	10.5	N/A
Fishing/Hunting	Acres	56,290	N/A
Campground			

* Fitness Center located within gymnasium facility
** Under construction, will be completed by September 1994.

(a) Is your library part of a regional interlibrary loan program? Yes

14. **Base Family Support Facilities and Programs.**

a. Complete the following table on the availability of child care in a child care center on your base.

Age Category	Capacity (Children)	SF			Number on Wait List	Average Wait (Days)
		Adequate	Substandard	Inadequate		
0-6 Mos	N/A					
6-12 Mos						
12-24 Mos						
24-36 Mos						
3-5 Yrs						

b. In accordance with NAVFACINST 11010.44E, an inadequate facility cannot be made adequate for its present use through "economically justifiable means." For all the categories above where inadequate facilities are identified provide the following information:

a. FACILITY TYPE/CODE:
b. WHAT MAKES IT INADEQUATE?
c. WHAT USE IS BEING MADE OF THE FACILITY?
d. WHAT IS THE COST TO UPGRADE THE FACILITY TO SUBSTANDARD?
e. WHAT OTHER USE COULD BE MADE OF THE FACILITY AND AT WHAT COST?
f. CURRENT IMPROVEMENT PLANS AND PROGRAMMED FUNDING:
g. HAS THIS FACILITY CONDITION RESULTED IN C3 OR C4 DESIGNATION ON YOUR BASEREP?

c. If you have a waiting list, describe what programs or facilities other than those sponsored by your command are available to accommodate those on the list. NA

d. How many "certified home care providers" are registered at your base? None

e. Are there other military child care facilities within 30 minutes of the base? State owner and capacity (i.e., 60 children, 0-5 yrs). No

f. Complete the following table for services available on your base. If you have any services not listed, include them at the bottom.

Service	Unit of Measure	Qty
Exchange	SF	6489
Gas Station	SF	1618
Auto Repair	SF	0
Auto Parts Store	SF	0
Commissary	SF	9381
Mini-Mart	SF	0
Package Store	SF	0
Fast Food Restaurants	Each	0
Bank/Credit Union	Each	2
Family Service Center	SF	0
Laundromat	SF	0
Dry Cleaners	Each	1*
ARC	PN	0
Chapel	PN	3523
FSC Classrm/Auditorium	PN	0
Cafeteria	SF	25474

*Contract Service

15. **Proximity of Closest Major Metropolitan Areas** (provide at least three):

City	Distance (Miles)
Indianapolis, IN	80
Louisville, KY	90
Cincinnati, OH	140

16. **Standard Rate VHA Data for Cost of Living:**
Rates effective 1 January 1994

Paygrade	With Dependents	Without Dependents
E1	46.44	25.98
E2	46.44	29.20
E3	30.74	22.28
E4	41.96	29.28
E5	60.11	41.97
E6	40.43	27.52
E7	83.32	57.88
E8	90.56	68.46
E9	104.99	79.70
W1	122.15	92.77
W2	86.39	67.66
W3	93.89	76.32
W4	54.01	47.89
O1E	38.11	28.27
O2E	63.15	50.35
O3E	65.55	55.46
O1	35.86	26.42
O2	42.37	33.12
O3	56.55	47.61
O4	58.98	51.29
O5	77.96	64.47
O6	51.71	42.80
O7	0.00	0.00

17. **Off-base Housing Rental and Purchase**

(a) Fill in the following table for average rental costs in the area for the period 1 April 1993 through 31 March 1994.

Note: There is a big difference in the cost of a rental in the small surrounding communities and the larger college community. The following information is an average of the two.

Type Rental	Average Monthly Rent		Average Monthly Utilities Cost
	Annual High	Annual Low	
Efficiency	250	200	70
Apartment (1-2 Bedroom)	463	350	136
Apartment (3+ Bedroom)	675	450	120
Single Family Home (3 Bedroom)	650	388	173
Single Family Home (4+ Bedroom)	800	538	191
Town House (2 Bedroom)	775	575	135
Town House (3+ Bedroom)	700	625	145
Condominium (2 Bedroom)	775	575	135
Condominium (3+ Bedroom)	1080	650	145

(b) What was the rental occupancy rate in the community as of 31 March 1994?

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Type Rental	Percent Occupancy Rate
Efficiency	98% R
Apartment (1-2 Bedroom)	98%
Apartment (3+ Bedroom)	98%
Single Family Home (3 Bedroom)	98%
Single Family Home (4+ Bedroom)	98%
Town House (2 Bedroom)	98%
Town House (3+ Bedroom)	98%
Condominium (2 Bedroom)	98%
Condominium (3+ Bedroom)	98%

R

(c) What are the median costs for homes in the area?

Note: There is a big difference in the cost of a rental in the small surrounding communities and the larger college community. The following information is an average of the two.

Type of Home	Median Cost
Single Family Home (3 Bedroom)	65,698
Single Family Home (4+ Bedroom)	102,905
Town House (2 Bedroom)	72,000
Town House (3+ Bedroom)	86,000
Condominium (2 Bedroom)	72,000
Condominium (3+ Bedroom)	95,000

(d) For calendar year 1993, from the local MLS listings provide the number of 2, 3, and 4 bedroom homes

(b) What was the rental occupancy rate in the community as of 31 March 1994?

Type Rental	Percent Occupancy Rate
Efficiency	
Apartment (1-2 Bedroom)	98%
Apartment (3+ Bedroom)	98%
Single Family Home (3 Bedroom)	98%
Single Family Home (4+ Bedroom)	98%
Town House (2 Bedroom)	98%
Town House (3+ Bedroom)	98%
Condominium (2 Bedroom)	98%
Condominium (3+ Bedroom)	98%

(c) What are the median costs for homes in the area?

Note: There is a big difference in the cost of a rental in the small surrounding communities and the larger college community. The following information is an average of the two.

Type of Home	Median Cost
Single Family Home (3 Bedroom)	65,698
Single Family Home (4+ Bedroom)	102,905
Town House (2 Bedroom)	72,000
Town House (3+ Bedroom)	86,000
Condominium (2 Bedroom)	72,000
Condominium (3+ Bedroom)	95,000

(d) For calendar year 1993, from the local MLS listings provide the number of 2, 3, and 4 bedroom homes available for purchase. Use only homes for which monthly payments would be within 90 to 110 percent of the E5 BAQ and VHA for your area.

NOTE: In checking with local realtors and using the MLS, information requested for this item does not change significantly in this area. There is a very slight increase in the availability of homes for sale in the spring/summer months.

Information is based on BAQ + VHA for this area ($428 - $523), 8% interest for 30 year loan ($55,000 to $70,000). Loan did not include taxes or insurance.

Month	Number of Bedrooms		
	2	3	4+
January	4	29	1
February	4	29	1
March	4	29	1
April	4	29	1
May	4	29	1
June	4	29	1
July	4	29	1
August	4	29	1
September	4	29	1
October	4	29	1
November	4	29	1
December	4	29	1

(e) Describe the principle housing cost drivers in your local area.

Within the commute area there are affordable homes for sale. However, the majority of assigned military personnel do not purchase homes due to the perceived difficulty of selling the property at the end of their tour.

There is very limited rental housing in the surrounding communities. The largest town located within a one-hour commuting distance is Bloomington, Indiana, home of Indiana University. Our military personnel must compete with approximately 36,000 students for what housing is available. The majority of assigned military seeking rental housing are in the E-4 to E-6 ranks. Average costs for rental housing in Bloomington exceeds BAQ, VHA and out of pocket amounts for these families.

Because of the recent increase in military assigned to the Crane Division, we are actively pursuing MILCON for additional family housing units. We have contracted with an architectural and engineering firm to do a market analysis to assess the actual need for additional housing.

18. **For the top five sea intensive ratings in the principle warfare community your base supports, provide the following:**

Rating	Number Sea Billets in the Local Area	Number of Shore billets in the Local Area
GMG	0	4
EW	0	2
STG	0	1
MS	0	4
AW	0	2

19. **Complete the following table for the average one-way commute for the five largest concentrations of military and civilian personnel living off-base.**

Location	% Employees	Distance (mi)	Time(min)
Bloomfield, Greene County	14	15	17
Lawrence County	12	25	27
Monroe County	7	30	33
Martin County	9	20	22
Daviess County	8	35	38

20. **Complete the tables below to indicate the civilian educational opportunities available to service members stationed at the installation (to include any outlying sites) and their dependents:**

(a) List the local educational institutions which offer programs available to dependent children. Indicate the school type (e.g. DODDS, private, public, parochial, etc.), grade level (e.g. pre-school, primary, secondary, etc.), what students with special needs the institution is equipped to handle, cost of enrollment, and for high schools only, the average SAT score of the class that graduated in 1993, and the number of students in that class who enrolled in college in the fall of 1994.

MONROE COUNTY *math/verbal

Institution	Type	Grade Level(s)	Special Education Available	Annual Enrollment Cost per Student	1993 Avg SAT/ ACT Score	% HS Grad to Higher Educ	Source of Info
Bloomington North	HS	9-12	yes	0.0	*491/433	72%	MCSC
Bloomington South	HS	9-12	yes	0.0	*514/458	72%	MCSC
Bloomington	Middle	7-8	yes	0.0	N/A	N/A	MCSC
Bloomington	Elem	1-6	yes	0.0	N/A	N/A	MCSC

MARTIN COUNTY

Institution	Type	Grade Level(s)	Special Education Available	Annual Enrollment Cost per Student	1993 Avg SAT/ ACT Score	% HS Grad to Higher Educ	Source of Info
Loogootee High School	Public	7-12	yes	$60.00 R	894	68%	Principal's office
Loogootee West	Public	K-3	yes	$60.00	N/A	N/A	Principal's office
Loogootee East	Public	4-6	yes	$60.00	N/A	N/A	Principal's office

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page 70R of 92
UIC 00164
9/12/94

20. **Complete the tables below to indicate the civilian educational opportunities available to service members stationed at the installation (to include any outlying sites) and their dependents:**

(a) List the local educational institutions which offer programs available to dependent children. Indicate the school type (e.g. DODDS, private, public, parochial, etc.), grade level (e.g. pre-school, primary, secondary, etc.), what students with special needs the institution is equipped to handle, cost of enrollment, and for high schools only, the average SAT score of the class that graduated in 1993, and the number of students in that class who enrolled in college in the fall of 1994.

MONROE COUNTY *math/verbal

Institution	Type	Grade Level(s)	Special Education Available	Annual Enrollment Cost per Student	1993 Avg SAT/ ACT Score	% HS Grad to Higher Educ	Source of Info
Bloomington North	HS	9-12	yes	0.0	*491/433	72%	MCSC
Bloomington South	HS	9-12	yes	0.0	*514/458	72%	MCSC
Bloomington	Middle	7-8	yes	0.0	N/A	N/A	MCSC
Bloomington	Elem	1-6	yes	0.0	N/A	N/A	MCSC

MARTIN COUNTY

Institution	Type	Grade Level(s)	Special Education Available	Annual Enrollment Cost per Student	1993 Avg SAT/ ACT Score	% HS Grad to Higher Educ	Source of Info
Loogootee High School	Public	7-12	yes		894	68%	Principal's office
Loogootee West	Public	K-3	yes	$60.00	N/A	N/A	Principal's office
Loogootee East	Public	4-6	yes	$60.00	N/A	N/A	Principal's office

GREENE COUNTY *math/verbal

Institution	Type	Grade Level(s)	Special Education Available	Annual Enrollment Cost per Student	1993 Avg SAT/ACT Score	% HS Grad to Higher Educ	Source of Info
Bloomfield High School	Public	9-12	yes	0.0	*461/406	80%	Supt.'s office
Bloomfield Jr. High	Public	7-8	yes	0.0	N/A	N/A	Supt.'s office
Bloomfield Elem.	Public	1-6	yes	0.0	N/A	N/A	Supt.'s office

LAWRENCE COUNTY *math/verbal

Institution	Type	Grade Level(s)	Special Education Available	Annual Enrollment Cost per Student	1993 Avg SAT/ACT Score	% HS Grad to Higher Educ	Source of Info
Bedford North Lawrence (BNL)High School	Public	9-12	yes	0.0	*482/415	45%	Supt.'s office
Bedford BNL Jr. High School	Public	7-8	yes	0.0	N/A	N/A	Supt.'s office
Bedford BNL Elem	Public	K-6	yes	0.0	N/A	N/A	Supt.'s office

(b) List the educational institutions within 30 miles which offer programs off-base available to service members and their adult dependents. Indicate the extent of their programs by placing a "Yes" or "No" in all boxes as applies.

Institution	Type Classes	Program Type(s)				
		Adult High School	Vocational/ Technical	Undergraduate		Graduate
				Courses only	Degree Program	
Indiana Univ. Bloomington, IN	Day	No	No	No	Yes	Yes
	Night	No	No	No	Yes	Yes
Ivy Tech. Bloomington, IN	Day	No	Yes	No	No	No
	Night	No	Yes	No	No	No
Bedford College Center Bedford, IN	Day	No	No	No	No	No
	Night	No	No	No	Yes	No
Several local high schools	Day	No	No	No	No	No
	Night	Yes	No	No	No	No

(c) List the educational institutions which offer programs on-base available to service members and their adult dependents. Indicate the extent of their programs by placing a "Yes" or "No" in all boxes as applies.

Institution	Type Classes	Program Type(s)				
		Adult High School	Vocational/ Technical	Undergraduate		Graduate
				Courses only	Degree Program	
Indiana State University	Day	No	No	No	Yes	No
	Night	No	No	No	No	No
	Corres-pondence	No	No	No	No	No
Ball State University	Day	No	No	No	Yes	Yes
	Night	No	No	No	No	No
	Corres-pondence	No	No	No	No	No
Rose Hulman Institue of Technology	Day	No	No	No	Yes	Yes
	Night	No	No	No	No	No
	Corres-pondence	No	No	No	No	No
National Technological University	Day	No	No	No	Yes	No
	Night	No	No	No	No	No
	Corres-pondence	No	No	No	No	No
Purdue University	Day	No	No	No	Yes	No
	Night	No	No	No	No	No
	Corres-pondence	No	No	No	No	No
Mind Extension University (George Washington University)	Day	No	No	No	Yes	Yes
	Night	No	No	No	No	No
	Corres-pondence	No	No	No	No	No

21. **Spousal Employment Opportunities.**

Provide the following data on spousal employment opportunities.

Skill Level	Number of Military Spouses Serviced by Family Service Center Spouse Employment Assistance			Local Community Unemployment Rate
	1991	1992	1993	
Professional	NA			
Manufacturing				
Clerical				
Service				
Other				4.1%*

*Obtained for Bloomington, IN area as of March 1994. Breakdown by skill level not reported.

22. **Medical/Dental.**

a. Do your active duty personnel have any difficulty with access to medical or dental care, in either the military or civilian health care system? Develop the why of your response.

Routine medical care for active duty members is provided on-center at a clinic which provides service to civilian employees and military dependents as well. A Military Medical Officer (GMO) and civilian physician are on staff. Care is available only during regular working hours (weekdays). After hours care, if emergency, is available at local civilian facilities, most frequently in Bloomington, 30 miles, and Bedford, 22 miles away.

Active duty personnel are currently referred to military medical facilities for specialty care. These facilities are located at Ireland Army Medical Center at Fort Knox, Kentucky, which is 120 miles away; Wright Patterson Air Force Base in Dayton, Ohio, which is 200 miles away; and Great Lakes Naval Hospital near chicago, which is 5 hours away. Emergency care is readily available at local civilian hospitals, most frequently in Bloomington, 30 miles and Bedford, 22 miles away.

The distance and driving time involved for any medical appointments at military medical facilities require the active duty member to be gone from duty for at least one full day. Prior approval from the Office of Medical Affairs at Great Lakes Naval Hospital for non-emergent civilian medical care is rarely granted. This often presents a hardship for the active duty member.

Dental care is not provided on-center. Routine dental care is available through civilian dentists, which are readily accessible. Any extensive dental care requires prior approval from Great Lakes naval Hospital, often necessitating referral to the military treatment facilities mentioned above.

b. Do your military dependents have any difficulty with access to medical or dental care, in either the military or civilian health care system? Develop the why of your response.

Medical care for dependents is available on a limited basis on-center. Due to the large volume of civilian employee and active duty patients, appointments are often not available for all dependents requesting them. Dependent care at the nearest military treatment facilities is on a space-available basis only. This necessitates frequent use of CHAMPUS services. For military members with large families or dependents with chronic or severe medical problems, this is often a significant hardship, especially for junior enlisted personnel. Many civilian medical providers do not participate in CHAMPUS, resulting in higher costs for the member.

Dental care for dependents is readily available for numerous civilian providers through DDP-Delta.

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NAVAL SURFACE WARFARE CENTER
CRANE DIVISION
CRANE SITE

RESPONSE TO CLARIFICATION QUESTION for Data Call #5, Question #23

Crime Rates for Martin County, Indiana, as per the following guidance:

- rate per 100,000 population
- rates obtained from county of appropriate law enforcement office (Martin County Sheriff's Office)

****

Violent Crime Rate	180 (per 100,000)
Property Crime Rate	290 (per 100,000)
Drug Crime Rate	270 (per 100,000)

* rates are for the calendar year 1993

* The above crime rates were scaled up by a factor of ten since the Martin County population is approximately: 10,900

Source:

Officer Rob Street, Martin County Sheriff's Office

23 **Crime Rate**. Complete the table below to indicate the crime rate for your air station for the last three fiscal years. The source for case category definitions to be used in responding to this question are found in NCIS - Manual dated 23 February 1989, at Appendix A, entitled "Case Category Definitions." Note: the crimes reported in this table should include 1) all reported criminal activity which occurred on base regardless of whether the subject or the victim of that activity was assigned to or worked at the base; and 2) all reported criminal activity off base.

Crime Definitions	FY 1991	FY 1992	FY 1993
1. Arson (6A)			
Base Personnel - military	0	0	0
Base Personnel - civilian	1	0	1
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
2. Blackmarket (6C)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
3. Counterfeiting (6G)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
4. Postal (6L)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0

Crime Definitions	FY 1991	FY 1992	FY 1993
5. Customs (6M)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
6. Burglary (6N)			
Base Personnel - military	0	0	0
Base Personnel - civilian	1	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
7. Larceny - Ordnance (6R)			
Base Personnel - military	0	0	0
Base Personnel - civilian	1	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	2	0	0
8. Larceny - Government (6S)			
Base Personnel - military	0	0	0
Base Personnel - civilian	4	1	7
Off Base Personnel - military	1	0	0
Off Base Personnel - civilian	3	1	1

Crime Definitions	FY 1991	FY 1992	FY 1993
9. Larceny - Personal (6T)			
Base Personnel - military	0	0	0
Base Personnel - civilian	1	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
10. Wrongful Destruction (6U)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	2	1	0
11. Larceny - Vehicle (6V)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	1
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
12. Bomb Threat (7B)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0

Crime Definitions	FY 1991	FY 1992	FY 1993
13. Extortion (7E)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
14. Assault (7G)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	1
Off Base Personnel - military	1	0	1
Off Base Personnel - civilian	0	0	0
15. Death (7H)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	1	1	1
16. Kidnapping (7K)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0

Crime Definitions	FY 1991	FY 1992	FY 1993
18. Narcotics (7N)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	1	3
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
19. Perjury (7P)			
Base Personnel - military	0	0	0
Base Personnel - civilian	1	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
20. Robbery (7R)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
21. Traffic Accident (7T)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0

Crime Definitions	FY 1991	FY 1992	FY 1993
22. Sex Abuse - Child (8B)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	1	1	1
Off Base Personnel - civilian	0	0	1
23. Indecent Assault (8D)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	1	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0
24. Rape (8F)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	1	0
Off Base Personnel - civilian	0	0	1
25. Sodomy (8G)			
Base Personnel - military	0	0	0
Base Personnel - civilian	0	0	0
Off Base Personnel - military	0	0	0
Off Base Personnel - civilian	0	0	0

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	1. Platforms, 1.1 Undersea
Life Cycle Work Area	4. Engineering & Mfgring Dev

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 123

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 55

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	1. Platforms, 1.3 Surf Ship
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.7__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__88__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__46__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	1. Platform, 1.3 Surf Ship
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 17.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 853

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 840

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	1. Platforms, 1.5 Ground Vehicles
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 219

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 213

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 525.1

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	2. Exploratory Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __2.3__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__116__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__14__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 33

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0.1

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 7.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 344

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 64

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 79.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 3803

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 6888

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 9637.1

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 24.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 920

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1761

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.1__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__49____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__223___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 50.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2695

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 749

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 210.4

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 32.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1845

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1342

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 635.7

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

Revised pg

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	8. Acceptance Testing

R

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 3

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.1 Gun Systems
Life Cycle Work Area	None

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 3

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.11 Weapons Fuzing
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 5

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 4

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 609.6

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.11 Weapons Fuzing
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 165

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 144

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.11 Weapons Fuzing
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 31.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1587

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1218

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 101.2

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.11 Weapons Fuzing
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 18.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 806

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 298

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.11 Weapons Fuzing
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 14.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 897

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1142

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 30.1

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.11 Weapons Fuzing
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 184

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 736

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 106

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.12 Weapons Propulsion
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 83

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 349

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 202.3

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.12 Weapons Propulsion
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 102

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 66

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 30.1

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.12 Weapons Propulsion
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 6.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 385

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 4507

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 211.9

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	2. Exploratory Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 187

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 253

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	3.Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 10.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 653

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1599

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 18.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1065

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 788

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 61.2

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 21.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1004

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 310

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 110.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 5952

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 7104

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 3033

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 36.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2007

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 726

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 140.1

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 11.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 643

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 310

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 529.8

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

Revised pg

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	15. Program Support

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Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 49

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 8

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.13 Other Ordnance
Life Cycle Work Area	None

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 49

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 8

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.14 Explosive Ordnance Disposal
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 0

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 16

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 202.3

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.14 Explosive Ordnance Disposal
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 232

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 739

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 211.9

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.2 Guided Missiles
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 27

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 59

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.2 Guided Missiles
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 15.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 603

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 495

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.2 Guided Missiles
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 129

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 30

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.2 Guided Missiles
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __21.2__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__1132__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__941__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.3 Free Fall Weapons & Rockets
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 6

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.3 Free Fall Weapons & Rockets
Life Cycle Work Area	6. Operational Systems Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 30

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 63

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.3 Free Fall Weapons & Rockets
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 6.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 336

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 367

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 404.7

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.3 Free Fall Weapons & Rockets
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 13.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 778

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 2327

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 20.9

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.3 Free Fall Weapons & Rockets
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 8.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 632

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 302

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 423.8

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.7 Explosives
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 5

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.7 Explosives
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 8.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 419

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 153

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.7 Explosives
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 87

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 16

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 2.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 155

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 6

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 456.9

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 83

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 56

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 4

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 54

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 10.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 611

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 255

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 56.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2436

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1240

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 33

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 38

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __30.7__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__1617__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__542__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__7151.3__

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	2. Weapon Systems, 2.9 Fire Control
Life Cycle Work Area	17. Training/ Operational Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 88

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 4

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.1 Subsurface
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 20.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1264

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 241

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.1 Subsurface
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 51.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2781

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 4579

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.1 Subsurface
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 198

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 220

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.1 Subsurface
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 0

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 45

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.2 Air
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 13

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 4

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.2 Air
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 0

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 3

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.2 Air
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 7

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 194

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 139

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 8

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 70

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 0

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 48

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 59.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2991

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 6727

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 2050.3

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 6.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 265

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 63

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 48.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2678

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 2523

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.3 Surface
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 5

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	3. Combat Systems Integration 3.4 Multiplatform
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 24.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1728

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 933

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 273

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 220

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 20

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	6. Operational Systems Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __10.5__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___606___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___334___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 1.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 110

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 75

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 13.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 763

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 634

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 1039.2

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.8__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___70___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___62___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 6.4 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 238

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 162

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 22.5

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.1 Landing Force Equipment and Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 29.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1510

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1301

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 112

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 249

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1016

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 13.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 661

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 166

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 30.3

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 29

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 29.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1623

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1999

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 5241.2

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.4__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__58____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___42___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 10.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 497

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1072

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	4. Special Operations Support 4.2 Coastal/Special Warfare Support
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 234

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 93

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

RANGE RESOURCES
RANGE CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Range Nomenclature or Title	1000 Yard Outdoor Firing Range

1. List all the ranges that your activity maintains and operates. Provide the following information on each range:

a. A brief statement of what the range is used for.

Co-located with this range is a 934 acre area for testing small arms. This range is discussed in the section for Small Arms technical capability.

The range is a shared facility used for testing night vision, laser systems, small arms, or any combination of these systems. Lasers up to and including Class 4 systems are approved for use on the range.

b. Geographic location of the range.

Crane Site, Crane Division, Naval Surface Warfare Center, Martin County, Indiana.

c. Distance from the range to the activity's headquarters facility (main site).

The Outdoor Firing Range is located approximately 6 miles from Building 1 (Crane Division Headquarters) and approximately 1 mile from Building 2521. (Code 8052, Laser Electro-Optics Branch).

d. Range size in square miles.

The Outdoor Firing Range is 0.022 square miles (14 acres) in area.

e. Scheduling authority.

The scheduling authority is Crane Site Director, Gun Weapon Systems Directorate, Crane Division.

f. Air space available/restrictions.

There are no general air space restrictions. However, lasers with larger hazard distances and weapons are not to be aimed into air space outside of the range boundary.

g. Maximum water depth available/restrictions.

Not applicable.

h. Instrumentation capability.

The Outdoor Firing Range has a full range of ballistic instrumentation for measuring pressure, velocity, accuracy, recoil, and for tracking projectiles in flight. Video capability is available for multiple locations within the range.

i. Accuracy of tracking.

Not Applicable.

j. Data collection/replay capability.

Most engineering data is digitized and recorded for subsequent analysis and reporting.

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or administrative activities (i.e., Holiday shutdowns).

Approximately 2000 hours.

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

1900 hours for weapons evaluations. 100 hours for Night Vision and Electro-Optics support.

m. What were the actual hours that this range was utilized in FY1993?

Approximately 2000 hours.

n. Who are the customers of the range?

NAVSEA	NAVAIR
USSOCOM	Army
USMC	Misc

o. Of the actual hours utilized what percentage of utilization time was provided to which customers?

NAVSEA - 66%	NAVAIR - 3%
USSOCOM - 14%	Army - 5%
USMC - 10%	Misc - 2%

p. Provide a sketch, drawing or map of the range.

See Attachment.

2. Are any of your ranges part of the DoD Major Range and Test Facility Base (MRTFB)? (yes/no) If yes, which ones?

No

3. Are there any limiting (current or future) environmental and/or encroachment characteristics that are associated with this range.

None

RANGE RESOURCES
RANGE CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Range Nomenclature or Title	Targeting & Calibration Range MK 86 Camera

1. List all the ranges that your activity maintains and operates. Provide the following information on each range:

a. A brief statement of what the range is used for.

Targeting and calibrating MK86 Gun Fire Control System camera.

b. Geographic location of the range.

NSWC Crane Division, Crane, IN
Between Bldg. 41 and Water Tower #5 (1 mile)

c. Distance from the range to the activity's headquarters facility (main site).

0.5 mile

d. Range size in square miles.

0.1 square miles.

e. Scheduling authority.

Code 706 at Crane

f. Air space available/restrictions.

Need 1 mile long unobstructed view.

g. Maximum water depth available/restrictions.

N.A.

h. Instrumentation capability.

Visual accuracy and angular displacement.

i. Accuracy of tracking.

N.A.

j. Data collection/replay capability.

Manual visual perception.

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or administrative activities (i.e., Holiday shutdowns).

5000 hours

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

1500 hours

m. What were the actual hours that this range was utilized in FY1993?

1300 hours

n. Who are the customers of the range?

Naval Ships Parts Control Center (NSPCC) and NSWC Port Hueneme Division (PHD)

o. Of the actual hours utilized what percentage of utilization time was provided to which customers?

90% NSPCC and 10% NSWC PHD

p. Provide a sketch, drawing or map of the range.

See attached map.

2. Are any of your ranges part of the DoD Major Range and Test Facility Base (MRTFB)? (yes/no) If yes, which ones?

No

3. Are there any limiting (current or future) environmental and/or encroachment characteristics that are associated with this range.

No.

RANGE RESOURCES
RANGE CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Range Nomenclature or Title	1000 Yard Outdoor Firing Range

1. List all the ranges that your activity maintains and operates. Provide the following information on each range:

a. A brief statement of what the range is used for.

This range is used for test firing small arms, mounts, fire control and night vision devices, and ammunition including the 25mm MK 38 Machine Gun System, grenades, and grenade launchers.

Co-located on this range is a 14 acre area for testing night vision systems. This range is reported as an asset of the Night Vision/Electro-Optics technical capability.

b. Geographic location of the range.

Crane Site, Crane Division, Naval Surface Warfare Center in Martin County, Indiana.

c. Distance from the range to the activity's headquarters facility (main site).

The Outdoor Firing Range is located 6.7 miles from Building 1 (Crane Division Headquarters) and 1.2 miles from Building 2521 (Gun Weapon System Directorate, Crane Site Headquarters).

d. Range size in square miles.

The Outdoor Firing Range is 1.46 square miles (934 acres) in area.

e. Scheduling authority.

The scheduling authority is Crane Site Director, Gun Weapon Systems Directorate, Crane Division.

Revised pg

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or administrative activities (i.e., Holiday shutdowns).

The lake facility is open year round with multiple shifts and weekends available when required to accommodate test demands. Night shifts are scheduled for low level noise measurements. The facility is capable of providing services 365 days a year. Weather sometimes limits testing (such as noise level).

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

LAKE UTILIZATION						
FISCAL YEAR:	1989	1990	1991	1992	1993	
TEST DAYS	312R	314R	207R	160R	161R	R
HOURS	2496R	2512R	1656R	1280R	1288R	R

Note: Lake facility was transitioned from Dugger to Glendora FY 1994. FY 1989-93 utilization data represents actual Dugger Lake data.

m. What were the actual hours that this range was utilized in FY1993?

1480 Hours (Customer scheduled & used).

f. Air space available/restrictions.

There are no general air space restrictions. However, some machine guns are mechanically restricted in elevation in order to keep projectile impacts safely within the range domain. Firing operations cease during the occasional ingress / egress of helicopters.

g. Maximum water depth available/restrictions.

N/A

h. Instrumentation capability.

The Outdoor Firing Range has a full range of ballistic instrumentation for measuring pressure, velocity, accuracy, recoil, and for tracking projectiles in flight. Events can be recorded on normal or high speed video equipment. Specific examples of equipment are six computer-controlled automatic targeting stations and Doppler radar.

i. Accuracy of tracking.

The Doppler Radar has a sampling rate of 1-3000 microsec^{-1} with a resolution of 0.1 microsec. It is able to track projectiles to a range of 140,000 calibers.

j. Data collection/replay capability.

Most engineering data are digitized and recorded on personal computers for subsequent analysis or reporting.

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or administrative activities (i.e., Holiday shutdowns).

Approximately 8000 hours per year.

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

FY 89 - 2000 hours	FY 90 - 2250 hours
FY 91 - 2100 hours	FY 92 - 2050 hours
FY 93 - 1950 hours	

m. What were the actual hours that this range was utilized in FY1993?

1950 hours.

n. Who are the customers of the range?

NAVSEA	NAVAIR	Reserves
SOCOM	Army	
USMC	USCG	

o. Of the actual hours utilized what percentage of utilization time was provided to which customers?

NAVSEA - 66%	NAVAIR - 3%	Reserves - 2%
SOCOM - 14%	Army - 3%	
USMC - 10%	USCG - 2%	

p. Provide a sketch, drawing or map of the range.

Enclosed.

2. Are any of your ranges part of the DoD Major Range and Test Facility Base (MRTFB)? (yes/no) If yes, which ones?

No

3. Are there any limiting (current or future) environmental and/or encroachment characteristics that are associated with this range.

None

RANGE RESOURCES
RANGE CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Range Nomenclature or Title	Blue Sky High Power Antenna Range

1. List all the ranges that your activity maintains and operates. Provide the following information on each range:

a. A brief statement of what the range is used for.

This range is used for high power testing of antennas for properties associated with arcing, thermal breakdown, general antenna characteristics. The antenna under test is mounted on its back with the RF radiating vertically into free space thus given the name "Blue Sky Test".

b. Geographic location of the range.

The Blue Sky Test Range is located at Latitude 38 52′ 19" N, Longitude 86 49′ 1" W. The location is along the North side of Building 41, approx. 30 meters from the Northwest corner.

c. Distance from the range to the activity's headquarters facility (main site).

1 mile from Headquarters, Building 1, NAVSURFWARCENIV Crane.

d. Range size in square miles.

3600 Square ft base with an altitude limit of 30,000 ft assigned by the FAA.

e. Scheduling authority.

The Range Safety Officer (Microwave Department Code 803) is responsible for scheduling the range. The FAA has regulated usage to low working populations such as evening and weekends.

f. Air space available/restrictions.

Restricted fly zone.

g. Maximum water depth available/restrictions.

Not applicable.

h. Instrumentation capability.

High Power Transmitter

i. Accuracy of tracking.

Not applicable.

j. Data collection/replay capability.

Not applicable.

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or administrative activities (i.e., Holiday shutdowns).

2000 Hrs

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

0 hours, became operational in 1994

m. What were the actual hours that this range was utilized in FY1993?

0 hours, became operational in 1994

n. Who are the customers of the range?

Naval Sea Systems Command and Naval Air Systems Command.

o. Of the actual hours utilized what percentage of utilization time was provided to which customers?

Naval Sea Systems Command - 90%.
Naval Air Systems Command - 10%.

p. Provide a sketch, drawing or map of the range.

See attached.

2. Are any of your ranges part of the DoD Major Range and Test Facility Base (MRTFB)? (yes/no) If yes, which ones?

No.

3. Are there any limiting (current or future) environmental and/or encroachment characteristics that are associated with this range.

None.

RANGE RESOURCES
RANGE CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Range Nomenclature or Title	BROAD BAND

1. List all the ranges that your activity maintains and operates. Provide the following information on each range:

a. A brief statement of what the range is used for.

The antenna range is used to support automatic test and analysis of shipboard, missile, and aircraft antennas, radomes and decoys to determine lot acceptance, surveillance and engineering/design modification. The range allows for automatic data collection and operation of the microwave signal source, microwave receiver, and multi-axes positioners. The range performs data acquisition, storage, and retrieval from principle plane and total or sector of the full four-pi steradian radiation tests at multiple frequencies and orientations. The automated system displays real time test patterns on the monitor or recorder; generates raster scan, contour, and radiation distribution plots; and performs planar pattern, monopulse, transmissibility, and sector analysis.

b. Geographic location of the range.

The range extends in various direction and differing in range lengths from a minimum of 10 feet to a maximum of 6200 feet. The range is centered around building 3006, latitude at 38 degrees, 86', 20" N, longitude at 86 degrees, 81', 10" W.

c. Distance from the range to the activity's headquarters facility (main site).

The distance from Building 3006 to headquarters at building 1 is approximately 1.5 miles.

d. Range size in square miles.

The range size is 1.0 square mile.

e. Scheduling authority.

The range safety officer is responsible for scheduling all tests.

f. Air space available/restrictions.

None.

g. Maximum water depth available/restrictions.

Not applicable.

h. Instrumentation capability.

Instrumentation consists primarily of heavy duty multi-axis positioners, automated microwave measurement systems, parabolic transmitting antennas, field probes and synthesized microwave signal sources. The range performs data acquisition, storage, and retrieval from principle plane and total or sector of the full four-pi steradian radiation tests at multiple frequencies and orientations, over the frequency range of 100 MHz to 20 GHz. The automated system displays real time test patterns on the monitor or recorder; generates raster scan, contour, and radiation distribution plots; and performs planar pattern, monopulse, transmissibility, and sector analysis.

i. Accuracy of tracking.

The accuracy of the range is within 0.05 degrees, less than 0.25 dB amplitude variation, and less than 22.5 degrees phase shift variation across the region occupied by the antenna under test.

j. Data collection/replay capability.

This test range allows data acquisition, storage and retrieval from principle plane and total or sector of the full four-pi steradian radiation tests at multiple frequencies and orientations. Real time test results can be displayed; allows multi-tasking; and generates raster scan, contour and radiation distribution plots; and performs planar pattern, monopulse, transmissibility and sector analysis.

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or administrative activities (i.e., Holiday shutdowns).

The maximum number of days that the range can be utilized is 2200 hours based on 90 days per year of inclement weather.

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

The range has been utilized an average of 1200 hours per year for the past five years.

m. What were the actual hours that this range was utilized in FY1993?

The actual hours the range was utilized in FY93 was 1360 hours.

n. Who are the customers of the range?

Naval Surface Warfare Center
Marine Corps
NAVSEASYSCOM
NAVAIRSYSCOM

o. Of the actual hours utilized what percentage of utilization time was provided to which customers?

Customer utilization as a percentage of total:

Naval Surface Warfare Center	- 10%
Marine Corps	- 10%
NAVSEASYSCOM	- 40%
NAVAIRSYSCOM	- 40%

p. Provide a sketch, drawing or map of the range.

See Attached.

2. Are any of your ranges part of the DoD Major Range and Test Facility Base (MRTFB)? (yes/no) If yes, which ones?

No

3. Are there any limiting (current or future) environmental and/or encroachment characteristics that are associated with this range.

No

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 28

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 26

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __5.5__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__296__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__505__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	6. Operational Systems Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.3__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__17__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__0__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 87.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 4070

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 5593

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 30.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1701

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1249

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __3.2__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__147__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__21__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 49

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 21

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __63.1__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) __3247__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) __2056__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) ____0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.1 Sonar Systems
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __2.6__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__121__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__22__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.2 Radar Systems
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 297

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 32

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.2 Radar Systems
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__0__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__0__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__10292__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.2 Radar Systems
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 93.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 5169

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 3659

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 6533

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.2 Radar Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 37.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1826

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1644

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 1996

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.2 Radar Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 44.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 2213

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 6545

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 5085

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.2 Radar Systems
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.1__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__5__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__0__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__79__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.3 Special Sensors
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__1__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__30__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.3 Special Sensors
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 7.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 309

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 645

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.3 Special Senors
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 142

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 102

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 102.6

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.3 Special Sensors
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 21.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1160

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1945

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 736.7

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	5. Sensors & Surveillance Systems 5.3 Special Sensors
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __5.7__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__340__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__251__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	6. Navigation 6.1 Submarine Navigation Systems
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.3__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__19__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__5__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communication and Intelligence (C^3I) 7.4 Land-Based
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.1__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__3__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__0____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__583.6__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	6. Operational Systems Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.5__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__121__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__9__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __3.1__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__156__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__69__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.9__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__37__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__15__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) -1

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 146

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __2.9__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__141__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__37__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __4.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__202__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__56__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence (C^3I) 7.8 Intelligence Information Systems
Life Cycle Work Area	17. Training/Operational Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 162

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 106

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___15.7__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___885__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___618__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, In
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	6. Operational Systems Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ____0.5__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___18___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)____0___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ____3.5__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___170__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)____211_

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___0.1___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___3____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)____0___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ____2.9__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___165__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___41___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___26.3__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__1419__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__1863__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___9.3___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_505____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)____595_

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0_

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __106.3__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_5493___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__3081__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

Revised pg

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	15. Program Support

R

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __4.6____WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__265___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__82____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.2 Countermeasures
Life Cycle Work Area	None

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __4.6____WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__265___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__82____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	4. Engineering and Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___9.9___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_554____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__70____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ____7.2__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_334____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__73____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___25.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_1091___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__1085__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___18.5__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_1022___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)_1146___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___25.6__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_1296___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___479__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___153.8_WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_6820___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__8017__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__3542.3__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	13. Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___0.8___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_42_____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___3____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___153.0_WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__7653__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__10648_

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__1345__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___5.1___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_281____

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__153___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_1482___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	8. Defense System 8.3 Electronic Warfare Systems
Life Cycle Work Area	None

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0____WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__0_____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___1____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	4. Engineering and Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___1.9___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_116____

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__14____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ____1.2__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_45_____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__12____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

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TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___62.5__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_3130___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__1542__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___784.4__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___0.0___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_1_____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___0____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___102.2_WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_5569___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__2954__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)_____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___6.1___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_243____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__207___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___1.8___WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_94_____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__0_____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0_____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	9. Strategic Programs 9.1 Navy Strategic Systems
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. ___82.7__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)_4205___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__1759__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__1761.9

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.2 Logistic Plan & Implementation
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.8__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__33__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__2__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.2 Logistic Plan & Implementation
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.9__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__38__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__122__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.3 Facilities Engineering
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__-1__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__29__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support 10.3 Facilities Engineering
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 14.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 605

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 833

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

Revised PB

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.3 Facilities Engineering
Life Cycle Work Area	15. Program Support

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Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.1__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___4___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__12___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.3 Facilities Engineering
Life Cycle Work Area	None

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 4

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 12

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.6 Crew Equip & Life Support, 10.6.3 Surf Ship
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 25

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 3

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.6 Crew Equip & Life Support, 10.6.3 Surf Ship
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___0___

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__38___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.6 Crew Equip & Life Support, 10.6.3 Surf Ship
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.9__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__101__

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__60__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.6 Crew Equip & Life Support, 10.6.3 Surf Ship
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)___0___

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__87___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.6 Crew Equip & Life Support, 10.6.3 Surf Ship
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 7.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 316

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 427

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.6 Crew Equip & Life Support, 10.6.3 Surf Ship
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 9.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 516

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 2580

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 2085

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 70.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 4107

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 2848

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 77

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 28.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1653

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1511

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 137

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	5. RDT&E Management Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 3.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 171

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 123

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	6. Operational Systems Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __2.4__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__127__

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__30__

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0__

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	7. Production

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.8 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 225

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 67

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 20.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1082

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 117

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 15.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 745

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 482

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 24.76

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 20.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1043

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 126

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	11. Maintenance

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 13.3 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 666

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 164

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	13. Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 18.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 944

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 207

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 17.5 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1030

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 259

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 18.42

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	15. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 14.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 732

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 132

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:

In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.8 Other Subsidiary Systems or Components
Life Cycle Work Area	16. Retirement

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__-1____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__0_____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)__0_____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	3. Advanced Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __1.0__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__71____

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)__164___

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)____0___

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	4. Engineering & Manufacturing Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 26.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1524

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 2200

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	5. RDT&E Management Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.6 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 39

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 4.7 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 214

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 464

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	9. Modernization

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 0

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 59

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 5.1 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 289

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 34

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	12. Repair

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 2.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 145

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 46

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	14. In-Service Engineering

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 0.0 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 0

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 38

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

Revision

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	7. Command, Control, Communications and Intelligence 7.3 Shipboard
Life Cycle Work Area	10. Program Support

R

R

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 5.6 WYs R

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 395 R

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 0 R

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 0 R

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	10. General Mission Support, 10.9 Activity Mission & Function Support
Life Cycle Work Area	None

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 183.2 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 22858

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 14434

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 808.7

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	11. Generic Technology Base, 11.4 Electronic Devices
Life Cycle Work Area	2. Exploratory Development

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. 18.9 WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K) 1169

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K) 1271

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K) 5069.2

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	11. Generic Technology Base, 11.4 Electronic Devices
Life Cycle Work Area	8. Acceptance Testing

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.3__WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__15____

b. **Out-of-House Expenditures.** Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___0____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

TECHNICAL FUNCTIONS
FUNCTIONAL SUPPORT AREA/LIFE CYCLE WORK AREA FORM

Technical Center Site	NSWC Crane Div Crane, IN
Functional Support Area	11. Generic Technology Base, 11.4 Electronic Devices
Life Cycle Work Area	10. Program Support

Note: An example of a functional support area - life cycle work area is "1. Platform, 1.1 Undersea, - 10. Program Support".

1. **In-House Work Years.** Provide the number of in-house government employee (civilian and military) work years for FY1993 that were performed in this functional support area - life cycle work area. Workyears are to be consistent with those used in the preparation of inputs to the President's budget. __0.1__ WYs

2. **Expenditures.**

a. **In-House Expenditures.** Provide the total in-house cost in FY1993 for this functional support area - life cycle work area. $(K)__11____

b. **Out-of-House Expenditures**. Provide the total funds expended during FY1993 for this functional support area - life cycle work area. **Do not** include direct cite funding. $(K)___0____

c. **Direct Cites.** Provide total direct cite funds expended on contract during FY1993 for this functional support area - life cycle work area. $(K)___0____

Note:
In-House Expenditures - Is comprised of the total obligation authority for direct labor, direct material, direct travel, direct equipment, direct computer support, other direct support services and all overhead.

Out-of-House Expenditures - Is comprised of total obligational authority for direct work (customer funded, mission oriented) performed or to be performed by other than the organizational entity. Out-of-house performers may include other departmental or DoD organizational entities, industrial firms, educational institutions, not-for-profit institutions and private individuals.

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Electronic Warfare Technical Capability

1. State the primary purpose(s) of the facility/equipment.

TECHNICAL CAPABILITY #1

ELECTRONIC WARFARE

SUMMARY DESCRIPTION

Crane Division is the Navy's recognized leader in Electronic Warfare (EW). This Technical Capability (TC) provides full spectrum support including: RDT&E, engineering, acquisition, maintenance, manufacturing, Fleet support and system retirement for a wide variety of shipboard and airborne EW systems. **The EW TC directly supports the Crane Division mission and the Naval Surface Warfare Center (NSWC) mission and plays a critical role in the successful accomplishment of current and future Naval missions.**

EW is an enduring capability that requires utilization of emerging technologies in developing cost efficient and effective countermeasures against new threats. Crane has developed state-of-the-art EW facilities, equipment and expertise to support the Navy's EW requirements. **The effectiveness of this total EW system support capability has been demonstrated in the development of a new expendable EW system, the reduction of operating cost of an airborne system, and in the rapid and effective introduction of a shipboard EW system during Desert Shield/Desert Storm operations.** Crane's EW leadership and dedication is critical to the government being a "smart buyer" and bringing affordability to these weapon systems.

MISSION

The purpose of EW is to decrease or prevent an enemy from using electronic detection and guidance devices against friendly forces. The Navy relies heavily on EW as a force multiplier in power projection, to protect high value land, as protective weaponry on sea and air combatants and to gather intelligence for

Marine Expeditionary forces and other joint or combined force operations. **To meet the emerging threats posed by weapons proliferation to the third world countries as well as the new weapons developed by "unfriendly" countries, EW systems must be effective and affordable.** Crane provides the Fleet, Program Managers (PEO, PMA, PMS), Supply Offices (SPCC, ASO), Marine Corps, and the Air Force full spectrum support for EW systems, subsystems, components and support equipment. The effectiveness of this capability was proven during Desert Storm when Crane provided timely on site engineering and modification of shipboard and airborne EW systems to meet new theatre specific threats.

JOINTNESS/DUAL USE

The Electronic Warfare TC supports the Joint Mission Areas of Joint Strike, Joint Littoral, Joint Surveillance, Joint Space and Electronic Warfare/Intelligence, Strategic Sealift/Protection and Strategic Deterrence. **This technical capability not only supports the NSWC product area of Electronic Warfare Systems, it also supports the Air Warfare Center, Marine Corps and Air Force.** The resources of the TC are extensively utilized by TCs of Microwave Components, Radar, Night Vision, Mine Countermeasures and Electronic Module Test and Repair.

The expertise within the TC is teaming with other NSWC Divisions and private industry to develop new corrosion resistant materials and processes. **Utilization of these new materials and processes in the Fleet leads to enhanced readiness and reduced overall operating cost of combat systems hardware.** Improvements in corrosion control will be directly applicable to all branches of the military and commercial products. The technology developed for EW systems is also proving to be a critical component in the Counter Drug Program. **The EW TC regularly provides technical and logistic support to all agencies involved in the Drug-Interdiction program.**

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

Crane provides engineering, logistics, depot maintenance and management services throughout the full life cycle of surface ship and airborne EW systems and related support equipment. The support provided by EW TC affects the design, development, acquisition, production, deployment, training, operations, maintenance and disposal of EW systems, components and support equipment.

As an example, Crane engineers were instrumental in the initial research and development for an off board EW system. Crane worked with the Naval Research Laboratory and the Australian Navy in the initial stages to develop the system specification. Once

the product specifications were developed, the building of the Engineering Development Models was contracted out to private industry in the U.S. and Australia. Crane was the Design Agent and Acquisition Agent for the electronic payload section of the EW system. **The addition of this EW system to the Fleet will affect the Navy's policy by greatly enhancing the successful defeat of anti-ship missiles at sea.**

During acquisition of new systems and equipments, Crane furnishes technical support to program managers by evaluating designs for technical adequacy, cost and risk reductions, logistics planning, supportability and testability. **Crane has been instrumental in developing logistics support for next generation Shipboard/Airborne EW systems and the improved high frequency transmitters being developed by the Air Force.** Crane's technical ability is exemplified in the procurement of an airborne EW pod radome. As acquisition agent for the next radome procurement, Crane developed a new specification and awarded the contract for a radome at a significantly reduced cost with technically superior performance characteristics to the previously procured radome.

The technical capability includes modern automated maintenance depot operations for both airborne and surface EW systems. **The lessons learned in industrial operations are immediately fed back to both the engineering and logistics functions to provide permanent corrective actions for failures found in Fleet returns.**

This TC develops technical requirements in direct support of Fleet EW requirements. Included are technical specifications in support of acquisition, technical publications and test procedures for manual and automated test equipment. **This TC also validates commercial technical publications for use in support of Fleet operations.** Included in these technical publications are applicable safety requirements. This TC develops and interprets Navy safety policy applicable to EW functions. Safety hazards that require prevention techniques in EW include high voltage and radiation. The TC personnel develop and conduct training of Fleet personnel in the maintenance and operation of EW systems and support equipment.

Crane maintains direct liaison with the Fleet and technical personnel at key field locations to resolve operational, reliability and maintainability problems. In addition to responsive and cost effective depot support, Crane develops technical specifications in support of Aviation Supply Office (ASO) and Ships Parts Control Center (SPCC) procurements and conducts qualification testing and material/equipment evaluation. These capabilities are also displayed by Crane's technology insertion efforts which extend the service life or improve

reliability of existing equipment and address piece part obsolescence. **A reduction in the life cycle cost while maintaining technical effectiveness (smart buyer capability) is a direct result of this approach.**

EXPERTISE

With consolidated EW support, Crane has developed and maintained a highly specialized core of expertise which cannot be exclusively developed by academic or industry sources because of the uniqueness and limited commercial application. **Utilizing this broad technical base, Crane provides expert technical guidance to Program sponsors, evaluates performance and supportability to reduce life cycle cost, minimizes deployment risks and assures that the government procures reliable, maintainable EW products.** Essential skills required to accomplish the Electronic Warfare functions involve over 320 trained and experienced EW Engineers, Technicians and Logisticians.

The Electronic Warfare Technical Capability consist of the following asset.

Asset #1 - The primary purpose of the facilities and equipment is life cycle support of shipboard, airborne and land based Electronic Warfare (EW) systems. These state-of-the-art EW facilities and equipment support the services warfare requirements as a force multiplier to project power, to protect high value land, sea and air combatants, and to gather intelligence for Marine Expeditionary Forces and other joint or combined force operations. The EW capability provides direct support to the Naval Surface Warfare Center, Naval Air Warfare Center, Space and Naval Warfare System Command, Marine Corps, Army and Air Force. The facilities and equipment are utilized in the full spectrum of support including RDT&E, engineering (In-Service-Engineering Agent), acquisition (Acquisition Agent), maintenance (Depot Overhaul Point), manufacturing, training, fleet support and system retirement.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

There are a variety of facilities and equipment located at Crane supporting all facets of EW support. Resident at Crane are anechoic chambers, EMI/RFI chambers, Ram Air Turbine wind tunnel test facility, EW system test beds, an environmentally safe corrosion control and waste treatment facility, environmental test tables and antenna range. These items are fixed facilities and would be cost prohibitive to move due to the extensive building modifications required. Moveable items include Automatic Test Equipment, high and low power RF/Digital/Analog/ High voltage test and measurement equipment, RF CASS automated test equipment, TWT test sets, environmental test chambers,

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2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

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3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The replacement value of the facilities and equipment is $153.3 million. The replacement value of the anechoic chambers and EMI/RFI chambers is $5 million, corrosion control and waste treatment is $4 million, wind tunnel is $4 million, EW system test beds is $7 million, high and low power RF/Digital/Analog/ High voltage test and measurement equipment is $70 million, material/failure analysis laboratory is $14.9 million, environmental test chambers and tables is $4.3 million, machine shop $10 million, antenna range is $3.3 million, metallurgy laboratory is $1.1 million, circuit card manufacturing facility is $5 million, technical documentation factory is $1.5 million, progressive maintenance facility is $32.5 million, prototype assembly facility is $1.2 million and tactical software laboratory is $1.4 million.

4. Provide the gross weight and cube of the facility/equipment.

The facilities occupy approximately 1,661,771 cubic feet and the equipment 56,452 cubic feet. The facility gross weight is approximately 1,917.2 tons and the equipment 138.7 tons. R

material and failure analysis laboratory, metallurgy laboratory, machine shop, printed circuit board manufacturing facility, technical documentation factory (NEDALS), progressive maintenance facility, prototype assembly facility and tactical software laboratory. These items are moveable but would require extensive utility support to be in place. There are no portable facility or equipment valued at over $500,000.

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The replacement value of the facilities and equipment is $153.3 million. The replacement value of the anechoic chambers and EMI/RFI chambers is $5 million, corrosion control and waste treatment is $4 million, wind tunnel is $4 million, EW system test beds is $7 million, high and low power RF/Digital/Analog/ High voltage test and measurement equipment is $70 million, material/failure analysis laboratory is $14.9 million, environmental test chambers and tables is $4.3 million, machine shop $10 million, antenna range is $3.3 million, metallurgy laboratory is $1.1 million, circuit card manufacturing facility is $5 million, technical documentation factory is $1.5 million, progressive maintenance facility is $32.5 million, prototype assembly facility is $1.2 million and tactical software laboratory is $1.4 million.

4. Provide the gross weight and cube of the facility/equipment.

The facilities and equipment occupy approximately 1,300,000 + 56,452 cubic feet with a gross weight of approximately 1462.5 + 138.7 tons.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

The special utility support required for these facilities and equipment include chilled and de-ionized water, forced air cooling and pure air breathing apparatus, 400 Hz power at various voltages, and up to 12,000 volt primary power for individual motors.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

Many of the EW test facilities use specialized configurations for equipment placement. For classified areas, special hardening is in place. Several test areas have ESD grounding for handling delicate electronic equipment. The anechoic and EMI/RFI chambers are shielded facilities to enable RF testing of antennas in both transmit and receive modes. These chambers as will as environmental test tables also have separate foundations for their individual positioning systems. The wind tunnel also has an isolated foundation. The corrosion control facilities have special floor contour, non-ferrous components, and structural steel coating.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

Temperature and humidity controls are integral to many EW areas processing electronic components. The corrosion control facilities have air scrubbers and liquid waste treatment equipment with a closed loop recycling system.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

The elimination or relocation of this EW TC would severely impact the Navy's capabilities in the complex arena of EW. Losing over 3200 workyears of corporate EW experience and the integrated facilities would result in a devastating loss to the Navy. The re-establishment of these capabilities at another location would require a minimum of five to seven years and be cost prohibitive. If a threat would arise during the transition, the response would be too late to effectively support the Fleet. There is no other source that could currently provide the support NSWC Crane is providing to the assigned EW systems. The success of these systems in the Fleet relies on the combined engineering, logistics and maintenance efforts of Crane. Substantial facilities and equipment investments have been made to maintain an integrated EW Command. The equipment and facilities are utilized by the combined engineering, logistics and maintenance team players in the most cost effective manner. Losing valuable corporate EW experience, facilities and equipment would be catastrophic in the rapidly changing and expanding EW arena.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

Most of the EW test and repair facilities were constructed or put in place inside existing buildings. The facilities were constructed and equipment installed between 1965 to present. The Electronic Maintenance Support facility, which houses the corrosion control function, was a MILCON project completed in 1993.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

The functional support area for all of these facilities and equipment is Electronic Warfare (EW) Systems. (8.3 of Appendix A)

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Utilization is defined as operating all facilities 8 hours per day 5 days per week.

FY89	FY90	FY91	FY92	FY93
90%	92%	93%	95%	96%

12. Provide the projected utilization data out to FY1997.

FY94	FY95	FY96	FY97
97%	95%	94%	94%

13. What is the approximate number of personnel used to operate the facility/equipment?

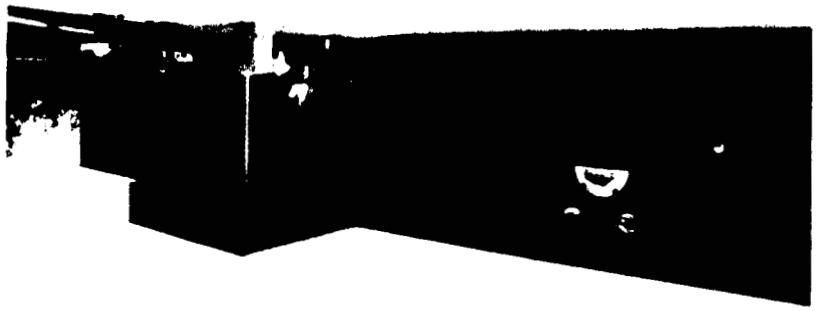
The facilities and equipment are operated by approximately 330 people. Highly skilled engineers, technicians, and logistical personnel perform various depot maintenance and management services throughout the full life cycle of surface ship and airborne EW systems and related support equipment.

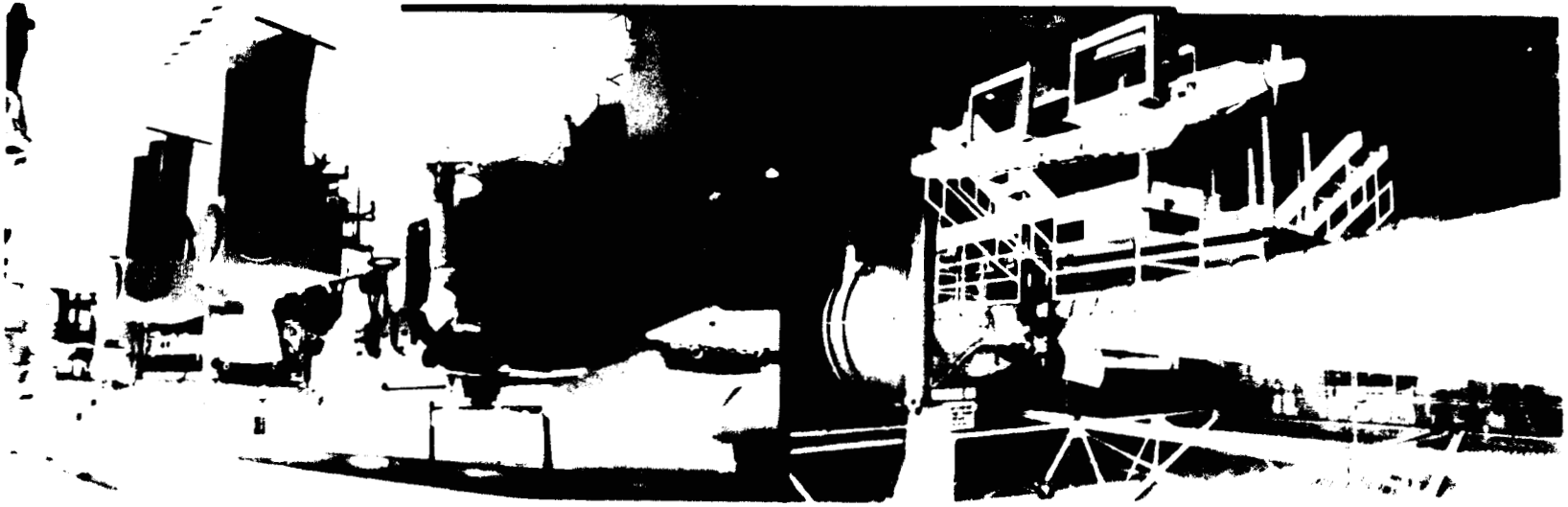
14. What is the approximate number of personnel needed to maintain the equipment?

The facilities and equipment are maintained by approximately 15 people. Maintenance includes calibration and alignment of equipment, utility upkeep, and upgrading of equipment as necessary to provide the most effective and efficient use of resources.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Provided separately.





SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	Crane Division Crane, IN
Facility/Equipment Nomenclature or Title	Microelectronic Technology Technical Capability

1. State the primary purpose(s) of the facility/equipment.

CRANE DIVISION TECHNICAL CAPABILITY #3 (TC#3)

TITLE: MICROELECTRONIC TECHNOLOGY

SUMMARY DESCRIPTION

The personnel of the Microelectronics Technology Technical Capability (TC) perform design validation, quality assurance, performance evaluation and extended life support for electronic/photonic components; circuit cards and processors; power supplies; packaging and interconnect technologies; and enclosures utilized in multiple fleet systems. **In many instances, Crane Division personnel maintain and support these systems over decades of extended life in the fleet.**

Microelectronic technology products are an integral part of all modern weapons systems. Crane Division engineers develop technical requirements to support acquisition offices which must be assured that these products are appropriately selected and robustly designed into systems to meet stringent requirements for reliability, maintainability and availability. **Continued reliability and availability of these systems throughout their life cycle is assured** by our management of diminishing manufacturing source issues, analysis of fleet problems and support for equipment upgrade redesigns.

MISSION

The Microelectronic Technology TC provides capability for the design, selection and application of electronic/photonic components; circuit cards and processors; power supplies; packaging and interconnect technologies; and enclosures **to assure that Navy systems meet reliability, maintainability and**

supportability requirements. The TC also provides engineering capabilities and special facilities to assure support of Navy equipment throughout the life cycle. The capabilities of the Microelectronic Technology TC are synergistic with and supporting of other Technical Capabilities within the Division. **Of particular significance are joint projects with the Electronic Module Test and Repair, Electronic Warfare, Microwave Components, Night Vision/Electro-optics and Naval Gun Weapons Systems Technical Capabilities.**

JOINTNESS/DUAL USE

The expertise and facilities associated with the Microelectronics Technology TC has led to our involvement in numerous industry and government organizations.

- **Project Reliance** - Navy lead for Microelectronic Assurance Technology
- Development of bipolar semiconductor technology for the **Defense Nuclear Agency**
- Navy representative on **OSD Defense Microcircuit Planning Group**
- Microcircuit industry quality audits in support of **NASA**
- Partnership with the **Electronic Industries Association** (EIA) in the development of an industry quality system for dual-use microcircuit products
- Leadership in industry standards groups (**IEEE and ANSI**) for the development of dual-use computer architecture (FUTUREBUS +) and networking standards (**FDDI**).
- Cooperative Research and Development Agreements (CRADA's) with industry for development of dual-use products and with **NIST** for development of advanced microcircuit metrology processes
- U.S. representatives to **NATO electronic module and component working groups.**

This wide recognition and involvement greatly enhances the value of Navy engineers in providing advice and assistance to program offices.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

Microelectronic Technology TC tasking includes program management, acquisition support(Design agent and Product Engineering Agent), assessment, development, transition-to-production, evaluation, prototyping, in-service support and fleet maintenance support for microelectronic products. The "goods and services" delivered to customers include the functions described below.

- **Program Management for the Navy Standard Hardware Acquisition and Reliability Program (SHARP) resides at Crane Division.** Personnel in the Microelectronic Technology TC perform the majority of the research in support of this logistics technology development (6.3A) program.

- Transition to production of commercial and military developmental technologies is accelerated by our support to both the research and acquisition communities. Crane engineers and scientists evaluate and analyze the performance of developmental products in military use environments. **This work positively influences producibility and reliability of these products.** The assessment of their readiness for fleet use reduces the risk of poor performance in the fleet.

- Technical direction for Commercial and Dual-use product application provided by Crane Division assures that products are properly selected and specified to meet reliability, maintainability and supportability requirements. **The technically sophisticated products used in Navy systems are increasingly dominated by those developed for non-DoD applications.** This creates significant challenges for the Navy engineering community. For example, commercial products (COTS/NDI) typically have life cycles much shorter than that needed by DoD and many cannot meet the requirements of rugged applications. **Crane Division provides "smart buyer" assistance to several customers facing these challenges.** The TRIDENT, AEGIS, AN/BSY-1, AN/BSY-2, AN/SQQ-89 and Navy Embedded Computer System program offices all officially task Crane Division for this support.

- Reduction of life cycle costs is supported through leadership in standardization and timely correction of fleet problems. **SHARP program personnel have a 20 year track record of documented cost savings brought about by insertion of common products into multiple system applications.** One case history documented nearly $200 million in life cycle savings resulting from reducing the number of power supply designs in one submarine combat system by a factor of ten .

- **The extensive failure and materials analysis capability at Crane Division is often used to determine the root cause of fleet problems and provide direction for corrective actions.** The resolution of a severe reliability problem with the stellar sensor used in the TRIDENT MK5 Guidance System resulted in a first year cost savings greater than $6 million.

- **Equipment life in the fleet is extended through the TC's capabilities** for management of product (non)availability issues, feedback of maintenance data into redesign and performance upgrade projects, and usage of special temperature and humidity controlled facilities for storage of military unique products.

- **Cost effective solutions for obsolescence problems in TRIDENT, AN/SQQ-89, AN/UYK-44 and other systems have provided documented cost savings.** Critical parts and assemblies for the TRIDENT Navigation, Fire Control and Guidance systems are stored in special temperature and humidity controlled facilities including dry nitrogen chambers. These critical parts are periodically analyzed and tested to assure their availability for repair processes for the life of the systems.

EXPERTISE

The capability of the Microelectronic Technology TC is heavily dependent on an experienced workforce with the following technical specialties:

- **ELECTRONIC ENGINEERING** (47 %) - radiation effects, microwave, fiber-optics, power systems, CAE and simulation, automated test equipment and system design

- **MECHANICAL ENGINEERING** (8 %) - mechanical structures, enclosure design and thermal analysis

- **CHEMIST, PHYSICIST, MATERIALS SCIENCE** (4 %) - materials analysis, semiconductor fabrication processes and physics-of-failure analysis

- **ELECTRONIC TECHNICIANS** (41 %) - electron-optics instrumentation, test & evaluation and prototyping

Full proficiency in many of these specialties must be gained through years of on-the-job experience and their functions could not be performed by newly hired graduates without five to ten years of similar experience. **The average length of service for professionals in the Microelectronic Technology TC is greater than 16 years.**

The Microelectronic Technology Technical Capability consists of the following assets.

- **State-of-the art diagnostic equipment for performing in-depth evaluation and characterization of electronic, semiconductor, and other materials, components, modules and assemblies.** Capabilities include Automatic Electrical Testing; Real Time X-Ray; CAD circuit simulation; Optical, Emission and Scanning Electron Microscopy; Gas Chromatography/Mass Spectroscopy; Secondary Ion Spectroscopy; Auger Electron Spectroscopy; Energy and Wavelength Dispersive Spectroscopy; and X-Ray Diffraction.

- **Specialized test and evaluation equipment for electronic/photonic components, electronic circuit cards and power systems to assure insertion of high-quality, reliable electronics in Navy systems.** Capabilities include a broad range of automatic test equipment; environmental simulation equipment including **a government unique Linear Accelerator** for simulation of transient nuclear radiation; computer aided engineering workstations; and computer networks specially designed to support obsolescence management of components used in Navy electronic equipment.

- **Thermal and mechanical analysis equipment for evaluation of electronic systems and equipment packaging.** Capability includes equipment for analysis of systems packaging design; vibration/shock analysis; human factors engineering; system maintainability and safety assessment; analysis of advanced materials and electronic cooling techniques; and cabinet level structural evaluations.

- **DoD unique capability for assessment of commercial open systems computer architectures.** Equipment includes automated test equipment customized for performance measurement of computer circuit cards and backplanes, fiber optic communications network evaluation and networked computers to support data analysis.

Revised pg

- **Capability for complete electrical and mechanical design and documentation of circuit cards, equipments and small systems.** Capability includes advanced Computer Aided Engineering (CAE) workstations for **development, simulation, and analysis** of design files representing actual hardware; circuit emulation equipment to verify performance during prototyping; networked computer system to support documentation and configuration management; and specialized systems to support software design.

- **Embedded computer test and evaluation capability.** Capability supports test, repair, retrofit and upgrade of Navy standard embedded computer equipment.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

- **Approximately 35% of the facilities/equipment is "fixed"** in that they are so large and/or integral to the building that they could only be relocated if exterior walls were demolished. Examples include a large thermal shock chamber, ionizing radiation test chambers and sources, and a linear accelerator. R

- **Approximately 35% of the equipment is "moveable"** consisting of permanently installed automated test equipment; major electron-optics materials analysis instruments; specialized instrumentation, computers and test stands; etc. and is considered relocatable with significant difficulty and expense in most cases because of the size, complexity, and associated utilities. R

- **The remaining 30% of the equipment is "portable"** and consists of equipment which is relatively easy to relocate.

The estimates of the percentages of fixed, moveable, and portable equipment/facilities above are based on cubic volume relative to the Microelectronics Technology TC total cube provided below.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The facility/equipment exclusive of buildings/utilities have a **replacement value of approximately $51.7 M.**

- **Capability for complete electrical and mechanical design and documentation of circuit cards, equipments and small systems.** Capability includes advanced Computer Aided Engineering (CAE) workstations for **development, simulation, and analysis** of design files representing actual hardware; circuit emulation equipment to verify performance during prototyping; networked computer system to support documentation and configuration management; and specialized systems to support software design.

- **Embedded computer test and evaluation capability.** Capability supports test, repair, retrofit and upgrade of Navy standard embedded computer equipment.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

- **Approximately 30% of the facilities/equipment is "fixed"** in that they are so large and/or integral to the building that they could only be relocated if exterior walls were demolished. Examples include a large thermal shock chamber, ionizing radiation test chambers and sources, and a linear accelerator.

- **Approximately 40% of the equipment is "moveable"** consisting of permanently installed automated test equipment; major electron-optics materials analysis instruments; specialized instrumentation, computers and test stands; etc. and is considered relocatable with significant difficulty and expense in most cases because of the size, complexity, and associated utilities.

- **The remaining 30% of the equipment is "portable"** and consists of equipment which is relatively easy to relocate.

The estimates of the percentages of fixed, moveable, and portable equipment/facilities above are based on cubic volume relative to the Microelectronics Technology TC total cube provided below.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The facility/equipment exclusive of buildings/utilities have a **replacement value of approximately $51.7 M.**

Revised pg

4. Provide the gross weight and cube of the facility/equipment.

Gross weight of facility/equipment:	**443,200 lbs**	R
Cube of facility/equipment:	**226,600 ft^3**	R

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

- **A variety of electrical power service types are required** for special test equipments used in electrical, optical, and environmental test and evaluation. These include:

  - 3 Phase, 240 V Delta and Wye service

  - 3 Phase, 208 V service

  - 3 Phase, Delta and Wye service, 400 Hz

- **Specialized equipment cooling requirements** exist. These include:

  - 300 psi liquid carbon dioxide coolant for temperature test chambers

  - 700 gal/hour of chilled water with 705 gal. reservoir for cooling electronics test equipment

  - Distributed dry nitrogen and distributed liquid nitrogen for a variety of electron-optic analytical equipment

- **Specialized air and water service are required.**

  - 100 psi dried, oil free compressed air for equipment control valves

  - both distilled and deionized water

- **Chemical lab specialized requirements** include:

  - Chemical drains, exhaust fans in chemical area, chemical storage and toxic waste disposal for small quantities of chemicals

4. Provide the gross weight and cube of the facility/equipment.

Gross weight of facility/equipment: **414,150 lbs**
Cube of facility/equipment: **255,650 ft^3**

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

- **A variety of electrical power service types are required** for special test equipments used in electrical, optical, and environmental test and evaluation. These include:

  - 3 Phase, 240 V Delta and Wye service

  - 3 Phase, 208 V service

  - 3 Phase, Delta and Wye service, 400 Hz

- **Specialized equipment cooling requirements** exist. These include:

  - 300 psi liquid carbon dioxide coolant for temperature test chambers

  - 700 gal/hour of chilled water with 705 gal. reservoir for cooling electronics test equipment

  - Distributed dry nitrogen and distributed liquid nitrogen for a variety of electron-optic analytical equipment

- **Specialized air and water service are required.**

  - 100 psi dried, oil free compressed air for equipment control valves

  - both distilled and deionized water

- **Chemical lab specialized requirements** include:

  - Chemical drains, exhaust fans in chemical area, chemical storage and toxic waste disposal for small quantities of chemicals

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

The Microelectronic Technology Technical Capability includes several specialized equipments for the test, evaluation and analysis of electronic components, circuit cards and enclosures which have budget requirements in addition to normal building cost.

- **The electron linear accelerator (LINAC)** is housed in a custom altered high bay building with a 24 inch thick reinforced concrete floor, and is surrounded with 7 to 9 feet of concrete shielding. The entire bay has a custom designed electronic interlock system to disable the LINAC if any access by personnel is detected during a test. Estimated replacement cost of the facility housing the LINAC exclusive of the basic building is $655 K.

- **The equipments used in photonics testing** must be enclosed in a facility with special non-laser reflecting wall coverings. In addition, 8" concrete floors are required to support the optical tables. One or more rooms must be rated safe for class IV laser testing to include entrance door safety power disconnects. Estimated replacement cost of the photonics facility (not including equipment) is $100 K.

- **Several other special requirements demand budgetary consideration including:**

  - A separate foundation and special plumbing for CO_2 would need to be installed as well as a vessel. Estimated replacement cost $80,000.

- Additional air conditioning equipment to handle increased heat load and humidity controls to meet Electrostatic Discharge (ESD) requirements. Estimated replacement cost $135K.

- Chemical/metallurgical areas (water, drains, compressed air, exhaust). Estimated replacement cost $100 K

- Liquid nitrogen storage tank (concrete platform and distribution system). Replacement cost $50 K.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

The Microelectronic Technology TC includes a large complement of specialized automatic test equipment, electron-optic analytical equipment and computer equipment which require well controlled environments. Special environmental controls include:

- **The facility housing the photonic component testing must be built to class 10000 clean room specifications.** These areas require HEPA filtered supply air.

- **The LINAC bay has 3 separate exhaust systems to remove both ozone and any radioactive airborne particulates** through a HEPA filter prior to emission to the atmosphere.

- **Several electron-optics instruments have special environmental requirements** summarized as follows:

Temperature control	+/- 1° F
Relative humidity	30%, +/- 5%
Vibration free floor	reasonably low level
Electric field free area	reasonably low level

- **Component package leak testing uses trace amount of a radioactive gas.** This requires custom-designed exhaust systems to mix fresh air with the by-products emitted during test.

- **All areas containing automated test equipment and computer equipment require temperature and humidity controls.**

Temperature control	72°F +/-5°F
Humidity control	45% +/-10%

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

Replication/Relocation. The Microelectronic Technology Technical Capability would be extremely difficult to relocate or replicate at another site. The facility is unique within the United States with respect to the breadth and depth of its capabilities for applying and assessing microelectronic technologies. The **combination of extensive test and evaluation equipment and the technical staff of approximately 200 experienced engineers and technicians who operate and maintain the facility are unmatched in government or commercial industry**. A primary reason for the existence of the facility is to have an integrated team of experienced personnel familiar with electronic equipment AND the wide range of parts and materials used to implement Navy systems. A significant portion of this capability consists of **unique and/or fixed facilities and equipment**. For example:

- The **open systems engineering capability is unique within both government and industry** in providing detailed test and analysis capability focused on commercial open system architecture computer products.

- The linear accelerator is a fixed facility which was uniquely designed and offers **radiation dose rates which are not achievable at any other United States facility**.

- The **electronic component engineering and test capability is unique within the United States**. The combination of equipment and over 60 experienced engineers and technicians apply their capabilities at the microelectronic product level and provide support to a wide spectrum of Navy programs, FSA's, and equipments.

- The extent and concentration of **failure and materials analysis instrumentation and the supporting engineering and scientific expertise available within this facility is unique within the government.**

Impact of Facility/Equipment Loss.

The "smart buyer" engineering support to acquisition programs provided by this facility is an inherently governmental function which is should not be transferred to private industry. The ultimate impact of the loss of this organic capability would be that the **Navy would not have the knowledge necessary to assure the performance and quality of future systems acquisitions**. The facility also provides direct support to electronic module and system test and repair, depot maintenance operations, and other deployed system support functions which would **lose the electronic**

product engineering capability required to be able to identify and correct problems in fielded systems. Some specific examples of impacts follow:

- The availability of this facility is **critical for the assessment of commercial processes and products** for acceptability in military applications. Loss of the facility would result in increased weapons system costs during acquisition and support phases.

- Several **critical Navy weapons systems programs, including the Trident Strategic Weapons System, have based their acquisition and life-cycle support plans on having access to the analysis and engineering capability offered by this facility.** Loss of this facility would severely impact the quality, reliability, and long-term support of these systems.

- The loss of the capability to evaluate embedded computer performance would result in a **severe impact on the ability to resolve fleet operational problems** for several in-service engineering and depot organizations. Original equipment manufacturer's depot capability has been disbanded.

- The **three services and the Defense Nuclear Agency depend on the linear accelerator at this facility to provide testing in simulated strategic and space radiation environments** for electronics. The ability to assure the operation of microelectronics in these critical applications would be lost or severely restricted if this facility were lost.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The Microelectronics Technology Facility is based on facilities and equipment **established beginning in 1961 to perform electronic component testing and engineering** support for Fleet Ballistic Missile weapons systems. Since that time major enhancements in technical capability have been added including:

- **Failure and materials analysis capability started in 1962** and has since evolved into the US Navy's most complete facility of its kind. The present **consolidated facility was completed in 1987.**

- The initial capability for **electronic system design was established in 1974** with the design of several small microelectronic control systems.

- Capability/equipment development for **electronic power supply test and engineering began in 1981** in response to the NAVMAT power supply reliability improvement initiative.

- A comprehensive **photonics capability was added in 1987** which integrates electronic and optical test capability.

- Capability for the **performance evaluation of embedded computers was initially established in 1989** in support of NAVSEA standard computers.

- The **linear accelerator was completed in 1989** after being designed, built as sub-assemblies by a contractor and then transported by truck to Crane for reassembly in a custom building.

- **Electronic packaging and thermal analysis capability was established in 1990** in support of the SHARP program and several NAVSEA programs.

- The capability for **open systems engineering test and engineering was developed during 1992-1994.**

The equipment was generally transported by commercial freight carriers and usually required the use of heavy materials handling equipment to off-load and set-up the equipment. Custom vans were normally required to transport the delicate electronic and electron-optic equipment. Frequently, major equipments such as the optical tables or the high-speed digital testers required **major reassembly, realignment, and calibration by the equipment manufacturer after they were moved into position within the facility**. Except as noted above, the buildings housing the facilities/equipment were typically **existing structures which were refurbished to provide the "special utility" and environmental control support** listed previously or the facilities were housed in minor construction additions to existing structures.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

The Microelectronics Technology TC provides **critical support to many Functional Support Areas since microelectronic products are used in almost all military systems**. The following FSA's are currently supported:

1.3	Surface Ship Platform Machinery Control Systems
2.1	Weapons Systems, Gun Systems
2.2	Guided Missile Weapons Systems
2.9	Fire Control Weapons Systems
3.1	Subsurface Combat Systems Integration
3.3	Surface Combat Systems Integration
3.4	Multiplatform Combat System Integration
4.2	Special Operations Support
5.1	Sensor & Surveillance Systems, Sonar Systems

5.2 Sensor & Surveillance Systems, Radar Systems
7.8 Intelligence Information Systems
9.1 Navy Strategic Systems
10.8 Other Subsidiary Systems or Components
11.4 Generic Technology Base, Electronic Components

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

The percent utilization is primarily based on equipment usage during an 8 hour work day (single shift operation). In some cases an estimate of the current throughput (eg. devices tested) vs. a maximum throughput for a fully staffed lab was considered.

The **average utilization percentage** for the Microelectronic Technology Technical Capability over the past five fiscal years is calculated to be **80 %.**

12. Provide the projected utilization data out to FY97.

The **projected utilization** for the Microelectronic Technology Technical Capability for FY94-97 is as follows:

FY 94	FY 95	FY 96	FY 97
80 %	**76 %**	**73 %**	**73 %**

13. What is the approximate number of personnel used to operate the facility/equipment?

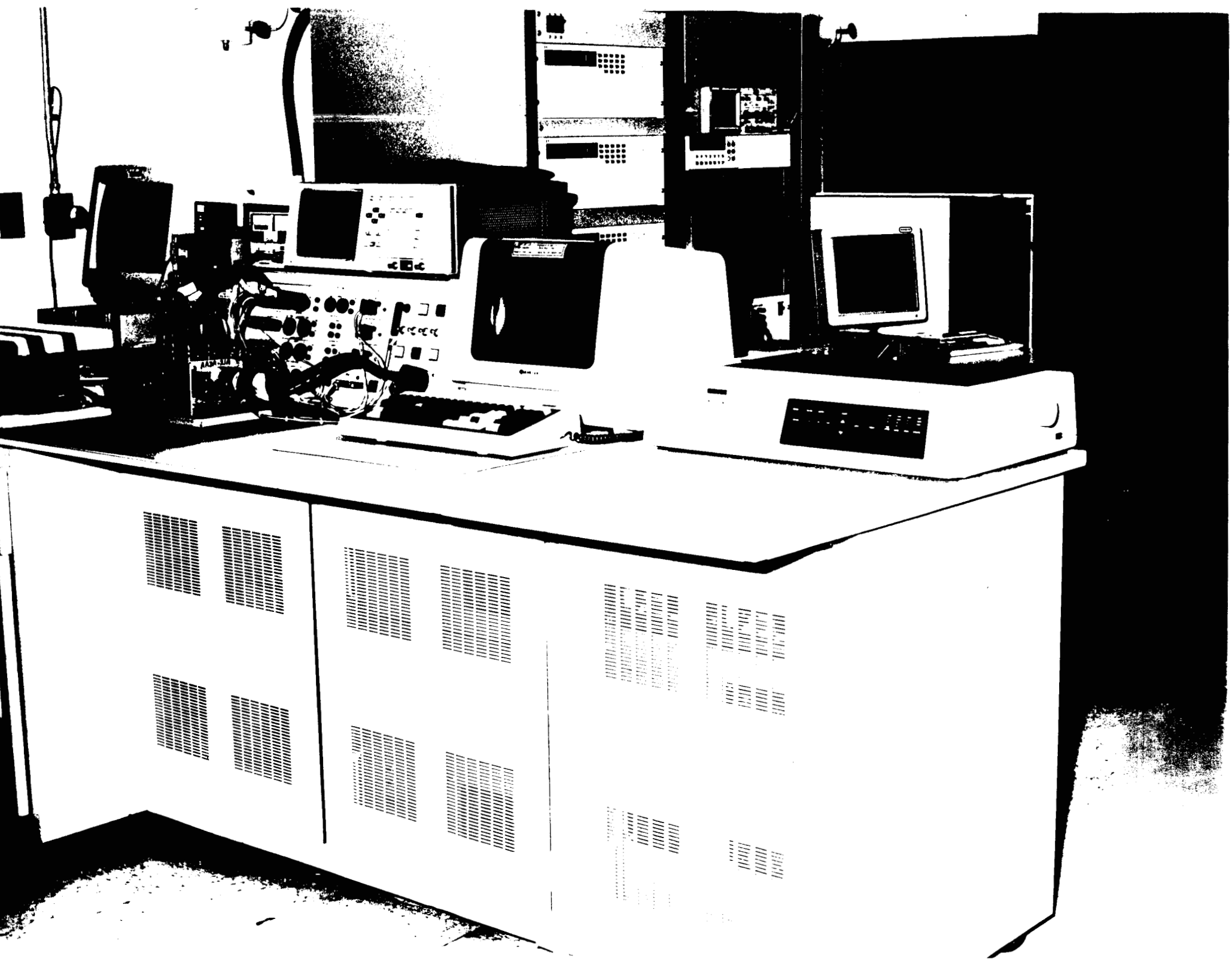
Approximately 186 people are required operate the Microelectronics Technology Technical Capability Facility.

14. What is the approximate number of personnel needed to maintain the equipment?

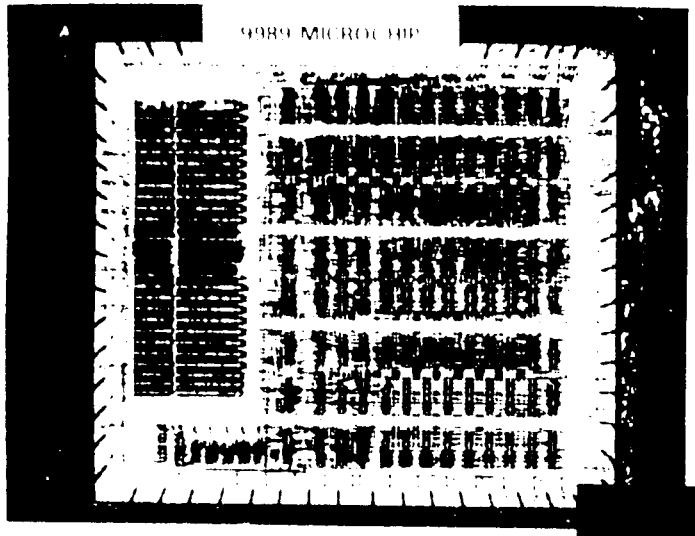
Approximately 13 people are required to maintain, repair, and calibrate equipment associated with this facility.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

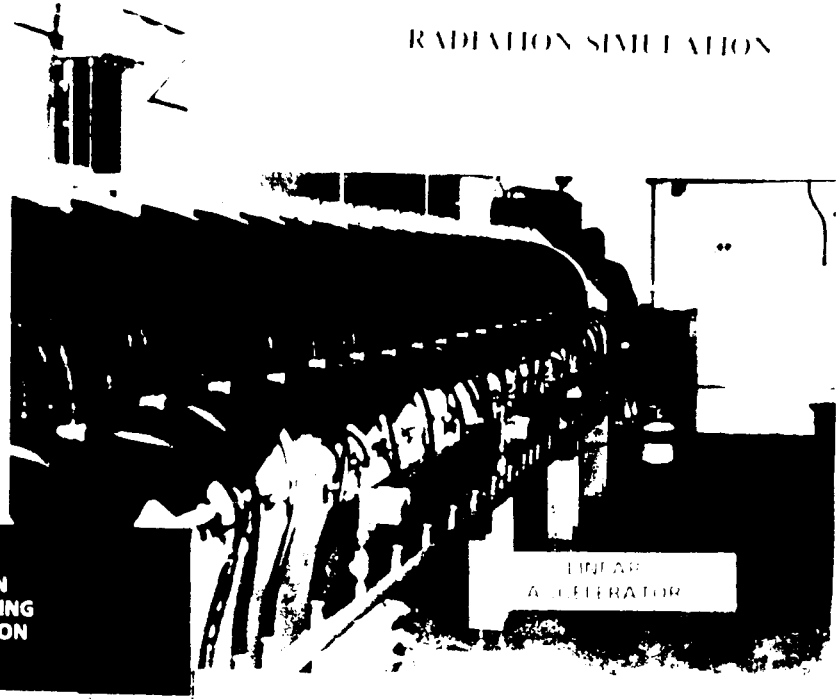
See attached.

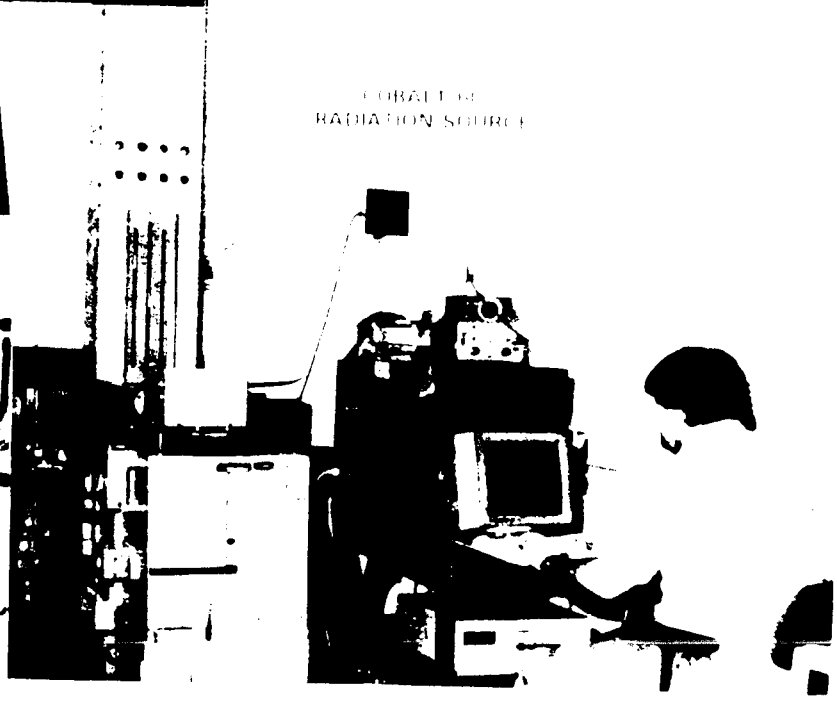


RADIATION SIMULATION



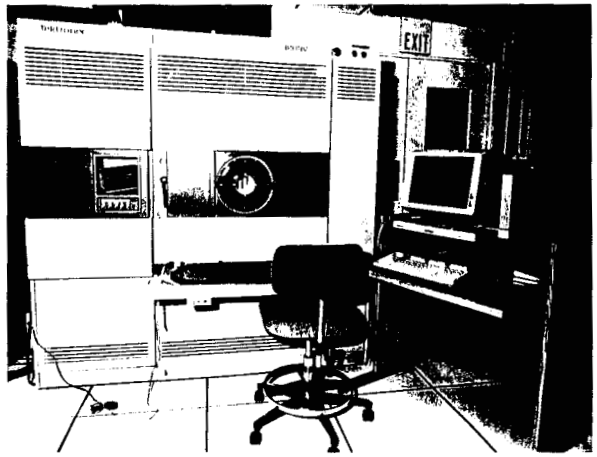
- DESIGN VALIDATION
- PROCESS MONITORING
- PRODUCT VALIDATION



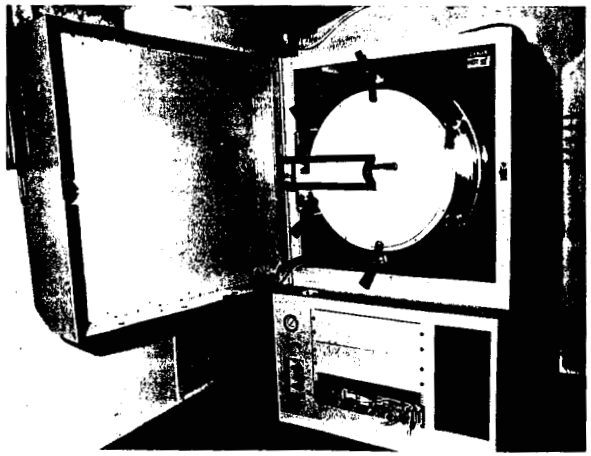


ELECTRONIC/PHOTONIC ENGINEERING & TEST FACILITY

AUTOMATIC TEST SYSTEM
CUSTOM MICROCIRCUITS



AUTOMATIC TEST SYSTEM
MEMORY MICROCIRCUITS



HIGHLY ACCELERATED STRESS CHAMBER
COMMERCIAL COMPONENTS

OPTICS TABLE
FIBER OPTIC COMPONENTS

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

TECHNICAL CENTER SITE	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Electronic Module Test & Repair Technical Capability

1. State the primary purpose(s) of the facility / equipment.

CRANE DIVISION
TECHNICAL CAPABILITY #4

TITLE

ELECTRONIC MODULE TEST AND REPAIR

SUMMARY DESCRIPTION

Crane Division is known throughout the world for the engineering and technical disciplines which support test and repair of electronic modules. The Division provides the full spectrum of system life cycle support functions at the module level.

Crane Division has developed a unique capability and reputation for solving system supportability issues by teaming with industry, academia, government agencies, and the Fleet in the field of electronic module manufacturing, test, and repair. For example, the Electronic Manufacturing Productivity Facility (EMPF) is a joint venture of Crane Division, the Naval Air Warfare Center Aircraft Division, and Indiana University-Purdue University at Indianapolis. The EMPF's mission is to work with industry and small business to solve a broad spectrum of manufacturing process problems.

The Standard Hardware Acquisition Reliability Program (SHARP) derives processes to reduce the risks involved in transitioning systems into the Fleet. This is accomplished by focusing government, industry, and academia logistic R & D tasks toward solving system supportability issues. Crane maintains printed wiring board and ceramic thick-film interconnect technology labs to help define and resolve unique manufacturing and repair processes. **These facilities also help generate and sustain competition and support for systems in the post-production phase.**

Crane Division is the Navy's focal point for introduction of Progressive Maintenance capabilities into the Fleet. This philosophy institutes orderly repair of electronic modules and circuit card assemblies through established maintenance levels: Organizational (O), Intermediate (I), and Depot (D). Progressive Maintenance capitalizes on the vast array of Crane Division engineering and logistic experience in repair processes and module tests/diagnostics. **Progressive Maintenance enhances mission sustainability and helps ensure optimum use of economic resources while achieving maximum operational readiness.**

MISSION

The mission of this TC integrates a number of functional disciplines throughout the life cycle of systems/equipments. These functions span requirements definition in support of the acquisition process, maintenance definition, technology and design consultation, factory to Fleet module testing development, Progressive Maintenance techniques, and unique specialized depot repair capabilities.

These missions are complemented by assigned responsibilities for program management of the Navy Miniature/Microminiature Electronic Repair Program (2M/ATE) which facilitates Fleet maintenance levels with repair tools, processes, and equipment; and the Standard Acquisition and Reliability Program (SHARP) which performs logistics research and development for common electronic products and their interfaces.

Teams of Crane Division and industry personnel develop processes and tools to mitigate the risk of transitioning products to the Fleet, with emphasis on supportability and maintainability. **Standardization efforts have proven to be highly cost effective in test systems, documentation, programming techniques, test fixtures, and training.** These unique support capabilities are applied to Navy, Marine Corps, Army, and National Security Agency systems.

Future mission requirements will be focused toward further development of the Progressive Maintenance philosophy. This will result in enhanced repair capabilities at the Fleet maintenance level, development of a "factory to Fleet" test strategy through usage of Navy standard automatic test equipment, and specialized depot repair capabilities for dual use/commercially available technology.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS AND SERVICES

Crane Division's ability to focus government/academic/industryteams to solve both manufacturing and repair problems insures increased system availability. Improving manufacturing processes and correcting poor practices also increases system service life, thereby fulfilling the Division's mission of realistic Fleet support.

The Electronic Manufacturing Productivity Facility teams Government and Industry to jointly solve manufacturing and repair technology problems. It also provides training of Government/Industry employees so that these technological innovations can be

utilized in dual fashion. Establishment of technical requirements, validation of manufacturing and repair processes through certification, and audits jointly focus Government and Industry on tough system support issues. **This unique relationship produces true "Dual-Use-Technology" initiatives.**

Capabilities in the fabrication area include engineering prototyping and limited production of multilayer printed wiring boards with epoxy-glass, copper-invar-copper, copper-molybdenum-copper, Kevlar, polyamide, and flexible substrates. Functions performed include computer aided design, manufacturing process development and control, printed wiring board failure analysis, assembly, automated bare board testing, and independent audits of private industry manufacturing facilities.

Crane Division provides core maintenance for weapons and computer system modules to Navy, Marine Corps, Army, and National Security Agency users. A portion of this TC's module repair capability supports Foreign Military Sales items as well. Inherently governmental functions include independent verification of the operational requirements of electronic modules; certification of test and repair processes and procedures; and advising program offices in the specification and selection of appropriate test/repair equipment, tools, and processes (Smart Buyer function). **Total life cycle support, including service life extension (post production support), is provided for Navy Standard Computers used aboard nearly every ship.** Life cycle support of automated test equipment for Government and Industry is also provided by this TC.

Crane Division works with system acquisition managers, in-service engineering agents, and the Fleet to evolve and enhance system supportability. **Crane has been instrumental in improving the Navy's maintenance philosophy and policies.** As a result of this improvement, Progressive Maintenance is evolving as a vehicle to help optimize system availability. Factory to field maintenance policy has been incorporated and Crane is supporting the program's integration. **This approach is expanding to the Department of Defense level to reduce system life cycle cost.**

Crane Division supports policy implementation through Progressive Maintenance process development, validation, and deployment. This includes tool development/selection, curriculum development, and fleet certification. **Crane has developed a plan to consolidate NAVSEA and NAVAIR Miniature/Micromaintenance Repair into a single Navy Progressive Repair Program.**

EXPERTISE

The "hands-on" knowledge possessed by engineering, technical, and skill-trained personnel is complementary to Fleet personnel at the waterfront. Many of Crane's technicians and trades people are Fleet trained veterans with unique skills. **Cross fertilization of knowledge occurs due to the close working relationship and teaming relationships Crane technical personnel have with leading defense contractors and Fleet operating forces.** Crane has expertise within the full spectrum of electronic modules from design and development to manufacturing, test, repair, and post production support. Technically trained personnel have evolved into subject matter experts over the past 30 years.

Technology areas covered by this TC include multilayer printed wiring boards, ceramic thick film technology applications, automated test engineering, diagnostic trouble-shooting, manufacturing/repair process development, test equipment maintenance and support, and precision rotating component test and repair.

The Electronic Module Test & Repair Technical Capability consists of the following assets.

Asset #1 - The Electronic Manufacturing Productivity Facility (EMPF) is a Navy MANTECH Center of Excellence advancing the state of the art in Electronics manufacturing. It is operated as a CRADA with NSWC Crane Division, NAWC Aircraft Division, and Indiana University/Purdue University, Indianapolis. The facility teams with government, industry and academia to develop and implement innovative electronics manufacturing technologies. The EMPF is comprised of three unique facilities: An Electronics Manufacturing Learning Center (EMLC); a demonstration factory; and an office facility. All of these are co-located in one building in Indianapolis, IN.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The facility would be considered moveable. The facility is not fixed as the building in Indianapolis is a commercially leased building. The lease is paid by IUPUI as their contribution to the CRADA.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The replacement value of facilities for EMPF office space is $550,00. This replacement value is for improvement to the basic structure of the building and does not include lease expense for use of the building structure. Demonstration Factory equipment: approx. $3,800,000; EMLC equipment: approx. $1,000,000.

4. Provide the gross weight and cube of the facility/equipment.

Gross weight and cube of demonstration factory: 32,000 lbs. gross weight (approx) 10,000 sq. ft. by 20 ft. ceiling height; 2,500 sq. ft. by 10 ft. ceiling height.

Gross weight and cube of EMLC: 11,000 lbs. gross weight (approx) 9,000 sq. ft. by 10 ft. ceiling height.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Demonstration Factory requires the following special utilities: clean, dry compressed air at 100 psi; Nitrogen gas at 75 psi; liquid nitrogen; deionized water; running water; special waste water treatment system; ventilation; drains, chilled water; hot water; electrical power requirements include 208V/220V/480V.

EMLC - requires the following special utilities: clean, dry compressed air at 100 psi; ventilation; electrical power requirements include 220V and 480V.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

This facility does not require special budget requirements for facilities.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

Special environmental requirements for the Demonstration Factory include: large volume make-up air to compensate for ventilation requirements; humidity controlled to 50% +/- 10%.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

This facility would be extremely difficult to replicate or relocate at another site. The bricks, mortar and equipment would be the easiest parts of the facility to relocate. The existing facility also facilitates access to the best applied electronics manufacturing expertise in the Navy (NAWC & NSWCC), globally recognized academic expertise in both business and engineering (IU and PU), and a central U.S. metropolitan location with a major air terminal that eases U.S. industry access. These were factors the Navy considered while reviewing multiple proposals from numerous government and commercial activities before deciding to relocate the facility to Indianapolis in 1990. If the facility were lost, the Navy would lose its only facility dedicated to the hardening, demonstration and training of electronics manufacturing processes - the necessary link between basic research activities (national/labs, universities) and industry production lines.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

This facility was relocated from Ridgecrest, CA to Indianapolis, IN in 1990. All equipment relocated was transported by commercial carrier. The structure itself is leased by Indiana University/Purdue University at Indianapolis. It was constructed to their requirement, and is provided to the government as part of a CRADA.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

The functional support areas the EMPF supports are 11.4 Electronic Devices and 11.5 Materials and Processes.

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Facility utilization (note that facility opened in February 1991):

Demonstration factory:
1991 - 20%, 1992 - 45%, 1993 - 60%, 1994 75%
(% equipment utilized)

EMLC: 1991 - 14%, 1994 - 33%, 193 - 40%, 1994 - 52%
(% maximum classroom capacity)

Office Area: 1991 - 35%, 1992 - 70%, 1993 - 90%, 1994 - 90%
(% useable space occupied)

12. Provide the projected utilization data out to FY1997.

Projected utilization rates are:

	FY95	FY96	FY97
Demo factory	70%	80%	90%
EMLC	65%	80%	90%
Other	40%	90%	90%

13. What is the approximate number of personnel used to operate the facility/equipment?

The total number of personnel involved in the operation within this facility is 78.

14. What is the approximate number of personnel needed to maintain the equipment?

Number of personnel required to maintain equipment: approximately 6 manyears (includes required daily maintenance performed by equipment operators).

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

See picture attached.

Asset #2 - Provides Navy focal point for introduction of Progressive Maintenance capabilities into the Fleet. Derives processes to reduce risk of transitioning systems into the Fleet. Institutes orderly repair of electronic modules and circuit card assemblies through established maintenance levels: Organizational (O), Intermediate (I), and Depot (D). Maintains printed wiring board and ceramic thick film interconnect technology labs to help define and resolve unique manufacturing processes. Generates and sustains competition for systems in the post-production phase.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The facility buildings are fixed, the majority of the equipment within the facility is a combination of portable and moveable. Two large high temperature firing furnaces are essentially fixed, as their removal would require either partial destruction of the building they are located in, or else
un-natural dismantling of the equipments.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

Replacement cost for major line items totals $29,492,000. Replacement cost for other miscellaneous equipment is estimated at $3,000,000. A breakout of major line items is listed in Table 1. Other TC facilities funded by and necessary to the functioning of TC#4 total $117,300,000. A breakout of major line items is listed in Table 2.

4. Provide the gross weight and cube of the facility/equipment.

Major line items of facility/equipment weigh a total of 150 tons, and occupy a total volume of 119,700 cubic feet. A breakout of major line items is listed in Table 1. Other TC facilities funded by and necessary to the functioning of TC#4 weigh a total of 1007.0 tons, and occupy a total volume of 660,800 cubic feet. A breakout of major line items is listed in Table 2.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utilities required for the subject facility are listed in Table 3.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

The Sensitive Compartmented Information Facility (SCIF) requires TEMPEST protection in the walls, floors, and ceilings to facilitate high security operations. The Precision Rotating Components Laboratory requires stabilization platforms (foundations) for seismic shock/vibration isolation. The waste water treatment pit required by the Printed Circuit Technology Facility requires walls and floors which meet EPA hazardous material containment regulations.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

A Class 10,000 clean room environment is required for the furnace room (approximately 10,200 square feet). Special air conditioning load requirements (on the order of 3 tons), as well as a minimum of 2 dedicated exhaust fans, also exist for the facility due to the ceramic firing furnaces. Two additional Class 10,000 clean room environments are required (approximately 700 square feet each with dedicated HVAC). Computer Aided Design film development for photoetching requires a dark room with strict HVAC requirements. Printed Circuit Board plot sensitive etching requires a "yellow room" to control light intrusion unto the room (strict HVAC requirements). Containment guards are required in plating areas to avoid hazardous spills (HVAC must be controlled to contain hazardous fumes). Computer systems and computer controlled test systems require HVAC and ESD protection. Temperature must be controlled at 22 ± 10 degrees C and relative humidity maintained between 42 and 48 percent.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

It would be extremely difficult to relocate this facility at another site due to the presence/installation of the nitrogen and air firing furnaces. These furnaces are the prime equipments involved in the ceramic circuit board manufacturing process and must be carefully fine tuned and aligned for the process to work correctly. In addition, the furnaces are not made to be dismantled. A relocation of this facility would require the existing building be broken open to allow removal of the furnaces, or that the furnaces themselves be un-naturally dismantled. The cost to move the Automated Storage and Retrieval System is 15% of the new price.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The equipment/facilities listed in Table 1 were established over a 30 year period of time beginning in the early sixties. Equipment in most cases is relatively new (i.e. equipment in the Printed Circuit Technology Facility has been upgraded/replaced in the last 5 years). The Engineering Analysis Lab was established in 1987 with the renovation of a inert storage building. Initial equipment assets were recycled Navy program

assets originally purchased for a prime contractor's development effort. Since that time, numerous equipment additions and upgrades have been funded by a variety of NAVSEA programs.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

The Functional Support Areas for the subject facility are listed in Table 4.

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Average utilization for the past 5 years is 0.80. A breakout of major line items is listed in Table 1.

12. Provide the projected utilization data out to FY1997.

Average utilization for FY94 through FY97 is projected to be 0.70. A breakout of major line items is listed in Table 1.

13. What is the approximate number of personnel used to operate the facility/equipment?

Staffing in FY93 was 208.

14. What is the approximate number of personnel needed to maintain the equipment?

Maintenance staff in FY93 was 18.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Photos are attached.

TABLE 1
FACIL/EQ DETAILS

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

DESCRIPTION	REPLACE-MENT VALUE $K	CUBE (K) FT3	GROSS WT TONS	HISTORICAL UTIL	PROJECTED UTIL
Ceramic Multilayer Facility	1574	14.2	15.1	0.85	0.88
Topaz Automated Tester (2)	1000	1.0	0.6	0.80	0.75
Tektronix S3270 Automated Tester	500	0.8	1.5	0.90	0.85
Tektronix S3260 Automated Tester	750	1.4	2.0	0.80	0.75
Teredyne L297 Automated Tester	3000	1.7	3.0	0.80	0.75
Military CASS Automated Tester	2200	0.8	3.0	0.90	0.85
Commercial CASS Automated Tester	1700	0.7	2.3	0.90	0.85

TABLE 1 (Continued)
FACIL/EQ DETAILS

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

DESCRIPTION	REPLACE-MENT VALUE $K	CUBE (K) FT3	GROSS WT TONS	HISTORICAL UTIL	PROJECTED UTIL
Texas Instruments TI553 Automated Tester (3)	1350	2.5	3.9	0.80	0.75
Teredyne L280 Automated Tester	2200	1.1	2.3	0.80	0.75
LTX Automated Tester	1000	0.6	1.1	0.90	0.85
Fairchild Automated Tester	1750	0.8	2.0	0.40	0.35
Test and Analysis Equipment	1256	13.0	12.0	0.79	0.74
Drilling/Solder Coating Facility	600	6.3	5.5	1.00	1.00
Plating Facility	450	8.9	3.4	1.00	1.00
Air Compressor	500	2.8	4.0	1.00	1.00

TABLE 1 (Continued)
FACIL/EQ DETAILS

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

DESCRIPTION	REPLACE-MENT VALUE $K	CUBE (K) FT3	GROSS WT TONS	HISTORICAL UTIL	PROJECTED UTIL
Photo Image Trans Facility	310	4.4	2.5	0.08	0.08
Bare Board Tester	300	2.0	0.3	0.40	0.40
Printed Wiring Board Facility	773	28.5	9.6	0.40	0.40
Rotating Components Facility	1005	7.8	55.0	0.60	0.60
Teradyne L210 Automated Tester	1200	1.5	0.2	0.10	0.40
Fin Stabilizer Test System	2753	8.5	15.2	0.10	0.10
Model Depot Equipment	1356	2.6	4.0	0.40	0.40
VXI Automated Tester (3)	600	0.1	0.3	0.50	0.50

TABLE 1 (Continued)
FACIL/EQ DETAILS

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

TOTAL	29492	119.7	150.0	0.80	0.70

TABLE 2
FACIL/EQ DETAILS (Other connected TCs)

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

DESCRIPTION	REPLACE-MENT VALUE $K	CUBE (K) FT3	GROSS WT TONS	HISTORICAL UTIL	PROJECTED UTIL
Micro-Electronics Technology Facility	51700	255.6	207.0		
Corrosion Control Facility	3000	320.0	160.0		
Microwave Integrated Circuits Test, Evaluation, and Repair Facility	2600	27.2	60.0		
Microwave Tube Test, Evaluation, and Repair Facility	60000	58.0	580.0		
TOTAL	117300	660.8	1007.0		

TABLE 3
SPECIAL UTILITY SUPPORT

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

Liquid Nitrogen Storage Tanks and associated piping
Dry Nitrogen piped to Work Stations
3 Phase Power of varied amperage and voltage
Compressed Air piped to Work Stations at up to 120CFM/100PSI (Must be dried and oil free)
Waste Water Treatment Facility for heavy metals
Hazardous Material Storage for photo engraving chemicals
400HZ Power of varied amperages, voltages, and phases
Power Conditioning to modulate voltage fluctuations
Uninterruptable Power Source (UPS) to protect data
Phase Protectors to protect equipment during Brown Outs

TABLE 2
FACIL/EQ DETAILS (Other connected TCs)

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

DESCRIPTION	REPLACE-MENT VALUE $K	CUBE (K) FT3	GROSS WT TONS	HISTORICAL UTIL	PROJECTED UTIL
Micro-Electronics Technology Facility	51700	226.6R	221.6R		
Corrosion Control Facility	3000	320.0	160.0		
Microwave Integrated Circuits Test, Evaluation, and Repair Facility	2600	27.2	60.0		
Microwave Tube Test, Evaluation, and Repair Facility	60000	58.0	580.0		
TOTAL	117300	660.8	1007.0		

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TABLE 2
FACIL/EQ DETAILS (Other connected TCs)

TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

DESCRIPTION	REPLACE-MENT VALUE $K	CUBE (K) FT3	GROSS WT TONS	HISTORICAL UTIL	PROJECTED UTIL
Micro-Electronics Technology Facility	51700	226,600R	221.6R		
Corrosion Control Facility	3000	320.0	160.0		
Microwave Integrated Circuits Test, Evaluation, and Repair Facility	2600	27.2	60.0		
Microwave Tube Test, Evaluation, and Repair Facility	60000	58.0	580.0		
TOTAL	117300	660.8	1007.0		

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TABLE 4
FUNCTIONAL SUPPORT AREAS

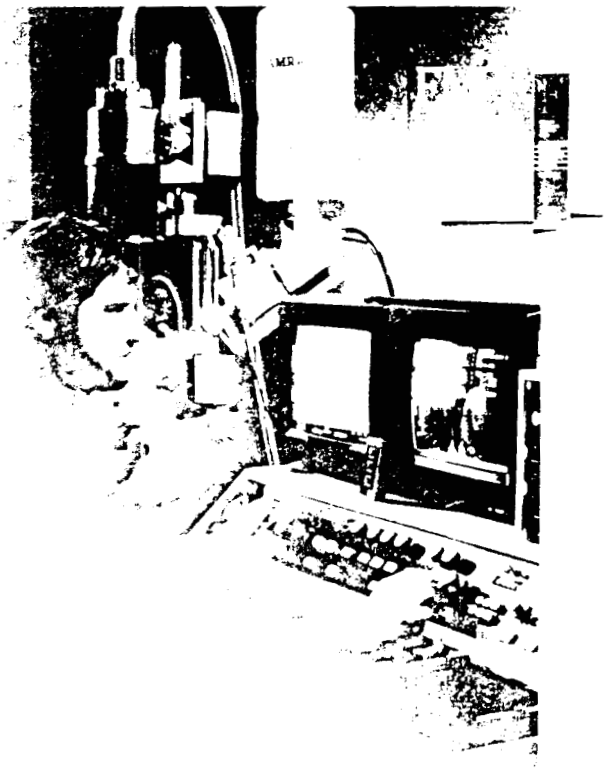
TECHNICAL CENTER SITE	NSWC Crane
FACIL/EQ NOMENCLATURE/TITLE	Progressive Electronic Maintenance Facility

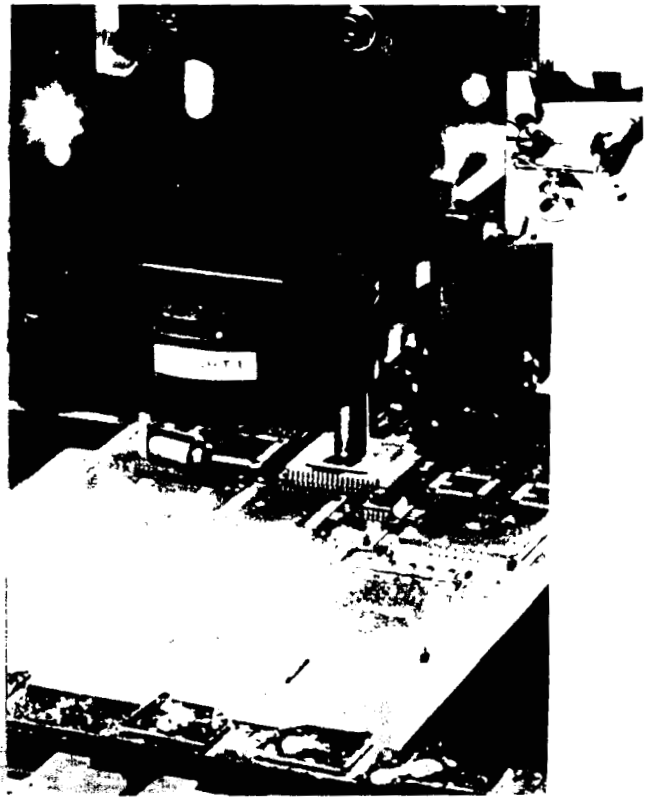
Platforms	Surface Ship	1.3
Weapon Systems	Fire Control	2.9
	Guided Missile	2.2
Integrated Combat System	Surface	3.3
	Subsurface	3.1
C3I	Intelligence Information Systems	7.8
Strategic Programs	Navy Strategic Systems	9.1
Logistics Planning	Implementation	10.2

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Division
Facility/Equipment Nomenclature or Title	Microwave Components Technical Capability

ELECTRONICS MANUFACTURING PRODUCTIVITY FACILITY

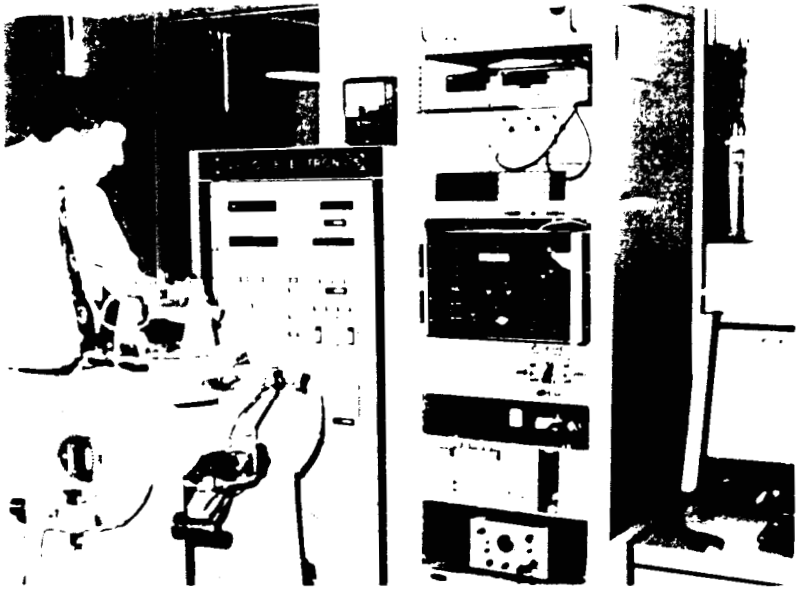


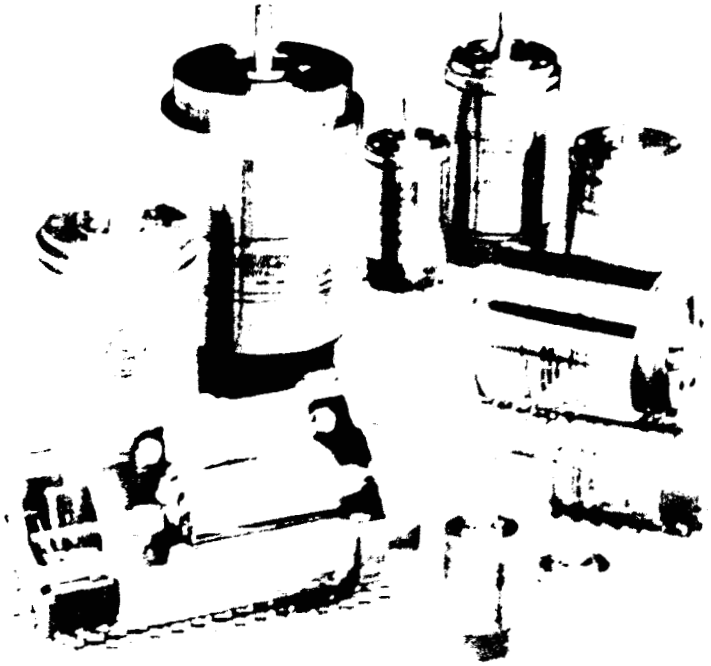


PROGRESSIVE ELECTRONIC MAINTENANCE FACILITY

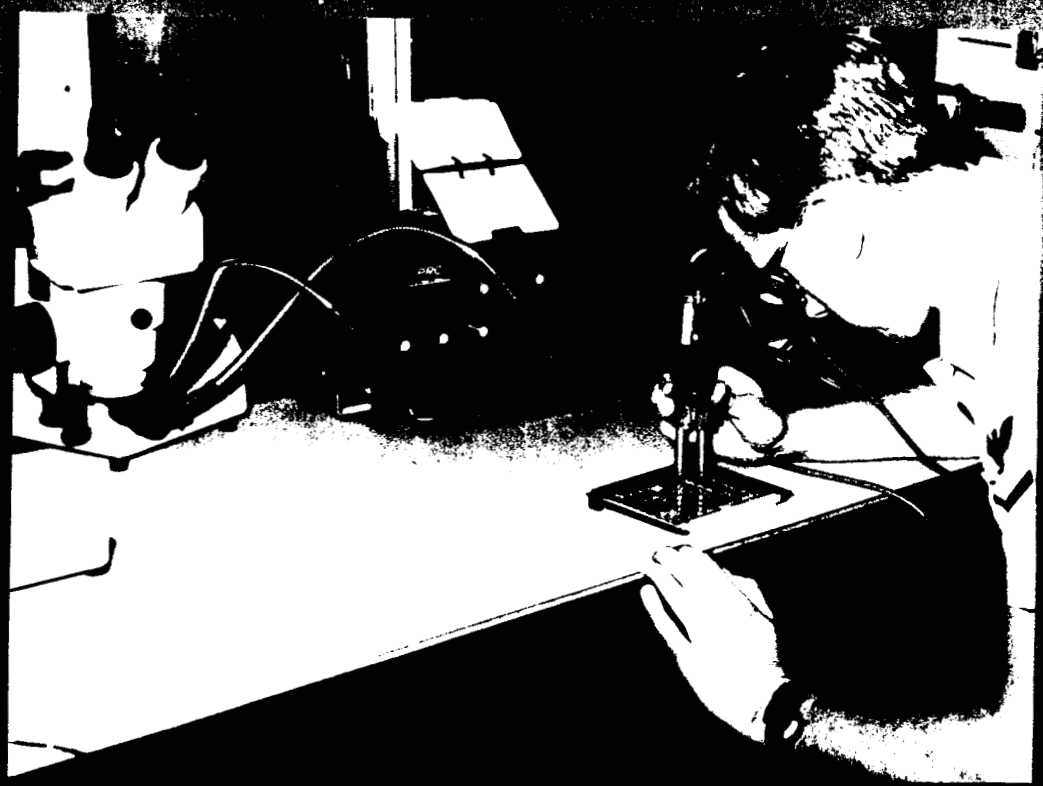
MIXED SIGNAL
LTX ATTACKMASTER
USM-192 TAT
FAIRCHILD SERIES 50
VXI
CASS

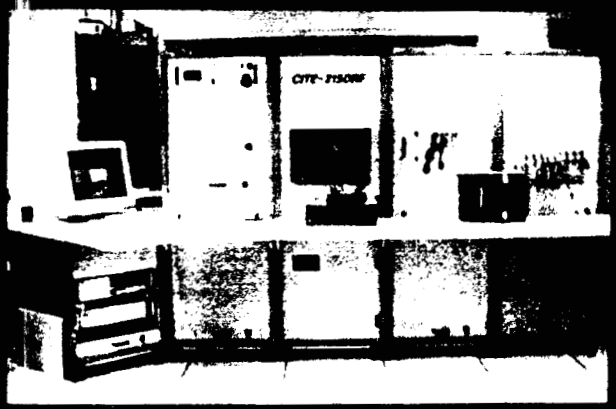
PRECISION ROTATING COMPONENTS

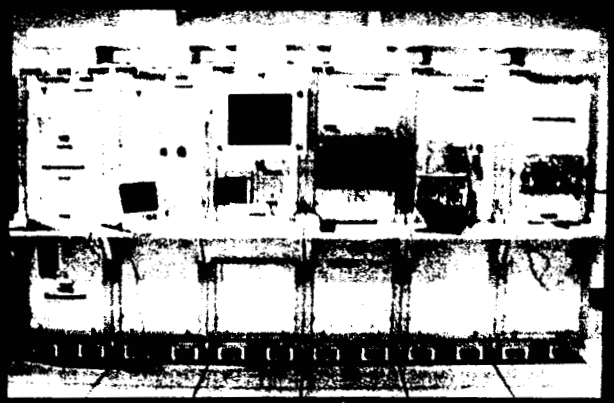




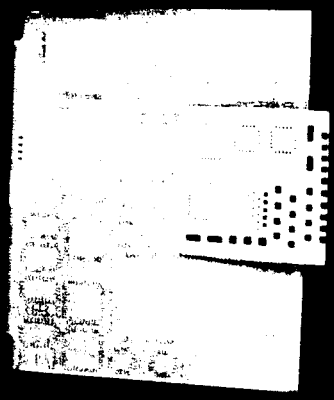
PROGRESSIVE ELECTRONIC MAINTENANCE FACILITY







PROGRESSIVE ELECTRONIC MAINTENANCE FACILITY



SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Division
Facility/Equipment Nomenclature or Title	Microwave Components Technical Capability

1. State the primary purpose(s) of the facility/equipment.

SUMMARY DESCRIPTION

Crane Division is widely recognized as the DOD microwave tube (MWT) expert. **With 30 years of experience, Crane remains the only DOD activity with a complete range of MWT test, evaluation, and repair facilities with both experienced MWT engineers and full material and MWT process analysis facilities.** This unique combination of MWT test and analysis capabilities, allowing "hands on" involvement of highly skilled personnel throughout the entire life cycle of MWTs is unique, existing nowhere else, neither in the government nor in private industry.

Crane is responsible for the full spectrum of life cycle management of MWTs, including initiating requirements through design/development, as well as transitioning these designs into production and Fleet operation. MWTs are technically complex, labor intensive to manufacture, and produced by a shrinking industrial base which is 95 percent supported by DOD. MWTs range in length from less than a foot to over four feet; in weight, they range from a few pounds to over 150 pounds. MWTs range in unit cost from less than $2,000 to over $100,000.

Driven by the high cost and technical complexity of MWTs, Crane performs the inherently governmental role of the "smart buyer" supporting the acquisition process. **As the "smart buyer," Crane knows what a MWT should cost, integrates the acquisition process with disciplined engineering practices, and insures the government receives an affordable and usable product.** Crane has consistently ensured MWTs are designed to meet military weapon system requirements at an affordable price while maintaining high operational reliability.

MISSION

Air and Surface Surveillance and Detection, Engagement, Electronic Warfare, Theater Air Defense, and Communication Systems are vital contributors to the current and future Naval mission. **MWTs are, and will be in the foreseeable future, the primary source of high power microwave energy for these systems.** In fact, 90 percent of these systems used by our military forces in Desert Storm were powered by MWTs. The Microwave Components Technical Capability (TC) of Crane plays a vital part in the mission of the Navy and the other services by ensuring affordable and reliable MWTs are designed and manufactured to meet the performance needs of DOD military systems.

Some commercial and industrial applications for MWTs exist, but is minimal in comparison to military use. Four major and several minor vendors - none individually capable of supplying the full range of MWTs required, comprise the industrial base. Driven by unfavorable DOD downsizing, the MWT industrial base is shrinking at a rapid rate. **The loss of microwave tube manufacturing and engineering capability in the U.S. threatens the reconstitution of our military forces.**

The Microwave Components TC acts as the Navy's principal agent assisting the MWT state-of-the-art industrial base, satisfying the quick-reaction, short-run, small quantity, and high-yield production orders that characterize military procurement, now and in the future. **The organic MWT capability maintained at Crane provides the Tri-Services the only capability to successfully address mobilization and surge capabilities, should natural disasters or unexpected world conflicts affect major MWT suppliers.** Crane's microwave tube test and repair facilities are capable of supporting the majority of DOD MWT requirements while simultaneously assisting the suppliers in getting their facilities either back on line or increasing production.

JOINTNESS

Crane is in partnership with Naval Research Laboratory, Defense Advanced Research Projects Agency, NASA, Rome Laboratory, Applied Physics Lab/Johns Hopkins University, Naval Surface Warfare Center Dahlgren Division, Army Research Laboratory and Wright Air Force Laboratory. We jointly determine requirements for, oversee, and measure the effectiveness of MWT R&D programs. **In this partnership, Crane's Microwave Component TC provides MWT expertise and capability to manage MWT transition from new design concepts to development and production, incorporating the latest technologies.**

Crane is one of two Navy members of the Tri-service Vacuum Electronics Steering Committee and heads the Design for Low Cost Initiative support of the Vacuum Electronics subpanel under the Electronics Panel of Project Reliance. In addition, Crane serves as a Navy member of Working Group A of the DOD Advisory Group on Electron Devices supporting the subpanel of RF Components under the Project Reliance Electronics Panel.

Crane chairs a subcommittee for Working Group A of the Advisory Group on Electron Devices, chartered by the Office of the Under Secretary of Defense for Acquisition. **This Working Group addresses the ability of the MWT industry to meet future DOD requirements and recommends DOD policy for procurement and management of MWTs.**

The Cathode Life Test Facility is a joint Tri-Service/NASA effort established within the Crane Microwave Components TC providing capability for independent assessment of new thermionic cathodes developed by the DOD, NASA, and private industry. **The jointness of this facility enables the maintenance of a repository of cathode technology supporting the MWT industrial base.**

Crane is leading an Industry/DOD Tri-Service/NASA effort to establish a MWT Manufacturability Initiative to provide MWTs to meet future DOD requirements. **Dual use impact in commercial arenas, such as communication and medical electronics, results from Crane's focus on cost-of-ownership driven MWT manufacturability efforts.**

TECHNICAL FUNCTION/CORE FUNCTIONS/GOODS & SERVICES

The Microwave Components TC is focused on baselining the design and manufacture of MWTs, measuring short and long term performance in military weapons, and feeding relevant information into product and process improvements. **Crane is responsible for cradle-to-grave (or full spectrum) management of Navy MWTs supporting the requirements for the Fleet, Aviation Supply Office, Ships Parts Control Center, Program Managers, and Program Executive Offices.**
Crane also provides MWT test and evaluation support to the Army, Air Force, and FMS customers. Shipboard weapon systems supported include the AEGIS Weapon System, Phalanx CIWS, AN/SLQ-32, AN/SPS-39, AN/SPS-40, AN/SPS-48C,E, AN/SPS-49, AN/SPS-67, MK-86, MK-92, MK-99 fire control systems, Cooperative Engagement Capability, and MILSTAR. Systems supported out of aircraft such as the EA6B, F-14, F-18, and B-52 include the AN/ALQ-99, AN/ALQ/126, AN/ALQ-162, AN/ALQ-/165, AN/AWG-9, AN/APG-65, AN/APS-115, AN/APS-116, AN/APS-130, AN/APQ-148, and AN/APQ-156.

Formal assignments, which vary by customer and weapon system, include MWT Acquisition and In-Service Engineering Agent, Designated Overhaul Point, Inventory Control Point, and Designated Stock Point. Responsibilities associated with these MWT assignments include:

(1) Establish MWT technical and logistic requirements and develop/implement plans of actions and milestones to meet these requirements.
(2) Certify MWT designs for technical adequacy to insure the MWTs meet system requirements.
(3) Develop, certify, and approve MWT specifications.
(4) Validate producibility and acceptability of MWTs.
(5) Procure, warehouse, control, and distribute MWTs.
(6) Provide MWT technical assistance in solving and improving design and manufacturing process problems.
(7) Assess and approve changes to MWT production baselines.
(8) Specify and insure compliance with quality assurance requirements.
(9) Evaluate performance of MWTs in the Fleet, assess deficiencies, and establish corrective actions.
(10) Perform independent MWT verification testing and evaluation.
(11) Repair MWTs in support of Fleet requirements when required to meet surge/mobilization requirements or when MWT requirements cannot be supported by industry.
(12) Provide MWT engineering support to weapon system program managers developing next generation of weapon systems.
(13) Provide training to the Fleet on how to handle, install, and operate MWTs.

Specific examples of the technical role Crane plays include:

- Directing the redesign of AWS MWTs to reduce signal noise thus improving AWS radar tracking and detection in high clutter sea to land operations **required to meet littoral warfare scenarios.**

- **Crane has been instrumental in development of new low noise microwave measurement techniques** for use throughout the MWT industry. This allows for system optimization to meet emerging threats.

- Qualifying and transitioning into production the Simplified Driver travelling wave tube in support of the upgrade to the AN/SPY-1B/D radar.

- **Establishment and maintenance of a MWT closed-loop systematic failure reporting and corrective action feedback system** (with over 25,000 microwave tubes at an estimated value of over $400 million being tracked) directed at detecting failures and failure trends and establishing corrective actions in a timely manner.

EXPERTISE

The Microwave Components TC within Crane does not exist elsewhere in the government or private industry. There are aspects of the physics related to the design and manufacturing of MWTs that remain unexplained resulting in both the manufacturing and repair of MWTs being an art as well as a science. **Over the last 30 years, Crane has built a cadre of artisans possessing MWT technical knowledge and hands-on experience in this art and science.**

Crane has successfully integrated technical disciplines such as microwave, digital, electromagnetic, metallurgical and mechanical engineering with the theoretical physics of MWTs. By integrating these technical experts with personnel who have maintenance, logistics, operational and acquisition expertise and by maintaining a close working relationship with the combat system program managers, the fleet and with MWT suppliers, **Crane has created a unique, successful capability within the DOD to support the Navy's critical systems so reliant on MWTs.** Crane Division's experience and expert MWT knowledge is recognized in the radar and electronic countermeasures commercial, NASA, and tri-service communities. Within the Microwave Components TC, Crane Division is the Navy's expert on the operation of crossed field amplifier MWTs.

FACILITIES & EQUIPMENT

The Microwave Components Technical Capability consist of specialized and fully operational state-of-the-art microwave test stations and high voltage equipment co-located with actual shipboard/aircraft radar transmitters, microwave integrated circuits test/evaluation & repair equipment, and the Tri-Service/NASA Cathode Life Test Equipment. This specialized facility supports not only the Microwave Components TC, but also Radar Engineering and Industrial Support, Electronic Warfare Systems, Micro-electronics, and Gun Weapon Systems TCs. Capability and capacity is designed into this facility to meet future technological changes and increased requirements due to

new military threats.This capability comprises over 50 specialized crossed field amplifier, switch tube, traveling wave tube, klystron, magnetron, and high voltage power supply and modulator test stations capable of performing the gamut of qualification and evaluation testing. The majority of these test stations utilize Automatic Test Equipment (ATE) which provides testing repeatability and increases throughput. MWTs requiring operational voltages of 50,000 volts @ 2 amperes DC to 60,000 volts @ 45 amperes pulsed can be tested on these test stations, a range of capability making this facility unique in DoD. A demineralized water coolant system provides high purity cooled water to both the test sets and MWTs under test.

The MWT test sets are supplemented by the latest state-of-the-art high voltage and microwave measurement equipment allowing for measurement of microwave power ranging from milliwatts to megawatts at frequencies ranging from 0.5 GHz to 44 GHz. Included in this facility is a Vacuum Process & Failure Analysis Laboratory, fully equipped for performing engineering and MWT prototype development. Both induction and retort brazing in hydrogen atmosphere at up to 1000 degrees C are available and include capability of brazing all of the typical brazing alloys from Cusil to copper. A double vacuum exhaust station achieves a high vacuum of 10 (-9) Torr after the high temperature bake in vacuum at 500 degrees C. This capability enables the Microwave Components TC to assist MWT suppliers analyze production process problems which occur during transition from engineering to production and during production. This laboratory, in conjunction with the surface analysis laboratory, within the Microelectronics TC at Crane, resolves metallurgical and surface physics problems. Resolution of these problems contributes to Crane being a smart buyer of MWTs and allows for development of new materials and production processes resulting in longer life and lower cost MWTs. Exact physical configuration and spacings are obtained by precise fixtures and insured by measurements made with calibrated microscopes. With the vacuum and residual gas diagnostic capability, failure trends identified in the fleet are investigated to determine the root causes of the failures so corrective actions can be taken.

Further enhancing this facility is the Integrated Environmental Test & Evaluation Laboratory containing a comprehensive array of equipment for military qualification testing in a variety of areas, including shock, vibration, temperature, humidity, altitude, and environmental stress screening. The collocation of this equipment with high power MWT test stations makes this laboratory unique to Crane. Shock testing capabilities include Navy high-impact (light-weight and medium weight) and free fall methods. Temperature and humidity testing is accomplished in an AGREE chamber providing temperature ranges of -67 degrees C to 88 degrees C with temperature rates as high as 10 degrees C per minute with 13% to 97% relative humidity. This laboratory houses a 40,000 pound-force electrodynamic shaker, one of the most powerful built in the U.S. and fully capable of performing the classic MIL-STD-167 vibration tests as well as transient shock pulses defined in MIL-S-202. In addition this shaker was designed specifically for Crane to be compatible with the AGREE chamber. Complementing this facility are computerized data collection and engineering analysis systems, including a shock analysis system, a vibration analysis system, and several engineering workstations. The shipboard/aircraft transmitter testbeds, integrated within this facility, are used for MWT/system interface testing, investigation

of shipboard and aircraft transmitter operating anomalies, and evaluation of microwave component engineering change proposals. These testbeds combined with the MWT test & evaluation test stations provide Crane the ability to perform the full range of MWT specification testing. Testbeds and associated equipment include the AEGIS Weapon System MK-99 Fire Control System, AN/SPY-1B/D, AN/SPS-40, AN/SPS-48C, Phalanx CIWS, AN/AWG-9, and AN/APG-65 transmitters. They consist of OEM production transmitter equipment configured to simulate actual shipboard/aircraft application. Use of EMI/RFI shielded enclosures and the dissipation of RF output into water loads prevents free-space transmission, allowing testing under classified conditions which would be restricted in production facilities and aboard ship/aircraft. This facility is unique, and is capable of full power radiation across the entire AN/SPY-1 and MK-99 Fire Control System operational bandwidth.

Tri-Service/NASA Cathode Life test equipments are used for evaluation of MWT thermionic cathodes and their supporting technologies. This collection of equipments are unique, and the only joint government/industry facility that supports these functions. They include an ultra high vacuum system, helium leak detector, two-color optical pyrometer, miram curve generator, and disappearing filament pyrometer in addition to cathode life test stations. In this facility new technology thermionic cathodes, in a CW operational configuration, under different loading and temperature conditions, can be evaluated and life tested for use in DoD weapon systems and NASA space applications.

Microwave integrated circuit test, evaluation, & repair equipments are used for analysis and replacement of Gallium Arsenide Field Effect Transistors and Microwave Monolithic Integrated Circuits. Included in these equipments are a state-of-the-art Class 10,000 clean room, deep access bonding machines, wedge and ball bonding machines, optical measuring and IR imaging equipment, micro welders, probing stations, a plasma cleaner, and specialized solid state device test stations. Complementing this clean room is a programmable milling machine for lid and connector removal, laser welder for lid and connector replacement. This laboratory affords Crane a unique capability in that it is the only activity within DoD or industry that can test, evaluate, and repair a broad array of solid state microwave devices down to the chip/substrate level.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

Most of the equipment comprising this facility is moveable as defined by paragraph 6, page 12; however, the Microwave Solid State Clean Room and Radio Frequency Shielded Room designed and constructed around the requirements of this facility are not moveable.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The replacement value of the equipment in this facility is $96.4 million.

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3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The replacement value of the equipment in this facility is $96.4 million.

4. Provide the gross weight and cube of the facility/equipment.

The facility equipment is estimated to fill a volume of 54,280 cubic feet at a gross weight of 684 tons. R

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

A water coolant system is required to provide 350 GPM of de-ionized, high purity, and nonconductive cooling water to the test stations. In order to operate, this system must be connected to external cooling towers with a capacity of 3.5 million BTUs per hour. Estimated costs of this high purity water system excluding installation and cooling towers is $1.5M. Additional electrical power above the normal required for lights and small items is 2,750 KVA at 450 volts (60 Hz), and 625 KVA (400Hz using tight tolerance solid state power converters). Due to the high power, high frequency pulses generated by the test stations in this facility, a grounding grid system independent of the facilities normal electrical power system support is required. Dry nitrogen is also required.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

A demineralized water coolant system provides high purity cooled water to both the test sets and MWTs under test. Estimated cost of system is $1.5M. A 3,000 sq. ft. EMI/RFI shielded enclosure is required to allow low noise MWT testing. Estimated cost of this enclosure is $750K. Special foundations are required for all the environmental equipment. Estimated cost of building these foundations is $275K. A grounding grid system is also required at an estimated cost of between $100K and $500K depending on the building.

Due to the low power low noise levels of microwave solid state devices, an environment free of electromagnetic radiation is required. A clean room is required for housing the solid state bonding machines, welders, and microscope work stations. Estimated cost of this clean room is $645K.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

Operation of this facility requires a controlled temperature and humidity environment to suppress arcing in the high voltage test stations and test fixtures and to protect sensitive computer equipment. Temperatures must be controlled at 75 degrees F +/- 5 degrees F and a relative humidity of 45% +/- 15%. The class 10,000 clean room must meet air flow/filtration, temperature and humidity requirements of FED-STD-209E.

4. Provide the gross weight and cube of the facility/equipment.

The facility equipment is estimated to fill a volume of 14,280 cubic feet at a gross weight of 684 tons.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

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8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

To replicate the facility would be at best extremely costly and at worst impossible. The facility evolved over the last 27 years integrating state-of-the-art commercial equipments with specialized high-power microwave components and software. It is a unique consolidation of MWT and solid-state test and evaluation capabilities into one facility. The typical MWT test station consist of a large modulator cabinet, power supply, large tank capacitor, test equipment rack, computer with associated peripherals, MWT socket, and associated RF components. Each test station, when packed and crated, would be a semi-truck load, and there are over 30 of these large MWT test sets. The Environmental Test & Evaluation Laboratory has several very large test stations requiring 6000 sq. ft. of floor space with 4 to 8 foot deep concrete pads installed per environmental test station. The Vacuum Process & Failure Analysis Laboratory has several large installed equipments requiring explosion proof exhaust systems and connection to several active gases used in the processing of MWTs through the repair cycle. There are more than 35 large equipment cabinets in the facilities systems transmitters (the typical transmitter cabinet is 4ft x 6ft x 3.5ft). The shipboard transmitters are heavy due to shock hardening and require plumbing for chilled water, significant electrical power, and controlled environment. Each transmitter system, when packed and crated, would be a semi-truck load, and there are five of these large transmitter testbed systems, along with three other systems.

To relocate this facility to another site would conceivably require four years to complete, and for three of those years the facility would be unavailable to the Navy and DoD. A conservative estimate of 250 work years would include trained engineers and technicians to disassemble, carefully mark each component, reassemble, calibrate, and complete the qualification process for each test set. This equipment could not be packed and transported by a normal moving company. The majority of the equipment would have to be moved on flat bed trailers with specialized air suspension trailers. The new site will require significant preparation , including increased electrical capacity, distribution of high voltage, plumbing for cooling and high purity water, explosion proof exhaust hoods, specialized active gas lines, and a grid grounding system. Assuming the use of an existing structure, site preparation would easily exceed five million dollars.

The ability to project high intensity power from the decks of our ships or aircraft while engaged in littoral warfare is dependent on Air and Surface Surveillance and Detection, Engagement, Electronic Warfare, Theater Air Defense, and Communication Systems. Failure of MWTs in these systems directly results in loss of mission capability. Furthermore the shrinking demand for MWTs threatens the continuity of the manufacturing processes at the suppliers. With a significant interruption in these processes, there is the real possibility that the "black-art" of MWTs manufacturing would preclude the MWT suppliers ever successfully recapturing the "recipe". If industry sources for MWT manufacturing and repair are lost or production problems result in lost "recipes", the Microwave Components Technical Center (TC) assists in

correcting process problems, performs limited MWT manufacture and repair, and develops new sources. Without the Microwave Tube Test, Evaluation , and Repair Facility, the Microwave Components TC would not have the tools to address these MWT manufacturing process problems or to oversee the preservation of the MWT industrial base. There is no other DoD facility or commercial supplier which has the capability of this facility.

An example of how this facility has impacted the Navy relates to the AEGIS Program. Early in the AEGIS Shipbuilding Program, the AEGIS Program recognized the problems MWTs had caused other Navy radars, i.e. poor quality, high cost, poor reliability, and established a MWT test and evaluation facility at Crane Division. This facility has positively impacted the AEGIS Fleet since that time. The number of AWS microwave tubes consumed during the building of CG47 Ticonderoga Class Cruisers was reduced by more than 57% since the first cruiser went operational in 1983. Today the cost of initially outfitting AEGIS cruisers with AWS MWTs is less than $2.8 million compared to over $10 million in 1983. From 1983 to 1993 the AWS MWT acquisition cost per operating hour per socket has been reduced from $4.55 to $0.61; this translates to a reduction of the annual MWT replenishment cost per AEGIS cruiser from over $3 million to less than $500K. Without this facility the above AEGIS success story of reduced cost and improved reliability would not have been possible.

This is the only known facility, within DoD and industry, that is effecting repair of a broad array of solid state microwave devices down to the chip/substrate level. Any one device that is being repaired may have several manufacturers which results in a relatively small quantity per manufacturer but collectively a decent quantity to sustain overall repair capability. Industry has not supported this type of repair philosophy. This facility can very easily accommodate small quantities of devices built by various manufacturers. For many of the items that are currently being repaired at this facility, this is the only known source of repair. To develop other repair sources for these items, if possible, would be time consuming and costly. In the out years, the navy would be losing their generic solid state microwave repair capability to fall back to as quantities shrink and industry's interest wanes even more than what it is today.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The first test set installed in this facility was in 1967. Since that time it has continued to evolve supporting the manufacturing and repair of microwave components out of Radar and Electronic Warfare Systems for all the services. The majority of the equipment in this facility was procured with a combination of capital investment funds and direct program funds.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

5.0 Sensors & Surveillance Systems, 5.2 Radar Systems
8.0 Defense Systems, 8.3 Electronic Warfare (EW) Systems

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Facility equipment has an average usage of 88% over the past five fiscal years.

12. Provide the projected utilization data out to FY1997.

Projected facility utilization for FY1994: 85%
Projected facility utilization for FY1995: 83%
Projected facility utilization for FY1996 and FY1997: 80%

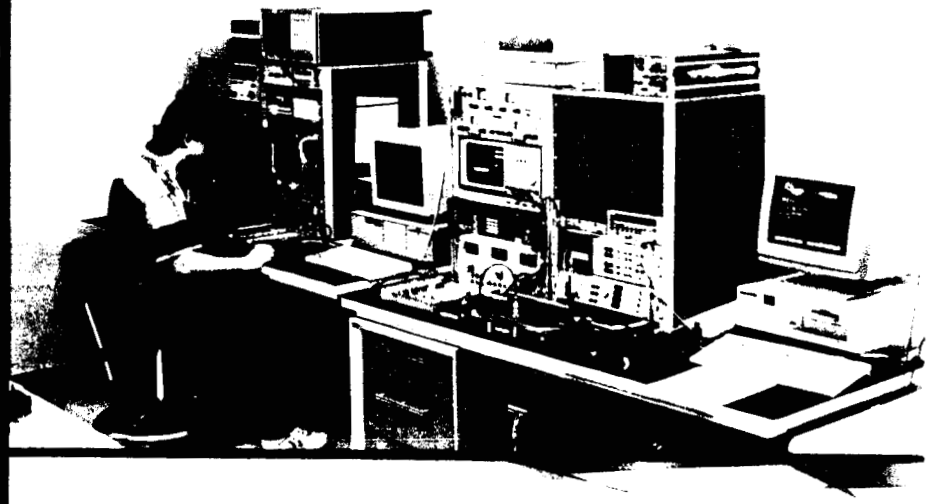
13. What is the approximate number of personnel used to operate the facility/equipment?

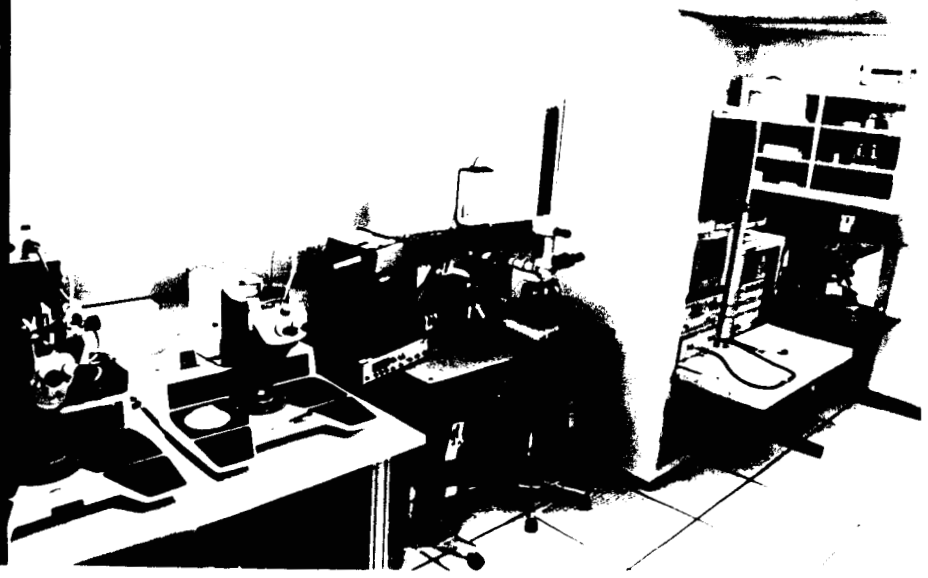
Facility operation requires 111 work years at current capacity.

14. What is the approximate number of personnel needed to maintain the facility/equipment?

Facility maintenance and calibration is an 11 work year effort.

15. Provide one 8 1/2 x 11 Black and white photo of the facility/equipment.





SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Facility/Equipment Nomenclature or Title	Electrochemical Power Systems Facility

1. State the primary purpose(s) of the facility/equipment.

SUMMARY DESCRIPTION

The Electrochemical Power Systems Technical Capability (TC#206) at Crane is a national asset providing a *full spectrum* of support for electrochemical power systems (batteries), including RDT&E, engineering, acquisition, depot rework, manufacturing, fleet support and system retirement. Such services are provided for a wide variety of batteries used in Navy as well as *Tri-Service* systems & platforms. Personnel in this TC are *recognized experts* in the field of electrochemical power systems.

This full spectrum of technical capability enhances cross-fertilization of ideas and promotes synergism. A *unique* mix of facilities, equipment and personnel provides significant in-house expertise. This expertise allows the government to *buy smart*, avoid technological surprise, advance standardization, assess progress in the battery industry, encourage competition and work with the private sector to strengthen their technical capabilities while preserving *inherently governmental* decision-making functions.

MISSION

To assure affordable, safe, and reliable batteries meet *current and future* performance requirements in operational environments: for the Navy & Marine Corps, the Army & Air Force, and other government agencies. Provide a *full spectrum* of support for batteries and related equipments from Research and Development (R&D) through system retirement.

JOINTNESS/DUAL USE

All Services within the Department of Defense (DoD) utilize this TC for battery support for both U.S. and Foreign Military Sales (FMS) requirements. Additional services and support are provided to other government agencies such as the National Aeronautics and Space Administration, the Department of Energy, Special Operations Command, and the Federal Aviation Administration. This TC is also participating in government/industry teaming such as the *dual-use* alternative fuel vehicles administered by the Advanced Research Projects Agency (ARPA). Attributes which make this TC unique are its equipment, personnel, experience and its connectivity to the power systems community. *Joint Mission Areas supported include Joint Littoral Warfare, Joint Surveillance, Strategic Deterrent, Forward Presence, and Shore Training.*

Cooperative teaming agreements between this TC and R&D activities, industry, universities, and other government agencies are in place to provide a network of knowledge and enhanced capabilities. These agreements are complementary and provide for sharing of resources and expertise to reduce program costs and attain solutions to complex battery problems.

TECHNICAL FUNCTION/CORE FUNCTION/GOODS & SERVICES

Batteries are *essential* to the operation of a great number of military systems and are a *critical* component. Military batteries differ from their commercial counterparts in that military batteries are expected to be more rugged, operate in more adverse environments and must be more reliable. There are more than 3800 different types of military batteries some of which exceed several thousand dollars each. In addition, military batteries may require special handling for safety, have a limited life requiring scheduled replacement, and are becoming difficult to dispose of due to environmental concerns.

Future military battery procurements are expected to decrease due to DoD downsizing. In order to continue to maintain technological leadership, the U.S. industrial base must be maintained at a level which maintains the quality and innovation now present. For these reasons, a core competency in batteries is *mission essential* to the DoD.

The Electrochemical Power Systems TC at Crane is a unique source of technical capability covering the *full spectrum* of battery types, support services, weapons, programs and platforms. This TC provides dedicated laboratories unavailable elsewhere, and a synergy amongst multiple programs which is *unique* within the DoD.

A full spectrum of support from RDT&E through system retirement is provided as well as many functions which are inherently government. Areas of support include requirements definition, design, development, prototyping and

limited manufacturing, standardization, test & evaluation, safety certification, technology evaluation and insertion, production engineering, in-service engineering, depot maintenance, and system retirement. Programs and projects supported include missiles and weapons, aircraft, ground support equipment, shipboard and underwater, special warfare, satellites and other space-based equipment, and various other systems (see Table 1).

Product Areas and other Technical Competency Areas supported include: NSWC *Product Areas* (i.e. Ships and Ship Systems, Surface Ship Combat Systems, Littoral Warfare Systems, Navy Strategic Weapon Systems, and Ordnance); NSWC *Technical Capabilities* (i.e. Mine Warfare Systems, Special Warfare Systems, Surface Ship Defense Systems, Surface Ship Combat & Weapon Systems, and Diving and Life Support Systems); and Crane Division *Technical Capabilities* (i.e. Night Vision/Electro Optics, and Acoustic Sensors).

This TC provides sponsors (1) *solutions* to battery problems, (2) the technical support necessary to enable them to be *smart buyers* of their power systems, (3) assistance with the *establishment of standards*, and (4) *independent verification, validation and certification* of component requirements and characteristics. Electrochemical power system improvements are fostered through resident science and technology efforts. *Technology insertion* efforts then transition these improvements to the Fleet.

Reverse engineering of batteries and associated equipments is performed to enable development of alternative sources and product improvements or investigate foreign technologies. Direct service to the Fleet is provided through liaison and training. Efforts involving *"Smart Buyer"* cost avoidances (in excess of $300 million to-date) associated with standardization and innovative *technology insertion* were recognized with the presentation of the 1992 DoD "Standardization Program Award for Excellence".

Production capabilities are provided for unique batteries for which no commercial source exists. Expertise is provided for the assessment of progress and results of government sponsored development and production programs, education of sponsors on alternatives and avoidance of technological surprise by being aware of what is available. Expertise is also provided for assistance in development and implementation of *Navy policies and standards*. The effort for the development of NAVSO P-3676 (Navy Primary and Secondary Batteries, Design and Manufacturing Guidelines) for the Under Secretary of the Navy (Research, Development and Acquisition) was originated by this TC.

Assistance was also provided to NAVSEA in the development of the Navy's *safety standard* for lithium batteries (S9310-AQ-SAF-010, Technical Manual for Batteries, Navy Lithium Safety Program Responsibilities and Procedures). The broad capabilities of this

TC allows the decision-making function concerning military batteries to remain a function of government rather than de-facto decision making by outside technical entities.

A healthy battery industrial base is an absolute necessity for the *reconstitution* of Naval forces. Employees from this TC are working members of Navy and Tri-Service industrial assessment teams which are evaluating the worldwide battery industrial base. These efforts in conjunction with smart buyer concepts, such as standardization and focused technology investments, allow this TC to participate in and *influence DoD battery policies* resulting in a smaller but thriving industrial base even in the face of downsizing.

This TC has a demonstrated history of *rapid response* to crisis situations. For example, during "Desert Shield" using our resident expertise and Prototyping Facility, batteries for the Tactical Remote Sensor System were designed, built, qualified and delivered within the short time window of four months for use in "Desert Storm". This system provided U.S. forces with first indications of Iraqi troop movements.

Employees also serve on "Red Teams" for weapons systems when failures occur which may impact weapons stockpile serviceability or *military readiness*. For instance, battery personnel have served as part of "Red Teams" assembled in response to anomalies with the TOW missile system in Somalia, the Navy's STANDARD Missile, and the Army's PATRIOT Missile.

EXPERTISE

The operational organization supporting this TC is comprised of a dedicated, professional work force with over forty-six percent scientists and engineers, and a unique depth of battery experience totalling over 1300 years. The personnel in this TC are recognized experts in the field of electrochemical power systems. Since expertise in the field of electrochemical power systems is not a curriculum in any major college or university and must be developed through years of on-the-job experience. It is critical that this *technical core* be maintained.

The Electrochemical Power Systems TC has been recognized by various programs through the issuance of formal assignments such as Technical Direction Agent, Cognizant Field Activity and In-Service Engineering Agent for several systems. Hosting of and participation at technical seminars and working groups provides for technical interchange between this TC and the *international* battery community to assure and up-to-date knowledge of the latest technological advances. Crane is a *proven leader* in the battery community. Leadership examples include (1) creation of Navy Battery Guidance Documents, (2) establishment of the Tri-Service **Av**iation **Batt**ery **S**tandardization **S**ubgroup (AVBATTSS), and (3) winner of the 1992 DoD Standardization Program Award for Excellence.

Revised pg

The Electrochemical Power Systems Technical Capability consist of the following asset:

Asset #1: This facility operates the DoD's largest (101,000 sq ft), full spectrum and most modern electrochemical power systems complex. *Unique in all the world* is a 26,400 sq ft High-Energy Battery Evaluation and Abuse Complex for test and evaluation of the latest technology batteries in a safe and ecologically suitable manner. In addition, the facility also includes a Missile/Mine Battery Evaluation Complex, a Shipboard/Aircraft Battery Evaluation Complex, an Aerospace Battery Evaluation Complex, a Material/Failure Assessment Complex, and a Battery Prototyping Complex. A list of representative equipment used in this facility is provided in Table 2. This facility is *fully functional and operational*, and was designed with expandability and flexibility to meet present and future Navy, as well as Tri Service and other government needs.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The Electrochemical Power Systems Facility is a *fixed* facility.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The facility includes a $12.5 million plant and over $23.1 million of *state-of-the-art* test and evaluation equipment, *all dedicated to batteries*.

4. Provide the gross weight and cube of the facility/equipment.

The Electrochemical Power Systems Facility is housed in 16 buildings. The volume of this facility is 1,409,200 cu ft. The facility contains a number of major equipment elements. A list of these equipments is provided in Table 2. The weight of these equipments is 382,085 lbs. R

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

The special utility support required by this facility other than normal electrical power is:

a. An additional 5,500 kVA of electrical power for operation of various items of test equipment.

b. Compressed air (120 psig) lines accessible throughout the facility.

c. Cooling towers to provide service to water-cooled equipments including three 150 ton units and one 130 ton unit or equivalent total cooling capacity.

BATTERY EXPERTISE (Years)	1-5	5-10	10-20	20+
Electronic Engineers	5	10	9	4
Chemical Engineers	1	13	0	0
Mechanical Engineers	0	3	3	2
Chemists	1	1	1	0
Technical	6	18	24	9

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a. An additional 5,500 kVA of electrical power for operation of various items of test equipment.

b. Compressed air (120 psig) lines accessible throughout the facility.

c. Cooling towers to provide service to water-cooled equipments including three 150 ton units and one 130 ton unit or equivalent total cooling capacity.

d. Additional air conditioning units for cooling of computer rooms and test areas where high heat generation equipment is located.

e. Backup electrical generators, one supplying 250 kVA and the other supplying 60 kVA.

f. Uninterruptable power systems, one providing 100 kVA and two providing 10 kVA each.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

Special budget requirements for the facility include:

a. The laboratory spaces for test and evaluation of lead-acid and lithium batteries must contain hazardous/toxic waste collection and washdown systems to prevent environmental damage in the event of an accidental release of electrolyte. The spaces for test and evaluation of lithium batteries must also have air scrubber systems to prevent release of hazardous/toxic gasses to the environment in the event of an incident.

b. Eight 5 lb High Explosive Test Cells equipped with 2500 lb blast doors. These cells must be integrated with the data acquisition and control laboratories. Environmental test equipments located within these cells must include a centrifuge, a drop shock machine and a vibration system, all capable of reproducing battery mission use environments.

c. Two 10 lb High Explosive Test Cells equipped with 4000 lb blast doors. These cells must be integrated with the data acquisition and control laboratories and environmental test equipments.

d. Vapor barrier walls surrounding lithium battery test cells with high pressure cable transits for access of test control and load cables.

e. Backup electrical generators, one supplying 250 kVA and the other supplying 60 kVA.

f. Special foundations and silencing for four environmental vibration testing systems.

g. Local Area Network connecting all engineering, laboratory and office spaces, including bridge to Wide Area Network.

h. Cable plant connecting test systems with all environmental test equipments. This cable plant currently exceeds 178 miles of wire.

i. A 630 ft^2 environmental controlled vault operation of a master computer and data storage.

j. Test alarm system integrated into facility.

k. Carbon dioxide fire suppression system for Data Acquisition and Control spaces and computer laboratories.

l. Separate test areas for each battery chemistry to avoid electrolyte contamination and for safety reasons.

m. Forklift materials handling and docking capability.

n. Office areas for 112 engineering and support personnel.

o. Integrated environmental simulation facilities including humidity, temperature cycling, vibration, shock, temperature/humidity/altitude (simultaneous and separate), sun/rain, sand/dust, salt spray, jolt, and jumble.

p. Access to x-ray facilities including real-time capability.

q. Access to ordnance materials analysis laboratory.

r. Access to Defense Reutilization and Marketing Office for recycling and disposal of test and analysis samples.

s. Operation of the facility requires a 24-hour three-shift operating crew 365 days per year.

t. Test areas secured to SECRET operations level.

u. Liquid nitrogen and carbon dioxide distribution and storage systems.

v. Closed circuit television systems for remote test monitoring and security.

w. Polypropylene ductwork in lithium battery test complex to resist caustic vapors.

x. Gas-tight valving and gas detection system in lithium battery test complex.

y. Uninterruptable power systems, one providing 100 kVA and two providing 10 kVA each.

z. Access to ordinance test range facilities.

aa. A Dry Room of 360 ft^2 and maintained at less than 3% relative humidity.

ab. Six 3 ton overhead cranes.

ac. Hazardous waste neutralization system.

ad. Nine vent hoods for venting noxious fumes.

ae. Three environmentally controlled vented chemical storage rooms.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

This facility requires a 360 ft^2 dry room controlled to a maximum of 3% relative humidity at 70°F and a 1350 ft^2 prototype laboratory controlled to 70°F and less than 60% relative humidity. Also required are two air scrubbers, one operating at 4,000 ft^3/min and one operating at 2,000 ft^3/min. All office and laboratory areas must be supplied with normal heating and air conditioning for personnel comfort. In addition, each test laboratory requires added air conditioning due to the increased heat load from computers and test systems. This facility requires a minimum of 10,712 ft^2 of temperature and humidity controlled storage space for the staging and storing of test samples.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

It would be extremely difficult to relocate or replicate this facility at another location. This is due to *unique facilities*, *imbedded major equipments*, *non-interruptible test commitments*, and the *extent of synergy* at the present complex.

Unique in all the world is a High-Energy Battery Evaluation and Abuse Facility for test and evaluation of the latest technology batteries in a safe and ecologically suitable manner. This facility is less than 2 years old and cannot be relocated, only replicated at another site. This facility contains 10 high energy test cells, air scrubbing systems, chemical containment system and other features which allow the safe evaluation of high energy battery systems while protecting the local ecology. The two 10 lb High Explosive Test Cells have 20 inch thick poured concrete walls/floors/ceilings each using 2.03 miles of 1 1/8 inch reinforcement iron bar and is equipped with 4000 lb blast doors. The eight 5 lb High Explosive Test Cells were constructed with 16 inch thick poured concrete walls/floors/ceilings each using 1.53 miles of 1 inch reinforcement iron bar and is equipped with 2500 lb blast doors. During the construction of this particular complex it was necessary to erect the building around the huge environmental test vibration system because it would not have been possible to move the vibration system into place after construction.

Several test programs conducted at this test facility are long term in nature (exceeding 20 years continuous). Interruption of these long term life tests would jeopardize test samples, data interpretation and mission replication. Any relocation of this equipment prior to test completion would truncate the test program. Some test samples cannot be shut down and moved without destroying the test samples. Sodium sulfur cells would have a severe impact because testing is conducted at 350 degrees C and because of the fragility of the cells.

Batteries are essential to all DoD mission areas and are critical components of most military systems. One of the unique features of this facility is the *synergy* between the *Navy*, *Army*, *Air Force* and other *Government Agencies* in batteries. This facility supports a wide range of battery chemistries incorporated into the full spectrum of military systems and platforms. This synergy allows the dissemination and cross fertilization of ideas throughout the government. Any piecemeal relocation of this facility would erode the cost benefits derived by synergy.

Loss of this facility would destroy a *unique* national asset capable of providing *full spectrum* support to electrochemical power systems and would result in higher cost to the Navy as well as other services and government agencies. Lost would be 1300 years of battery expertise and knowledge which could not be reconstituted. Loss of this facility would ruin the synergy between Services, and erase future cost avoidances achieved through teaming, standardization and technology insertion. The Crane site is an *exceptional* blend of state of the art and ecologically compatible facilities and equipment unavailable anywhere else in the world and serves as a bridge between industry, the user and the research community. An additional loss would be the Navy's critical capability to prototype hardware and manufacture batteries when private industry is unable to perform this function. This facility is a rare source

of technical capability covering the full spectrum of battery types and support services for multiple systems and platforms, and provides dedicated laboratories and a synergy amongst multiple programs for solving today's problems as well as tomorrow's.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The development of this facility originated in the late 1950's when the Navy decided there was a requirement for an *organic capability* to assist with battery problems. The facility has grown through the refurbishment of torpedo loading buildings and construction of specialized laboratories. This growth was in response to program requirements and the changing character of the services provided. The focus of this facility has transformed from a test laboratory to an engineering laboratory with sophisticated electronic equipments for evaluation of batteries and battery materials. The buildings were constructed on-site and were either constructed or refurbished to meet the unique needs of the battery facility. The various equipments were obtained through procurements over the span of existence of this facility. The majority of the specialized battery test equipment was designed and fabricated at NSWC Crane Division. One highly unique complex in this facility is the High-Energy Evaluation and Abuse facility. This unique facility was constructed on site. The two 10 lb High Explosive Test Cells have 20 inch thick poured concrete walls/floors/ceilings each using 2.03 miles of 1 1/8 inch reinforcement iron bar and is equipped with 4000 lb blast doors. The eight 5 lb High Explosive Test Cells were constructed with 16 inch thick poured concrete walls/floors/ceilings each using 1.53 miles of 1 inch reinforcement iron bar and is equipped with 2500 lb blast doors. Integrated into this facility is air scrubber systems and hazardous/toxic waste collection and washdown systems.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

Batteries are essential to all mission areas and are critical components of military systems. This facility provides *General Mission Support* for *batteries* in *Functional Support Area 10.8 - Other Subsidiary Systems or Components*. These batteries are incorporated into platforms, systems, subsystems and programs in the following Functional Support Areas:

PLATFORMS

1.1 Undersea
1.2 Aircraft
1.3 Surface Ship
1.4 Space Satellites
1.5 Ground Vehicles

WEAPON SYSTEMS
- 2.2 Guided Missiles
- 2.3 Free Fall Weapons and Rockets
- 2.4 Torpedoes
- 2.5 Mines
- 2.13 Other Ordnance

SPECIAL OPERATIONS SUPPORT
- 4.2 Coastal/Special Warfare Support

SENSORS & SURVEILLANCE SYSTEMS
- 5.3 Special Sensors
- 5.5 Ocean Surveillance

NAVIGATION
- 6.1 Submarine Navigation Systems
- 6.2 Aircraft Navigation Systems
- 6.3 Surface Ship Navigation Systems

COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE
- 7.2 Airborne
- 7.3 Shipboard
- 7.7 Air Traffic Control Systems
- 7.8 Intelligence Information Systems

DEFENSE SYSTEMS
- 8.1 Ballistic Missile Defense
- 8.2 Countermeasures

STRATEGIC PROGRAMS
- 9.1 Navy Strategic Systems
- 9.2 Nuclear Weapons and Effects

GENERAL MISSION SUPPORT
- 10.6.2 Aircraft Crew Equipment and Life Support

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

The majority of the complexes comprising this facility operate 8 hours a day, 5-days a week. Some complexes operate 24 hours a day, 7 days a week, 365 days per year. Those complexes which operate on a 5 day week are frequently in use beyond the normal 8 hours per day schedule. The unit of measure used for utilization is defined as continuous operation of the facility for its intended function within normal work schedules. For fiscal years 1989 through 1993, this facility was utilized 100% or more of normal work schedules.

Utilization is different from capacity which allows the addition of similiar work. The capacity of the facility is approximately 70%. For FY 90, 91, 92 and 93, this facility operated at 142, 144, 131 and 135 workyears respectively.

12. Provide the projected utilization data out to FY1997.

Projected utilization FY 1994 through FY 1997 is 100% or greater.

Electrochemical Power Systems Facility was designed with flexibility to allow for considerable workload expansion. This flexibility includes state of the art equipments designed with the foresight to accommodate a wide variety of batteries, capable of multiple use, and easily upgradable. Also available are environmental equipments capable of simulating field conditions and material analysis capabilities required by each of the three services. The Electrochemical Power Systems Facility can easily accommodate 40 additional workyears in any combination across life cycle areas in support of batteries.

he approximate number of personnel used to operate the facility/equipment?

This facility is operated by 112 personnel including scientists, engineers, technicians and clerical staff.

14. What is the approximate number of personnel needed to maintain the equipment?

Maintenance costs are approximately $110,000 of contracted equipment maintenance and 1.5 workyears in-house.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

See attached.

TABLE 1. Programs/Projects Supported

(Electrochemical Power Systems used in the following applications)

MISSILES AND WEAPONS

STANDARD Missile (SM-2, SM-1, STD ARM)
TOMAHAWK Missile
HARPOON Missile
TRIDENT I & II Missiles
POSEIDON Missile
POLARIS Missile
PHOENIX Missile
AMRAAM Missile
SPARROW Missile
SIDEWINDER Missile
Air Launched Cruise Missile (ALCM)
HELLFIRE I & II Missiles
SLAM & SLAMER Missiles
SHRIKE Missile
MAVERICK Missile
HARM & Improved HARM Missiles
TOW Missile (Basic, ER, ITOW, 2A, 2B)
MINUTEMAN I & II Missiles
PEACEKEEPER Missile
JAVELIN Missile
ATACMS Missile
CHAPARRAL Missile
HAWK Missile
LANCE Missile
LEAP Missile
LOSAT Missile
MAVERICK Missile
MLRS Missile
NIKE-HERCULES Missile
PATRIOT Missile
REDEYE Missile
ROLAND Missile
STINGER Missile
Vertical Launched ASROC
GATOR Bomb and Mines
TALD & ITALD Target Drones
GBU-24 Laser Guided Bomb
BDU-38 Practice Bomb
Supersonic Low Altitude Target (SLAT)
MK-50 Series Sea Mines
CAPTOR Mines
MK-57 Mine Destructor System
MK-30 Practice Torpedo

AIRCRAFT

A-6 INTRUDER Aircraft
AV-8B HARRIER II Aircraft
F-4 PHANTOM Aircraft
F-14 TOMCAT Aircraft
F-16 FALCON Fighter Aircraft
F/A-18 HORNET Aircraft
F-22 Fighter Aircraft
F-117 STEALTH Fighter Aircraft
P-3 ORION Aircraft
B-1B Bomber Aircraft
B-52 Bomber Aircraft
V-22 OSPREY Vertical Take-Off Aircraft
H-1 HUEY Helicopter
AH-1W SEA COBRA Helicopter
H-2 SEASPRITE Helicopter
H-3 SEA KING Helicopter
H-46 SEA KNIGHT Helicopter
H-53 SUPER STALLION Helicopter
H-60 SEAHAWK Helicopter
VH-60N EXECUTIVE Helicopter
AH-64 APACHE Helicopter
C-2 GREYHOUND Cargo Aircraft
C-130 HERCULES Aircraft
C-141 STAR LIFTER Cargo Aircraft
T-2 BUCKEYE Trainer Aircraft
T-34 MENTOR Trainer Aircraft
T-38 TALON Trainer Aircraft
T-45 GOSHAWK Trainer Aircraft

SHIPBOARD AND UNDERWATER SYSTEMS

AN/WSN-2 & 5 Surface Ship Navigation Systems
AN/WSN-1 & 3 Submarine Navigation Systems
AN/WIC Submarine Communication and Alarm Systems
Damage Control Wire Free Communication (WIFCOM) System
Standard Monitoring and Control System
AN/BSY-1 & 2 Submarine Combat Systems
TRIDENT Fire Control System
Cooperative Engagement Capability (CEC) System

SPECIAL WARFARE

MK-8 & MK-9 Seal Delivery Vehicle
Night Vision Equipment
Marine Corp Communications Equipment
Target Detection Systems
Diving Equipment

SATELLITES

Space Based Surveillance
Space Station Freedom
Global Positioning Satellite (GPS)
Upper Atmosphere Research Satellite (UARS)
National Oceanic Atmospheric Administration Satellite (NOAA)
Cosmic Background Explorer (COBE)
Tracking Data Relay Satellite System (TDRSS)
International Ultraviolet Explorer (IUE)
Gamma Ray Observatory
Hubble Space Telescope
Geostationary Operational Environmental Satellite (GEOS)
Defense Meteorological Satellite
Earth Radiation Budget Satellite
Long Duration Exposure Facility
Application Technology Satellite
Planetary Explorer
Radio Astronomy Explorer
Orbiting Astronomical Observatory
Dynamic Explorer

GROUND SUPPORT EQUIPMENT

Aircraft Tow Tractors
Armament Maintenance Trailer
Weapon Loader
Mobile Electric Power Plant
Electrical Power Unit/Auxiliary Power Unit Test Set
Portable Floodlight Set
RPV Support Trailer
Ultrasonic Flaw Detector
Electronic Flaw Detector
Oxygen/Nitrogen Generating Plant
Turbofan/Jet Engine Test System
Portable Hydraulic Power Supply
Tactical Aircraft Deicer
Spray Outfit Preservation Machine
Portable Air Compressor
GSE Towing Tractor
Aircraft Maintenance Crane
Truck Mounted Aircraft Deicer
Crash Crane
Aircraft Maintenance Platform
Aircraft Boarding Staircase
Gas Turbine Auxiliary Trailer
Electric Ammunition Loader
Aircraft Spotting Dolly
Fire Fighting Truck
Mobile Air Conditioning Unit

OTHER SYSTEMS

FAA Navigation Aid Systems
FAA Air Traffic Control Communications Systems
MK-72 Flares
Tactical Remote Sensor System (TRSS)
Coast Guard Navigational Aids
Emergency Lighting Systems
Electric Vehicles
Natural Gas Vehicles
NACES Aircraft Ejection Seat
LTN-72 Aircraft Inertial Navigation System
Solid State Barometric Altimeter (SSBA)
AN/DKT-27 Missile Telemeter
AN/DKT-42 Missile Telemeter
AN/DKT-53 Missile Telemeter
AN/DKT-71(V) Missile Telemeter
SLAM Data Transfer Module
MODSM Module
POET Transponder
General Purpose Applications (MIL-B-18)

TABLE 2. Equipments

SPECIALIZED BATTERY TEST SYSTEMS

Shipboard Battery Test System
Mine Battery Test System
Navigational Battery Test System (Qty-2)
Primary Battery Test System (Qty-5)
Silver Battery Test System
High Frequency Battery Test System
Aerospace Cell Test Data Retrieval System
Aerospace Data Reduction System
Aerospace Nickel Hydrogen Cell Test System (Qty-2)
Aerospace Nickel Cadmium Cell Test System (Qty-2)
Air Force Charge/Discharge Test System
Airborne Equipment Test System
Aircraft Lead Acid Battery Test System
Aircraft Nickel Cadmium Battery Test System
Coast Guard Solar Panel Test System
Engineering & Acceptance Test System (Battery Prototype Development) (Qty-2)
FBM Battery Plate Test System
Fleet Ballistic Missile Battery Test System (Qty-2)
High Temperature Power Sources Test System
Industrial Data Link Automatic Test Equipment
Lithium Safety Test System (Qty-9)
MIL-B-18 Test System
NELO Cell Screening & Analysis Test System
NELO Life Cycle Test System (Qty-3)
NELO Low Rate Test System (Qty-2)
NELO Polarization Test System
NELO Safety Test System
Power Test 8000 ATE
Sodium Sulfur Life Cycle Test System
Sodium Sulfur Pulse Test System
Strategic System Battery Universal Cell Tester
Switch Mode Power Amplifier Test Station
TRSS Test System
Water-Activated Battery Test System

ENVIRONMENTAL TESTS

Altitude Chambers (Qty-2)
Centrifuge (Qty-2)
Dynamic Pressure System (Unique)
High Temperature Test Chamber/Ovens (Qty-3)
Re-entry Vehicle Spin Test Machine
Salt Spray

ENVIRONMENTAL TESTS—continued

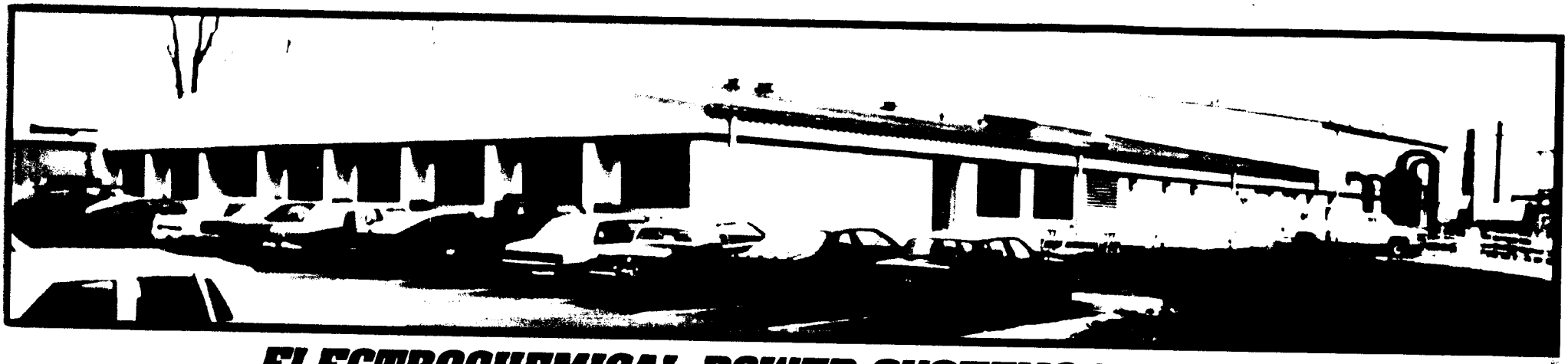
Shock Impact Test Machines (Qty-2)
Shock Spectrum Synthesizer
Temperature Chambers (Qty-56)
Temperature and Humidity Chambers (Qty-2)
Transient Recorder
Vibration Control Systems (Qty-4)
Vibration Systems (Qty-4)

MATERIAL ANALYSIS

Carbon Coulometer (Unique)
Carbon Sulfur Analyzer
Emission Spectrometer
Fourier Transform Infrared Spectrometer
Gas Chromatograph (Qty-2)
Inductively Coupled Plasma Spectrometer
Inert Atmospheric Enclosure
Ion Chromatograph
Mass Spectrograph with Gas and Liquid Chromatography (LC/GC/MS)
Surface Area Analyzer (Unique-Whole Plate)
Tensile Strength Instrons (Qty-2)
Thermal Analysis Equipment (TG/DSC)
X-Ray Diffraction
X-Ray Photoelectron Spectrometer (Unique-Whole Plate)

OTHER SYSTEMS & EQUIPMENT

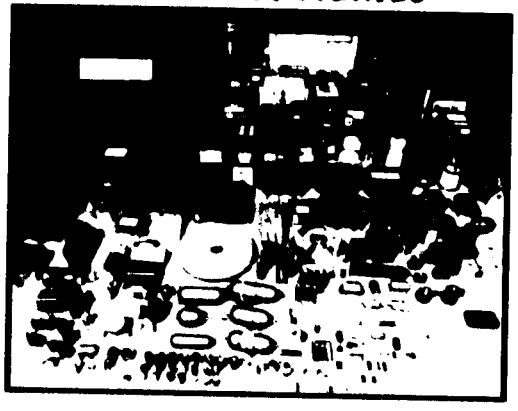
CAD Systems (Qty-3)
Foam In-Place System
Graphics Workstations (Qty-3)
Horizontal Milling Machine
Mass Spectrometer Helium Leak Detector (Qty-2)
Network Access Servers (Qty-2)
Precision Microscope
Signal Memory Recorder
Test System Uninterruptible Power Source (Qty-2)
Thermal Imaging System
Water-cooled 20kW loads (Qty-3)
Waveform Recorder (Qty-3)
150 PCs connected through four network servers with 50 printers/plotters/scanners



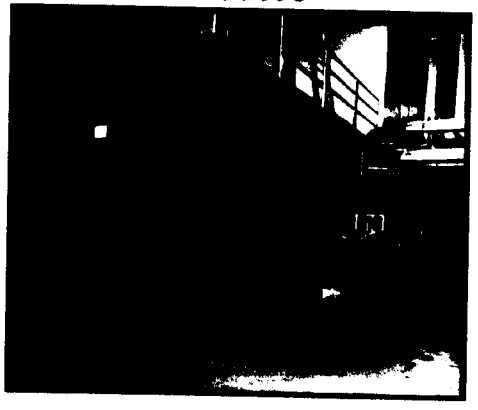
ELECTROCHEMICAL POWER SYSTEMS FACILITY

FAILURE ANALYSIS

FAMILY OF BATTERIES



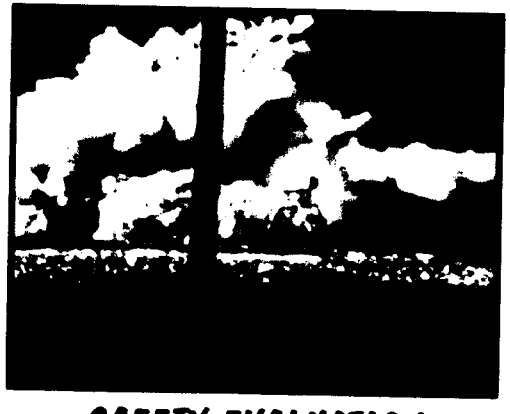
TEST CELLS



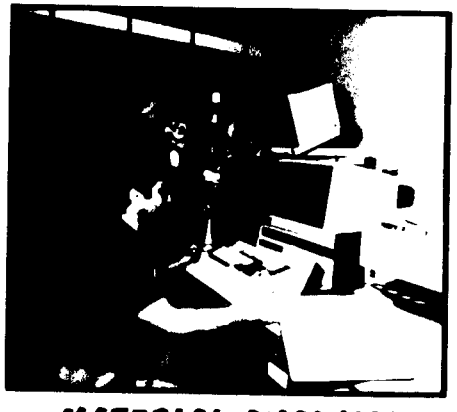
ENVIRONMENTAL

PROTOTYPE

PERFORMANCE EVALUATION



SAFETY EVALUATION



MATERIAL ANALYSIS

SPECIAL FACILITIES AND EQUIPMENT FACILITY/EQUIPMENT CAPABILITY FORM

Technical Center	NSWC Crane Division Crane, IN
Facility/Equipment Nomenclature or Title	Small Arms

1. State the primary purpose(s) of the facility/equipment.

SUMMARY DESCRIPTION

Crane Division is the Navy's recognized expert in small arms, providing the only comprehensive life-cycle support capability in one location anywhere within the Department of Defense. Through the Division's technical leadership, the Navy and Naval Special Warfare Forces are provided with the world's finest small arms weaponry, fully supported by engineering, acquisition, logistics management, maintenance and training. **Similar support is also provided for the Marine Corps, Army, Air Force and United States Special Operations Command** on a variety of small arms programs. New warfighting strategies predicated on rapid response capabilities highlight the Division's vital importance in a changing global environment, with Fleet responsiveness the primary focus of a professional staff and modern infrastructure dedicated solely to small arms support. **The unique arrangement of all functions, facilities and personnel within one location creates synergy which provides the Navy with unmatched small arms flexibility and technical knowledge for meeting the small arms needs of the Navy well into the 21st century.**

MISSION

The mission of the Small Arms Technical Capability (TC) is to maintain small arms readiness for the Navy and for Naval Special Warfare consistent with mobilization requirements. Full life-cycle support, including design, development, acquisition, engineering, test and evaluation, logistics management and maintenance is performed on small arms weapons, mounts and ammunition to meet Navy needs for shipboard defense, amphibious operations, base security, anti-terrorist activities, Navy construction battalions, Fleet support use and training. In addition, the Small Arms TC provides rapid response capability in the event of crisis situations, and surge capacity to meet mobilization requirements. With the Navy's shift in focus from blue water operations to littoral warfare, as outlined in the strategic document "From the Sea: Preparing the Naval Service for the 21st Century," **increased utilization of Naval Special Warfare and Marine Corps forces will place mission emphasis on providing advanced, state-of-the-art weaponry designed to meet the unique requirements of unconventional warfare in a littoral setting.**

JOINTNESS/DUAL USE

The Small Arms TC plays an extensive teaming role in Tri-Service small arms programs, often through Memorandums of Agreement, Memorandums of Understanding, and Inter-Agency Agreements. As

part of a joint Department of Defense program for small arms development (the Joint Services Small Arms Program, JSSAP), **Crane participates with the Army and Air Force in research and development programs for advancing the state-of-the-art in small arms weapons, mounts and ammunition.** Crane also represents the Navy on various JSSAP technical committees which oversee this program. Munitions Effectiveness Studies are conducted for the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG-ME) on Special Operations Forces targets. **Crane is also a principal weapons developer for the United States Special Operations Command (SOCOM)**, serving as Program Manager for the Offensive Handgun Program (USSOCOM's first joint service developmental program) and the M4 Carbine Special Operations Modification (SOPMOD) program, and as Weapons Integration Manager for the MK V, Patrol Coastal and RIB Craft. Research and development, test and evaluation and asset tracking and serialization control are performed for the Marine Corps. **Small arms depot level maintenance and repair are performed for selected Army, Air Force, and Marine Corps assets** under Depot Maintenance Interservice Agreements. Additionally, the **Coast Guard Small Arms Facility is co-located with the facilities of this technical capability** and is supported through acquisition, storage, and the sharing of equipment and ranges.

Crane promotes dual-use technologies in small arms by processing information gathered through extensive fleet/user interface into science and technology requirements for industry. **These requirements are translated into system improvements, which are then transitioned into the fleet.** Although small arms for military applications are similar to their commercial counterparts, the maritime environment in which Navy small arms operate is the harshest in the world. **Crane provides technical oversight and input which insures that products developed by the private sector as a result of commercial-military integration meet the specified needs of the user.** Recent examples of private sector science and technology efforts to support Navy requirements include ammunition development programs for a 40mm high velocity cannister cartridge and 9mm frangible ammunition, development of the Offensive Handgun, and stabilization of the .50 caliber machine gun.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

I. *TECHNICAL FUNCTIONS.* **The Small Arms TC provides full spectrum life-cycle support for the Navy and Naval Special Warfare Forces and is the Navy's only source of this capability.** All functions, facilities, personnel and equipment exist within one location to provide:

- Complete life-cycle engineering on small arms weapons, mounts and associated equipment, including requirements definition and validation, concept development, translation of design approaches into producible hardware, scientific, engineering and technical analyses, technology evaluation (including foreign weapons), engineering and performance documentation incident to acquisition, safety certification, malfunction and failure

investigations, type classification, development of maintenance and logistics requirements, configuration control for Navy unique hardware, and training. **Extensive test and evaluation capabilities support developmental programs, acquisition, product improvements, safety certification, fleet/field failure investigations, and maintenance.**

- Comprehensive engineering and technical support for small arms ammunition, light anti-armor munitions, grenades, mines, mortar ammunition, and special purpose munitions. Engineering analyses, threat assessment, technical performance evaluation, specification development, malfunction investigations and munitions effectiveness studies are performed to support acquisition, product improvement programs, safety certification and production. **This wealth of ammunition expertise compliments engineering efforts for weapons and mounts to form a total system capability for small arms.**

- Program support to the Navy Small Arms Program Manager through maintenance of a worldwide weapons serialization and tracking program, bar-coded inventory management of Navy weapons and mounts, allowance management, verification of all afloat and ashore unit assets, requirements planning, identification of unusable inventory, and disposal of unwanted assets. **Crane is the inventory control point for small arms weapons, mounts, and special purpose ammunition.**

- **Intermediate level maintenance on all Navy small arms, and depot level maintenance on selected weapons for other services as well as on Navy unique weapons.** Match conditioning is performed on all Navy match small arms, through conversion/conditioning from standard weapons or fabrication from basic components. Intermediate and depot maintenance is performed on sniper weapons. **Match vans provide support and training for Navy shooters at service and fleet matches and at training sites around the country.**

II. *CORE FUNCTIONS*. Small arms are a critical component in maintaining the readiness of Naval forces worldwide. They play a vital role not only in combat situations for the Navy and Naval Special Warfare personnel, but also in providing the last line of defense for the physical security of Navy assets (both afloat and ashore) and the personnel safeguarding those assets. **Because the maritime operating environment for small arms is stringent, harsh and unique to the Navy alone, maintaining a core competency in small arms technology is mission essential to the Navy.** Crane is a unique source of technical capability covering the full-spectrum of Navy small arms requirements, and provides unmatched synergy amongst its functions which is not available elsewhere. The core functions performed within this technical capability include:

- **Personnel within the Small Arms TC are experts in all areas of technology relating to small arms, mounts and ammunition.** The sustainment of this technology base is essential to being able to direct commercial, academic and government resources to the operational and environmental problems of Navy small arms, and in ensuring that technological innovation is a continuing part of Navy small arms programs. **This latter point is particularly important for Naval Special Warfare forces,** whose mission requirements are the most encompassing in the world.

- The Small Arms TC plays an integral part in the acquisition process. As is true in many areas, the development and production of small arms is left primarily to the private sector. **Crane's role is to ensure the design of commercial equipment is technically sound and meets the performance requirements of the user.** In addition to technical determinations, an economic assessment must be made as to whether the item is producible and affordable, thus Crane must serve the **role of a "smart buyer"** as well.

- Crane's role as a full spectrum provider of small arms life-cycle support for the Navy, as well as for other services, has afforded the opportunity to **develop and maintain state-of-the-art test ranges and facilities that cannot be economically duplicated in the private sector.** In addition, the Small Arms TC has the advantage of sharing these resources with other Crane technical capabilities (Night Vision/Electro-Optics, Conventional Ammunition) as well as having access to facilities it does not own (such as environmental test facilities).

- Crane has unmatched personnel, facility and equipment resources to achieve **rapid response in times of national crisis.** Any or all engineering, T&E, prototyping, production, acquisition, maintenance, shipping and tracking functions can be called on to react immediately to mobilization requirements. In addition, **this co-location of all personnel, facilities and equipment, coupled with Crane's role as the inventory control point for small arms assets, virtually eliminates lag time, thus increasing responsiveness to a level which cannot be approached elsewhere.**

- **Crane's experienced technical base closely monitors emerging small arms technologies for rapid insertion into the operational environment,** particularly for Special Operations Forces (SOF) applications, where mission requirements may be jeopardized without the most sophisticated equipment. By developing close working relationships with SOF personnel, Crane technical experts are also able to translate user needs into technology requirements for industry, thus **insuring a continuing advancement of the state-of-the-art in small arms weaponry.** For small arms

mounting applications (primarily machine guns), where commercial applications are limited, Crane engineers play a lead role in design and development, yet still **utilize advanced materials and components developed by industry for use in other maritime applications.**

III. *GOODS AND SERVICES.* **The Small Arms TC provides support for a wide range of small arms weapons, mounts and ammunition utilized by the Navy and Naval Special Warfare Forces.** Engineering and technical services supporting this product line include:

- Total life-cycle engineering for small arms weapons/mounts; acquisition engineering, production engineering and technical support for ammunition.
- Close linkage of small arms experts to the evolving technology base for small arms weaponry in order to avoid technological surprise, validate technical requirements, and support the Navy as a smart buyer.
- Safety certification of weapons, mounts and ammunition for service use.
- Life cycle weapons tracking and requirements determination.
- Secure weapons storage and staging; rapid shipping to support mobilization.
- Intermediate/depot maintenance, capable of significant surge capacity.
- Maintenance of the Navy's match conditioning program for weapons and sniper rifles; custom handloading of ammunition for match competition/SOF Forces.
- Rapid prototyping and low-rate initial production of hardware to support mobilization or limited deployment.
- Manning of on-site repair vans to support Naval Special Warfare units on both coasts and various training sites nationwide, including Sniper Schools.

EXPERTISE

The coupling of small arms engineering, acquisition, logistics and maintenance has produced a seasoned, professional workforce with over **1200 years experience** in small arms technology. **Crane is the Navy's recognized expert for this technical capability.** Personnel disciplines include:

- Mechanical engineers (1-35 years experience) with extensive theoretical and operational knowledge in the design and functionality of small arms systems, continuously supplemented by hands-on experience gained through engineering development, test and evaluation, and technical support for fielded hardware.

- Engineering technicians with (4-26 years experience) with significant small arms technical/operational expertise, again acquired through extensive hands-on work in development, prototyping, test and evaluation, and field support.

- Equipment specialists and program analysts (<1-24 years experience) with expertise in logistics, configuration management and data analysis as these disciplines pertain to full life-cycle support for small arms.

- Systems analysts (21-25 years experience) who are specialists in data management/computer program development. An extensive knowledge base has been generated working with DOD requirements for small arms serial number tracking, inventory control, requirements planning and asset control reporting.

- Small arms repairers (3-22 years experience, gained through sizable military as well as government service) with intricate knowledge of small arms maintenance and repair, including the complex operations associated with match weapon conditioning and fabrication. These personnel provide complete small arms training and instruction to fleet and special warfare personnel.

The Small Arms Technical Capability consists of the following asset.

Asset #1 - The primary purpose of the Weapon Development and Test Facility (WDTF) is to develop, manufacture, evaluate, repair, maintain and store small arms (up to and including 25mm) weapons, mounts and ammunition. Night vision equipment is also repaired, tested and stored. The WDTF is a high security complex and houses the technical personnel who are responsible for small arms hardware development and testing. Approximately 90% of a weapon system's development can be accomplished within the complex. This results in significant operational cost savings and a much improved security control capability. The WDTF features the following capabilities:

Prototype Shop and Underground Range. 18,000 sq. ft. is dedicated to a rapid prototyping shop, engineering test and assembly areas, and a 100 meter underground test range which is unique to the Navy. The underground range has the capability to test calibers up to 25mm and features a climatic test cell for firing weapons under temperature/humidity extremes and freezing rain conditions. State-of-the-art test equipment within this facility which compliments developmental efforts includes temperature chambers, a salt-fog test chamber, a cyclic load test machine, and extensive data acquisition and ballistics test equipment. With the capability for testing lasers and night-vision equipment under controlled lighting and temperature conditions, the facility is dual-use with the Night Vision/Electro-Optics technical capability.

1000-Yard Outdoor Firing Range. This range, encompassing 14 acres, contains computer-controlled automatic targeting system stations (from 50-1000 yards) and a full range of ballistic test equipment including a doppler radar unit which can provide continuous projectile velocity information. The electronic, computer controlled, targeting system is capable of determining precise hit locations and remaining velocity, energy, and time of flight for projectiles at protective target locations out to 1000 yards. It allows for two simultaneously active firing points (two firing lanes) and includes an additional portable system for use at indoor or other range facilities. It also has an integral chronograph and weather station. The system includes pop-up targets allowing for collection of target acquisition data and hits as a function of time at various ranges. Reports can be stored, printed and fully tailored to a specific test with all statistical data available after each shot group is fired. The system is used in conjunction with various ammunition, rifle and machine gun tests. The range can accommodate sniper weapon firing or large mounts up to 25mm affixed to reinforced concrete and steel pads. This facility is also dual-use with laser and night-vision equipment.

Maintenance Shop. A 22,000 sq. ft. maintenance shop is set up in a flexible work station layout to accommodate intermediate/depot maintenance and repair on all Navy small arms, in both large and small quantities. An adjacent 1000 inch indoor range equipped with 6 firing lanes and an automatic targeting system supports maintenance operations through function firing and malfunction investigations. All Coast Guard small arms repair activities are co-located within this shop.

U.S. Coast Guard Small Arms Maintenance Shop. The U.S. Coast Guard Small Arms maintenance shop is co-located within the Small Arms Maintenance Shop and is supported by the same equipment and facilities, including ranges. This includes parts acquisition, cleaning of small arms, metal cleaning, refinishing (including phosphate coating, black oxide, and painting) function firing, final cleaning, and packaging for storage, storage and shipment. The Coast Guard is a DOT organization, however in time of war the Coast Guard becomes part of the U.S. Navy. In such an eventuality, the co-location, coordination and support is even more important to both the Navy and the Coast Guard.

Match Conditioning Shop. A 1600 sq. ft. sniper/match grade weapons condition-ing shop contains integral machining, grinding and finishing equipment to manufacture and maintain match grade, competition and sniper weapons.

Secure Storage/Staging. Over 85,000 sq. ft. of warehousing space is available for small arms storage/staging. Security controls include limited personnel access, a 24-hour security watch, perimeter fencing with motion detectors and video surveillance, and a continuous door alarm system. Inventory management and preservation and packaging capabilities are inherent to this facility. The relatively remote location of Crane Division in a rural area, the size of the Crane Site (64,000 Acres), the location of the Small Arms Facility (over two miles from the Division entry gate by road and over a mile over rough terrain to the Division perimeter fence), and the location of the Outdoor Range and range impact area between the Small Arms Facility and the Division perimeter fence - all contribute to enhanced security. This level of security would be difficult, if not impossible, to duplicate elsewhere without tremendous expense.

EQUIPMENT. A wide array of modern, specialized equipment is contained within the WDTF. This includes advanced CAD/CAE engineering workstations, standard and rapid prototyping equipment, match weapon conditioning equipment, test and evaluation equipment and instrumentation, maintenance and repair equipment, and a networked file server for small arms data management. Additionally, several pieces of equipment specially designed for environmentally safety are under procurement to support maintenance and testing operations, including corrosion control powder coating equipment with a stationary shot blast system and waste water treatment system, soap-based (rather than tetrachloride based) parts degreasers, and a passive bullet trap to minimize lead contamination from weapons firing. A list of equipment supporting the technical capability and its associated replacement value is listed in Table 1.

The total capabilities of the WDTF are truly unique in the United States.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

This facility is not portable or moveable. The enclosed portion of the complex includes over 120,080 sq. ft. of floor space. The underground range alone contains 2,000 cubic yards of poured reinforced concrete. The terrain of the outdoor range is uniquely suited for this type of operation and includes test capabilities up to 1000m.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

Replacement value:

Facility	*$15,016,500*
Equipment	*$ 2,786,600*
Total	*$17,803,100*

4. Provide the gross weight and cube of the facility/equipment.

Gross weight: approximately 247 tons.
Gross volume: approximately 2,391,300 cubic feet.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support, other than normal electrical power:

a. Steam (for HVAC Systems) approximately 1,100,000 pounds per year.

b. Compressed air (for HVAC Control System) approximately 4,000 cubic feet @20 PSIG per year.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

Special budget requirements: servicing bullet traps - $72,000 per year.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

This facility is designed to maintain a temperature of 72°F ± 4°F and 50% ± 5% relative humidity. Specialized exhaust systems in both indoor ranges and in plating facility.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

The Weapon Development and Test Facility is unique in that it was designed to support the total development/test & evaluation/maintenance and repair/data management/receipt & storage of weapon systems at a single site at Naval Surface Warfare Center Crane Division. Over 1,200 man-years of Small Arms experience are present at this location. Extensive security is maintained both by state-of-the-art-security measures and by the remote physical location of the facility. It therefore, would be extremely difficult or impossible to replicate or relocate this facility/equipment to another site.

The total capability of the WDTF does not exist at any other location within the United States. Some very specialized WDTF capabilities, such as firing complete, assembled small arms weapon systems under high (160°F) or low (-65°F) temperature conditions and firing under controlled icing/freezing rain may not exist within the United States. Other WDTF capabilities do exist at Government and commercial facilities within the Untied States, however a large expense would be incurred in transporting and housing personnel and in transporting weapon systems/ammunition hardware to the locations of facilities having the desired capabilities. In addition to these additional expenses, there is the ever present security risk of weapons/ammunition loss during transportation. Therefore, the loss of this capability at this site would have a significant negative impact on the Navy in terms of the cost and technical competence associated with maintaining small arms readiness.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The basic building is concrete block on a poured concrete slab and was constructed in 1944. Small arms maintenance facilities were moved here in 1968. The indoor pistol range and the adjacent outdoor range were added in 1973. The Underground Range (a poured reinforced concrete structure) and Prototype shop (metal construction) were constructed between September 1988 and August 1991 as part of a MILCON project.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

FUNCTIONAL SUPPORT AREAS
2. Weapon Systems;
2.1 Gun Systems

4. Special Operations Support;
4.2 Coastal/Special Warfare Support

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

UTILIZATION
FY89: 110.0 wkyrs.
FY90: 107.0 wkyrs.
FY91: 115.4 wkyrs.
FY92: 117.2 wkyrs.
FY93: 113.4 wkyrs.

Utilization is defined as the number of workyears performed by personnel throughout the WDTF on an annual basis, including the test ranges and storage areas.

12. Provide the projected utilization data out to FY1997.

PROJECTED UTILIZATION
FY94: 114.6 wkyrs.
FY95: 102.5 wkyrs.
FY96: 102.7 wkyrs.
FY97: 93.3 wkyrs.

13. What is the approximate number of personnel used to operate the facility/equipment?

The number of personnel operating this facility and its equipment totals 125.

14. What is the approximate number of personnel needed to maintain the equipment?

Approximately three persons are needed to maintain this facility and its equipment.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

See attached.

TABLE 1: WEAPON DEVELOPMENT AND TEST FACILITY

Equipment/Equipment Replacement Cost

ENGINEERING

Hewlitt-Packard CAD System	$ 75,000
Intergraph CAD/CAE System	153,800
Drafting Plotter	9,800
CPS Printer	2,000
Data Acquisition System	10,000
Personnel Computers (Engineering)	370,800
Data Management Computer System	68,000

PROTOTYPING/FABRICATION

Coordinate Measuring Machine	24,800
CNC Milling Machine	53,600
Digital Optical Comparator	33,000
CNC Turning Center	190,000
Lathe	14,400
Vertical Milling Machine	24,900
Milling Machine	16,000
Arc Welder	1,800
Gun Drill	1,500
Rifling Machine	1,500
Rapid Prototype Sterolith	126,000
Surface Grinder	15,200

TEST & EVALUATION

Targeting Systems (Outdoor)	200,000
Targeting Systems (Indoor)	60,000
Magnetic Particle Inspection Machine	13,400
Cyclic Load Test Machine	109,000
Environmental Test Chamber	21,500
Environmental Test Chamber	6.000
Environmental Test Chamber	5,500
Environmental Test Chamber	7,700
Thermal Imaging System	28,000
Digital Oscilloscope	34,300
Oscillographic Recorder	10,000
Oscilloscope	6,700
Digital Spring Tester	5,000
Salt Fog Chamber	19,400
Doppler Radar System	88,100
Flash X-Ray Detector System	95,000
Velocity Computing Computer	12,000
Velocity Skyscreens (2)	17,600
Impulse Photometer	15,300
Pressure Tester	27,700
Multi-Frequency Sound Analyzer	9,000

MAINTENANCE/MATCH WEAPON CONDITIONING

Coating Tanks/Exhausts	16,000
Vapor Degreaser	44,800
Vapor Degreaser	15,200
Organic Degreaser	20,000
Wheelabrator	40,000
Powder Coating Equipment	300,000
Stationary Shot Blast System	63,000
Waste Water Batch Treatment	78,000
Hoists	5,000
Parts Washers (Biodegradable) (4)	34,800
Blast Cleaning Hone	19,000
Hones (3)	27,000
Flap Sander	5,000
Paint Booth	4,000
Magnaflux Machine	40,000
Cleaning Line Tanks/Exhaust (6)	8,500
Lathes (2)	12,000
Mills (2)	10,000
Drill Presses (2)	2,000
Blast Cabinets (2)	24,100

SECURITY

Metal Detector	5,700
Video Surveillance System	50,000
Perimeter Alarm System	75,000

TOTAL EQUIPMENT VALUE $ 2,786,600

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Conventional Ammo Technical Capability

1. State the primary purpose(s) of the facility / equipment.

CRANE DIVISION
TECHNICAL CAPABILITY #10

TITLE

CONVENTIONAL AMMUNITION ENGINEERING

SUMMARY DESCRIPTION

The Crane Division is the Navy's recognized expert in the production of surface ship ammunition. **For over 20 years, Crane has provided the link from design to production and delivery of safe and reliable ammunition to the Fleet.** Crane has provided these unique required services through the development and implementation of a program that includes ordnance engineering, production support, statistical process control, product testing and disciplined configuration management.

The need to maintain this ordnance engineering expertise became apparent in the mid-1960's when the Navy experienced a number of in-bore detonations in ship's 5-inch guns. **These failures highlighted the lack of production engineering expertise in the Navy and resulted in the formation of a cadre of engineers and scientists at Crane** (the Naval Ammunition Production Engineering Center) to provide a single focal point for engineering control over design, production and maintenance of safe Naval Ordnance.

MISSION

The Conventional Ammunition Technical Capability (TC) provides safe, reliable, and effective conventional ammunition to the Fleet and Marine Corps from acquisition through demilitarization. The scope varies from surface ship conventional ammunition (2T cognizance ammunition) to selected items of air launched conventional ammunition (2E cognizance) and to ground launched conventional ammunition used by the Marine Corps (OT cognizance).

Product support includes gun ammunition, off-board countermeasures, Special Warfare special purpose munitions, and demolition devices. The Marine Corps ammunition includes air defense and anti-armor missiles, missile launch platforms and their command and control systems. **Engineering efforts also support Army, Air Force, Special Operations Command, Coast Guard, FBI, DIA and Foreign Military Sales.**

The Conventional Ammunition TC supports the Joint Littoral Mission Area in the Operational Capabilities of Battlespace Dominance and Power Projection. Support for Naval Special Warfare special purpose munitions and fire support for amphibious assault operations is provided by this capability.

EXPERTISE

Crane Divisions professional and technical workforce averages 17 years of experience. Conventional Ammunition TC experience is listed below by major skills groups.

YEARS OF EXPERIENCE	1-5	5-10	10-20	20+
IND/MECH/AERO ENGINEERS (73)	3	16	21	33
ELECTRONICS ENGINEERS (30)	2	12	4	12
CHEMICAL ENGINEERS (12)	1	5	3	3
CHEMISTS (10)	1	1	4	4
ENGR/MECH/IND TECHNICIANS (90)	1	8	30	51
ELECTRONICS TECHNICIANS (38)	4	8	13	13
MATH STAT/OPS RES ANALYSTS (18)	0	4	7	7
LOG MNGT/PROG ANALYST (42)	0	6	16	20
EXPLOSIVE OPERATORS (38)	2	3	18	15
TOTALS (351)	**14**	**63**	**116**	**158**

Crane's life cycle engineering support of the many different ordnance items represented by conventional ammunition requires a knowledgeable technical staff of scientists, engineers (mechanical, electronic and chemical), logisticians and technicians working in a hands-on environment which brings them into direct contact with Fleet users. **This Team work allows urgent requirements for these products to be identified and solutions quickly provided.**

The analysis of the end use effectiveness, safe manufacture, producibility and testing of the items requires not only experience and knowledge but an understanding of the basic science and engineering involved in developing these items. The skills and knowledge required to develop and manufacture ordnance

items that will perform in a safe and reliable manner cannot be obtained through an academic course of study. A minimum of five to seven years on-the-job training is required. **The experience and knowledge base at Crane coupled with the unique facilities and equipment is unsurpassed anywhere in the world.** There are **6000 work years** of ordnance related experience at Crane. Crane's technical capability is enhanced by the selective utilization of special skills through our Omnibus Contracts.
The **Conventional Ammunition Engineering** technical capability is supported by a variety of specialized facilities that are essential to the design, development, production and testing of conventional ammunition. These facilities are fully operational and are designed to meet future projected needs.

In the **Ordnance Environmental Test Facility** the Crane Division provides environmental testing of ordnance items for the three Services. In these facilities the design, selection and procurement of test equipment and facilities have been made with the test and evaluation of explosive and other hazardous materials in mind. Environmental test facilities and equipment are available to do vibration, shock, temperature, humidity, altitude, jolt, jumble, sunshine and rain, sand and dust, and salt spray. Environmental test facilities are contained in four buildings with 20,000 square feet. This facility is used approximately 10 percent of the time in support of "laboratory" operations. The remainder of the usage is for acquisition support.

The **Ordnance Radiographic Facility** provides radiographic testing of ordnance items for the three Services. Radiographic inspection capabilities include both real time and conventional X-ray. A special high bay exposure room with a high energy accelerator is available for radiographic inspection of very large items, e.g. 2,000 pound bombs, that can be brought in on trucks/trailers and X-rayed without unloading. The radiographic facilities are in two buildings with 7,100 square feet. This facility is used approximately 10 percent of the time in support of "laboratory" operations. The remainder of the usage is for acquisition support.

The **Demilitarization Evaluation Facility** is a new facility just being completed that allows for remote disassembly of various ordnance devices up to 500 lbs. The facility has the capability of pilot operations for the demilitarization of conventional and hazardous ordnance items. The facility's design is such that all waste is contained and disposed of without escaping to the environment.

The **Missile Fuze Test Facility** provides for testing a wide variety of missile fuzing components (warhead section components). Equipment used includes centrifuge, burn rate/velocity tester, active optical test ranges, leak detectors and many specialized pieces of equipment. This test equipment supports production acceptance, surveillance, and maintenance of these fuzing components. Approximately 25 missiles are supported including STANDARD, TOMAHAWK and SIDEWINDER. This effort supports the Navy as well as joint programs with the Air Force, Army, Foreign Military Sales and private parties.

The **Proximity Fuze Free Space Facility** (10,000 ft reflectivity plane) is the certified Navy Standard used to establish the electronic values of Radio Frequency Fuze Standard Monitors. These Standard Monitors are used for correlation of systems used in production and testing of Proximity Fuzes by both the private and public sectors. Radio Frequency Proximity Fuzes are used on all the major caliber ammunition in the Navy stockpile.

The **Ordnance Components Test Facility** (Buildings 142/365) provides lot acceptance and surveillance testing of numerous ordnance components and sub-assemblies as well as small explosives devices. The facility has test cells which provide capability for controlled and monitored function testing of components. Test cells are also equipped with capability for remote breakdown and dissection of ordnance components for failure analysis. Ordnance items tested in the facilities include demolition devices, fuzes, linear explosives, detonators and offboard countermeasures.

Fleet Ballistic Missile, Ordnance Components Test Facility provides support to the Fleet Ballistic Missile Strategic Weapons System ordnance evaluation programs throughout the life cycle of the Trident I and II Missiles. This is accomplished through the design manufacture of ordnance test systems and the test and evaluation of missile ordnance components utilized in the Launch, Missile Body and Reentry Systems. This facility is unique in respect to its design, construction and safety site approval which allows ordnance components and assemblies to be destructively tested safely. This building allows explosive operations and still meets the quantity-distance requirements of NAVSEA OP-5.

Missile Maintenance Facility performs intermediate level maintenance on STINGER air defense missiles and TOW and DRAGON anti-armor missiles. Engineering support services are available for test equipment and test fixture design, maintenance line layout and missile configuration monitoring and control. The larger of two facilities is a 19,000 square foot reinforced concrete multi-bay structure designed to minimize personnel

injuries and capability loss in the event of an explosive incident. A second smaller facility is a 5,000 square foot earth covered structure designed to allow performance of minor maintenance and double as a shipping and receiving facility. Both structures are protected by static and ordnance grounding systems and lightning protection systems. Both facilities are DOD safety site approved and with no explosive operating waivers or exemptions.

Marine/Corps Weapons Command and Control Systems Development andProduction performs prototype development and low rate initial production of Command and Control electronics shelters. Engineering support services available for systems integration and configuration control. Three separate facilities comprise the prototype complex. A 5,000 square foot facility is used for subsystem assembly and checkout. Two 4,000 square foot facilities are used for complete system assembly and checkout. All three facilities are pre-engineered steel structures. No special equipment or utilities are required.

Missile Storage Facilities perform storage of preposition war reserve Navy and Marine Corps Stinger Missiles and Marine Corps Tow and Dragon Missiles. Perform receipt, storage, and issue of training missiles for the Marine Corps. Urgent missile delivery capability to operational areas worldwide is provided via Wright Patterson Air Force Base, Dayton, Ohio. Total storage space for Risk Category 1 arms, ammunition and explosives (AA&E) is 45,000 square feet. Total storage space for Risk Category 2 AA&E is 50,000 square feet.

Ordnance Ready Magazine Storage in Support of Ordnance Engineering Directorate provides ordnance receiving, shipping and storage for the various Programs of the Directorate. The facilities are used to receive a wide variety of ammunition and explosives for the Directorate. After receipt, the ordnance is either forwarded immediately to the user or placed in storage magazines temporarily until ready for evaluation. Total number of magazines is 37 with 57,400 square feet of storage space.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

For the past thirty-five years, Crane Division has been involved in the development, engineering, and production of conventional ammunition. The Conventional Ammunition Engineering TC provides total life-cycle support including program management, design and development, test and evaluation, product improvement, acquisition and production support, quality evaluation, fleet support and demilitarization, and disposal for Naval Sea Systems Command and Naval Air Systems Command (selected) conventional

Revised pg

EQUIPMENT. A wide array of modern, specialized equipment is contained within the WDTF. This includes advanced CAD/CAE engineering workstations, standard and rapid prototyping equipment, match weapon conditioning equipment, test and evaluation equipment and instrumentation, maintenance and repair equipment, and a networked file server for small arms data management. Additionally, several pieces of equipment specially designed for environmentally safety are under procurement to support maintenance and testing operations, including corrosion control powder coating equipment with a stationary shot blast system and waste water treatment system, soap-based (rather than tetrachloride based) parts degreasers, and a passive bullet trap to minimize lead contamination from weapons firing. A list of equipment supporting the technical capability and its associated replacement value is listed in Table 1.

The total capabilities of the WDTF are truly unique in the United States.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

This facility is not portable or moveable. The enclosed portion of the complex includes over 120,080 sq. ft. of floor space. The underground range alone contains 2,000 cubic yards of poured reinforced concrete. The terrain of the outdoor range is uniquely suited for this type of operation and includes test capabilities up to 1000m.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

Replacement value:

Facility	*$15,016,500*
Equipment	*$ 2,786,600*
Total	*$17,803,100*

4. Provide the gross weight and cube of the facility/equipment.

Gross weight: approximately 247 tons.
Gross volume: approximately 2,391,300 cubic feet.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support, other than normal electrical power:

a. Steam (for HVAC Systems) approximately 1,100,000 pounds per year.

b. Compressed air (for HVAC Control System) approximately 4,000 cubic feet @20 PSIG per year.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

Special budget requirements: servicing bullet traps - $45,400 per year. R

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

This facility is designed to maintain a temperature of 72°F ± 4°F and 50% ± 5% relative humidity. Specialized exhaust systems in both indoor ranges and in plating facility.

mmunition. **The Division provides support in defining and validating technical requirements and support and analysis of Fleet testing operations.** The Division develops specifications and data packages to allow the Single Manager for Conventional Ammunition to procure the devices and assists in introducing the devices into the Fleet by preparing technical and ordnance loading manuals.

The Conventional Ammunition Engineering TC provides development, first article, lot acceptance and quality evaluation testing for conventional ammunition including contractor support during acquisition and production of these devices.

2. Indicate whether the facility/equipment is portable, moveable, or fixed as defined by paragraph 6, page 12 of this data call.

The Conventional Ammo TC Facility is a **fixed** facility.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The facility equipment is valued at $33.9M. The facility plant is valued at $47.9M.

4. Provide the gross weight and cube of the facility/equipment.

The facility is contained in 21 buildings and 56 ordnance magazines comprising over 281,980 square feet. The volume of the equipment is 163,433 cubic feet and the weight is 634,700 pounds.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support other than normal electrical power includes:

1. Electrical power - 440/220 volt 3 phase, 447/208 volt 3 phase, 220/240 volt 3 phase and 220 volt 1 phase

2. Compressed air at 120 psi with 60 cfm delivery

3. Water at 50 psi with 15 gpm delivery

4. Fire protection sprinkler system

5. Cooling tower - capacity 350 ton

6. Lightening protection

7. Ordnance and static ground system

8. CO2 piped to test cells

9. 75,000 gallon water tank (deluge system)

10. 70,000 gallon waste water storage tank

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

Special budget requirements for the facility include:

a. Remotely operated test and breakdown equipment requires shielding to provide personnel and equipment protection in the event of an inadvertent detonation.

b. The facility must have shielding/construction that allows the processing of up to 1,000 pounds of high explosive. This includes 60 test cells ranging from 1/2 inch steel to 3 feet of reinforced concrete.

c. The facility must meet approved safety requirements for grounding, lightning protection and quantity-distance requirements for explosive operations. Location of this facility would require separation from inhabited buildings by a minimum of 1250 feet and designed in accordance with NAVFAC P397 "Structures to Resist the Effects of Accidental Explosions".

d. All siting must be DDESB approved for net explosive weight stored and handled.

e. The facility must have approved hazardous material storage capability to contain explosive contaminated solvents and other manufacturing and testing by-products.

f. The facility must have access to an approved open burning, open detonation area for the disposal of ordnance materials.

g. The facility must have magazines for the storage of ordnance and energetic materials. A minimum of 152,400 square feet of ordnance storage is required.

h. Radiographic equipment requires shielding to provide operators protection from radiation.

i. Facility must be protected by intrusion detection system for unattended storage, fencing, face lighting for risk category 1 & 2 AA&E.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

The demilitarization evaluation facility requires special pollution abatement requirements for hazardous waste/material containment. Pollution control equipment for on going processes.

To prevent environmental pollution from discharging explosion residue and lead particles to the atmosphere, exhaust vent systems with high efficiency filters are required.

The laboratory facilities require temperature and humidity conditioning are necessary for proper equipment operation.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

It would be extremely difficult to replicate or relocate this facility at another location. The facilities of the Conventional Ammo TC are located in areas that allow the production, testing and storage of ammunition within accepted quantity-distance arcs for the safe use of ammunition. The group of facilities are all routinely used in the development of new or improved devices. Ordnance items are subjected to safety, environmental and radiographic testing in the associated facilities. Relocating a portion of the facilities without relocating the entire capability would make cost effective development of new devices a virtual impossibility. The remote location of the test areas provides the ability to do all-up-round testing within State and Federal guidelines. The Division's unencumbered location with no encroachment considerations provides the ideal place to develop and test pyrotechnic and ordnance items both now and in the future.

Co-location with the Crane Army Ammunition Activity provides the opportunity for a surge/mobilization capability for pyrotechnics and ordnance manufacture. Crane Army is a tenant activity and has significant production capability and workload as a Single Manager for Conventional Ammunition government owned, government operated activity. Crane Army is currently involved with several Navy sponsored Low Rate Initial Production efforts in pyrotechnics and ordnance. These efforts provide Crane engineers

with the opportunity to easily monitor the production of new devices on a daily basis if required to validate the data packages that will be used for production by private contractors. Moving the Conventional Ammo TC facility would eliminate the synergism and production based training ground that this co-location provides.

The functional integration of the knowledged-based experience and the unique facilities and capabilities now allows the Navy to provide the Fleet with the lowest cost, highest quality and maximum performance ordnance devices in the most efficient manner. This integration provides a synergistic effect that makes the Crane organization unique in all DOD and private industry in the ordnance field. Crane engineers and scientists routinely provide assistance to both Army and Air Force personnel in the development, testing and acquisition areas. With its state-of-the-art laboratories, test ranges, prototype manufacturing facility and co-location with the Crane Army Ammunition Activity, Crane is able to design, develop, test and manufacture virtually any ordnance device for the Navy, DOD or private concerns. Any attempt to perform the same type of development effort at separate locations would result in much higher development and life cycle costs.

The interaction of the development and production support engineers provides the Navy with the ability to critically review and examine the items being developed and produced in the private sector. Without the knowledge-based experience government employees would be reduced to monitoring delivery schedules and reviewing test data generated by contractors in tests designed by contractors. The Navy would quickly find itself in the position of knowing what they wish to buy but not having the knowledge to determine if they got what they wanted at a reasonable price; they would lose the ability to be a "smart buyer". This same interaction allows safety investigations to be performed and solutions identified when problems arise. The detailed investigations done by developers and design agent engineers working together are likely to provide simultaneously an identification of the causes of the problem and a solution.

Loss of technical expertise would also compromise the Navy's ability to safely produce an acceptable product. Support engineers work closely with manufacturers before and during production to ensure that operations are done correctly. The expertise also provides the opportunity to correct problems as they occur during production.

Co-location of engineering functions supporting surface ship, air launched and Marine Corps ammunition (e.g., acquisition, ammunition logistics management, surveillance, modification,

maintenance, testing, demilitarization and disposal) provides a synergism and efficiency that would be unavailable if these efforts were dispersed among several activities. Co-location of the Program Management and engineering functions with a major DOD ammunition production, storage, maintenance and disposal activity, the Crane Army Ammunition Activity (CAAA), provides rapid response capability throughout the life cycle to major regional conflicts such as Operation Desert Shield/Desert Storm.

The Crane Division is a unique Navy activity in that significant Single Manager for Conventional Ammunition (SMCA) production is performed by CAAA, the Army tenant, located at Crane. CAAA has 208 production and maintenance/repair buildings comprising 696,000 square feet of production capacity. Supporting explosive operations are 1,818 storage buildings and explosive magazines with a storage capacity in excess of 625,000 short tons (4.9 million square feet) of Hazard Class 1.1 to 1.4 ammunition. Fifty-eight percent of CAAA's ordnance magazine storage (1.9 million square feet) contains Navy/Marine Corps Ammunition assets. Co-location of Navy acquisition, maintenance, and demilitarization and disposal engineering functions with SMCA production operations at Crane offers excellent opportunities to incorporate modifications and improvements to Navy production commodities.

Many portions of the conventional ammunition technical capability are inherently governmental in nature and must be maintained by the Navy. Acquisition program management, engineering support for acquisition (including such functions as review of requests for changes by manufacturing contractors and quality assurance testing) and production engineering must be done by a governmental entity. Seventy-five percent of ammunition component/end item production (industry/government) is within 750 miles (38 percent within 500 miles) of NSWC Crane thus allowing almost same day response to resolve on-site production related problems. The maintenance of product expertise is the only means available to assure safe, reliable and effective ammunition to satisfy Fleet requirements.

Transferring this capability from the Crane Division would deprive the Navy of essentially unlimited space for ordnance operations. The Navy would lose: (1) the technical talent at an activity with no problems of encroachment or environmental liabilities from past or current practices; (2) the efficiency and effectiveness of having ammunition technical expertise located at the same activity which produces and stores much of its inventory of ammunition, and; (3) the ability to critically review and examine the items being developed and produced in the private sector thus losing the ability to be smart "buyers" and implementing continuous improvement. Attempting to re-establish

this expertise and facilities at another location would require years of training and millions of dollars of reconstruction and relocation costs.

Ammunition production, handling and consumptions provide many opportunities for catastrophic safety related incidents. A major turnover of personnel in the unique field of ammunition would undoubtedly carry a high probability for increased occurrences of undesirable incidents. Most safety experts, especially those affecting policy, have in excess of 13 years (average) of ordnance related experience. This area of potential loss does not lend itself to cost appraisal but appears to be far too great a risk to ignore.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

These facilities have been constantly developing since the mid 1960's. Most of the facilities were constructed on site and/or modified existing World War II structures to meet the specific requirements of the Conventional Ammunition TC. The majority of equipment was delivered by truck.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

This facility supports the following functional support area:

2.1 Gun Systems
2.2 Guided Missiles
2.3 Free Fall Weapons and Rockets
2.5 Mines
2.7 Explosives
2.8 Launchers
2.9 Fire Control
2.10 Weapons Data Links
2.11 Weapons Fuzing
2.12 Weapons Propulsion
2.13 Other Ordnance
2.14 Explosive Ordnance Disposal
4.1 Landing Force Equipment and Systems
5.1 Sonar systems
5.5 Ocean Surveillance
8.2 Countermeasures (CM)
9.1 Navy Strategic Systems
11.6 Energy Storage

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

1989: 85% of one shift
1990: 84% of one shift
1991: 84% of one shift
1992: 80% of one shift
1993: 80% of one shift

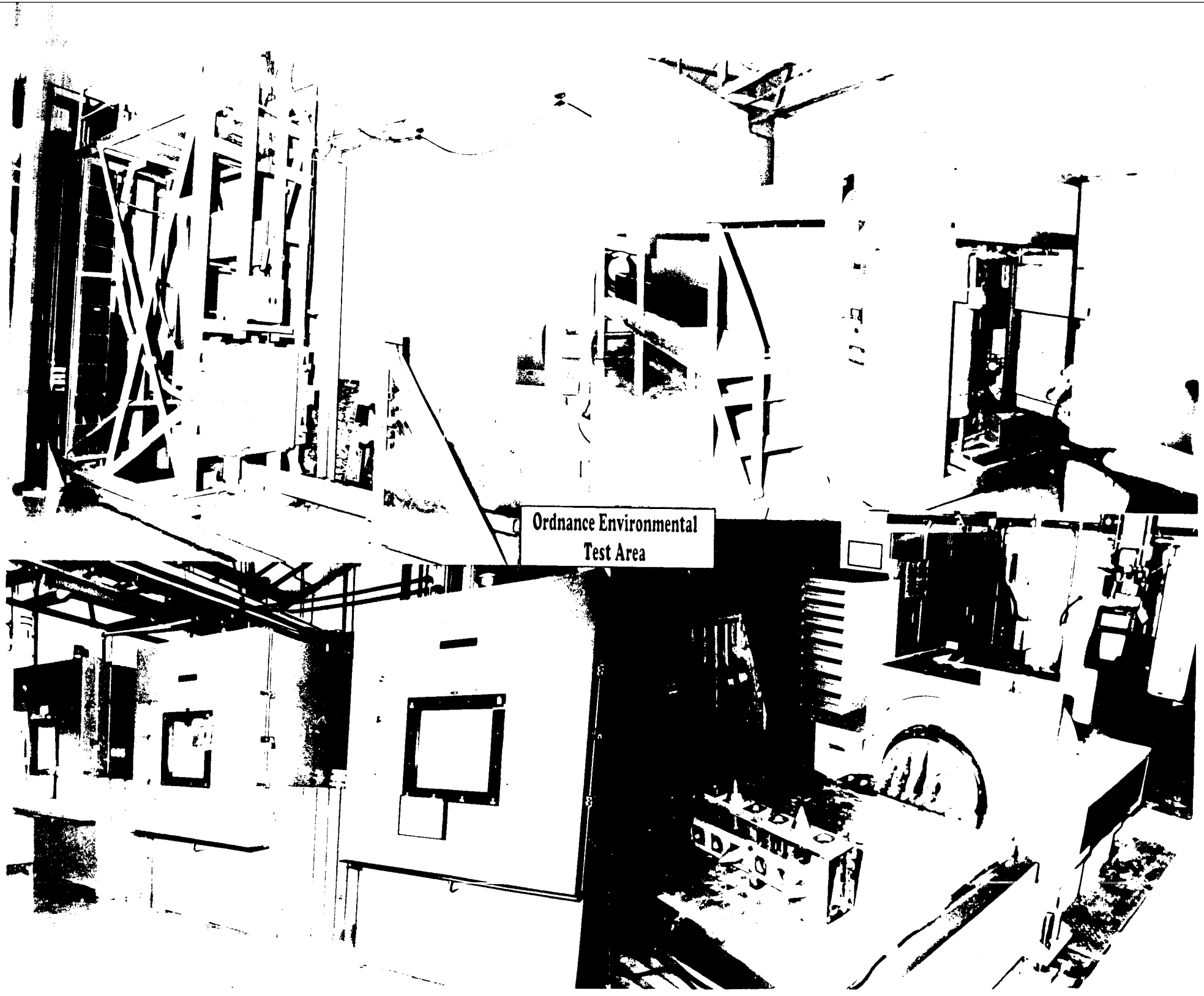
12. Provide the projected utilization data out to FY97.

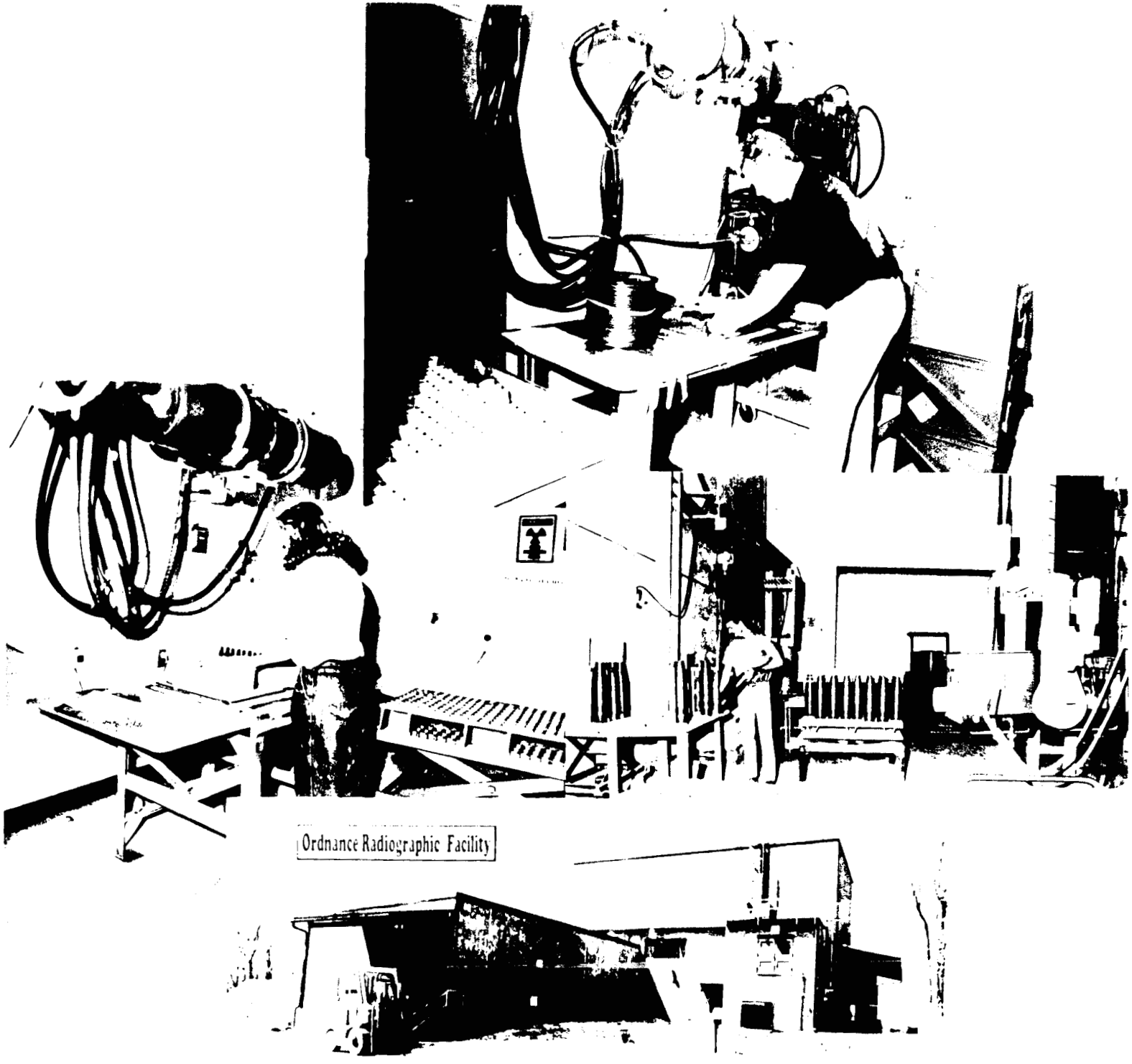
1994: 75% of one shift
1995: 75% of one shift
1996: 75% of one shift
1997: 70% of one shift

13. What is the approximate number of personnel used to operate the facility/equipment? Approximately 140 personnel are currently used to operate this facility.

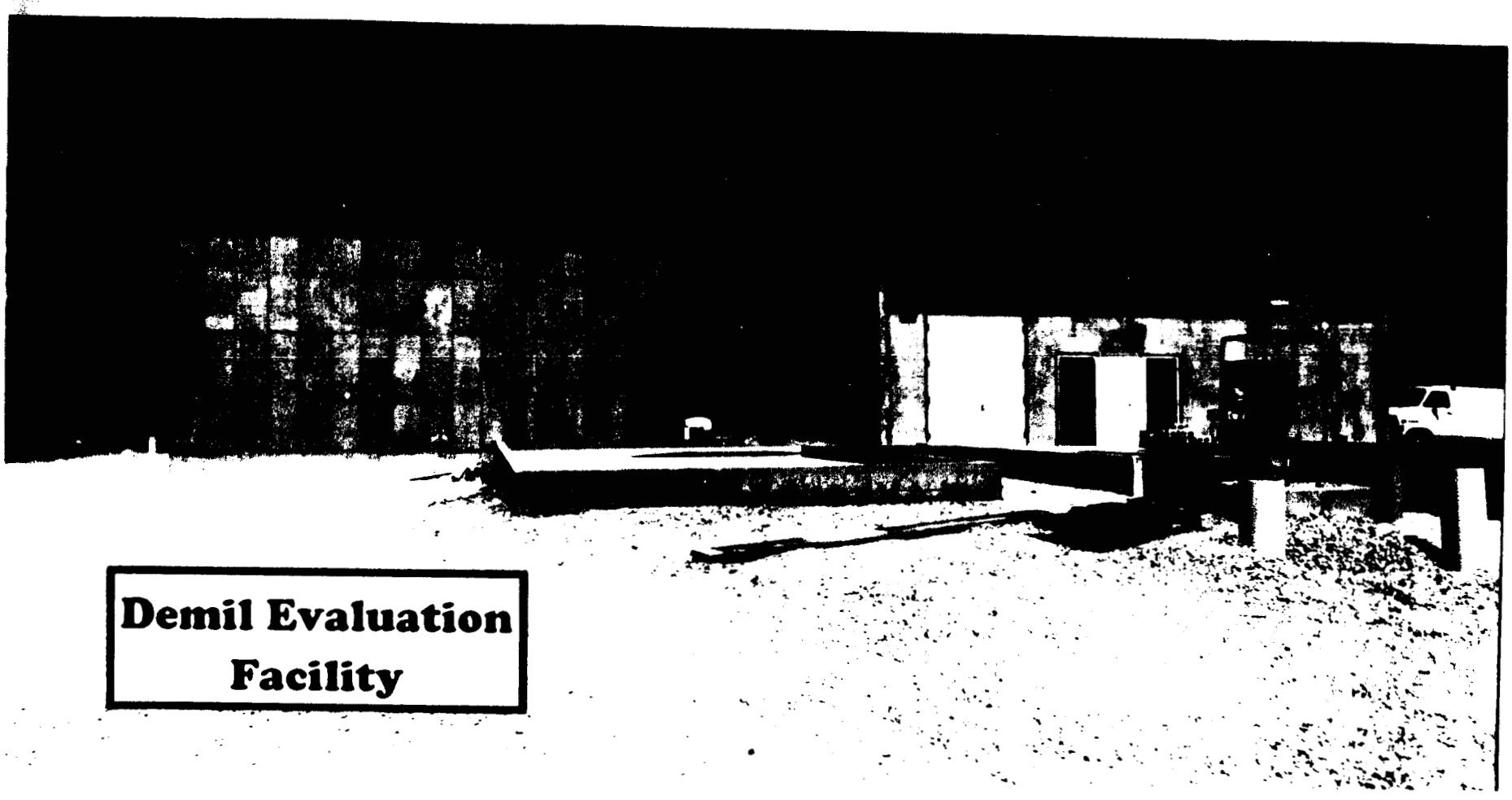
14. What is the approximate number of personnel needed to maintain the equipment? Approximately 18 personnel area needed to maintain the facility.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment. See Attached.


Ordnance Environmental
Test Area



Ordnance Radiographic Facility

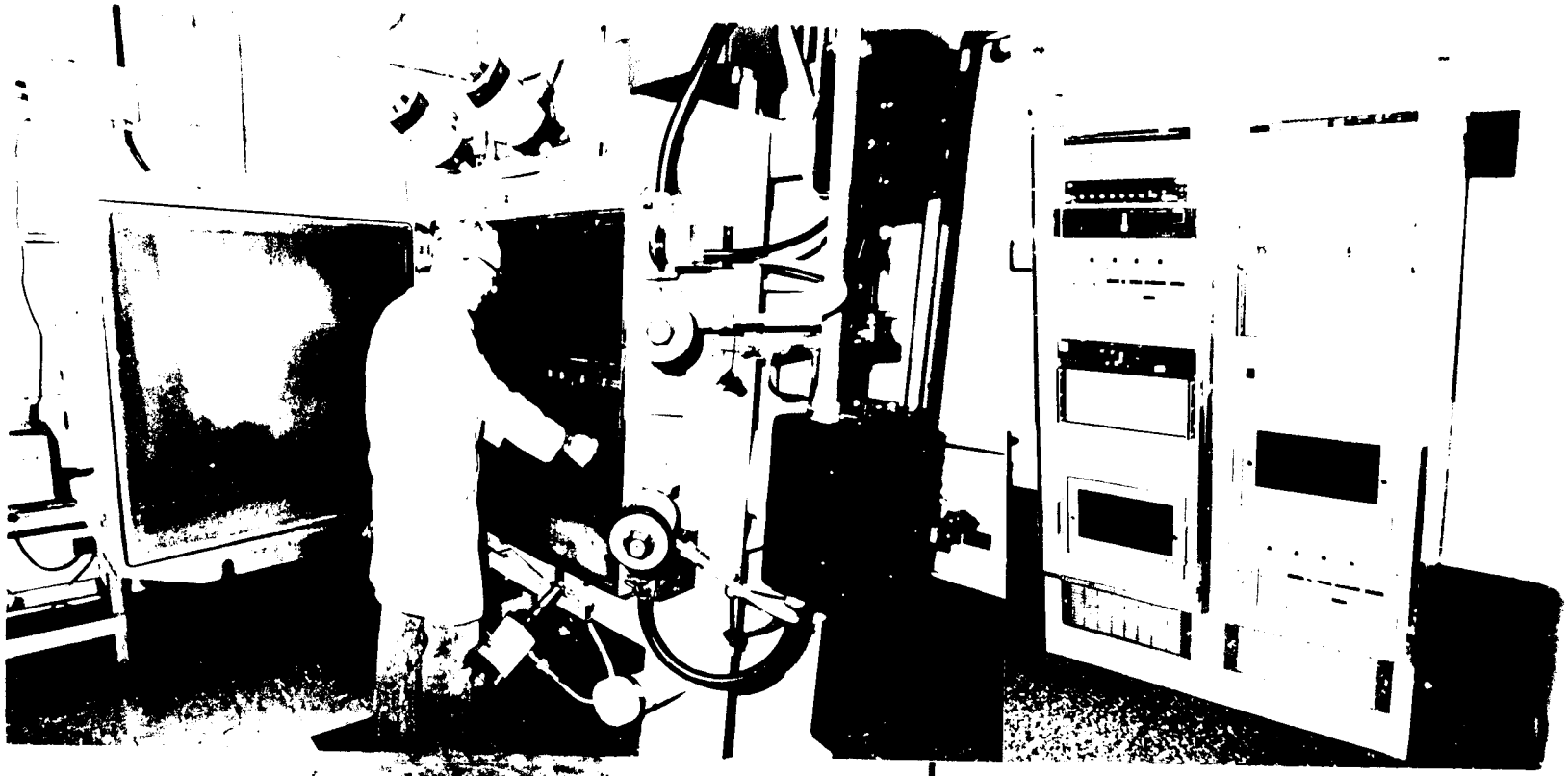


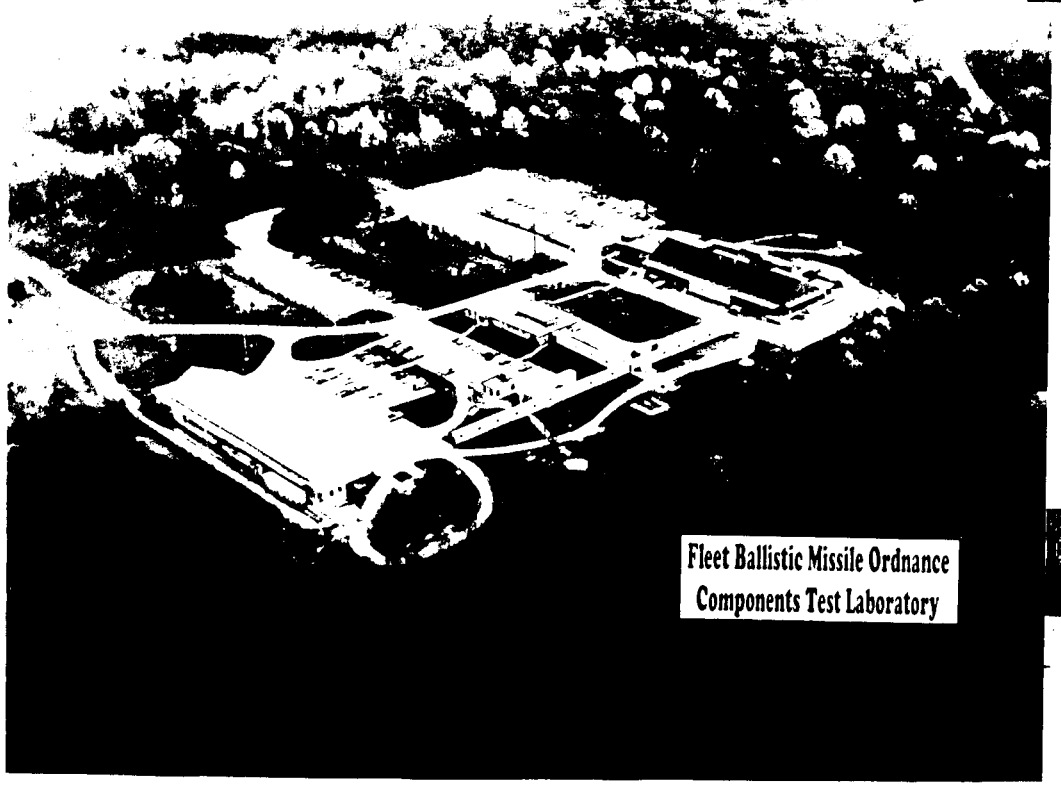
Demil Evaluation Facility

Missile Fuze
Test Laboratory

Ordnance Components Test Laboratory, B-365

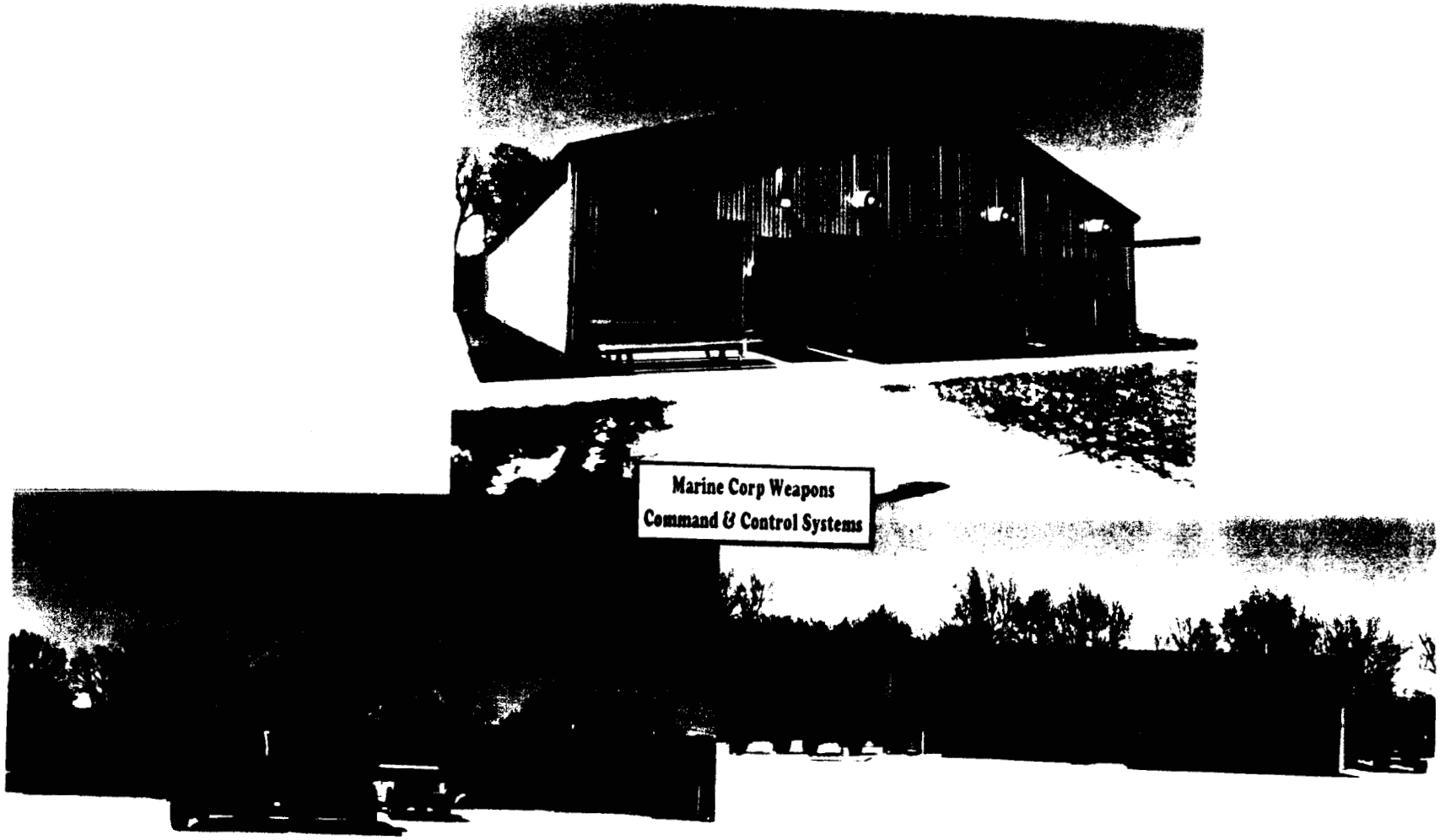
Ordnance Components Test Laboratory, B-142

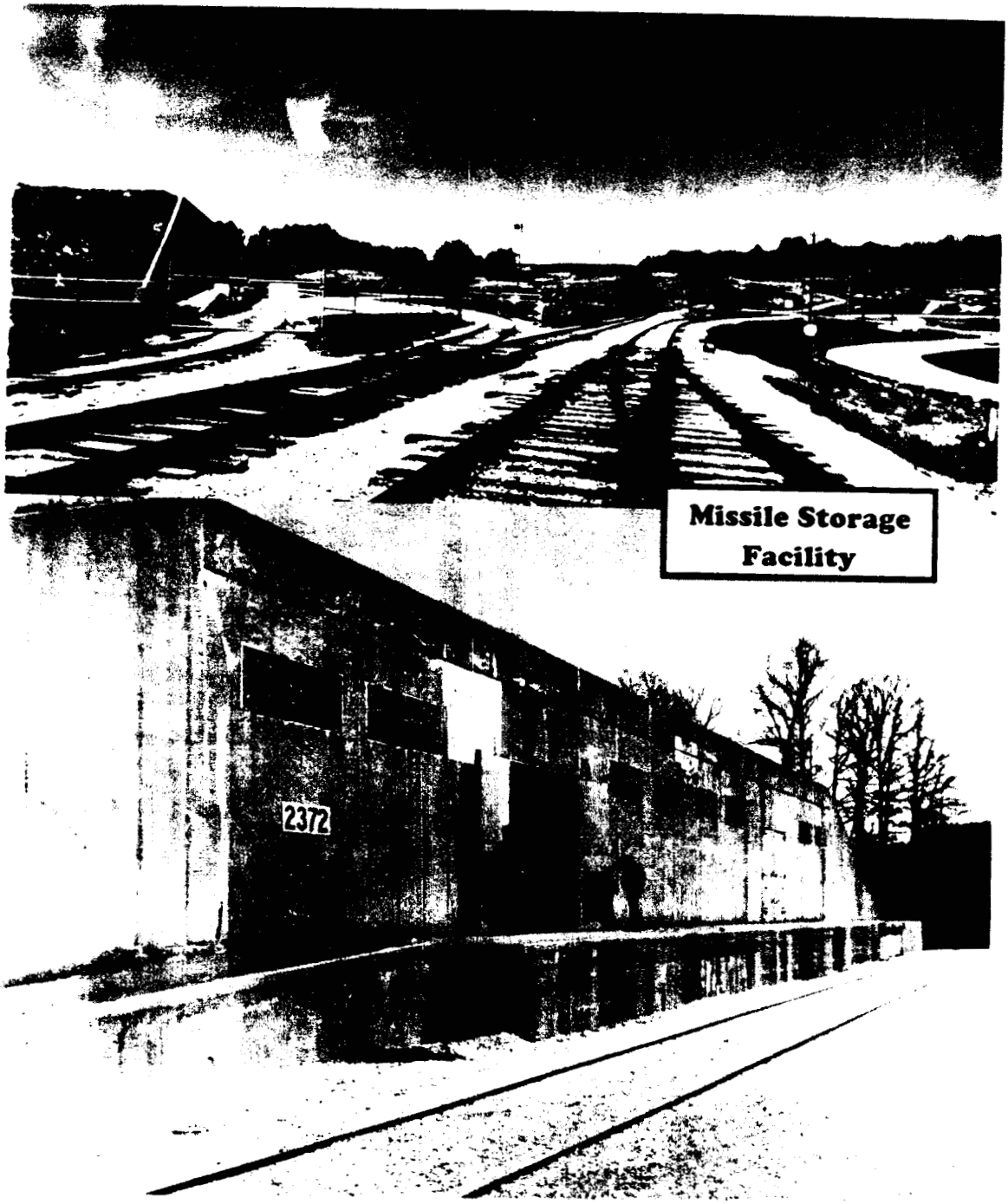




Fleet Ballistic Missile Ordnance
Components Test Laboratory

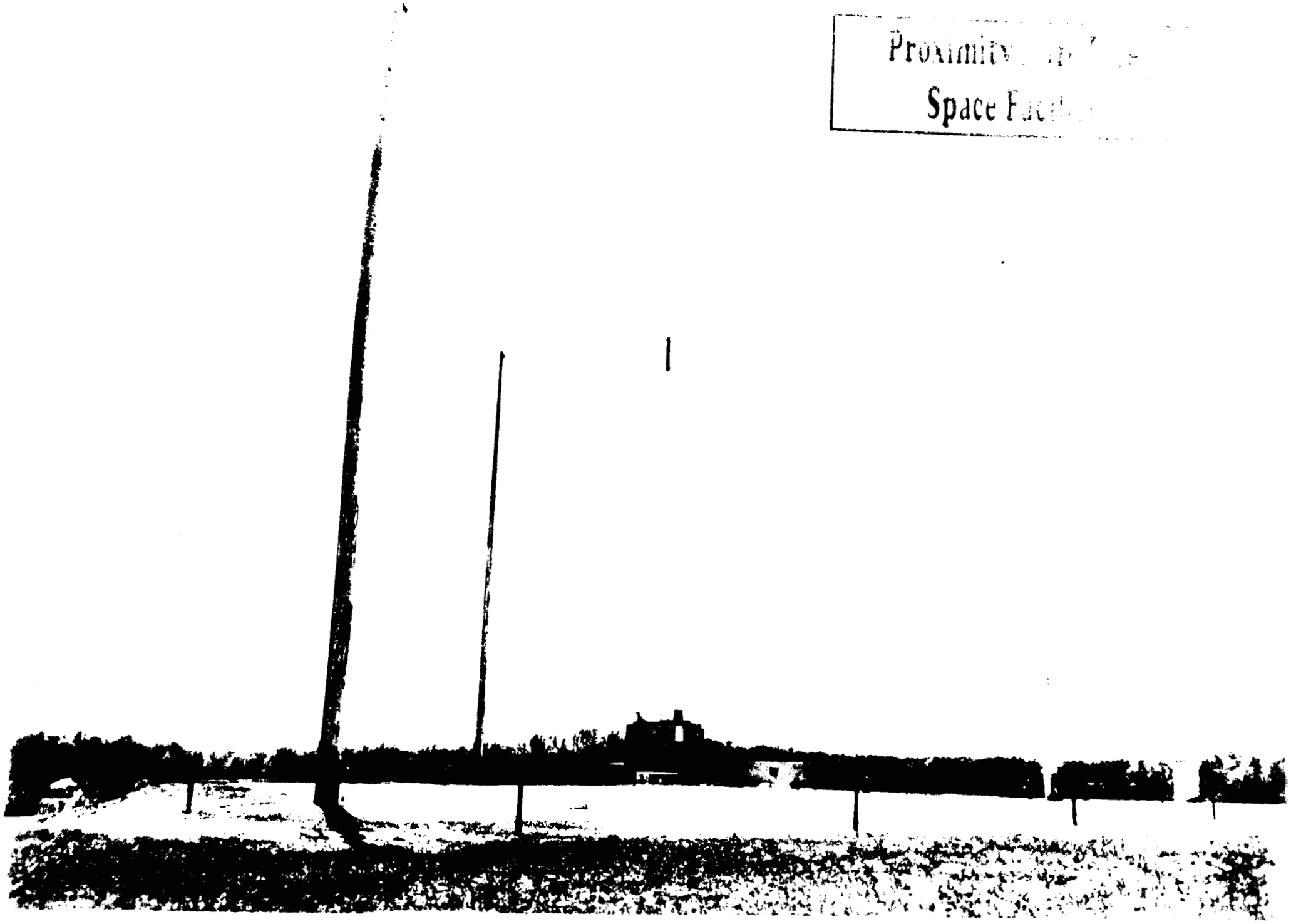
Missile Maintenance Facility


Marine Corp Weapons
Command & Control Systems



Missile Storage Facility

Ordnance Ready
Magazine Storage


Proximity
Space Fac

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Pyrotechnics Technical Capability

1. State the primary purpose(s) of the facility/equipment.

CRANE DIVISION
TECHNICAL CAPABILITY #11

TITLE

PYROTECHNICS DESIGN, DEVELOPMENT, TEST AND EVALUATION, ACQUISITION SUPPORT AND FLEET SUPPORT

SUMMARY DESCRIPTION

The Crane Division is a recognized leader in pyrotechnics RDT&E, acquisition engineering, and Fleet support. Pyrotechnics are used daily in Fleet operations for aircraft self-protection, search and rescue operations, anti-submarine warfare, special warfare operations and numerous signaling and marking missions. Infrared decoy pyrotechnics are carried on virtually all Navy aircraft, and pyrotechnic signals and markers are carried on surface ships and submarines. **Pyrotechnics are necessary to support new joint mission strategies as well as counter emerging threats to Navy platforms.**

The Pyrotechnics TC will continue to provide safe, reliable and effective pyrotechnics through its design, development, acquisition and Fleet support efforts. Over the years, Crane Division has provided new decoy countermeasures, submarine signals, distress markers and numerous other pyrotechnic devices. Working closely with Fleet personnel, the Division has also developed tactics for the most effective use of pyrotechnics. **The Pyrotechnics TC provides these same services to the Army, Air Force, non-DOD and private concerns.**

MISSION

The Pyrotechnics TC has a continuing vital Navy mission to provide total life cycle support to assure safe, reliable and effective pyrotechnics for Fleet use. Pyrotechnics are used daily in Fleet operations in such diverse applications as decoying heat seeking missiles for aircraft self-protection, search and rescue operations, special operations applications, training, anti-submarine warfare, and a variety of low intensity conflicts in support of Joint Strike and Joint Littoral Mission Areas. Decoy flares are the only fielded countermeasure for aircraft self-protection against many heat seeking missiles.

With constantly emerging missile seeker threats driven by advances in electronics technology, the need for new infrared pyrotechnics will continue to exist for the foreseeable future.

Supporting the new joint mission areas with emphasis on littoral warfare and battlespace dominance will require new marking, signaling and obscuring pyrotechnics. In recent years, this TC has demonstrated its ability to provide new technology to the Fleet through the introduction of the MJU-8A/B and the MJU-22/B Decoy Flares and the MJU-27 Decoy Device.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

For the past thirty-five years, Crane Division has been involved in the research, development, engineering, and production of pyrotechnics. **The Division is recognized as the Navy expert and lead activity for pyrotechnics.** The Pyrotechnics TC provides total life-cycle support including program management, design and development, test and evaluation, product improvement, acquisition and production support, quality evaluation, fleet support and demilitarization, and disposal for Naval Sea Systems Command and Naval Air Systems Command pyrotechnics. **The Division provides support in defining and validating technical requirements and develops and demonstrates concepts to meet these requirements.** Support and analysis of Fleet testing operations are also provided. The Division develops specifications and data packages to allow the Single Manager for Conventional Ammunition to procure the devices and assists in introducing the devices into the Fleet by preparing technical and ordnance loading manuals.

Crane engineers provide contractor support during the acquisition and production of the devices. **The Division is actively involved in the exploitation, evaluation and surrogate production of foreign pyrotechnics as well as the exploitation of foreign missile seekers to determine their susceptibility to countermeasures.** Pyrotechnic devices such as the Mk 18 Illuminating Load are developed for Navy gun ammunition in support of the Conventional Ammunition TC. Pyrotechnic warheads are also being developed for the Advanced Rocket System.

The Pyrotechnics TC provides substantial support to Army and Air Force pyrotechnics efforts. The Crane Division is formally involved with the U.S. Air Force Advanced Strategic and Tactical Expendables Program as a co-participant. In this role, the Division designed, produced and demonstrated six candidate infrared decoy proof of concept devices. **The Division provided missile effectiveness testing and evaluation for this Air Force effort and for several other efforts to develop countermeasure techniques and tactics against threat missiles during the Gulf War, for Desert Storm and for operations in Bosnia.** The Division's technical and acquisition expertise has been used on numerous occasions to procure special decoy flares for the three Services. Division personnel have been actively involved in combined Army and Navy efforts to identify substitute materials for red phosphorus - the major component of marking and obscuration pyrotechnics.

Crane scientists and engineers are recognized throughout DOD and the private sector as experts in the design, development and production of pyrotechnics and in the testing and analysis of the effectiveness of infrared countermeasures against a variety of domestic and foreign missile seekers. The Crane Division serves as the Assistant Deputy Program Manager for Airborne Pyrotechnics and for Infrared Decoys for the Naval Air Systems Command.

The Pyrotechnics TC provides development, first article, lot acceptance and quality evaluation testing for pyrotechnics. First article and lot acceptance testing are done in the recognized Navy standard tunnel for decoy flare testing. Development testing is also done at the Windstream Test Facility. **Testing has been done in this facility for Army, Air Force and private industry flare developers.**

EXPERTISE

The total life cycle engineering support provided by the Pyrotechnics TC requires a knowledgeable technical staff of engineers, scientists, logisticians, and technicians. In addition to an understanding of the basic science and engineering involved in developing pyrotechnics, experience and knowledge are required in the analysis of the end use effectiveness, safe manufacture, producibility, and testing of these items. The skills and knowledge required to develop and manufacture safe and reliable pyrotechnics cannot be obtained through an academic course of study. **Basic scientific and engineering skills must be supplemented with hands-on work experience in the pyrotechnics area.** This on-the-job training, coupled with the limited formal course work available, requires five to seven years working in the area to develop a pyrotechnics expert.

The experienced technical staff supporting pyrotechnics includes mechanical, aerospace, electronics and chemical engineers, chemists, physicists, safety and logistics specialists, and a variety of technicians with experience in the design, manufacture, and testing of pyrotechnics. **There are over 2,500 workyears of pyrotechnic experience in this TC at Crane.**

WORKYEARS TABLE	1-5	5-10	10-20	20+
Mech/Indust/Aero Engineers	1	7	7	9
Electronic Engineers	0	0	0	2
Chemical Engineers	0	3	0	5
Chemists/Physicists	1	2	1	4
Math/Math Stat/Ops Research	1	2	0	3
Logistics Specialists	0	0	1	2
Eng/Elec Technicians	0	8	6	21
Explosive Workers	0	2	5	10

The Pyrotechnics technical capability is supported by a variety of specialized facilities that are essential to the design, development, production and testing of pyrotechnics. These facilities are fully operational and are designed to meet future projected needs.

The Automated Infrared Test Facility is used for first article, lot acceptance, quality evaluation and qualification testing of infrared decoy flares. **This unique state-of-the-art facility is not duplicated anywhere in the United States and is the accepted Navy standard for acceptance and first article testing.** The facility is contained in a specially modified 10000 square foot building and consists of a chamber capable of burning decoy flares up to 1000 grams, a 70 meter radiometric tunnel with an environmentally controlled measurement room and several support rooms adjacent to the tunnel.

The **Transient Velocity Windstream Facility** is a free jet expansion windstream apparatus designed to provide adjustable air velocity versus time profiles to simulate the launch of decoy flares from a moving aircraft. The outdoor apparatus consists of several air compressors, a bank of air storage tanks, a computer controlled valve to control air flow and a nozzle and can produce air flows from 0.1 to 0.9 Mach at either a constant velocity or, under computer control, a variable velocity versus time profile to simulate the observed velocity versus time behavior experienced by a decoy flare when ejected from an aircraft. Radiant and spectral radiant intensity are measured at distances of 30, 80 and 500 meters and at angles from 10 - 300 degrees around the device. **This combination of space, facilities and measurement equipment is unique in the United States and is used by all of DOD and several private contractors to assess the performance of decoy flares and concepts in a test apparatus that is much less expensive to operate than an actual air-to-air test.**

The **Ordnance Prototype Manufacturing Facility** is contained in four buildings and occupies 28000 square feet. It is used for the development of prototype models of new designs and product improvements of pyrotechnic devices and explosive components. Mixing, blending and consolidation equipment allows the development and production of a large range of pyrotechnic compositions for infrared, colored and illuminating flares, colored smokes and other devices. **Virtually any pyrotechnic composition in the DOD inventory can be manufactured in this facility.**

The Crane Division provides test ranges and facilities for first article, lot acceptance, surveillance, qualification and safety testing of pyrotechnic, demolition and conventional ammunition items at the **Ordnance Test Area.** The test areas have a total of 88 unencumbered acres and are supported by eleven buildings (5600 square feet). In addition to normal function testing the ranges also support Insensitive Munitions Testing on All-Up-Rounds (pyrotechnic, demolition and conventional ammunition) including Fast and Slow Cookoff, Bullet Impact and Sympathetic Detonation. This facility supports the Conventional Ammunition TC and the Crane Army Ammunition Activity.

Revised pg

self-heating and ignition the Division operates a complete thermal characterization laboratory. This facility also supports the Conventional Ammunition TC and the Crane Army Ammunition Activity.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The Pyrotechnics TC Facility is a **fixed** facility.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The facility equipment is valued at $11.2 M. The facility plant is valued at $15.3 M.

4. Provide the gross weight and cube of the facility/equipment.

The facility is contained in 20 buildings comprising over 61,300 square feet. The volume of the equipment is 216,007 cubic feet R
and the weight is 856,950 pounds. The facility also includes 88 R
acres of unencumbered open air test areas.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support other than normal electrical power includes:

1. Electrical power - 440/220 volt 3 phase, 447/208 volt 3 phase, 220/240 volt 3 phase and 220 volt 1 phase

2. Compressed air at 120 psi with 60 cfm delivery

3. Water at 50 psi with 15 gpm delivery

4. High Pressure water at 125 psi

The **Ordnance Material Characterization Laboratory** provides chemical and metallurgical laboratories for performing failure evaluations, thermal characterization analyses, physical and chemical properties of materials and materials selection/compatibility of explosives, propellants, pyrotechnics, metals, polymers, ceramics, adhesives, coatings and compositions. Accelerated aging studies of ordnance materials complete with temperature controlled environments for isothermal studies as well as temperature cycling studies are provided in an ordnance qualified facility. In addition to the normal quality evaluation and safety tests of ordnance materials such as impact, friction and electrostatic sensitivity, vacuum and thermal stability, self-heating and ignition the Division operates a complete thermal characterization laboratory. This facility also supports the Conventional Ammunition TC and the Crane Army Ammunition Activity.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The Pyrotechnics TC Facility is a **fixed** facility.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The facility equipment is valued at $11.2 M. The facility plant is valued at $15.3 M.

4. Provide the gross weight and cube of the facility/equipment.

The facility is contained in 20 buildings comprising over 61,300 square feet. The volume of the equipment is 64,311 cubic feet and the weight is 1,090,069 pounds. The facility also includes 88 acres of unencumbered open air test areas.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support other than normal electrical power includes:

1. Electrical power - 440/220 volt 3 phase, 447/208 volt 3 phase, 220/240 volt 3 phase and 220 volt 1 phase

2. Compressed air at 120 psi with 60 cfm delivery

3. Water at 50 psi with 15 gpm delivery

4. High Pressure water at 125 psi

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

Special budget requirements for the facility include:

1. The facility must provide for the testing of decoy flares. It must have shielding and construction that allows the handling of up to 150 pounds of pyrotechnic flares and the burning of up to one pound of infrared flare grain. It must have a burning chamber with sufficient upward exhaust to remove combustion products and with a tunnel leg at least 60 meters long opening onto the chamber. A separate control room must be available for monitoring the testing. Room must be available to house air compressors and air storage tanks for the airstream portion of the testing.

2. The facility requires an open area appropriately cleared and graveled to allow the burning of pyrotechnic devices producing flames up to 30 meters long in a high speed windstream. Wind speeds up to Mach 0.9 must be attainable. It must be possible to control the velocity versus time profile to simulate decoy flare launch from an aircraft. The area must provide for radiometric coverage from 10 to 300 degrees around the burning flare. An instrument site with a clear measurement path of at least 500 meters is required to utilize the necessary measurement equipment. Tanks, valves, connections and welds must be certified for use at 200 psi.

3. The facility requires an open area appropriately cleared and graveled to allow the open burning and detonation of pyrotechnic and explosive devices. Remotely operated test and breakdown equipment requires shielding to provide personnel and equipment protection in the event of an inadvertent detonation.

4. The facility must have shielding/construction that allows the processing of up to 50 pounds of high explosive. A minimum of six explosive test cells configured in at least two bays with substantial dividing walls and blowout walls are required for simultaneous operations.

5. The facility must meet approved safety requirements for grounding, lightning protection and quantity-distance requirements for explosive operations.

6. The facility must have magazines for the storage of ordnance and energetic materials. A minimum of 6000 square feet of ordnance storage is required.

7. All siting must be approved by the Department of Defense Explosive Safety Board for net explosive weight stored and handled.

8. The facility must have approved hazardous material storage capability to contain explosive contaminated solvents and other manufacturing and testing by-products.

9. The facility must have access to an approved open burning, open detonation area for the disposal of pyrotechnic materials.

10. The facility must be located in close proximity to facilities that allow for the environmental stress conditioning and testing and radiographic examination of ordnance devices. These facilities must meet the same safety requirements for grounding, lightning protection and quantity-distance requirements for explosive operations.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

The pyrotechnics processing facilities must have appropriate temperature and humidity control to maintain 70 +/- 5 degrees F and 60 +/- 10 % relative humidity. Exhaust systems must contain filters that will trap explosive/pyrotechnic dust generated during manufacture.

The flare testing facility control room and robot load room must be controlled for normal laboratory environment. The exhaust from the facility must be directed through a filtering mechanism to remove the solid combustion products produced during testing.

The laboratory facilities require temperature and humidity conditioning necessary for proper equipment operation.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

It would be extremely difficult to replicate or relocate this facility at another location. The facilities of the Pyrotechnics TC are located in areas that allow the production, testing and storage of pyrotechnics within accepted quantity-distance arcs for the safe use of ammunition. **The group of facilities are all routinely used in development of new or improved devices.** The manufacturing facility makes the devices which are then tested in the outdoor windstream, tunnel or ordnance test area. As the development continues full up devices are subjected to safety, environmental and radiographic testing in the associated facilities. Relocating a portion of the facilities without relocating the entire capability would make cost effective development of new devices a virtual impossibility. The remote location of the test areas provides the ability to do testing of all-up-rounds within State and Federal guidelines. **The Division's unencumbered location with no encroachment considerations provides the ideal place to develop and test pyrotechnic and ordnance items both now and in the future.**

Co-location with the Crane Army Ammunition Activity provides the opportunity for a surge/mobilization capability for pyrotechnics and ordnance manufacture. Crane Army is a tenant activity and has significant production capability and workload as a Single

Manager for Conventional Ammunition government owned, government operated activity. Crane Army is currently involved with several Navy sponsored Low Rate Initial Production efforts in pyrotechnics and ordnance. These efforts provide Crane engineers with the opportunity to easily monitor the production of new devices on a daily basis if required to validate the data packages that will be used for production by private contractors. **Moving the Pyrotechnics TC facility would eliminate the synergism and production based training ground that this co-location provides.**

The functional integration of the knowledge-based experience and the unique facilities and capabilities now allows the Navy to provide the Fleet with the lowest cost, highest quality and maximum performance pyrotechnic devices in the most efficient manner. This integration provides a synergistic effect that makes the Crane organization unique in all DOD and private industry in the pyrotechnics field. Crane engineers and scientists routinely provide assistance to both Army and Air Force personnel in the development, testing and acquisition areas. With its state-of-the-art laboratories, test ranges, prototype manufacturing facility and co-location with the Crane Army Ammunition Activity, Crane is able to design, develop, test and manufacture virtually any pyrotechnic device for the Navy, DOD or private concerns. Any attempt to perform the same type of development effort at separate locations would result in much higher development and life cycle costs.

The loss of the capability in the pyrotechnics area at Crane would result in the Navy losing virtually its total expertise in the life cycle engineering support of these items. These items are used daily for aircraft self-protection, search and rescue operations, anti-submarine warfare, special warfare operations and numerous signaling and marking missions. **In the area of infrared countermeasures the entire Navy technical expertise in the development of devices resides at this activity.** Loss of the capability would result in the Navy not being able to most efficiently design, build and field new devices to defeat the emerging threats to Navy platforms from infrared seeking missiles.

The interaction of the development and production support engineers provides the Navy with the ability to critically review and examine the items being developed and produced in the private sector. Without the knowledge-based experience government employees would be reduced to monitoring delivery schedules and reviewing test data generated by contractors in tests designed by contractors. The Navy would quickly find itself in the position of knowing what they wish to buy but not having the knowledge to determine if they got what they wanted at a reasonable price; **they would lose the ability to be a "smart buyer."** This same interaction allows safety investigations to be performed and solutions identified when problems arise. The detailed investigations done by developers and design agent engineers working together are likely to provide simultaneously an identification of the causes of the problem and a solution.

The loss of technical expertise would also compromise the Navy's ability to safely produce an acceptable product. Pyrotechnic production support engineers work closely with manufacturers before and during production to ensure that operations are done correctly. The expertise also provides the opportunity to correct problems as they occur during production.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

These facilities have been constantly developing since the mid 1960's. Most of the facilities were constructed on site to meet the specific requirements of the Pyrotechnics TC. The majority of equipment was delivered by truck.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

This facility supports the following functional support area:

2.1 Gun Systems
2.2 Guided Missiles
2.3 Free Fall Weapons
2.7 Explosives
2.8 Launchers
2.11 Weapon Fuzing
2.12 Weapon Propulsion
2.13 Other Ordnance
2.14 EOD
8.2 Countermeasures
9.1 Navy Strategic System

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Historical workload is as follows. Unit of measure is percent of full capacity. An unconstrained, fully staffed and fully workloaded facility is 137,280 hours/year, i.e. 100%. This assumes 1760 hours per person per year.

1989: 64%
1990: 63%
1991: 60%
1992: 63%
1993: 54%

12. Provide the projected utilization data out to FY1997.

1994: 53%
1995: 50%
1996: 48%
1997: 46%

13. What is the approximate number of personnel used to operate the facility/equipment? Approximately 50 personnel are currently used to operate this facility.

14. What is the approximate number of personnel needed to maintain the equipment? Approximately 8 personnel area needed to maintain the facility.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment. See Attached.

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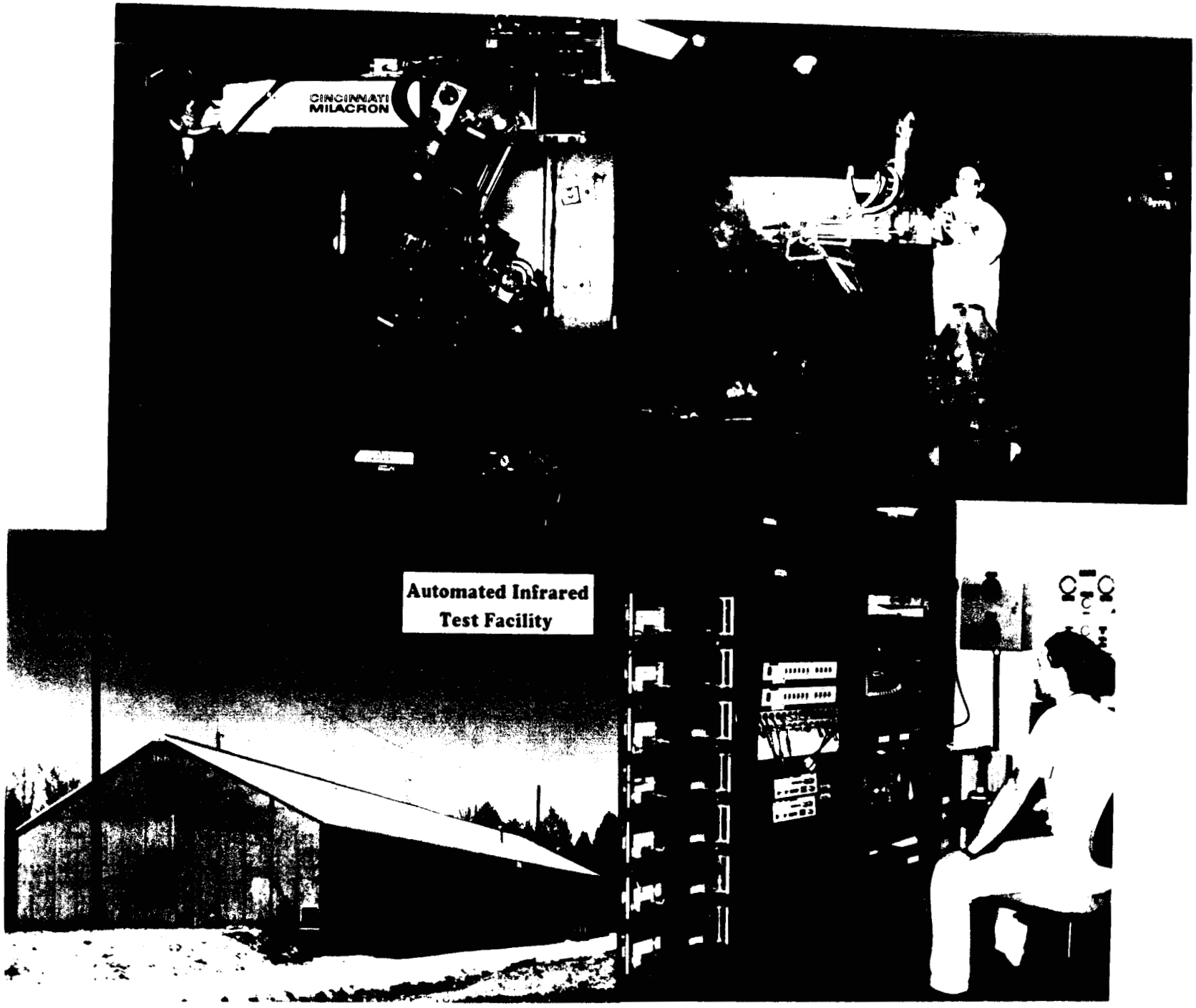
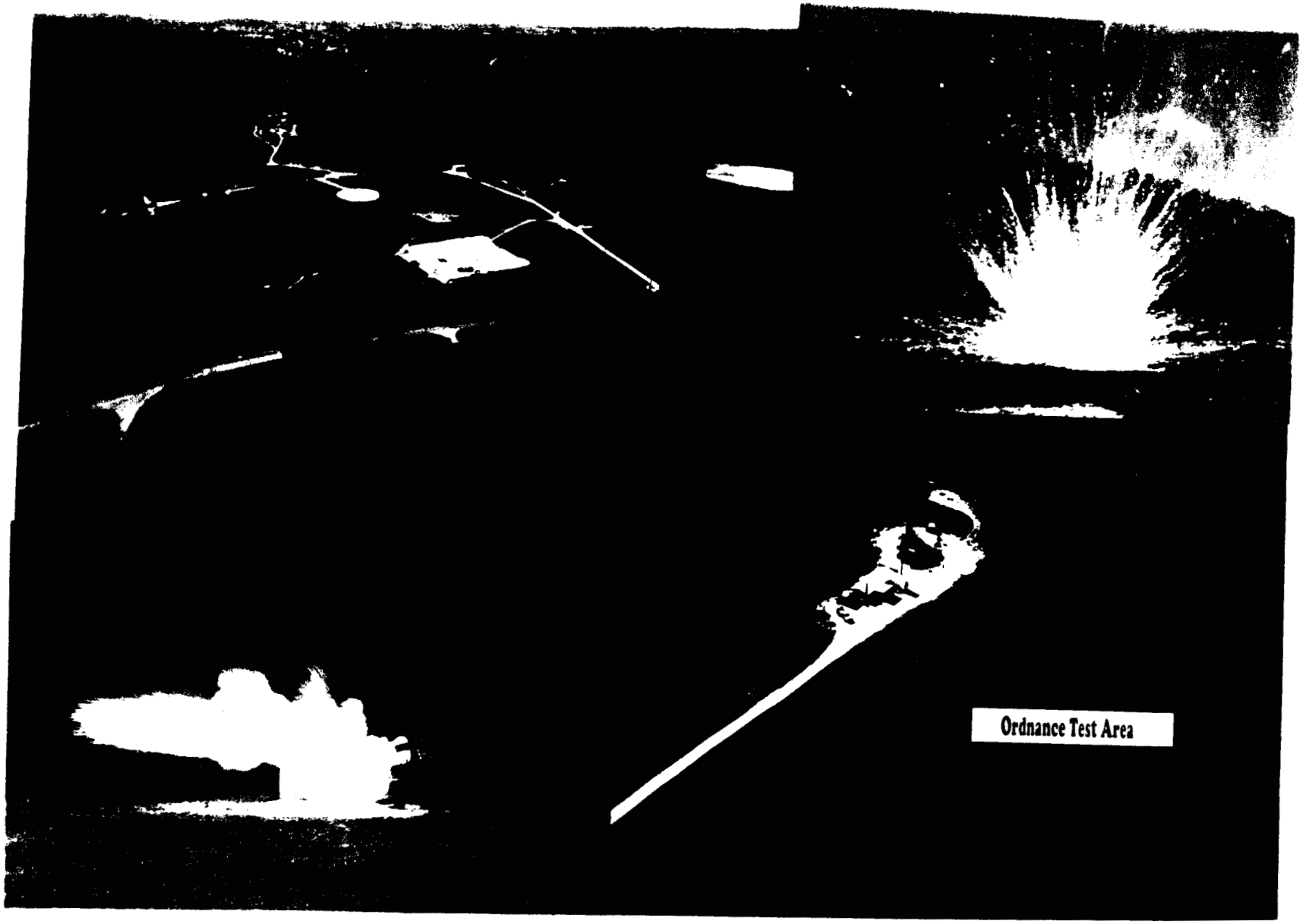
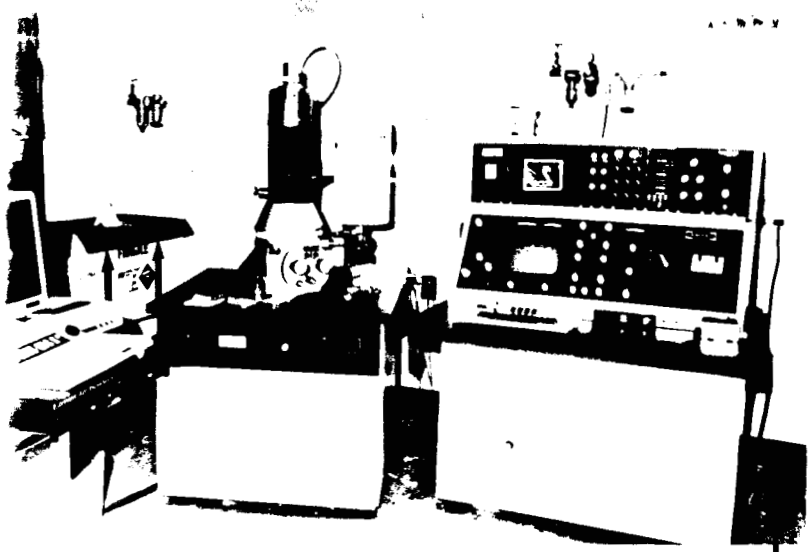


Automated Infrared Test Facility

Transient Velocity
Windstream Test Apparatus

Ordnance Prototype Manufacture


Ordnance Test Area



Ordnance Materials
Analysis Laboratory

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Night Vision Technical Capability

1. State the primary purpose(s) of the facility/equipment.

TECHNICAL CAPABILITY 15

NIGHT VISION/ELECTRO-OPTICS

SUMMARY DESCRIPTION

This Technical Capability describes a one-of-a-kind combination of people, facilities and equipment that provide Program Management and technical support to a wide variety of Night Vision (NV), Electro-Optics (EO), and Chemical Warfare Detection (CWD) equipment and systems in use by the Navy, Marine Corps and Army. **The depth and breadth of management, technical and hardware support services provided by this technical capability is unparalleled in any other activity, Government or private, and encompasses full equipment life-cycle support tailored to individual military customers needs.** Utilizing specialized expertise and state-of-the-art facilities and equipment, NSWC Crane can determine requirements, buy, test, maintain and improve various equipment including personal night vision devices and weapon sights, lasers, thermal imagers (forward looking infrared sensors), environment scanning/sampling chemical agent detectors, TV sensors, and multi-sensor systems.

MISSION

Crane Division's ability to manage the Navy's night vision program and to provide, improve, maintain and sustain Night Vision/Electro-Optic and Chemical Warfare Detection equipment is critical for all surface Navy ships and craft, fixed wing aviators, rotary wing aviators, and special warfare/special operations forces to be able to train, operate and fight at night. As was most recently demonstrated during Desert Shield/Desert Storm, and emphasized by "...From the Sea", current and future conflicts will be fought at night, utilizing joint forces in littoral environments, perhaps in threat of chemical agent attack from Third World adversaries. **The ability of these forces to defend themselves and operate efficiently, safely, and with minimum loss of life depends to a large extent upon the availability, performance and reliability of these night vision/electro-optic and chemical detection equipments.**

During Desert Shield/Desert Storm, and more recently during Operation Restore Hope, NSWC Crane provided surge capability to rapidly field, install and maintain various NV/EO and CWD equipment. Additionally,

direct support in theater was provided to the Navy and Marine Corps to maintain the operational readiness of many critical equipments. To this day, NSWC Crane maintains a presence in the Persian Gulf, **providing field services to install, remove, troubleshoot and maintain the Navy Mast Mounted Sight, a multi-sensor system with thermal imager and low-light level TV sensor for navigation, surveillance, and detection of surface mines, 24 hours a day in all weather conditions.**

In cluttered and congested littoral environments, electro-optic sensors have been performing a critical function for the Navy in recent years by providing visual detection, verification and identification of surface and airborne contacts. Incidents in the Persian Gulf prior to full deployment of these systems illustrate the need. The USS PRINCETON, USS TRIPOLI, and USS SAMUEL B. ROBERTS may have been able to detect and avoid the surface mines they struck during Desert Shield/Desert Storm had they been equipped with the Navy Mast Mounted Sight. Similarly, USS VINCENNES may have been able to avert the 1988 tragedy of shooting down the commercial Iranian airliner.

Future military forces will employ more and more electro-optic devices as this relatively new technology continues to improve and mature. The Gulf War was begun, fought and won at night. **Thus, even in an era of downsizing, NV/EO and CWD equipment will continue to be introduced in increasing numbers.** This is especially true for the Navy as it begins to introduce multi-sensor systems and improved chemical, and even biological, detection systems to defend against existing and emerging threats in littoral environments.

JOINTNESS/DUAL USE

As an example of a current joint service program, NSWC Crane is performing a USSOCOM acquisition of the Special Operations Forces Laser Marker (SOFLAM) to be utilized as a marker and designator for Laser guided ordnance by Navy, Army and Air Force Special Forces and by the Marine Corps and Air National Guard. This program has involved assisting in requirements establishment, preparing technical specifications for procurement, performing the acquisition, acceptance testing the product, assisting in operator training and user field assessment, developing logistics support documents and plans, establishing interim depot (repair and maintenance) support capability, and developing a system upgrade by designing and introducing a night vision enhancement. **This program also exemplifies the breadth and depth of support that is provided at NSWC Crane.**

Another program of joint service interest is Crane's interim Joint Service Depot assignment by the Army program manager to perform warranty screening and unserviceable screening for Generation III night vision image intensification tubes used in the joint service Aviator's Night Vision Imaging System program.

NV/EO equipment is employed in ever increasing numbers in civil law enforcement operations. **NSWC Crane has provided direct support to Navy drug interdiction efforts and has provided information, as well as limited training and support, to law enforcement agencies - local, state and federal.**

Crane Division maintains close liaison with the NV/EO and CWD industries to maintain technical proficiency and state-of-art knowledge, and to be able to assess industry developments to compare with known user requirements.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

Crane Division possesses an integrated combination of facilities, equipment and technical and management expertise unparalleled in DOD in the area of NV/EO and CWD equipment and technology. **NSWC/CD has likewise developed an in-depth understanding of the user of these equipments based on years of direct interaction with the military community.** As such, NSWC/CD has developed unique knowledge and capabilities to interpret, understand and quantify requirements to be able to analyze, evaluate and verify hardware performance and costs to ensure best value for acquisition of these equipments. This knowledge and ability to evaluate and assess NV/EO and CWD products, both domestic and foreign military, encompasses the wide variety of environments and tactics of military users, including those which are unique to Navy, Marine Corps and Special Warfare/Special Operations Forces.

As the Navy Night Vision Program Manager, NSWC Crane provides overall program management and technical direction to determine, certify and validate requirements for Night Vision Devices, set program priorities, to establish budgets and obtain funding, to determine and implement Navy policy, procedures and safety standards, review/approve allowances, and provide inventory management. NSWC Crane established and now maintains the Navy NV Devices management data file as the central Navy record for serialization control, asset population and distribution, and missing, lost, stolen and recovered assets. **The Program Manager represents the Navy in interfacing with the other Services and Agencies and in answering program and technical questions.**

Crane engineers and technicians provide direct support to military users in installations, maintenance, training, safety, troubleshooting and developing tactics. **As was demonstrated during Desert Shield/Desert Storm, this support can be provided with quick response to urgent needs** to solve safety problems, improve performance (at night/during poor visibility), enhance survivability (threat of chemical agent attack), and counter unanticipated threats (Navy Mast Mounted Sight for surface mine detection).

Crane Division recognizes the criticality of NV/EO and CWD to mission success and to the safety and survivability of operational personnel. **The expertise represented in this Technical Capability is able to establish policies and determine requirements, provide acquisition oversight, recommendations/decisions and test support to ensure requirements are met with the highest quality equipment.** This Technical Capability then supports the product by helping to maintain the same quality, performance and readiness throughout the product's service life.

Crane has developed a synergistic combination of management/engineering/technical expertise, facilities and equipment

unparalleled and unduplicated in all of DOD and private industry in its ability to manage, acquire, assess, test, evaluate, maintain and repair (intermediate and depot level) and provide engineering and field support for NV/EO and CWD components, equipment and systems. Formal assignments include Program Manager, Technical Direction Agent, Acquisition Engineering Agent, Design Agent, System Integration Agent, Intermediate Repair Facility, interim Depot Repair Facility, and In-Service Engineering Agent for these equipments.

The technologies and products supported by this technical capability include:

*Image Intensification Devices	-Aviator Goggles, Weapon Sights, Night Vision Goggles, Surveillance Scopes, Components
*Lasers	-Rangefinders, Designators, Markers, Weapon Aiming, Signalling
*Thermal Imaging/Infrared	-Weapon Sights, Fire Control, Chemical Agent Detection, Surveillance/Navigation, Target Detection and Tracking
*Multi-Sensor Systems	-Thermal Imaging, Lasers, Fiber Optic Transmission, TV & LLLTV Sensors, Video Tracking (EX 46MOD 0 Sight and Navy Mast Mounted Sight)

As these technologies continue to mature, systems are being developed to provide biological warfare detection as well as enhanced chemical agent detection capabilities. **Multi-sensor systems and systems with various sensor images "fused" together will be introduced to the fleet in increasing numbers.** Thermal imaging sensors will become smaller and better and will be employed more and more as individual combat equipment for soldiers, sailors and aviators. Lasers will be introduced as imaging devices and as weapons to supplement their current role as weapon enhancements. **NSWC Crane has the core expertise and capability to plan and execute the introduction and employment of these future and follow-on systems and equipments into the DOD and to provide the same life-cycle management and support currently provided for existing equipment.**

Conversely, the NV/EO Technical Capability is supporting older generation technologies that cannot be supported anywhere else in the U.S.! Generation I image intensification tubes and the systems they are used in are being maintained and repaired at NSWC Crane for both the Navy and the Army. **Industry has long ago lost the desire and the capability to perform this work, and no other Government facility exists with any similar capability.**

EXPERTISE

Due to the integration of engineering/technical/integrated logistics support (ILS) and program management functions with test, repair and field support at this unique activity, Division personnel have accumulated many years of hands-on experience with assigned equipments in the laboratory as well as in the fleet, on the ground and in the air with the various military users, resulting in an unprecedented capability to equate the laboratory/shop to the "real world." **This further supports Crane's role as a "smart buyer" able to meet military needs and requirements, either urgent or long-term.**
Crane has dedicated program and technical NV/EO and CWD expertise utilizing Electronic and Mechanical Engineers, Mechanical Engineering and Electronic Technicians, Equipment Specialists, Logistics Management Specialists, Configuration Management Specialists, Optical Instrument Repairers, Program Analysts, Production Controllers, and Computer Specialists.

In particular, Electronic Engineering and Electronic Technician skills are essential to development of core electro-optics technical expertise. Mechanical skills complement electronics for packaging, tooling, support equipment and interfacing of equipment and systems. Logistics expertise provides the planning and follow through for adequate, cost effective reliability, maintainability and sustainability of the equipment. **Through experience, formal and informal training, hands-on use, and frequent military user interaction, the special knowledge and skills are acquired to make judgements and decisions on programmatic, quality, safety, cost and performance issues.**

The Night Vision Technical Capability consist of the following asset.

Asset #1 - This facility supports the total life-cycle support (i.e. buying, testing, maintaining, improving and disposing) of Night Vision Equipment, Electro-Optic Systems and Chemical Warfare Detection Equipment.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 13 of this data call. This facility is movable according to paragraph 6, page 13. The facility requires special power, controlled conditions for testing of equipments, and special realignment/calibration after shipment.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The replacement cost of this facility's hardware and equipment is $5,112,793.

The knowledge and experience of the facility's personnel is irreplaceable.

4. Provide the gross weight and cube of the facility/equipment.

The gross weight of this facility is: 7,898,164 lbs.

The gross cube of this facility is: 183,885 ft^3

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Other special power requirements are 208 VAC, 3-phase power and 115 VAC, 400 Hz power.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

Facility must have roof access hatch to permit full extension of system test stand mast assembly. Requires controlled lighting down to darkroom levels (less that 2×10^{-6} foot candles).

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

Humidity controlled to 45±5%. Temperature controlled at 75±5 °F.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

The facility/equipments of the Night Vision Electro-Optics Technical Capability (NVEO TC) are an integrated life-cycle support capability with program management, engineering, logistics and repair/maintenance capabilities co-located.

The NV/EO Technical Capability utilizes the full spectrum of technical and support services offered by the Crane Division and its total of 17 collocated Technical Capabilities. The supply Directorate is the primary Navy storage and distribution point for NV/EO and CWD equipments and provides receipt, storage and shipping support, as well as procurement services. The Mechanical Manufacturing Technical Capability provides hardware and cable fabrication for numerous tasks, most notably the Navy Mast Mounted Sight. The small arms Technical capability provides indoor and outdoor range facilities for laser testing and for testing of night vision devices with controlled light conditions. The electronic Module test and repair Technical Capability provides circuit card test and repair and equipment calibration. The Microelectronic Technology Technical Capability conducts failure analysis. Battery test and evaluation support is performed by the Electrochemical power system Technical Capability. All of the

capabilities supplied by the collocated TC's are essential to the performance of our mission.

The synergy of the NV/EO Technical Capability with these other TCs and supporting functions results in full utilization of capability and resources, improved efficiency, and has resulted in significant cost avoidance by negating unnecessary duplication of equipment facilities and supporting expertise.

A unique feature of the location of the NV/EO Technical Capability is the rural location. This permits night time outdoor night vision testing under realistic environmental conditions without the interference of "Backlighting" of the sky as would be the situation if this TC were located near an urban area.

The personnel of the Facility are mostly native to the south central Indiana area. This is an area with strong family ties and history and a low cost of living. It is extremely unlikely that the personnel would be willing to relocate.

Due to the unique characteristics of our location and the support provided by the collocated TC's it would be extremely difficult if not impossible to replicate or relocate this Facility. No other facility within the Navy exists with the expertise, facilities and equipment to support night vision and electro-optic systems throughout their life cycle.

[Indicate the impact to the Department of the Navy if this facility/equipment were lost]

The interrelationship's of this Technical Capability (TC) to the other TC's within NSWC/CD results in considerable cost avoidance and improved efficiency across the broad spectrum of products and customers supported. This translates to improved operational readiness and capability for the military community or "more bang for the buck". Loss or relocation of this TC would not only disrupt performance of other collocated TC's, it would also severely impair our warfighting and peacekeeping capabilities.

Because NSWC/CD provides a full spectrum of support for night vision, electro-optical and chemical warfare detection equipment from development to disposal, the expertise that has been developed permeates the boundary between theory and practice, laboratory and real world. This is, perhaps, the most unique and valuable trait of this TC. No other DOD activity provides such a broad core of knowledge and expertise. It is very probable that most of the personnel would not be willing to relocate. This would create a tremendous expertise and knowledge 'void' in this rapidly changing area of technology, and it would be nearly impossible to regain this capability again.

NSWC/CD's ability to manage, provide, improve, maintain, and sustain night vision/electro-optic and chemical warfare detection equipment is critical for all surface Navy ships and craft, fixed wing aviators, rotary wing aviators, and special warfare/special operations forces to be able to operate and fight at night. As was most recently demonstrated during Desert Shield/Desert Storm and is emphasized by

"...From the Sea", current and future conflicts will be fought at night, utilizing joint forces in cluttered and congested littoral environments and perhaps in threat of chemical agent attack from third world adversaries. The ability of these forces to defend themselves and operate efficiently, safely, and with minimum loss of life depends to a large extent upon the performance and reliability of these night vision/electro-optic and chemical detection equipments.

Loss of NSWC/CD's technical capability would severely cripple the DOD's ability to train for and support this critical warfighting capability for Navy, Army, Marine Corps and Special Operations Forces, and most probably result in increased casualties during peacekeeping/humanitarian operations or armed conflict. Loss of NSWC/CD's surge/mobilization repair capability would adversely affect U.S. Military capability to sustain such operations or to contend with multiple scenarios simultaneously.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The facility has evolved from occupying shared spaces with other technical capabilities in the late 1960's to installing a clean room facility, obtaining special power requirements and expanding into vacated spaces to meet the growth requirements as recently as 1992. Some of the equipments/platforms were manufactured and installed at Crane. Other equipments were procured, delivered, and then calibrated after installation.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

4. SPECIAL OPERATIONS SUPPORT
   - **4.1** Landing Force Equipment and Systems
   - **4.2** Coastal/Special Warfare Support

5. SENSORS & SURVEILLANCE SYSTEMS
   - **5.3** Special Sensors

10. GENERAL MISSION SUPPORT
    - 10.6 Crew Equipment and Life Support
      - **10.6.3** Surface Ship

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Average utilization 53%.

12. Provide the projected utilization data out to FY1997.

FY 94 - 78%
FY 95 - 72%
FY 96 - 81%
FY 97 - 83%

13. What is the approximate number of personnel used to operate the facility/equipment?

Ninety five personnel

14. What is the approximate number of personnel needed to maintain the equipment?

Two personnel

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Mine Countermeasures Technical Capability

1. State the primary purpose(s) of the facility/equipment.

CRANE DIVISION
TECHNICAL CAPABILITY #16

MINE COUNTERMEASURES IN-SERVICE ENGINEERING AGENT, SOFTWARE SUPPORT ACTIVITY, AND DEPOT

SUMMARY DESCRIPTION

The Crane Division, Naval Surface Warfare Center (NSWC Crane) is a unique asset to the Navy, serving as the Navy's expert and primary life cycle support activity for the combat systems used in the surface Mine Countermeasures (MCM) Fleet. The MCM Technical Capability (TC) at NSWC Crane provides full spectrum support -- research, development, test, and evaluation; engineering; acquisition; manufacturing; depot repair; direct fleet support; and system retirement -- for MCM systems, including navigation/command and control and sonar systems used to locate and neutralize a wide range of floating, moored, and bottom mines.

This support covers the entire life cycle of MCM systems, beginning early in the life cycle as NSWC Crane assists in requirements definition and system design. Support continues into system acquisition as NSWC Crane utilizes its vast electronics experience coupled with knowledge of the MCM mission to recommend intelligent acquisition decisions and strategies, helping the Navy make "Smart Buyer" choices.

NSWC Crane continues to support these systems throughout their useful lives with hardware, software, and logistics products to ensure operational readiness. NSWC Crane conducts or assists in system test and evaluation and provides direct Fleet support in the areas of In-Service Engineering and logistics to MCM-1, MHC-51, LHD-1, MSO, and COOP ship classes. **Timely on-site technical assistance is routinely provided, as was demonstrated in Operation Desert Shield/Desert Storm.** Emergency production capability exists for components, subsystems, and systems to meet Fleet surge/mobilization requirements. **NSWC Crane provides a uniquely secure, land-locked setting for its highly specialized personnel to perform work on classified projects.** The MCM TC is closely linked with, and is required by, the Mine Warfare Technical Capability at Dahlgren Division.

MISSION

The MCM TC plays an enduring and vital role in the current and future Navy mission. As outlined in "From the Sea...", the focus has shifted from a global threat to regional challenges and from "blue water" operations to littoral warfare, the most likely scenario in the foreseeable future. The Navy's need to provide MCM in support of amphibious operations will remain. The mining of the Persian Gulf during Desert Shield/Desert Storm demonstrated the continued need for MCM. Mine warfare, and MCM in particular, is a key to rapidly and safely deploying forces to the next area of conflict. The **MCM TC is required in order to provide rapid response in times of national crisis and during surge/mobilization**. In that respect, NSWC Crane **directly impacts the operational readiness of current and future MCM forces** to meet this challenge. The TCs located at NSWC Crane share not only various facilities, but also the use of various areas of expertise within the TCs. **The Tactical Software Support Branch within the MCM TC provides unique direct support to the Electronic Warfare TC threat libraries; the MCM TC is the only source available in the government or private industry to support this software.** This group also supports test equipment (the ULM-4 in the AN/SLQ-32) for the Electronic Warfare TC.

JOINTNESS/DUAL USE

Although the mission of this TC does not include direct support to any other Services, **the TC does support Tri-Service efforts**. The Logistics Support Branch and the Tactical Software Support Branch within the MCM TC also provide support to the Marine Corps, Coast Guard, and Special Warfare.

The MCM TC supports commercial-military integration (dual use) technology; the navigation/command and control systems on the MCM Fleet have utilized commercial technology for several years. **Commercial navigation sensors and computer peripherals have been integrated with military equipment to form combat systems.**

NSWC Crane continues to work closely with commercial equipment manufacturers to derive benefits from the dual use of this equipment. **Competitive packages are developed for the acquisition of commercial off-the-shelf equipment.** After the equipment is put into service, communications are maintained with manufacturers in order to avoid obsolescence of the equipment.

This TC works closely with the Applied Research Laboratory at the University of Texas, which provides support in the areas of research and development, evaluation, and product improvement. NSWC Crane personnel also have a close working relationship with Raytheon Equipment Division, which serves as the prime contractor for the AN/SQQ-32(V) and provides interim depot support and limited production.

NSWC Crane establishes and maintains excellent working relationships with private industry to ensure that all Fleet supportability issues are identified and resolved as early as possible in the acquisition process so that the MCM systems the Navy buys have maximum operational effectiveness.

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS AND SERVICES

Program Executive Office Support - NSWC Crane is a full-service organization that provides full-spectrum direct support to the Program Executive Office (PEO) for Mine Warfare by acting as the designated program manager for several mine hunting sonar and navigation systems. **Crane serves as the Navy's expert MCM TC and primary support activity for the combat systems used in the surface MCM Fleet.** The MCM TC is an enduring capability that covers the entire life cycle of Level III MCM combat systems. NSWC Crane personnel are actively involved in setting program priorities; establishing, certifying, and validating technical requirements, program planning and budgeting; and providing direction to the various support activities and contractors. NSWC Crane personnel monitor contractor performance and technical status and assist the PEO in solving technical problems, acquiring deliverables, and reducing costs and risks pertaining to MCM systems. **Crane works with the contractors to strengthen their technical capabilities while preserving inherently governmental functions.**

Based upon their experience in the logistics and configuration management areas, this TC has prepared and assisted the PEO in the establishment of Navy MCM combat system processes and policies. This policy development is evident specifically in the areas of Integrated Logistics Audits; supply support (interim support and provisioning); and configuration management plans, processes, and procedures, including configuration status accounting.

The MCM TC is closely linked with, and is required by, the Mine Warfare Technical Capability at Dahlgren Division.

System Development/Acquisition Involvement - Crane participates early in the development and acquisition cycle for combat systems. Practical experience in MCM applications, coupled with specialized expertise in the areas of microelectronics, electronic module test and repair, electrochemical power systems, acoustic sensors, and mechanical manufacturing, are used to **recommend intelligent acquisition decisions and provide "Smart Buyer" capability to the PEO.**

Integrated Logistics Support Planning and Management - **The MCM TC at NSWC Crane is very strong in the area of Integrated Logistics Support (ILS), with widely-recognized experts in that area.** ILS includes the identification and acquisition of all resources necessary to economically and efficiently support a system throughout

its life cycle. The major elements of ILS include maintenance planning; support and test equipment; supply support; packaging, handling, storage, and transportation; management of technical data; manpower and personnel; training and training support; facilities; computer resources; and design interface, which ensures logistics planning meshes with other disciplines such as configuration management, reliability and maintainability, quality assurance, safety, and human engineering. **The importance of ILS is evidenced by the fact that logistics support costs for military**

systems are typically several times greater than the total costs to develop, evaluate, and manufacture the systems. More and more emphasis is being placed on efficient logistics support as less money is available for new systems development and acquisition.

Development and implementation of a comprehensive ILS program requires a thorough understanding of the development process, the role of support activities, and operational considerations. **Since ILS is a systematic process involving the careful planning, managing, and pulling together of a variety of Defense resources, it is important that it be performed under the control of an in-house technical organization.** Crane's MCM TC encompasses the development of ILS strategy, along with the associated plans and processes to ensure resources are in place to provide system supportability throughout the life cycle. **The PEO has designated NSWC Crane to serve as the ILS Manager for 16 separate MCM programs.** The assignment of this responsibility evolved as a result of the unyielding efforts of MCM logistics personnel at NSWC Crane to provide quality and timely support to the Fleet. **Crane personnel maintain a close working relationship with the end users (sailors).** MCM logistics support personnel serve with the PEO on the ILS Management Teams for MCM-1 and MHC-51 ship classes, meeting on a quarterly basis to ensure that Fleet requirements are being met.

Training and Training Support - The MCM TC develops and maintains the operation and maintenance training curriculum for MCM navigation/command and control and mine hunting sonar systems. This TC was requested by the PEO to review and comment on the new proposed instruction for curriculum (MIL-STD-1379D). **NSWC Crane was selected as a test site for the Authoring Instructional Materials (AIM) system by NAVSEA SEA04MP due to the large volume of curriculum materials being developed and maintained by the In-Service Engineering Agent.** This system automates the development of curriculum materials by allowing the technical personnel to enter the technical characteristics of the subject matter into a relational database. This greatly reduces the maintenance of curricula.

Formal classroom training is conducted at NSWC Crane for Fleet personnel, and shipboard personnel training is provided on demand. NSWC Crane provides advisory services to Navy school instructors prior to and following pilot course conduct, as required.

Technical Documentation Development/Management - The MCM TC develops and maintains technical documentation including technical manuals, engineering drawings, preventive maintenance documentation, specifications, and repair standards for assigned MCM combat systems. **Because of the in-depth experience in technical manual development, this TC supports the Ships Acquisition Program Manager (NAVSEA PMS303) in exercising Technical Manual Contract Requirements.**

Test and Evaluation Support - **NSWC Crane personnel prepare, conduct, and monitor all required tests to assure the combat systems meet operational requirements.** Involvement in factory acceptance and other qualification tests ensures procured systems are certified to meet technical requirements.

NSWC Crane personnel have been actively involved in evaluating foreign weapons systems and integrating foreign equipment into U.S. Navy systems. The largest MCM program supported at this time is the AN/SQQ-32(V) Minehunting Sonar, which uses French-developed mine classification hardware. Other French and British systems have also been evaluated, and the British-developed AN/SYQ-15 Operations Central Display is now being used in the AN/SSN-2(V) Precise Integrated Navigation System.

Combat System Upgrades - Crane develops, tests, and installs upgrades and enhancements to assigned MCM systems. **These upgrades are designed to enhance system performance and supportability, or to introduce new technology to the MCM Fleet.**

Combat System Software Development/Maintenance - NSWC Crane is the designated Software Support Activity for MCM systems, and **provides the only source of tactical software products for the navigation/command and control and mine hunting sonar systems.** Much of this software is developed by recognized experts within the TC, as it is highly specialized software that is critical to the Fleet and is not available

in private industry. **Any software developed elsewhere is subjected to a quality assurance process administered by NSWC Crane software engineers.** Each system's software configuration is managed and distributed directly to the Fleet.

Field Service - This TC also encompasses direct technical support to the Fleet for deployed systems. This support includes installation of hardware and software, test and evaluation, depot level repair, and shipboard training. **Crane personnel routinely provide rapid response technical assistance to urgent issues that exceed the capability of ship's forces and cannot wait for normal procedures.** NSWC Crane personnel performed pre-deployment combat system grooms as well as on-site technical assistance in war zones during Operation Desert Shield/Desert Storm.

Production Capability - System, subsystem, and component level manufacturing is routinely performed under this TC. **The manufacturing capability is utilized when no known sources of supply exist and/or fleet requirements cannot be met by private industry.**

System Maintenance - Organizational (shipboard), intermediate (shore-based), and depot level maintenance strategies are determined within this TC. NSWC Crane has depot assignments for navigation/command and control and mine hunting sonar systems. **The MCM TC teams with the Electronic Module Test and Repair Technical Capability also located at Crane to accomplish this task.**

EXPERTISE

NSWC Crane has been involved in Mine Warfare programs since 1984. In order to provide the unparalleled, specialized support this TC offers the Fleet, Crane employs a dedicated and professional workforce comprised of highly knowledgeable, flexible core personnel. **Most of the expertise required for MCM support can only be acquired through years of on-the-job training and experience.**

The skill mix of NSWC Crane personnel supporting this TC includes Scientists and Engineers -- 47%; Technicians -- 25%; and Logisticians and Others -- 28%.

- *Scientists and Engineers* - This group includes Electronics, Mechanical, and Computer Engineers, as well as Physicists. Knowledge and in-depth experience in systems engineering, computer architecture, combat system command and control, navigation principles, hydroacoustics, and MCM tactics and operations are required.

- *Technicians* - This group consists of Electronics, Mechanical, and Engineering Technicians. In-depth understanding of each specific combat system, as well as production and repair processes, is required to perform production, maintenance, and field service tasking generally performed by this group.

- *Logisticians and Others* - This group is made up predominately of Logistics Management Specialists. In-depth knowledge of ILS principles, along with specialized expertise in MCM mission and support requirements, are essential to deliver ILS, configuration management, and technical documentation products and support to the customer.

These three groups combine for over 500 man-years of experience in life cycle support of MCM combat systems. **This MCM TC is required because other sources cannot be found elsewhere in the Government or private industry.**

The purpose of the Mine Countermeasures Technical Capability facility is to support engineering, logistics, and depot efforts for Mine Countermeasures (MCM) Combat Systems equipment for which NSWC Crane has In-Service Engineering Agent (ISEA) and Software Support Activity (SSA) assignments. These systems/equipment include the AN/SQQ-32(V) Minehunting Sonar Set; AN/SSN-2(V) Precise Integrated Navigation System; AN/SQQ-30 Mine Classifying-Detecting Set; OK-520/SQQ Common Winch; AN/SYQ-13 Navigation, Command and Control System; AN/WQN-1(V) Sonar Detecting-Ranging Set; and AN/SSQ-94 Combat Systems Integrated Training Equipment.

The MCM TC facility consists of two laboratory assets (a Combat Systems Laboratory and a Tactical Software Laboratory) that work together to provide full spectrum support.

The Combat Systems Laboratory allows NSWC Crane engineering, technical, and logistics personnel daily access to system hardware as required to accomplish life cycle support for MCM Combat Systems equipment for production, direct Fleet support, training, hardware and software integration testing, and hardware upgrades. The synergy of having the technical support staff from various disciplines co-located with actual MCM hardware results in better support for the customer.

The Tactical Software Laboratory is used to maintain, distribute, and evaluate tactical countermeasures software. NSWC Crane is the designated SSA for the MCM systems; the software facility provides the only source of tactical software products for the navigation/command and control and mine hunting sonar systems. Each system's software configuration is managed and distributed directly to the Fleet.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The overall MCM TC facility is moveable. The facility is distributed among three buildings in the NSWC Crane industrial area, and consists of a combination of Class 3 (portable) and Class 2 (moveable) equipment in about 17,000 square feet of dedicated space. About 75% of the total MCM Combat Systems equipment is classified as moveable, since it consists of equipment that is interconnected and shared by several projects.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The total replacement of the MCM TC facility is $25,645K, broken down as follows.

Major components of the MCM Combat Systems laboratory (and estimated replacement costs) include the AN/SQQ-32(V) engineering development and training system ($8,000K); AN/SQQ-30 engineering development system ($3,000K); AN/SSN-2(V) environmental conditioning area ($70K); AN/SSN-2(V) engineering development and training system ($2,000K); AN/WQN-1(V) engineering development system ($750K); AN/SYQ-13 engineering development and training system ($900K); Combat Systems mock-up and training laboratory ($55K); and the MCM circuit card depot ($1,625K). Total replacement value of the MCM Combat Systems facility/equipment (separate from building and utilities), including plant account and minor property is approximately $22,111K.

Total replacement value of the Tactical Software Laboratory facility/equipment (separate from building and utilities) is approximately $1,924K. In addition, the Tactical Software Laboratory has software equipment licenses and site licenses in effect. Maintenance agreements and software licenses are, by definition, site specific. Some software is unique to this installation. Modification, relocation, or duplication of the tactical software facility in these cases would require reverse engineering and redevelopment. Estimated cost for licenses, maintenance contracts, and re-establishment of the engineering environment is $250K.

4. Provide the gross weight and cube of the facility/equipment.

The estimated gross weight and cube of major systems/equipment within the MCM TC facility are shown in the table below. The total gross weight is approximately 62,711 lbs; total cube is approximately 6,362 ft^3.

COMBAT SYSTEMS LABORATORY

SYSTEM/EQUIPMENT	GROSS WEIGHT	CUBIC FT.
AN/SQQ-32(V) Advanced Minehunting Sonar	24,500 lbs	396
AN/SSN-2(V) Precise Integrated Navigation System	5,500 lbs	450
AN/SQQ-30 Mine Classifying-Detecting Set	10,700 lbs	195
AN/SYQ-13 Navigation, Command and Control System	4,250 lbs	300
AN/WQN-1(V) Detecting-Ranging Set	2,951 lbs	270
AN/SSQ-94 Combat Systems Integrated Training Equipment	610 lbs	26
Tactical Software Laboratory	11,400 lbs	1,890
MCM Circuit Card Depot	15,000 lbs	6,000

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support for the Combat Systems Laboratory includes 440 VAC 3-phase power and dedicated air handling (temperature and humidity controls) for several systems, at a cost of $35K.

The building was modified to meet the Tactical Software Laboratory's requirements for special power, air handling, and raised flooring (approximately 600 sq. ft.), at a cost of $80K. Special fire prevention equipment has been installed to protect the equipment in case of fire.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

The MCM Combat Systems Laboratory has a 10-ton moveable overhead crane in place to facilitate the movement/maintenance of the 5-ton sonar towed bodies. Ceiling height to accommodate the crane must be at least 15 feet. Special stainless steel cradles were made to support the towed bodies during repair, maintenance and training (two cradles at $5K each).

The Tactical Software Laboratory provides products and support directly to the Fleet. To satisfy Fleet requirements, the facility must remain in a state of operational readiness at all times. Maintenance contracts are in place to assure 24-hour turn around time for all essential equipment. Special budget requirements to maintain this state of readiness amount to $50K/year.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

The facility requires a special air handling system to adequately dissipate the BTU output from the various pieces of equipment used. Stable temperature and constant humidity must be maintained when the equipment is fully operational. The facility includes a special environmental chamber (approximately 144 ft^2) that is used during factory acceptance testing and the environmental screening process. The estimated cost of this chamber is $30K.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

It would be possible to relocate the portable and moveable equipment in the Combat Systems Laboratory. Relocation would, however, result in the loss of many of the benefits realized by co-location with other NSWC Crane technical capabilities (including Microelectronic Technology, Electronic Module Test and Repair, Electrochemical Power Systems, Acoustic Sensors, Mechanical Devices, and Naval Drawings). Co-location with NSWC Crane programs from other Warfare areas and these technical capabilities helps provide MCM customers with full spectrum support and specialized expertise available no place else in the Government or private industry.

Much of the equipment in the Tactical Software Laboratory is standard commercial equipment and could be easily replicated. However, the AN/SQQ-32(V) software facility uses AN/UYK-44(V) Microprocessor Development Systems, which are no longer available for procurement. Standard AN/UYK-44(V) units could possibly be used in place of these special systems, but would require backplane modification and unique cable development. Total cost for developing duplicate resources is estimated at $750K. This cost assumes procurement of equipment and cable components, fabrication, and installation.

The loss of the MCM TC facility would severely limit the Navy's ability to counter the mine threat in both deep and shallow water. MCM hardware, software, and logistics products would not be available to the Fleet. Without this support, the MCM force would be rendered ineffective; without an effective MCM force, much of the Navy's mission simply could not be accomplished.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

The MCM TC facility was developed over about a ten-year period at the NSWC Crane site, using direct project and minor construction funds when the facilities were required to support emerging project needs.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

This facility supports the Defense Systems, Countermeasures (CM), functional support area number 8.2.

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Historical utilization (based on square feet used/available) for the MCM TC facility is shown below.

FY89	FY90	FY91	FY92	FY93
80%	80%	85%	85%	90%

12. Provide the projected utilization data out to FY1997.

Projected utilization (based on square feet used/available) for the MCM TC facility is shown below.

FY94	FY95	FY96	FY97
90%	90%	85%	85%

13. What is the approximate number of personnel used to operate the facility/equipment?

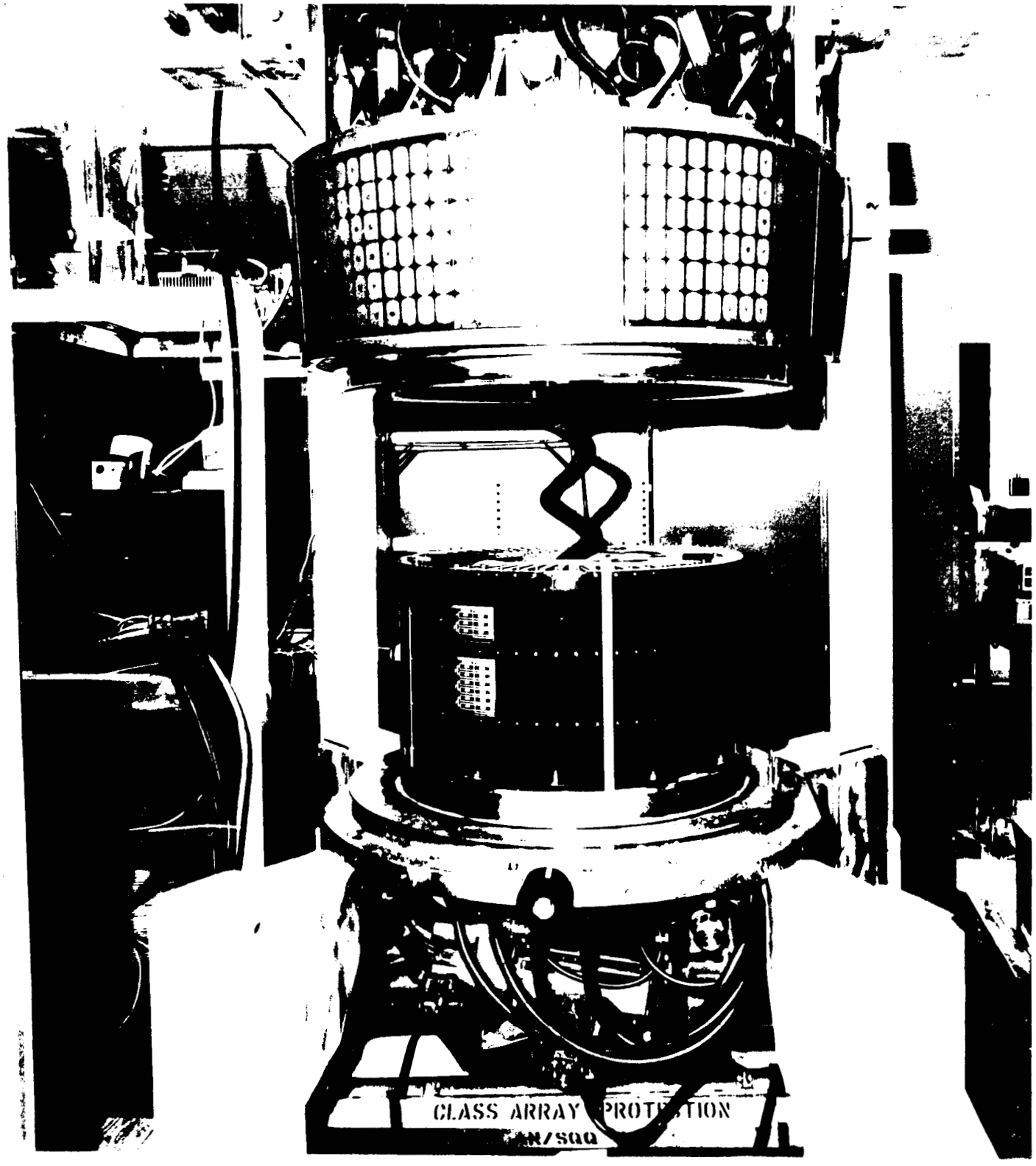
Approximately 140 personnel operate the facility/equipment.

14. What is the approximate number of personnel needed to maintain the equipment?

About five personnel are required to maintain the equipment.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Photos are attached.


CLASS ARRAY PROTECTION
AN/SQQ

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Radar Technical Capability

1. State the primary purpose(s) of the facility/equipment.

TECHNICAL CAPABILITY TITLE

RADAR ENGINEERING AND INDUSTRIAL SUPPORT

SUMMARY DESCRIPTION

The Radar Engineering and Industrial Support Technical Capability (TC) provides the engineering, technical, logistics and depot/industrial capabilities necessary to support multiple Naval Surface Ship Combat System Radars. **These radars are the primary shipboard sensors for air and surface surveillance systems.** This TC provides the expertise and facilities required to assure the Navy is a smart buyer, receiving products which satisfy both performance and readiness requirements. **This capability complements several additional capabilities forming a major portion of the Crane Division mission, support for microwave systems and components.**

MISSION

Radar is the primary sensor used in surveillance and detection roles in both blue water and littoral warfare engagements, and will be for the foreseeable future. Detection radars provide accurate threat positions enabling weapons control systems to launch early and on target. Surface detection radars support navigation and ship control during open ocean and littoral maneuvers. Collateral mission functions include Anti-Submarine Tactical Aircraft Control, Air Intercept Control and Theater Air Traffic control.

JOINTNESS/DUAL USE

The systems supported by this technical capability support the Joint Mission Areas of Joint Strike, Joint Littoral, Joint Surveillance, Strategic Sealift Protection and Strategic Deterrence. The Coast Guard utilizes several Navy systems and contributes to the support and development for them.

TECHNICAL FUNCTIONS

The Radar Engineering and Industrial support capability includes the following assignments under Deputy Program Manager for Air and Surface Detection Radars: radar depot management; radar equipment engineering; repair and limited manufacturing support for radar systems and components; and responsibility as the Navy's Acquisition Engineering Agent (AEA) for these systems. **As the AEA, Crane provides technical expertise for independent review and validation of contractors' technical proposals to verify that the Navy's performance requirements are satisfied.**

The combination of across the board knowledge of surface ship and submarine radars and the years of experience provides a unique capability permitting the Navy to function as a "smart buyer." **This knowledge base provides unbiased recommendations and judgements to avoid costly duplication of effort and reduce development, procurement, and logistics support costs for increasingly sophisticated and expensive radar systems.** Deputy Program Manager and AEA functions include providing technical support for monitoring equipment manufacturers' performance once contracts have been awarded. These functions are inherently governmental and require in-depth technical knowledge.

Crane serves as the Navy's long term corporate memory for this product area. Hands-on maintenance experience and component quality knowledge enable Crane to identify potential operational problems which may result from equipment changes to Navy Radar Systems. **The ability to provide failure analysis, to detect poor workmanship and interface problems, and to solve logistics problems enables Crane's engineering staff to initiate prompt corrective action for Fleet failures.**

Radar System Acquisition Engineering provides full support for the development, system engineering, integration, and production of major improvements to New Threat Upgrade radars. Crane is supporting the following Major developments:

- **AN/SPS-48E AUXILIARY DETECTION PROCESSOR (ADP) and POST DOPPLER UPGRADE** - These improvements provide additional detection capability for the smaller targets of the future and reduce the inherent land clutter presented to this radar in the littoral environment. The system concept is the use of Commercial-Off-The-Shelf (COTS) hardware to increase the processing capability and sensitivity to moving targets within the radar beam. **This allows a low cost, performance increase in a large volume, air detection radar used by Naval Amphibious forces.**

- **SURFACE SEARCH RADAR** - Crane is the lead field activity for the joint Navy and Coast Guard development of the next generation surface search radar. This radar will replace all surface search (AN/SPS-64) radars used for harbor and near land navigation within the Navy and Coast Guard. This radar meets or exceeds all International Maritime Office Treaty requirements. It is also a low cost replacement for antiquated radar equipments when linked with Non-Developmental Technology from private industry. **This equipment becomes more critical to Naval missions as we move to the littoral warfare environment.**

- Crane provides industrial support for air detection radars (AN/SPS-40,48,49), surface detection radars (AN/SPS-64,67) and radar displays and distribution systems (AN/SPA-25F/G, SB-4229, CV-3989). **This multiple system capability is unique in the Navy.**

EXPERTISE

Personnel providing support to this technical capability have multi-discipline engineering expertise that provides the necessary skills for solving a variety of complex radar development and production problems. **Since expertise in the field of radar engineering is not a curriculum in any major college or university, it must be developed through years of on-the-job experience and is critical to maintaining this technical capability.**

Over a period of 5 to 15 years, Crane has developed and maintained a highly specialized technical workforce across a wide range of disciplines that are core to supporting the continued operational readiness of Fleet Detection and Fire Control radars. Specific disciplines include: Radar System Production Engineering, Antenna Structural Engineering, Tribophysics, Monolithic Microwave Circuit design, Radar Performance evaluation, Material Analysis, Spectral Analysis, Industrial Engineering, Radio Frequency Design and Analysis and Maintenance Engineering.

The Radar Technical Capability consist of the following asset.

Asset #1 - The primary purpose of the facilities and equipment is life cycle support of Air and Surface Detection and Fire Control Radars. These state-of-the-art facilities and equipment support a broad spectrum of radar systems used during open ocean and littoral warfare scenarios. The facilities and equipment are utilized in the full spectrum of support including RDT&E, Acquisition Engineering, Maintenance Engineering, Industrial Engineering, Depot Overhaul Point, Manufacturing and Training. These facilities and equipment provides direct support to the Naval Sea Systems Command, Naval Surface Warfare Center, Naval Undersea Warfare Center, Program Executive Office - Theater Air Defense, Coast Guard, Military Sealift Command, Foreign Military Sales, Fleet Support and Marine Corps.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

The overall MCM TC facility is moveable. The facility is distributed among three buildings in the NSWC Crane industrial area, and consists of a combination of Class 3 (portable) and Class 2 (moveable) equipment in about 17,000 square feet of dedicated space. About 75% of the total MCM Combat Systems equipment is classified as moveable, since it consists of equipment that is interconnected and shared by several projects.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The total replacement of the MCM TC facility is $26,849K, broken down as follows. R

Major components of the MCM Combat Systems laboratory (and estimated replacement costs) include the AN/SQQ-32(V) engineering development and training system ($11,000K); AN/SQQ-30 engineering development system ($3,000K); AN/SSN-2(V) environmental conditioning area ($70K); AN/SSN-2(V) engineering development and training system ($2,000K); AN/WQN-1(V) engineering development system ($750K); AN/SYQ-13 engineering development and training system ($900K); Combat Systems mock-up and training laboratory ($82K); and the MCM circuit card depot ($1,625K). Total replacement value of the MCM Combat Systems facility/equipment (separate from building and utilities), including plant account and minor property is approximately $5,100K. R R R

Total replacement value of the Tactical Software Laboratory facility/equipment (separate from building and utilities) is approximately $2,072K. In addition, the Tactical Software Laboratory has software equipment licenses and site licenses in effect. Maintenance agreements and software licenses are, by definition, site specific. Some software is unique to this installation. Modification, relocation, or duplication of the tactical software facility in these cases would require reverse engineering and redevelopment. Estimated cost for licenses, maintenance contracts, and re-establishment of the engineering environment is $250K. R

Revised pg

4. Provide the gross weight and cube of the facility/equipment.

The estimated gross weight and cube of major systems/equipment within the MCM TC facility are shown in the table below. The total gross weight is approximately 62,711 lbs; total cube is approximately 6,362 ft^3.

COMBAT SYSTEMS LABORATORY

SYSTEM/EQUIPMENT	GROSS WEIGHT	CUBIC FT.
AN/SQQ-32(V) Advanced Minehunting Sonar	24,500 lbs	396
AN/SSN-2(V) Precise Integrated Navigation System	5,500 lbs	450
AN/SQQ-30 Mine Classifying-Detecting Set	10,700 lbs	195
AN/SYQ-13 Navigation, Command and Control System	4,250 lbs	300
AN/WQN-1(V) Detecting-Ranging Set	3,502 lbs R	270 R
AN/SSQ-94 Combat Systems Integrated Training Equipment	610 lbs	26
Tactical Software Laboratory	11,400 lbs	1,890
MCM Circuit Card Depot	15,000 lbs	6,000

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

Special utility support for the Combat Systems Laboratory includes 440 VAC 3-phase power and dedicated air handling (temperature and humidity controls) for several systems, at a cost of $35K.

The building was modified to meet the Tactical Software Laboratory's requirements for special power, air handling, and raised flooring (approximately 600 sq. ft.), at a cost of $80K. Special fire prevention equipment has been installed to protect the equipment in case of fire.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

The MCM Combat Systems Laboratory has a 10-ton moveable overhead crane in place to facilitate the movement/maintenance of the 5-ton sonar towed bodies. Ceiling height to accommodate the crane must be at least 15 feet. Special stainless steel cradles were made to support the towed bodies during repair, maintenance and training (two cradles at $5K each).

The Tactical Software Laboratory provides products and support directly to the Fleet. To satisfy Fleet requirements, the facility must remain in a state of operational readiness at all times. Maintenance contracts are in place to assure 24-hour turn around time for all essential equipment. Special budget requirements to maintain this state of readiness amount to $50K/year.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

There are a variety of facilities and equipment located at Crane supporting radar systems. Resident at Crane are multiple anechoic chambers, multiple compact ranges, antenna high power test range, indoor near field range, gear metrology laboratory, shipboard windload environmental simulator, class 10,000 microwave solid state devices clean room, micro-miniature repair facilities, radar components test/repair equipment, shipboard radar system test facility, environmentally safe corrosion control and waste treatment facility, environmental test tables, material and failure analysis laboratory, metallurgy laboratroy and machine shop. There is one portable compact range. Movable equipments are comprised of antenna positioners, automated antenna test and analysis equipment, automated radar component test equipment, gear metrology equipment, windload test equipment, high and low power test systems, failure and material analysis equipment, mettalurgy equipment, machine shop facilities and microminiature repair facilities. While all this equipment is movable, it is integral to the overall mission of the radar technical capability. The class 10,000 clean room is a fixed facility.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The replacement value of the facilities and equipment is $52.8 million. The replacement value of the portable facilities and equipment is $670,000. The replacement value of the movable facilities and equipment is $51.5 million. The replacement value of the fixed facilities is $645,000.

4. Provide the gross weight and cube of the facility/equipment.

The facilities and equipment occupy 1,061,900 cubic feet and the gross weight is approximately 588 tons.

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

The special utility support required for these facilities and equipment include chilled and de-ionized water, forced air cooling, 440V 3 Phase 60 Hz Power, 440V 3-Phase 400 Hz, filtered clean electrical power, 100 psi compressed air, dry nitrogen, clean (1 micron) dry (-40 dew point) air 10 CFM at 100 psi, and fire suppression systems.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.).

Special budgetary requirements for the facilities and equipments include shock absorbent flooring for the Gear Metrology laboratory, reinforced foundations for antenna positioners and clean room, ESD flooring and special grounding for microminiature repair area and radar components test/repair equipment.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

Temperature and Humidity controls are integral to most radar areas processing electronic components. Specific environmental control requirements for the gear metrology laboratory are clean (1 micron) dry (-40 dew point) air 10 CFM at 100 psi, humidity control of 40% RH at 63 F +/- 2 F.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

NSWC Crane Division is the Navy's only activity providing both the acquisition and industrial support for Air, Surface and Fire Control Radars. In order to avoid severely impacting fleet readiness during the relocation of this facility and equipment, it would be imperative that the relocation process be completed in a short time period. No other Naval activity has the unique combination of supporting facilities and equipment available to readily take over these responsibilities. Therefore, it is not practical to expect the relocation to be completed in a short time frame. It should be expected that the relocation of this facility and equipment would require at least 2 to 5 years. Industrial maintenance of radar equipment is a vital function for fleet readiness. Hence the relocation of the facilities and equipment would negatively impact Fleet readiness.

The loss of this equipment and facility with its inherent capability would negatively impact NAVSEASYSCOM's ability to continuously verify and validate systems performance as they become and remain operational in the Fleet. Furthermore, the Navy's industrial experience/knowledge of these systems would wane without the ability to have "hands-on" day to day working experience with these complex systems. The loss of versatility provided by this equipment/facilities would negatively impact the Navy's operational readiness in regards to radar and its ability to function at its current high level of competence. A "Black hole" would definitely be created in the Navy's ability to have access to radar systems that are fully functional.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

Most of the Radar Engineering and Industrial Support facilities were constructed or put in place inside existing buildings. The facilities were constructed and equipment installed between 1964 to present.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

The functional support areas for all of these facilities and equipment are Fire Control (2.9) and Radar Systems (5.2).

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

Utilization is defined as operating all facilities 8 hours per day, 5 days per week.

FY89	FY90	FY91	FY92	FY93
124%	174%	122%	191%	120%

12. Provide the projected utilization data out to FY1997.

Utilization is defined as operating all facilities 8 hours per day, 5 days per week.

FY94	FY95	FY96	FY97
96%	104%	104%	140%

13. What is the approximate number of personnel used to operate the facility/equipment?

The facilities and equipment are operated by approximately 51 people.

14. What is the approximate number of personnel needed to maintain the equipment?

The equipment is maintained by approximately 5 people.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

SPECIAL FACILITIES AND EQUIPMENT
FACILITIES/EQUIPMENT CAPABILITY FORM

Technical Center Site	NSWC Crane Div Crane, IN
Facility/Equipment Nomenclature or Title	Acoustic Sensors Technical Capability

1. State the primary purpose(s) of the facility / equipment.

CRANE DIVISION
TECHNICAL CAPABILITY #7
ACOUSTIC SENSORS

SUMMARY DESCRIPTION

Crane Division's **composite hydroacoustic capabilities** provide for total underwater acoustic evaluation in free field, littoral, and simulated ocean environments and is **unique within the United States industrial base**.

The acoustic sensors TC provides products and services supporting acoustic devices **through the entire life cycle - design, development, acquisition, appraisal, production, operation, and demilitarization.**

The hydroacoustic capabilities used to support these products and services are a mixture of unique and common facilities. **In many cases, these special purpose facilities are not practical for the private sector.** These facilities have been shared by the Surface Warfare Center, the Undersea Warfare Center, the Air Warfare Center, Special Operations, Strategic Systems, the Naval Research Laboratory, the Army, and a large number of private contractors.

Through the full spectrum sonar sensors TC workload, **Crane Division provides the Navy with "Smart Buyer" services, mobilization surge backup, private sector manufacturing relief, and an interdependent depot/Navy industrial base,** all interconnected, providing one-stop shopping during normal and emergency situations.

MISSION

The Acoustic Sensors TC is a vital part of the Navy, **providing the most complete hydroacoustic device test complex within the United States.** This facility has the capability to appraise performance and acceptability of mine and submarine countermeasures, sonar arrays, hull materials, wet-side cables and connectors, ordnance cable cutters, sequential line charges, hydrophones and transducers, and related materials.

The TC supports the Navy industrial base by maintaining prototype and surge capacity for watertight cables, connectors, and special items. This TC **assures proper utilization of acoustic related hardware after fleet introduction** through on-site training, installation, repair, upgrade, and maintenance.

JOINTNESS/DUAL USE

Support is provided to other technical centers within Crane Division (e.g., mine countermeasures, electrochemical power sources, microelectronic technology, electronic module test and repair, mechanical manufacturing, conventional ammunition engineering), the Surface Warfare Center (Carderock, Dahlgren), and other Warfare Centers (e.g., NAWCADI, NUWC Newport, NUWC Keyport, NCCOSC San Diego, NUWC DET Norfolk, and shipyards) to ensure organic project execution. **Teaming arrangements with these activities support Navy policy to enhance safety (e.g., lithium battery safety certifications on acoustic sensor devices) and reduce negative environmental impacts (e.g., elimination of plastics and heavy metals), and establish Navy safety standards for aircraft and weapons loading.**

Crane Division's private and academic sector teams are augmented with feedback from engineering and acceptance testing to enable private industry to analyze, improve, and correct hardware designs, thereby providing quality, low cost products. Support was provided to the Applied Research Lab of Pennsylvania State University by aiding in the deployment and manufacturing of special purpose sonobuoys for acoustic propagation studies.

Crane Division improves private industry production practices by applying the expertise within this technical capability. For instance, AN/WQC-2 Communication Sonar production has been assumed from private industry (involuntary bankruptcy), yielding not only timely system fabrication, but also enhanced industrial engineering processes. These include electronic packaging improvements, redesigned hardware replacing obsolete components, and streamlined electronic acceptance test procedures. **A completely revamped procurement package is under development to assure successful future private industry production.**

An existing depth sounder in the Navy is being considered for redesign using commercial off-the-shelf (COTS) technology and a functional specification was written. **COTS modules utilizing a common base structure are being considered.**

TECHNICAL FUNCTIONS/CORE FUNCTIONS/GOODS & SERVICES

HYDROACOUSTIC TEST FACILITY

Many of the facilities of this capability are fixed assets. These include the 350 acre Glendora Lake Facility and 1,000,000 lb. anechoic test tanks. **Several areas of the capability require remote locations in order to operate.** These include the Radiated Frequency (RF) Test Facility (no RF interference and no sources

of RF reflection) and a Sonobuoy Safety Certification Test Facility (open air for dispersal of gases generated by lithium battery ventings.)

The Glendora Lake facility is unique from the standpoint it is Navy owned and operated. **This gives complete control over physical security.** For example, this eliminates problems such as coordination with Coast Guard and/or municipal authorities concerning safety issues relating to humans and marine mammals as well as other environmental issues. **Another advantage is that test and evaluation activities can be controlled and executed with no interference from civil marine traffic** unlike test facilities in densely populated coastal areas. The result is effective execution of test processes with minimal cost due to the avoidance of down time and freedom from excessive public relations complications. **The geographic location of this site in a remote rural area is a distinct advantage because contact with the public is limited, naturally minimizing potential problems.**

SONOBUOY LIFE CYCLE ENGINEERING/LOGISTICS

Sonobuoy Test Engineering/Evaluation Complex - **Enables the Navy to be a smart buyer of sonobuoys built to performance specifications.** Contractors design and produce sonobuoys and the Navy must then conduct comprehensive evaluation to assure that the sonobuoy design performs as required by the specification. Responsibilities include:

- **Appraising** Program Executive Officer, Air Anti-Submarine Warfare Assault and Special Mission Program of sonobuoy **design suitability, reliability**, and other related program issues.

- Integrated logistics support during conception and development of new generation sonobuoys.

- **Design qualification** of the contractors' production prototype.

- **Lot acceptance tests after production begins**; storage of production units prior to issue.

- Both on and off-site support and **training to the Fleet on sonobuoy issues** during operational use.

- **Monitoring of the Fleet sonobuoy stockpile** for age and failure trends.

- **Demilitarization** of overage, Fleet returned stock.

- **The Naval Test Intelligence Center utilizes the Navy's expertise located at Crane Division to support "cluster project" investigations.** These investigations are generally classified and could involve reverse engineering, acoustic testing, or technology transfer. (**Do our enemies utilize technology developed and used by the United States industrial base?**)

The staff to conduct these functions includes highly trained engineers, technicians, logistics management specialists, and active duty Fleet operating personnel. This entire engineering/logistics complex is essential to maintain the capability for submarine surveillance operations. **In short, Crane Division's involvement in this program constitutes comprehensive life cycle support of sonobuoys - from cradle to grave.**

Full spectrum capability has developed over the past three decades to the point where Crane Division has become the premier site for sonobuoy life cycle support.

SONAR HARDWARE, MOLDED PRODUCTS, MANUFACTURING & REPAIR

Crane provides **full spectrum manufacturing/repair capability** for a wide variety of acoustic sensors/sonar systems, and molded products via **prototyping, first article production, limited production, large scale production, and repair.** Products include sonar transducers and hydrophones, acoustic windows, underwater cables, electronic assemblies and subassemblies, and specialty molded items such as gaskets, seals, and shock mounts.

Crane provides the Navy with "smart buyer" capability for acoustic sensors and windows, underwater cables, and specialty molded products through appraisal of private sector products, organic developed capability, and technology transfer. The manufacturing/repair capability is developed/modified, the end item is produced, and technology transfer is implemented through development of a competitive, non-proprietary product specification/documentation package. **This ensures that the Navy will obtain a product that is affordable, producible, reliable, and maintainable.** Technology insertion and commercial off-the-shelf philosophies are utilized to enhance "smart buyer" effectiveness.

Crane provides backup manufacturing capability to the Navy in the event of private industrial sector technical, schedule, or financial problems. Product areas include acoustic sensors and windows, underwater cables, specialty molded items, and electronic assembly from the subassembly level to full-up assembly at the cabinet level.

ACOUSTIC SYSTEMS ENGINEERING/DEPOT MAINTENANCE

Crane provides a full spectrum of Depot level maintenance capabilities for acoustic systems, sensors, countermeasures and their subassemblies and components. This facility has a complete capability range from complex system level acceptance and integration testing to maintenance of equipment end items. Maintenance phases include inspection, test repair and overhaul. **Modernization, alteration and conversion capabilities extend the life of in-service equipment and inject improved reliability.**

Complementary co-located, in-service, and acquisition engineering activities provide resources to install and test product improvements and assist in failure analysis services. **Crane Division retains production resources to provide for the manufacture of critical components no longer available in the private sector.** This strengthens the nation's industrial base and is an invaluable asset in the Navy's mobilization posture. Crane maintains capability both to support intermediate maintenance activities and respond to emerging fleet support requirements including on-demand depot support and emergency shipboard repair services.

- ACOUSTIC COUNTERMEASURES FACILITY - Performs inspection, evaluation repair and final testing on countermeasure systems and components. **Provides technical and maintenance support required by shipyards during system upgrade and modification efforts.** Provides technical consultation services to system manufacturers concerning production and serviceability issues.

- ACOUSTIC SYSTEMS FACILITY - Performs lowest level of repair unit maintenance through complete system level integration testing. In addition to standard depot capabilities, **retains the facilities and expertise to perform comprehensive system overhauls and upgrades which are no longer performed by original equipment manufacturers** due to technological and economic considerations. Retains production and depot engineering support to improve product maintainability and reliability. **Provides production resources for manufacturing backup to the Navy in the event of private industrial sector technical, schedule, or financial problems.**

- SENSOR DEPOT FACILITY - Performs evaluation, test and repair,and limited manufacture of hydrophones, transducers and other acoustic devices. Provides specific capabilities required for development and production of specialty molded elastomer products such as underwater cables, seals and acoustic windows. **Maintains the maintenance engineering expertise and equipment to provide support to the Navy in an area of expertise that is rarely found in the private sector.**

SONAR TOWED ARRAY HANDLING EQUIPMENT

The primary purpose of this function is to provide total life cycle support to the Navy for the OK-542 and OK-276 sonar Towed Array Handling Systems (TAHS). This support includes: **engineering, acquisition, logistics, manufacturing, overhaul, and direct fleet support.** Crane Division is the primary Naval Sea Systems Command I-level TAHS training agent for the submarine Navy. **This full spectrum life cycle capability sustains the Navy Industrial Base and is essential in preserving a moderate level of organic strength.**

The OK-542 Assembly and Test Facility is composed of a full industrial electro-mechanical and hydraulic-mechanical manufacturing and test installation and includes the Test and Control Stand and the Assembly and Inventory Control Laboratory.

This test facility is unique to the Navy Industrial Base in that no other has a complete system match up that allows the entire TAHS to be viewed operationally as a system.

ACOUSTIC SENSORS INTERCONNECTIVITY

The acoustic sensors capability has been developed over the last three decades, and has matured to the point that Crane Division has become the premier site for sonobuoy life cycle support. When considering the total capability, the **synergism gained by co-location of the expertise over a full spectrum of hydroacoustic products and the in-depth interconnectivity as shown on the following table is immeasurable.**

ACOUSTIC SENSORS WORK MATRIX INTERCONNECTIVITY

DESCRIPTION	AEA	CFAISEA	PRODUCTION	DEPOT	TRAINING	FLEET SUPPORT	ENGR SUPPORT	ILS	ASST PROG MANAGER LOGISTICS
SONOBUOYS		X			X	X	X		X
SURFACE SHIP SONAR			X	X		X			
SUBMARINE SONAR	X	X	X	X	X	X			
SURFACE/SUBMARINE SONAR	X	X	X	X	X	X			
LITTORAL SONAR	X	X		X	X				
ACOUSTIC COUNTERMEASURE	X	X	X		X	X	X		
SONAR HANDLERS	X	X	X	X	X			X	
SONAR TEST SETS	X	X	X	X	X	X			
MINE DETECTION TRANSDUCERS	X	X	X	X		X	X		
NAVIGATION/ COMMUNICATION TRANSDUCERS	X	X	X	X		X	X		
FIRE CONTROL TRANSDUCERS	X	X	X			X	X		
DOMES AND WINDOWS	X	X					X		
WET-SIDE CABLES			X			X	X		
COUNTERMEASURES TRANSDUCERS	X	X	X						
AIRBORNE LOW FREQUENCY SONAR							X		

Revised pg

EXPERTISE

The Crane Division has been involved with acoustic sensors since the mid-1960's. Specialized disciplines providing for the Navy's corporate knowledge base include ocean engineers, elastomer technicians, hydroacoustic specialists, at-sea field engineers, and both recently retired and active duty Aviation Warfare Sensor Operators. **This specialized support is driven by a professional, motivated, and conscientious work force acquired by three thousand years of experience and on-the-job training.**

SKILL MIX		
Engineers and Scientists	28% R	R
Military Technicians	1% R	R
Technicians	61% R	R
Non-Technical	10% R	R

Attrition rates within this technical capability are extremely low, resulting in average experience of 17 years per engineer and 15 years per technician.

Many of these engineers and technician are recognized experts in this field. This experience is hands-on in nature and has been developed through actual evaluation of hardware during the R&D phase, the production qualification phase, through Fleet operational use and demilitarization - a full spectrum process.

Acoustic Sensor Technical Capability Consist of the following assets.

Asset #1 - Provides capability to **appraise performance** of transducers, hydrophones, countermeasures, sonar arrays, hull materials, wet-side cables and connectors, ordnance cable cutters, sequential line charges, and related materials at simulated ocean temperatures (2-50 degrees c) and depths (to four miles, 10,000 psi) at frequencies of 5 to 350,000 Hz. Automated extraneous noise and conventional acoustic measurement services are provided for engineering, production and depot support.

The "Hydroacoustic Test Facility" described here is an **aggregate of the test facilities located at NAVSURFWARCENDIV Crane.** These facilities were established primarily in the 1960's and early 1970's by NAVAIR to support the high volume test requirements of the Sonobuoy Program. They developed into the most complete full-spectrum hydroacoustic test complex in the Navy and have been used by the entire sonar transducer community (private sector as well as most associated Navy activities/ agents) over the past 20 years because of their efficiency, low cost, and data accuracy. Several customers contributed in the early 1990's toward upgrading the Lake and Anechoic Facilities to support the broader hydrodynamic, frequency and depth requirements of the Navy of the future.

EXPERTISE

The Crane Division has been involved with acoustic sensors since the mid-1960's. Specialized disciplines providing for the Navy's corporate knowledge base include ocean engineers, elastomer technicians, hydroacoustic specialists, at-sea field engineers, and both recently retired and active duty Aviation Warfare Sensor Operators. **This specialized support is driven by a professional, motivated, and conscientious work force acquired by three thousand years of experience and on-the-job training.**

SKILL MIX	
Engineers and Scientists	37%
Military Technicians	2%
Technicians	52%
Non-Technical	9%

Attrition rates within this technical capability are extremely low, resulting in average experience of 17 years per engineer and 15 years per technician.

Many of these engineers and technician are recognized experts in this field. This experience is hands-on in nature and has been developed through actual evaluation of hardware during the R&D phase, the production qualification phase, through Fleet operational use and demilitarization - a full spectrum process.

Acoustic Sensor Technical Capability Consist of the following assets.

Asset #1 - Provides capability to **appraise performance** of transducers, hydrophones, countermeasures, sonar arrays, hull materials, wet-side cables and connectors, ordnance cable cutters, sequential line charges, and related materials at simulated ocean temperatures (2-50 degrees c) and depths (to four miles, 10,000 psi) at frequencies of 5 to 350,000 Hz. Automated extraneous noise and conventional acoustic measurement services are provided for engineering, production and depot support.

The "Hydroacoustic Test Facility" described here is an **aggregate of the test facilities located at NAVSURFWARCENDIV Crane.** These facilities were established primarily in the 1960's and early 1970's by NAVAIR to support the high volume test requirements of the Sonobuoy Program. They developed into the most complete full-spectrum hydroacoustic test complex in the Navy and have been used by the entire sonar transducer community (private sector as well as most associated Navy activities/ agents) over the past 20 years because of their efficiency, low cost, and data accuracy. Several customers contributed in the early 1990's toward upgrading the Lake and Anechoic Facilities to support the broader hydrodynamic, frequency and depth requirements of the Navy of the future.

UNIQUENESS.

The composite capabilities for providing total underwater acoustic evaluations in free field, littoral and simulated ocean environments (temperature and pressure) is unique within DOD. Following are individual facility characteristics:

a. ANECHOIC TANK FACILITY (UNIQUE). The **Navy's largest temperature controlled, anechoic pressure vessel** used for economical, precision acoustic calibrations, directivity, and complex impedance measurements are located at Crane Division. Due to the size of each tank (50,000 gallons) large devices can be tested and over a much wider frequency range. Temperatures can be varied between 2-50°C to depths of over one mile. Efficiency and production capacity is significant because of multiple tanks.

b. GLENDORA LAKE (UNIQUE). An **extremely quiet** lake facility, located on a **remote** 364 acre site, wholly **owned and controlled by the Navy** with secure access. The lake has a surface test area of 120 ft by 5,100 ft with high wall boundary conditions. Specialized testing includes free-field acoustic calibrations, hydrodynamic measurements, high level shock test (planned), thermal noise measurements, and mine and littoral warfare training/evaluations/exercises. The remote location and complete control of activity on or near the lake provide conditions quiet enough to conduct thermal noise measurements and low frequency acoustic and flow noise evaluations of sonobuoy hydrophone/suspension systems.

c. OVERWATER RADIO FREQUENCY TEST RANGE (UNIQUE). An antenna test range for precision measurements for Radio Frequency (RF) characteristics over simulated seawater. This fixed asset contains an in-ground, concrete test pool with buried, saltwater storage tank. Measurements also require no RF interference from outside sources. **Thus, a remote location away from potential RF sources is required.**

Other non-unique facilities are:

d. ANECHOIC TEST TANK. Original "Anechoic Test Facility" installed in 1969 to perform acoustic testing at temperatures of 2-50°C Centigrade in a 10,000 gallon high pressure vessel (to 1,500 psi).

e. EXTRANEOUS NOISE FACILITY. Quiet pressure tanks and pressure cycling systems provide life cycle and extraneous noise evaluations of submarine transducers, hull mounted materials and sonobuoy initiation and implosion prevention devices during simulated depth changes.

f. CYPRESS TANK. A 20 feet deep by 20 feet diameter 44,000 gallon open cypress tank and automated measurement system provides economical screening of acoustic devices at ambient temperatures and depths.

g. HYDROSTATIC FACILITY. Three Hydroacoustic tanks provide watertight integrity evaluations of transducers, cables, connectors, and other underwater devices during repeated/prolonged pressure cycling at pressures to 10,000 psi.

h. LOW FREQUENCY FACILITY. Low frequency plane-wave acoustic calibrators are specifically designed for sensitivity and directivity measurements on velocity sensors (predominately used for sonobuoys). Calibration sensitivity and directivity of pressure gradient hydrophones down to 5 Hz at pressures to 10,000 psi at simulated ocean temperatures are achieved.

i. DESCENT RATE FACILITY. A 50 foot descent rate tank provides motion/deployment/descent evaluations on bathythermograph probes, electronic signal underwater source and sonobuoy devices as well as exploitation of foreign underwater devices.

j. DATA ACQUISITION SYSTEMS. All facilities are supported by automated control and data acquisition instrumentation which provides essentially real-time data analysis and reporting. New data acquisition or reporting requirements can normally be accommodated with a few hours notice.

NOTE: The Glendora and Dugger Lake facilities which are a part of Crane's full-spectrum hydroacoustic test complex are not included since they are designated as "Range Resources" and included in "TAB C" of this data call.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

Fixed. Portability of the total hydroacoustic test facility is considered fixed, since several major components are "fixed" (see table below) according to the definitions/guidance of this data call.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

$31.5M (not including buildings or utilities).

4. Provide the gross weight and cube of the facility/equipment.

2,956,000 lbs (shipping weight, no water)
1,478 tons

GROSS CUBE: 273,998 ft^3 (operational configuration)
87,544 ft^3 ("shipping" configuration)

HYDROACOUSTIC TEST FACILITIES (SIZE/WEIGHT*)						
FACILITY	FACILITY DIMENSIONS (Ft.)			SHIPPING DATA		DEGREE OF PORTABILITY
	WORKING AREA	SUPPORT AREA	CUBE (Ft^3)	CUBE (Ft^3)	WEIGHT (Tons)	
ATF1	38x32x20	38x32x10	36480	13462	124	Fixed
ATF2	60x50x18	60x80x25	174000	64944	1253	Fixed
OPEN TK	30x30x20	30x30x17	33300	2325	20	Fixed
LOW FREQ	24x20x10	15x20x8	7200	1975	10	Moveable
STEN	25x25x10	included	6250	1946	34	Moveable
H/P	32x16x20	32x12x17	16768	2892	37	Moveable
TOTALS:			273998	87544	1478	FIXED

* Note: Weights do not include water in tanks.

The facilities and equipment (reference assets #2 through #5) are interconnected with the hydroacoustic test complex and the Glendora lake facility

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

a. STEAM BOILER. All temperature controlled facilities are heated with steam. The ATF2 facility alone requires 1,000,000 BTU/hr for full heating capacity.

b. The ATF2 system also provides 100 tons of cooling capacity which requires 1,000 KVA of 3 phase electrical service.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

a. FOUNDATION. A special foundation is required to support the mass of the ATF2 tanks which each weigh approximately 840 tons full of water.

b. ISOLATION. Most of the test tanks, including the large ATF2 tanks need to be isolated from the building floor/structure if other (noisy) activities are performed in the same building, since they are used for acoustic measurements. Some degree of isolation (barrier) is also required to minimize personnel exposure to high pressure plumbing, etc. during operation.

c. CLASSIFICATION. Provisions must be made for classified testing and storage of classified data and/or hardware up through at least Secret.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

Most tank facilities are temperature and pressure controlled including the two large 840 ton ATF2 tanks. Some degree of isolation (barrier) is also required to minimize personnel exposure to high pressure plumbing, etc. during operation. All facilities include computer controlled data acquisition systems that require a relatively clean environment with temperature and humidity control.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

This facility would be essentially impossible to relocate any significant distance (because of the size/weight of the test vessels) and would cost approximately $24M and take several years to replicate.

The Navy has no other tank capabilities with the frequency range (due to size) and pressure capability of the anechoic tank facility. Nowhere else in the United States is a collection of all the hydroacoustic testing capabilities available in one location.

These facilities are also supported by a nearby deep, quiet inland lake facility described in Tab C of this data call.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

Various component facilities were transported and constructed from 1968 through 1994, with the most recent ATF2 tanks transported in 1988-90 and construction of the facility completed in 1994. Relocation of the large/heavy surplus nuclear reactor vessels was possible through the coincidence of both locations being on/near the same inland waterway.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

This facility provides underwater/acoustic test services for the following areas:

1.1 (**Undersea Platforms**)
1.3 (**Surface** Ship **Platforms**)
2.4 (**Torpedo** Weapons Systems)
2.5 (Mine Weapons Systems)
2.14 (Explosive **Ordnance** Disposal Weapons Systems)
4.2 (Costal/Special Warfare Support to **Special Ops**)
5.1 (**Sonar** Systems/Sensors)
5.5 (Ocean **Surveillance** Sensors)
6.1 (Submarine **Navigation** Systems)
6.3 (Surface Ship **Navigation** Systems)
8.2 (**Countermeasures** Defense Systems)

Following is a list of the major customers:

v

HYDROACOUSTIC TEST FACILITY CUSTOMERS	
CUSTOMERS:	**PRODUCTS TESTED:**
SURFACE WARFARE	
NAVSEA (NSEA-55N)	Ship Hull Treatments
NAVSEA (PMS-407)	Mine Sweep Sonars
Carderock Division	Acoustic Target Source
UNDERSEA WARFARE	
NAVSEA (NSEA-91T)	Sonar Acoustic Target Source
NAVSEA (PMS-402)	Torpedo Transducers
NAVSEA (PMS-415)	Acoustic Countermeasures
NAVSEA (PMS-425)	Ship/Submarine Transducers
NAVSEA (PMO-425)	Towed Array Systems
Strategic Systems (SP-24)	TR-143/333 Transducers
Keyport Division	Torpedo & Torpedo Range Transducers
Newport Division	UQC Range Transducers
San Diego Detachment	Torpedo/Tracking Transducers
AIR WARFARE	
NAVAIR (PMA-264)	Sonobuoys, Acoustic SUS
NAWC Aircraft Division	Helicopter Dipping Sonar
RESEARCH	
Naval Research Laboratory	Fiber Optic Sensors
ORDNANCE	
NAVSEA (NSEA-91Z) NAVSEA (NSEA-PM4) Spec Ops	Explosive Line Charges Sequential Explosive Signals Cable Cutters
PRIVATE CONTRACTORS:	
Actran Benthos Brunswick Burke Industries Edo Western Electric Boat Ainslie Alliant Techsystems Applied Physics Lab Applied Research Lab General Dynamics Hazeltine Hermes Electronics Hughes Aircraft	International Transducer Litton Industries Loral Magnovox Martin Marietta Massa Products Oil States Industries Raytheon Company SAIC Maripro Sippican Sonotech Sparton Corporation Westinghouse Corporation

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

TOTAL FACILITY TEST DAYS						
FISCAL YEAR:	1989	1990	1991	1992	1993	AVERAGE
TOTAL TEST DAYS:	758	818	661	512	450	640
TOTAL DAYS AVAILABLE:	1100	1100	1100	1100	1100	1100
UTILIZATION (%):	69	74	60	47	41	58

NOTES:

a. A "facility test day" is used to describe one work shift (8-9 hours) in a test facility, no matter how many personnel were assigned.

b. Use of multiple tanks within a single facility (as categorized above) are identified as only one test day.

c. Average test days available in each facility is 220/year.

12. Provide the projected utilization data out to FY1997.

TOTAL FACILITY TEST DAYS (PROJECTED)					
FISCAL YEAR:	1994	1995	1996	1997	AVERAGE
TOTAL TEST DAYS:	300	425	425	425	394
TOTAL DAYS AVAILABLE:	880	1100	1100	1100	1045
UTILIZATION (%):	31	39	39	39	38

NOTES:

a. The increase in projected work days is primarily the result of anechoic test tanks and new capabilities at Glendora put on line during FY 1994 and scheduled production support of the BQS-15
EC-17.

b. A significant decline in total test days is the result of the extraneous noise facility workload going to essentially zero over the past two years. The total days available reflect the mothballing of the extraneous noise facility in FY 1994 and the addition of anechoic test tanks in FY 1995.

13. What is the approximate number of personnel used to operate the facility/equipment?

5 (Five personnel are currently scheduled on a daily basis to the individual test facilities based upon workload)

14. What is the approximate number of personnel needed to maintain the equipment?

3.5 (Four personnel are currently assigned to full time maintenance of test facilities, including 0.5 for the lake facility which is accounted for in TAB C). These personnel provide development and maintenance support for the mechanical facilities, instrumentation and related software.

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Composite photograph containing

a. Lake test barge.

b. Large, high pressure anechoic test tanks.

c. Low frequency calibrator.

Asset #2 - a.Sonobuoy Test Engineering/Evaluation Complex - Enable the Navy to be a **smart buyer of sonobuoys** which are built to performance specifications. Contractors design and produce sonobuoys and the Navy then must conduct **comprehensive evaluation** to assure that the sonobuoy design performs as required by the specification. Responsibilities include:

(1) **Appraising** Program Executive Officer, Air Anti-Submarine Warfare Assault and Special Mission Program of sonobuoy **design suitability, reliability**, and other related program issues.

(2) Integrated logistics support during conception and development of new generation sonobuoys.

(3) **Design qualification** of the contractors' production prototype.

(4) **Lot acceptance tests** after production begins; storage of production units prior to issue.

(5) Both on and off-site support and **training** to the Fleet on sonobuoy issues during operational use.

(6) **Monitoring of the Fleet sonobuoy stockpile** for age and failure trends.

(7) **Demilitarization** of overage, Fleet returned stock.

The staff to conduct these functions includes highly trained engineers, technicians, logistics management specialists, and **active duty Fleet operating personnel**. This entire engineering/logistics complex **provides a critical need** to the Navy and **is essential** to maintaining the capability for submarine surveillance operations. **In short, NAVSURFWARCENDIV Crane involvement in this program constitutes comprehensive life cycle support of sonobuoys - from cradle to grave**.

b. Radiated Frequency Test Facility. Enable the Navy to be a smart buyer of sonobuoys which are built to performance specifications by assuring that radiated frequency parameters meet performance requirements.

c. Launch Tower Facility. Provides capability to Cartridge Actuated Device launch sonobuoys from a helicopter horizontal launcher. It is a "specialty" facility in that it allows static deployment of new sonobuoy types from a launcher with no safety of flight risks to an actual helicopter platform.

d. Safety Certification Test Facility. All sonobuoy designs containing these devices must undergo rigorous safety certification testing at this facility before entering the Fleet stockpile. **This facility has been primarily responsible for the excellent safety record of Fleet sonobuoys containing these devices over the past 15 years.**

e. Descent Rate Measurement Facility. The primary device in which this controlled rate is required is a temperature indicating sonobuoy. Correct temperature depth information from this sonobuoy is dependent upon a uniform and controlled descent rate. This facility provides an effective means to accomplish this measurement. A secondary function of the facility is to evaluate suspension system characteristics of underwater acoustic sensors. Underwater cameras and lights provide viewing of descent rates and deployments.

b. Digital Data Management (DDM) Facility. Provide a Computer-Aided Acquisition and Logistic Support (CALS) compliant DDM system for the Naval Air Systems Command (NAVAIR) Airborne Low Frequency Sonar (ALFS) acquisition and the SH-60B/F Helicopter Block II upgrade program.

(1) CALS compliant Data Management (DM) is mandated for future Department of Defense acquisition programs by the Secretary of Defense. CALS compliant data manipulation provides an almost **paperless environment** for acquisition program managers and field activities. Reduction in paper-based data provides savings in physical space and overall acquisition cost and enhances ease of use and filing.

(2) The NAVSURFWARCENDIV Crane ALFS DDM system is currently being considered for use by other NAVAIR programs. The NAVSURFWARCENDIV Crane ALFS DDM system is currently the most advanced NAVAIR computerized DM system. It has the capability of handling numerous acquisition program's DM needs. The system accepts digital data deliveries from primary defense contractors and provides delivery in appropriate digital format to Government users and other contractors. It also archives engineering drawings and acquisition-related text for use by user activities. On-line data transfer is available from the NAVSURFWARCENDIV Crane ALFS DDM file server through a 24 hour computer bulletin board system allowing Fleet users round-the-clock access to the latest data. A CALS compliant DM system is essential to cost effective acquisition program management in today's downsized, budget constrained Navy.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

a. Fixed.

(1) The Sonobuoy Radiated Frequency Test Facility is a fixed asset. It contains an in-ground, concrete test pool with buried, saltwater storage tank. Measurements also require no Radio Frequency (RF) interference from outside sources. **Thus, a remote location away from potential RF sources is required.**

(2) Electro-Magnetic Interference Room and Measuring System.

(3) Launch Tower Facility.

(4) Safety Certification Test Facility Enclosure.

(5) Descent Rate Measurement Facility.

b. Moveable - Magnetic Environment Measurement System, Quiet Room, Sonobuoy Simulated Launch Test System, Environmental Test Chambers.

c. Portable.

(1) Electronic Equipment.

(2) Activation Tanks.

(3) Digital Data Management Equipment.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

a. Sonobuoy Test Engineering/Evaluation Complex: $2.7M

b. Radiated Frequency Test Facility: $230K

c. Launch Tower Facility: $175K

d. Safety Certification Test Facility: $175K

e. Descent Rate Measurement Facility: $175K

f. Digital Data Management Facility: $125K

4. Provide the gross weight and cube of the facility/equipment.

a. Sonobuoy Test Engineering/Evaluation Complex.

(1) Magnetic Environment Measurement System.
Cube - 1,100 cubic feet
Weight - 2,000 lbs. (est.)

(2) Quiet Room.
Cube - 1,500 cubic feet
Weight - 5 tons (est.)

(3) Electro-Magnetic Interference Room and Measuring System.
Cube - 12,000 cubic feet
Weight - 15 tons (est.)

(4) Sonobuoy Simulated Launch Test System.
Cube - 2,400 cubic feet
Weight - 5 tons (est.)

(5) Environmental Test Chambers.
Cube - 3 chambers at 280 cubic feet each
Weight - 3 chambers at 2 tons each (est.)

(6) Electronic Equipment.
Cube - 4,000 cubic feet (est.)
Weight - 5 tons (est.)

b. Radiated Frequency Test Facility - The entire facility covers approximately two acres.

c. Launch Tower Facility - Tower is 100 feet tall ad approximately 20 feet square at base.

d. Safety Certification Test Facility - Facility covers approximately 0.5 acre.

e. Descent Rate Measurement Facility .
Cube - 4,000 cubic feet (est.)
Weight - 15 tons (est.)

f. Digital Data Management Facility.
Cube - 150 cubic feet
Weight - 3,750 lbs. (est.)

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

a. Sonobuoy Test Engineering/Evaluation Complex.

(1) Environmental Test Chambers require a Cooling Tower to recycle water used in heating/cooling.

(2) Electronic equipment requires an uninterruptible power supply.

b. The Digital Data Management Facility requires five data quality, low noise telephone lines capable of carrying a minimum of 28.8 kilo baud and an uninterruptible power supply.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

a. Sonobuoy Test Engineering/Evaluation Complex.

(1) Magnetic Environment Measurement System is lined with non-ferrous material.

(2) Electro-Magnetic Interference Room is shielded against spurious electromagnetic radiation.

b. Digital Data Management Facility - Electro-magnetic shielding is required for security purposes to protect sensitive classified data.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

a. Sonobuoy Test Engineering/Evaluation Complex - Ambient air temperature must be maintained at 25 $\pm$10 degrees C and relative humidity less than 90%.

b. Radiated Frequency Test Facility - Must be remotely located away from RF interference sources and in an open area free of RF reflective surfaces. In addition, the underground storage tank for the saltwater provides safe, effective environmental control of a potentially hazardous fluid.

c. Safety Certification Test Facility - This facility must be distanced from populated areas in case of lithium battery venting during test. Such ventings are routine in safety certification testing. The vented gases contain sulfur dioxide and other hazardous compounds that must be dispersed in the air before humans and wildlife are exposed to them.

d. Digital Data Management Facility - Air conditioning is required for the computers.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

a. Sonobuoy Test Engineering/Evaluation Complex - As with any program, this facility could be replicated or relocated **with sufficient funding**. However, replication of the entire capability at another location would be impractical and cost prohibitive. The Sonobuoy Life Cycle Engineering/Logistics Facility is closely **tied to the Hydroacoustic Test Complex** at NAVSURFWARCENDIV Crane. This comprehensive assemblage of lake and tank facilities is essential for evaluating the underwater hydrophone assemblies of sonobuoys.

The remote, quiet environs in and around NAVSURFWARCENDIV Crane are ideally suited for location of these facilities because of essentially no RF interference and very quiet acoustic ambients required for hydroacoustic measurements.

The lake and most of the tank facilities are fixed assets. Fragmentation of this capability would greatly reduce the effectiveness and efficiency of the program.

The synergism gained by co-location of these full spectrum facilities, integrated logistics support capabilities, test engineering expertise, and Fleet support functions is immeasurable.

With current budget constraints, relocating this entire capability to one location is unfeasible.

Full spectrum capability has developed over the past three decades to the point where NAVSURFWARCENDIV Crane has become the premier site for sonobuoy life cycle support.

Loss of this organic capability would severely cripple the Navy's ability to effectively assure that high quality, low cost sonobuoys are delivered to the Fleet.

b. Radiated Frequency Test Facility - This facility would be difficult to replicate or relocate due to requirement for no RF interference and area free of RF reflective surfaces. The Navy would have no way of assuring radiated sonobuoy RF parameters meet requirements. **This facility is unique possessing the only known capability of this type**. It provides a controlled environment in which to measure radiated RF parameters over a saltwater ground plane. These RF parameters are critical for assuring that aircraft can effectively monitor (listen to) sonobuoys during Fleet operations. **Relocation to any area near radio frequency interference sources would negate the effectiveness of this facility**. In addition, sonobuoy RF transmissions would interfere with the commercial VHF band which includes police, fire, and other emergency communications.

c. Launch Tower Facility - As with any program, this facility could be replicated or relocated **with sufficient funding**. However, it is **co-located** with the entire sonobuoy life cycle engineering/logistics complex at NAVSURFWARCENDIV Crane and therein lies a major portion of its value. Its value would be greatly diminished as a stand-alone facility, and thus, movement of it alone is impractical without relocation of the entire sonobuoy complex. As stated previously, the practicality of relocating the entire complex to another location is not feasible.

d. Safety Certification Test Facility - This facility could be replicated or relocated **with sufficient funding**. As with other aspects of the sonobuoy life cycle engineering/logistics complex, a portion of its value can be attributed to its co-location with other facilities. Safety certification test units must undergo certain environmental and electronic tests prior to certification testing. Therefore, it is essential that capability to conduct these other tests be located nearby, as is the case with the full spectrum capability at NAVSURFWARCENDIV Crane. Loss of this capability to the Navy would increase potential for sonobuoy safety problems during Fleet use. A venting lithium battery in a sonobuoy carried aboard a Fleet aircraft could result in a fatal accident. Failure to properly evaluate these batteries and other potentially hazardous devices prior to Fleet introduction would greatly increase the possibility of safety incidents during Fleet sonobuoy transport, storage, and deployment.

e. Descent Rate Measurement Facility - This facility would be very difficult to relocate. It is 50 feet high, ten feet in diameter, and imbedded ten feet in the floor of a 40 foot tall building. Loss to the Navy could increase potential for erroneous data (especially temperature vs. depth information) from certain sonobuoy types during Fleet use. This in turn could result in improper sensor depth selection required to detect potentially hostile submarines.

f. Digital Data Management Facility - Could be replicated or relocated with associated break in service. The NAVSURFWARCENDIV Crane ALFS DDM system is a true "paperless" DM program. ALFS, SH-60B Block II, and possible future programs would be required to return to paper-based data acquisition which would greatly increase cost of the contracts. Contractor delivery of many copies of paper-based contract deliverables is more costly than digital delivery of one copy to a central digital hub.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

a. Sonobuoy Test Engineering/Evaluation Complex - Initial sonobuoy support began in 1965. Facilities, equipment, and expertise have been expanded and improved since then to the point that NAVSURFWARCENDIV Crane has become **the one-stop location for sonobuoy life cycle support**.

b. Radiated Frequency Test Facility - Initial facility constructed in 1970. Latest renovation was in 1992.

c. Launch Tower Facility - This facility has been utilized to conduct sonobuoy launch simulation for approximately 15 years.

d. Safety Certification Test Facility - This facility was constructed in 1982.

e. Descent Rate Measurement Facility - This facility was constructed in 1979.

f. Digital Data Management Facility - This facility was constructed in 1992.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

a. Sonobuoy Test Engineering/Evaluation Complex: 5.5

b. Radiated Frequency Test Facility: 5.5

c. Launch Tower Facility: 5.5

d. Safety Certification Test Facility: 5.5

e. Descent Rate Measurement Facility: 5.5

f. Digital Data Management Facility: 5.1

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

a. Sonobuoy Test Engineering/Evaluation Complex: 100%

b. Radiated Frequency Test Facility: 25%

c. Launch Tower Facility: 5%

d. Safety Certification Test Facility: 10%

e. Descent Rate Measurement Facility: 10%

f. Digital Data Management Facility: 60%

12. Provide the projected utilization data out to FY1997.

a. Sonobuoy Test Engineering/Evaluation Complex: 100%

b. Radiated Frequency Test Facility: 25%

c. Launch Tower Facility: 5%

d. Safety Certification Test Facility: 10%

e. Descent Rate Measurement Facility: 10%

f. Digital Data Management Facility: 100%

13. What is the approximate number of personnel used to operate the facility/equipment? 23

14. What is the approximate number of personnel needed to maintain the equipment? 4

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Over Saltwater Radiated Frequency Evaluation Facility

Asset #3 - a. Provide **Full Spectrum Manufacturing/Repair Capability** for a wide variety of acoustic sensors/sonar systems, and molded products via **prototyping, first article production, limited production, large scale production, and repair**. Products include sonar transducers and hydrophones, acoustic windows, underwater cables, electronic assemblies and subassemblies, and specialty molded items such as gaskets, seals, and shock mounts.

b. Provide the Navy with **Smart Buyer** capability for acoustic sensors and windows, underwater cables, and specialty molded products through **appraisal** of private sector products, organic developed capability, and **Technology Transfer**. The manufacturing/repair capability is developed/modified, the end item is produced, and **Technology Transfer** is implemented through development of a competitive, non-proprietary product specification/documentation package. This ensures that the Navy will obtain a product that is affordable, producible, reliable, and maintainable. **Technology Insertion** and **Commercial Off The Shelf** philosophies are utilized to enhance **Smart Buyer** effectiveness.

c. Provide **Backup Manufacturing Capability** to the Navy in the event of **private industrial sector technical, schedule, or financial problems**. Product areas include acoustic sensors and windows, underwater cables, specialty molded items, and electronic assembly from the subassembly level to full-up assembly at the cabinet level.

d. Provide valuable support to Technical Centers within the Crane Division including **Mine Countermeasures, Acoustic Sensors, Microelectronic Technology, Pyrotechnics, Shipboard Physical Security, Electronic Warfare, and Electronic Module Test and Repair**, and to activities outside Crane including both the **Air and Undersea Warfare Centers**. This support is offered in the form of technical knowledge, commercial product knowledge, and manufacturing/repair capability for acoustic sensors and windows, molding (both rubber and polyurethane), and underwater cables.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

a. Fixed - Temperature/Humidity Control Chamber, Walk-in Freezer, Fume Hoods.

b. Moveable - Electronic Storage Devices, Automated Cable Tester, Rubber Molding Presses, Rubber Mixing Mill, Lathe, Drill Press, Overhead Hoist Systems, Tensile Strength Tester, Rubber Analysis Equipment, Elastomer Curing Ovens, Vibration Test Equipment, Sand Blasters.

c. Portable - Electronic Test/Measurement Equipment, Solder Stations, Work Benches, Shelving, Molds, Fixtures, Tools.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

$5.34M

4. Provide the gross weight and cube of the facility/equipment.

a. AN/BQS-15 EC-17 Manufacturing Facility/Equipment.
Weight - 4 tons
Cube - 9,500 cubic feet

b. AN/WQC-2A Manufacturing Facility/Equipment.
Weight - 5 tons
Cube - 14,000 cubic feet

c. Molding/Underwater Cable Manufacturing Facility/Equipment
Weight - 90 tons
Cube - 40,000 cubic feet

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

a. Three Phase 220 VAC.

b. Three Phase 440 VAC.

c. Dry Low Pressure Air.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

a. Hazardous and Flammable material storage capabilities are required. The majority of the cleaning, preparation, and molding materials are hazardous/flammable and require special storage considerations.

b. Special ventilation is required to exhaust fumes and gasses that result from cleaning, priming, mixing, and molding operations. These fumes and gasses can contain carcinogens and are a health hazard.

c. A reinforced foundation is required to support the heavy equipment utilized, mainly in the molding operations. A single piece of equipment may weigh 10 tons and be contained within 30 square feet.

d. An oversized entry way is required to accommodate the size of the products manufactured/repaired.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

a. Polyurethane materials are utilized for molded products, acoustic windows, and also for potting acoustic sensors. When mixing and molding polyurethane both temperature and humidity must be controlled.

(1) Temperature. A minimum curing temperature of 78°F is required for most products with recommended curing temperatures of **180°F**.

(2) Humidity. Humidity must be maintained below 50% (40% preferred) to prevent moisture absorption into the material and subsequent air bubbles in the cured product.

b. The Sonar Equipment/Molded Products/Engineering/ Manufacturing and Repair Facility produces/repairs items of up to thirty inches in diameter and 730 pounds that require these elevated temperatures and controlled humidity.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

a. Relocate/Replicate.

(1) This is an extremely difficult facility to relocate/replicate due to its **dependance on the full spectrum hydroacoustic test facility** maintained at NAVSURFWARCENDIV Crane. All acoustic sensors and underwater cables require hydrostatic pressure and/or acoustic tests. Certain items require testing at temperature-pressure combinations while others require large test distances for special testing. NAVSURFWARCENDIV Crane's hydroacoustic Test Facility maintains hydrostatic tanks (pressure tests), large anechoic tanks (pressure-temperature combinations for acoustic tests) and a Lake Site (large test distances).

(2) The **acoustic sensor, underwater cable, and specialty molding operations** are all **interdependent**. Therefore, relocation or replication would have a negative impact if all capabilities did not **co-exist** at the same facility.

b. Impact.

(1) Portsmouth is the only Transducer Repair Facility (TRF) remaining to support the Fleet. The Sonar Equipment/Molded Product Facility is capable of performing TRF workload and its loss would jeopardize Fleet operational readiness by limiting the Navy's capability in **overflow situations**, and by **eliminating a backup** to Portsmouth.

(2) The Navy would lose a **quick response** manufacturing/ repair capability for sonar transducers and hydrophones, underwater cables, acoustic windows, and specialty molded products including **technology transfer capability for mobilization surges**. An example of such capability is the production of the AN/BQS-15 EC-17 Mine Detection/Classification Sonar. The Sonar Equipment/Molded Product Manufacturing Facility will produce the projector array, hydrophone array, calibration transducer, and oil cables for thirty two AN/BQS-15 EC-17 systems. The first systems worth of components will be produced within seven months of drawing release and production will be completed within thirty two months.

(3) This manufacturing facility, coupled with the acoustic sensor test complex, gives the Navy an **organic environment** that provides **cradle to grave industrial base support** for acoustic sensors including development, prototype, first article manufacture and test, production, acceptance test, and repair. Its loss would impact the time and cost efficiencies generated by having these capabilities located at the same site. Also lost are the benefits of the synergism obtained from having both full spectrum acoustical talents/knowledge coupled with full spectrum industrial based talents/knowledge.

There would be a negative impact on product cost as a result of **diminished competition**, **diminished Smart Buyer** capabilities, and **increased private industry dependance**. An organic source for acoustic sensors and windows, underwater cables, and molded products will be eliminated. Smart Buyer enhancements provided by this facility through **appraisal** of private sector products and through **organic developed capability** as discussed in question one will be eliminated. In addition, this facility could no longer provide **back-up production/repair capability** for critical system level components if the current producer has schedule, technical, or financial difficulties; thus the Navies ability to mobilize would be jeopardized.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

a. This facility was gradually developed over a 22 year period as a result of the increasing **interdependencies** between Acoustic Test and Industrial Base Capability for acoustic sensors. As the need to support Crane's acoustic test operations with organic manufacturing/repair knowledge and capabilities increased, the capability to support this need was developed. During this development process, the need for molding expertise became evident. The development of the Sonar Equipment/Molded Products/Engineering/Manufacturing and Repair Facility has culminated with **full spectrum Industrial Base Capability** for acoustic sensors, acoustic windows, underwater cables, and specialty molded products.

b. Facility construction occurred in four phases, each phase correlating directly with increased support requirements. The latest construction was completed in 1990. Equipment was steadily accrued over the entire 22 year period and continues today.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

1.1, 1.3, 2.1, 5.1, 5.3, 6.1, 6.3, 8.2, 9.1

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

1989-1993 75%

12. Provide the projected utilization data out to FY1997.

88%

13. What is the approximate number of personnel used to operate the facility/equipment?

Twenty-five

14. What is the approximate number of personnel needed to maintain the equipment?

One

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Sonar Equipment/Molded Products/Engineering/ Manufacturing and Repair Facility.

Asset #4 - a. Provide a full spectrum of Depot level maintenance capabilities for acoustic systems, sensors, countermeasures and their subassemblies and components. This facility has a complete capability range that spans from complex system level acceptance and integration testing to maintenance of equipment end items. Maintenance phases include inspection, test repair and overhaul. Modernization, alteration and conversion capabilities **extend the life of In-service equipment and inject improved reliability.** Complement co-located in-service and acquisition engineering activities by providing resources to install and test product improvements and assist in failure analysis services. Retain production resources to provide for the **manufacture of critical components no longer available in the private sector.** This **strengthens the nation's industrial base** and would be an **invaluable asset in the Navy's mobilization posture.** Maintain capability to support intermediate maintenance activities and respond to emergent fleet support requirements including on-demand depot support and emergency shipboard repair services.

(1) ACOUSTIC COUNTERMEASURES FACILITY - Perform inspection, evaluation repair and final testing on countermeasure systems and components. Provide technical and maintenance support required by shipyards during system upgrade and modification efforts. Provide technical consultation services to system manufacturers concerning production and serviceability issues.

(2) ACOUSTIC SYSTEMS FACILITY - Perform lowest level of repair unit maintenance through complete system level integration testing. In addition to standard depot capabilities, retain the facilities and expertise to **perform comprehensive system overhauls and upgrades which are no longer performed by original equipment manufacturers** due to technological and economic considerations. Retain production and depot engineering support to improve product maintainability and reliability. Provide production resources for manufacturing backup to the Navy in the event of private industrial sector technical, schedule, or financial problems.

This facility is integrated with a work force that has gained specialized experience since the mid - 1970's and is comprised of a **unique skill mix.** Extensive "hands on" expertise is available and has been developed throughout the acquisition, production, fleet in-service and demilitarization phases. This knowledge base is **a resource that is not duplicated anywhere else in DOD.**

(3) SENSOR DEPOT FACILITY - Perform evaluation, test and repair,and limited manufacture of hydrophones, transducers and other acoustic devices. Provide specific capabilities that are required for development and production of specialty molded elastomer products such as underwater cables, seals and acoustic windows. Maintain the maintenance engineering expertise and equipment to **provide support to the Navy in an area of expertise that is rarely found in the private sector.**

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

a. Portable. Electronic test equipment, jigs and fixtures, test stands.

b. Movable. Elastomer curing ovens, system test consoles, chemical cleaning stations.

c. Fixed. None

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

$1,157,566

This value includes off the shelf equipment costs and development and fabrication estimate of jigs and fixtures.

4. Provide the gross weight and cube of the facility/equipment.

Gross Weight: 47,095 LBS.

Gross Cube:	Facility (operational space)	175,609 FT3
	equipment.	11,427 FT3

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

a. Compressed air source.

b. A true earth ground for special test system operational requirements.

c. 3 - phase, 400 cycle power.

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

Reinforced foundation to support floor loading by temperature ovens and acoustic systems.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

a. HVAC control for meeting test equipment and repairable temperature and humidity operational ranges.

b. Custom ventilation systems for hazardous fume removal.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

The facility/equipment could be replicated, but unquestionably at a **prohibitive expense.** Relocation could be accomplished with **sufficient funding,** but would be difficult due to a number of factors. **Extensive storage** requirements are needed because several systems are no longer supported by original equipment manufacturers and massive quantities of out of service equipment are stored for the cannibalization of obsolete parts. Dependance on the **fixed hydroacoustic test facility** co-located at this site is required for operational and acceptance testing on numerous repairables. This fixed facility provides a **support capability no where else available** in the United States. The same reliance applies to a nearby deep, **quiet lake facility** described in TAB C. Reduced cost, test times and unencumbered test schedules result from this co-location. Unique Elastomer laboratory and environmental test facilities as well as system engineering agent organizations are also located at this site providing similar synergetic effects. The co-location of these resources generates a **synergetic effect** that results in process effectiveness and efficiency **practically impossible to reproduce** anywhere else. The **elimination of this facility would cause disruption of organic support to the detriment of fleet readiness, permanent loss of specialized expertise and destroy the sole source of many obsolete critical components.**

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

Segments of the facility have been constructed from 1975 to the present with minor construction modifications occurring periodically during this time frame.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

a. 5.1, 4.2, 8.2, 5.3, 6.1, 6.3, 9.1, 7.8.

b. Teams with the private and academic sector by providing technical feedback such as prototype evaluations, acceptance testing and equipment compatibility studies. This enables private industry to improve or correct hardware designs and decrease costs which will also ultimately result in the fleet receiving superior products.

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

74%

12. Provide the projected utilization data out to FY1997.

79%

13. What is the approximate number of personnel used to operate the facility/equipment?

25

14. What is the approximate number of personnel needed to maintain the equipment?

3

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

Acoustic systems engineering/depot maintenance facility.

Asset #5 - a. The primary purpose of this function is to provide total life cycle support to the submarine Navy for the OK-542 and OK-276 sonar Towed Array Handling Systems (TAHS). This support includes: **engineering, acquisition, logistics, manufacturing, overhaul, and direct fleet support.** NAVSURFWARCENDIV Crane is the primary Naval Sea Systems Command (NAVSEA) I-level **training agent** for the submarine Navy for TAHS. This full spectrum life cycle capability sustains the Navy Industrial Base and is essential in preserving a moderate level of organic strength.

b. The OK-542 Assembly and Test Facility is composed of a full industrial electro-mechanical and hydraulic-mechanical manufacturing and test installation and includes the Test and Control Stand and the Assembly and Inventory Control Laboratory. The equipment necessary to operate this facility includes a 35 ton overhead crane, heavy duty high pressure hydraulic supply system, and a 20 ton industrial mule. The facility has a 30 feet ceiling clearance to permit operation of the overhead crane. The OK-276 Overhaul and Test Facility consists of four major components including the Test Stand, Ocean Simulator, Pump Stand, and Sound Proof Enclosure. These assembly, overhaul, and test capabilities are used as follows:

(1) Test individual units and complete systems after overhaul.

(2) Calibrate all electronics and hydraulics on the system.

(3) Duplicate and troubleshoot problems experienced in the fleet.

(4) Proof out conceptual design improvements.

2. Indicate whether the facility/equipment is portable, moveable or fixed as defined by paragraph 6, page 12 of this data call.

This facility/equipment is considered moveable. However, the entire facility is mounted, plumbed, and wired in place. Much of the permanent hydraulic interconnecting is imbedded in concrete. The equipment and special test fixturing is massive and will require costly, heavy duty handling equipment to relocate.

3. Provide the replacement value of the facility/equipment. Report the facility/equipment cost separate from any building and utilities that may be integral to the facility/equipment.

The cost to replace this facility/ equipment is $3M. The entire assembly and test complex is one of a kind in the world and would require total new design/ engineering effort to replicate.

4. Provide the gross weight and cube of the facility/equipment.

a. OK-542 Test Stand.
Cube - 24,000 ft^3
Weight - 10 tons (est.)

b. OK-276 Test Stand.
Cube - 575 ft^3
Weight - 6.5 tons (est.)

c. OK-276 Ocean Simulator.
Cube - 575 ft^3
Weight - 6.5 tons (est.)

d. OK-276 Pump Stand.
Cube - 125 ft^3
Weight - 2.5 tons (est.)

e. OK-276 Sound-Proof Enclosure.
Cube (Assembled) - 2856 ft^3
Weight - 3 tons (est.)

5. Indicate any "special" utility support required by this facility/equipment other than normal electrical power.

a. OK-542 Test Stand area -
200 gallon/3,000 psi (41 gpm) hydraulic supply system.

b. OK-542/OK-276 manufacturing and overhaul area -
440 vac 3 phase
35 ton overhead crane
125 psi compressed air.

c. Pump Stand -
Chilled water (40° F)

d. Heavy duty, industrial concrete flooring (two ft thickness) for weight support and equipment anchoring.

e. High overhead ceiling clearance (>30 ft.).

6. Indicate any special budget requirements for the facility/equipment (i.e., special foundations, non-ferrous materials, shielding, hardening, etc.)

a. Heavy graded industrial facility designed for large weight (> 30 tons) support.

b. High ceiling clearance for movement of overhead crane.

7. State any environmental control requirements for the facility/equipment (i.e., temperature, humidity, air scrubbing).

a. Ambient noise must be controlled and minimized when performing noise testing on these systems.

b. Hydraulic Pumps and Ocean Simulator System must be enclosed in a sound-proof room.

8. Indicate if this facility/equipment would be extremely difficult or impossible to replicate or relocate at another site and the impact to the Department of the Navy if this facility/equipment were lost. Consider existing Government-wide and commercial capabilities as the replication and impact statements are formulated.

This facility/equipment would be extremely costly and difficult to relocate and/or to replicate.

This test facility is unique to the Navy Industrial Base in that no other has a complete system match up that allows the entire TAHS to be viewed operationally as a system.

This feature enhances system training effectiveness and engineering utility. The original contractor source for this equipment failed to meet required system delivery schedules which impacted new ship construction schedules. Relocating this facility/equipment will introduce 6-12 month down time for hardware alone and an additional 24-36 months for training of new personnel. These estimates are based on actual experience and the assumption that no personnel would relocate with the operation. The impact to the Navy should this facility/equipment be relocated would be that significant cost would be incurred and hard gained experience would be lost. Fleet readiness would be negatively impacted for a 3 year period.

9. Indicate how and when the facility/equipment was transported and or constructed at the site.

a. OK-542 Assembly and Test was established at NAVSURFWARCENDIV Crane in 1989. The basic capability was constructed from government furnished material left over from a defaulted contract. The test stand capability was enhanced to the current during a system upgrade in 1992.

b. The OK-276 Test Facility was established in 1990. Installation, including a system upgrade, required 14 months.

10. List the functional support areas (previously provided in Tab A) that this facility/equipment support. Refer to Appendix A for the list of functional support areas.

1.1

This facility/equipment supports the undersea platform area.

11. Provide the historical utilization average for the past five fiscal years (1989-1993). Define the unit of measure used.

75-80%

The OK-542 and OK-276 Test Stands are heavily utilized during new and overhauled system testing. However, significant windows of under utilization exist during the assembly and overhaul portion of the process when no system is installed on the stand.

12. Provide the projected utilization data out to FY1997.

75-80%

13. What is the approximate number of personnel used to operate the facility/equipment?

Fifteen

14. What is the approximate number of personnel needed to maintain the equipment?

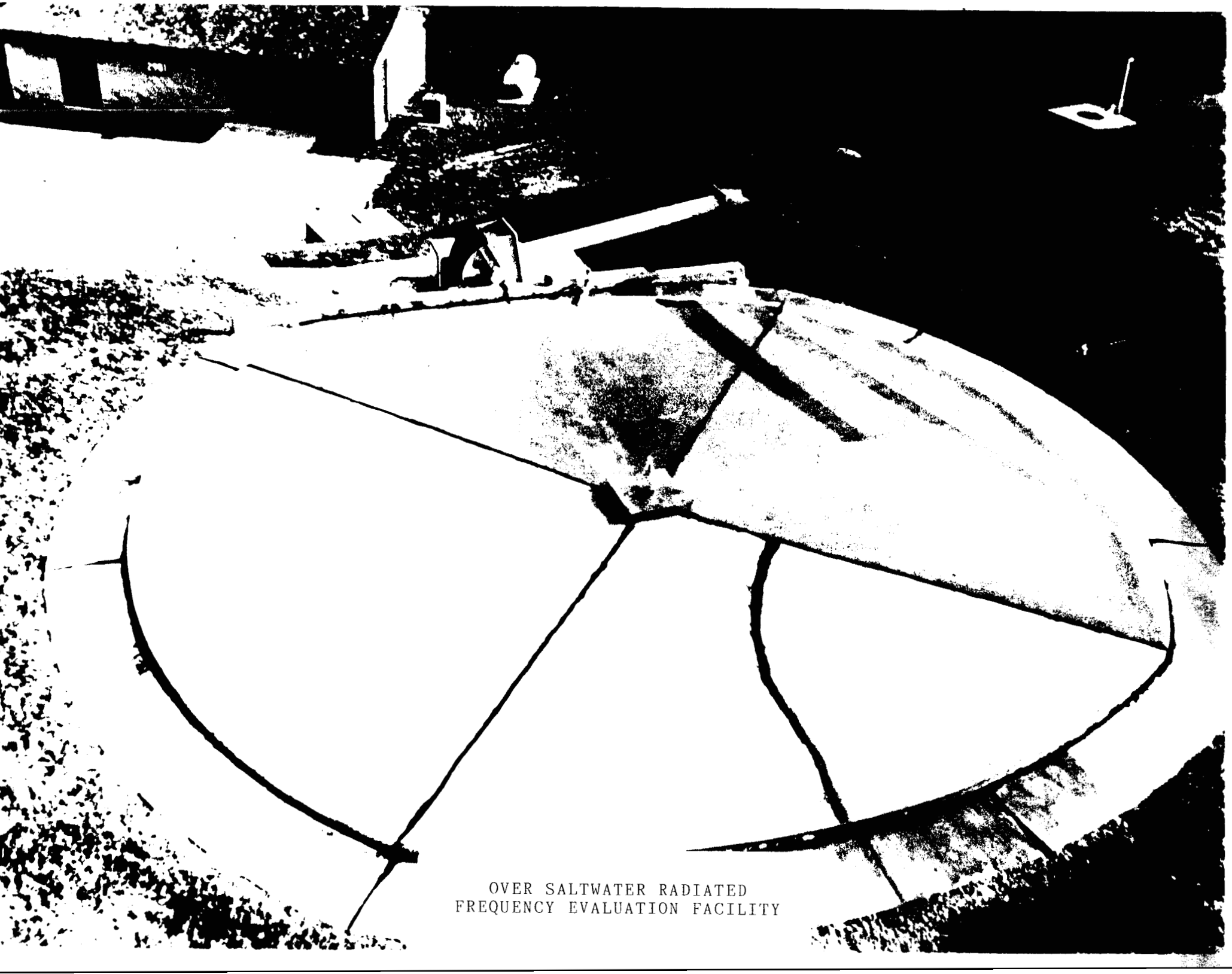
Four

15. Provide one 8 1/2 x 11 black and white photo of the facility/equipment.

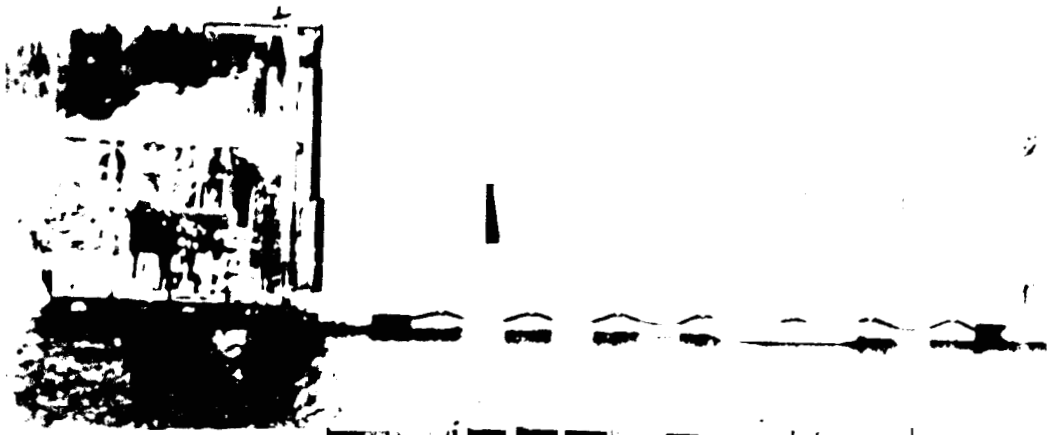
OK-542 and OK-276 Towed Array Handling System and Test Stand

ACOUSTIC SYSTEMS
ENGINEERING/DEPOT
MAINTENANCE FACILITIES

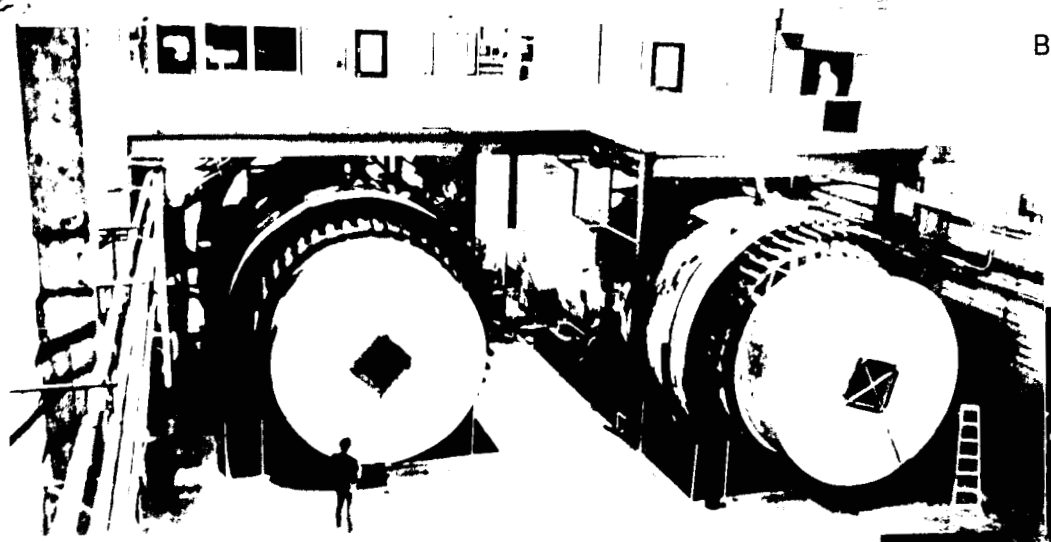
SONAR EQUIPMENT/MOLDED PRODUCTS/
ENGINEERING/MANUFACTURING AND
REPAIR FACILITY



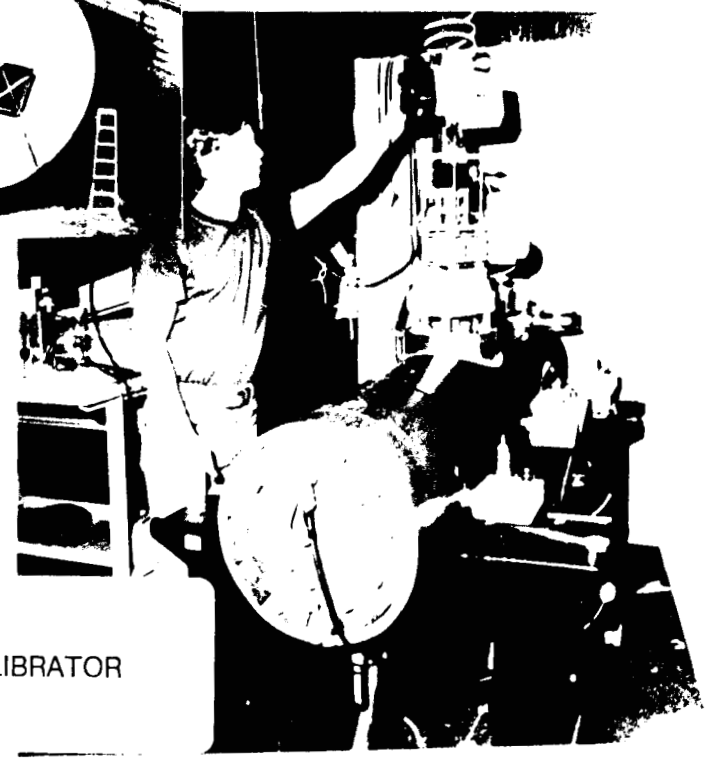
OVER SALTWATER RADIATED
FREQUENCY EVALUATION FACILITY



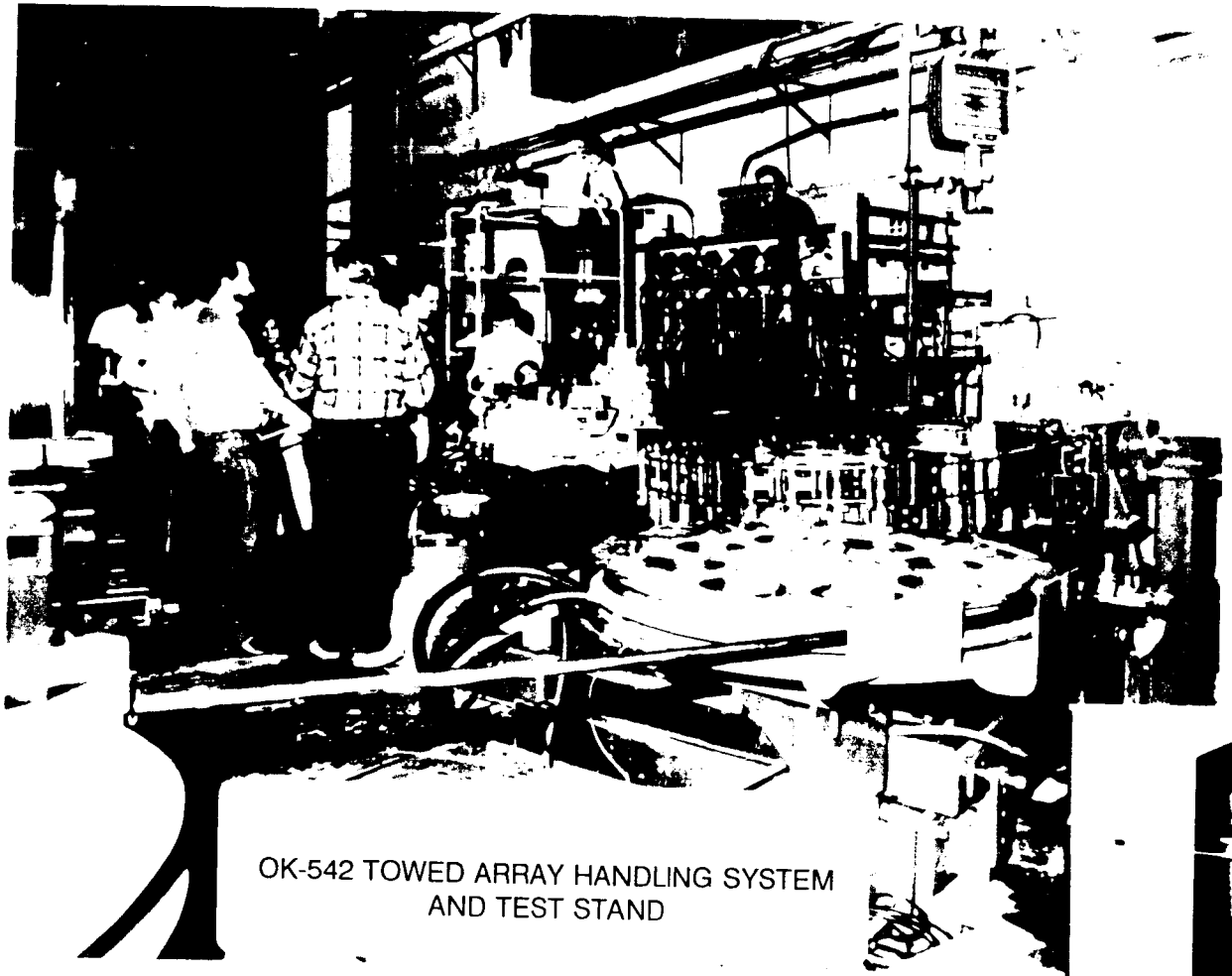
A. LAKE TEST BARGE



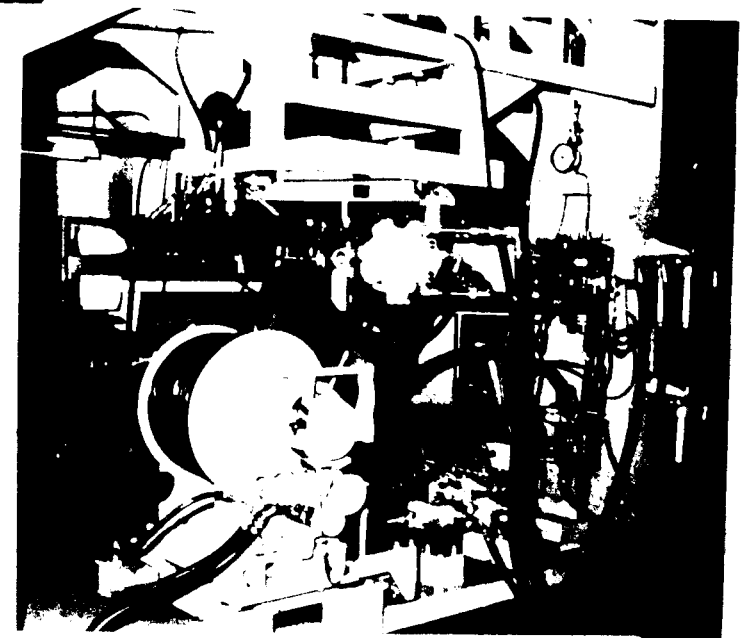
B. LARGE, HIGH PRESSURE ANECHOIC TEST TANKS



C. LOW FREQUENCY CALIBRATOR

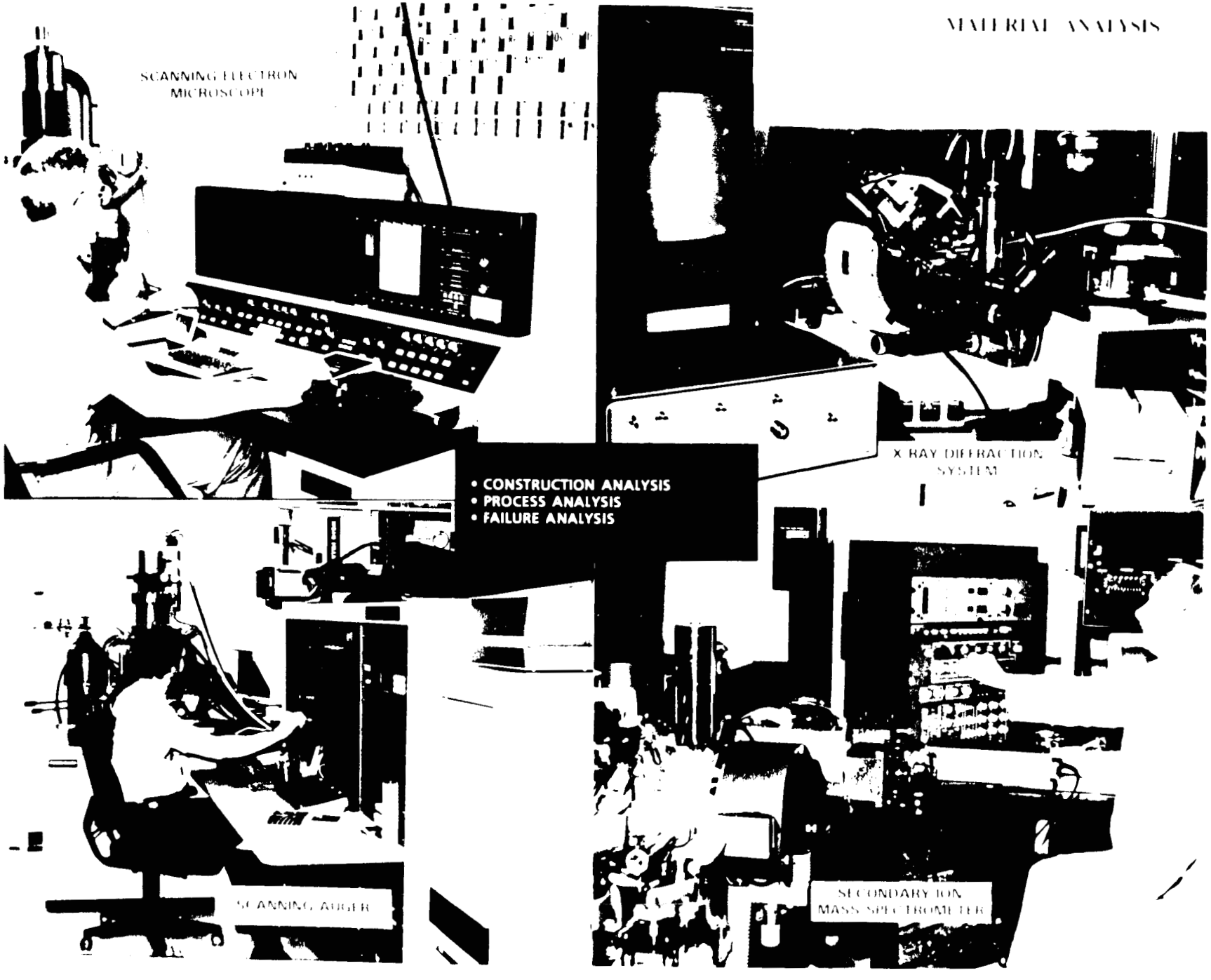


OK-542 TOWED ARRAY HANDLING SYSTEM
AND TEST STAND

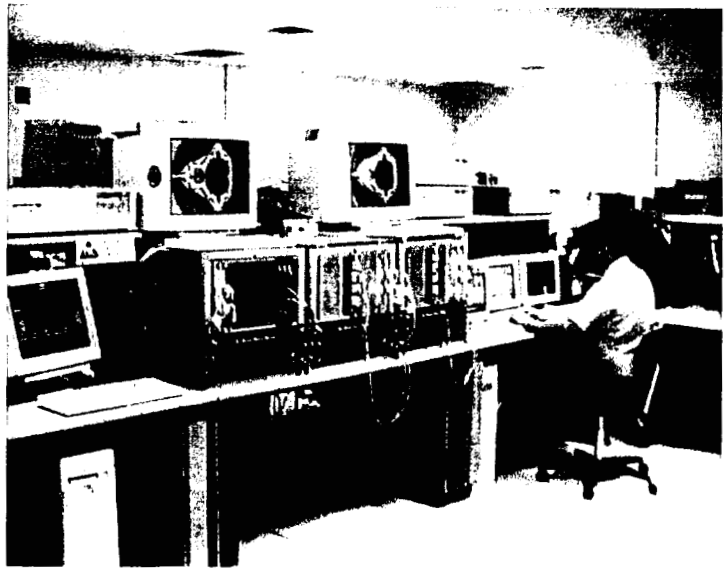


OK-276 TOWED ARRAY HANDLING SYSTEM
AND TEST STAND

MATERIAL ANALYSIS



- CONSTRUCTION ANALYSIS
- PROCESS ANALYSIS
- FAILURE ANALYSIS



RANGE RESOURCES
RANGE CAPABILITY FORM

Technical Center Site	NSWC Crane Division Crane, IN
Range Nomenclature or Title	Glendora Lake Facility

1. List all the ranges that your activity maintains and operates. Provide the following information on each range:

a. A brief statement of what the range is used for.

The Glendora Lake range is used for the test and evaluation of underwater acoustic devices such as: Sonobuoys, Submarine and Surface Ship sonar transducers/ hydrophones, acoustic countermeasures, and mine hunting sonar equipment. Evaluation of underwater launched pyrotechnic devices and demolition charges, such as cable cutters, are performed for First Article and Lot Acceptance Tests. The range is also used for conducting mechanical noise/flow, thermal noise, and sea-state simulation tests, and to study and evaluate the water impact of air deployed devices.

b. Georgraphic location of the range.

The lake facility/range is located in a remote isolated area 2.5 miles east of Sullivan, IN on County Road 300 North. This is 30 miles south of Terre Haute, IN on US 41, where the closest commercial and military air fields are located.

c. Distance from the range to the activity's headquarters facility (main site).

The lake facility/range is 45 miles from Crane, IN, where the Crane Division headquarters is located.

d. Range size in square miles.

0.6 Square Miles

e. Scheduling authority.

All testing is scheduled and coordinated by on site personnel at the lake. A real-time range test schedule is available to the headquarters facility by electronic mail for monitoring and planning purposes.

f. Air space available/restrictions.

Military helicopters are used for air deployment tests, which are coordinated through the Air National Guards located in Terre Haute, IN or Indianapolis, IN. The range is currently under no restrictions, but this could change once pending approval is received for higher level explosive testing.

g. Maximum water depth available/restrictions.

This relatively new lake currently has a depth of 90 feet but is still in the process of filling. The projected depth of the lake will be 110 to 120 feet. This level is expected to be reached this year based on the past/current fill rate. **This facility is owned and controlled by NAVSURFWARCENDIV Crane as is the entire lake. All access is under NAVSURFWARCENDIV Crane control.**

h. Instrumentation capability.

The main test platform at the facility is instrumented with an automated data collection and analysis system for conducting acoustic testing such as: free field receive sensitivity, sound pressure level, transmitting response, directivity, impedance, and spectral analysis measurements. A Tow System is available for conducting mechanical noise/flow tests along with a vertical motion machine for sea-state simulation. This system is also used for deploying targets for mine hunting tests and test samples for explosive cable cutter tests. RF equipment is available for Sonobuoy full-up tests and remote data collection requirements. A mobile instrumented test barge is available for special acoustic tests requiring test item deployment away from the main test platform. A 26 foot boat with a cabin for instrumentation is available for special tests.

i. Accuracy of tracking.

Tracking is currently not a requirement at the range.

j. Data collection/replay capability.

The majority of data collected is digitized and stored on computer (hard drives) or on magnetic tape. Multi-channel analog recorders are available for special test requirements.

k. What are the maximum hours per year that this range is available to support activities? Provide the actual hours that the range was up and capable of providing services. Do not count "down time" due to maintenance, reconfiguration, or

administrative activities (i.e., Holiday shutdowns).

The lake facility is open year round with multiple shifts and weekends available when required to accommodate test demands. Night shifts are scheduled for low level noise measurements. The facility is capable of providing services 365 days a year. Weather sometimes limits testing (such as noise level).

l. What were the actual hours this range was utilized per year for the last five years (FYs 1989-1993)?

LAKE UTILIZATION					
FISCAL YEAR:	1989	1990	1991	1992	1993
TEST DAYS	316	283	202	154	186
HOURS	2528	2264	1616	1232	1480

Note: Lake facility was transitioned from Dugger to Glendora FY 1994. FY 1989-93 utilization data represents actual Dugger Lake data.

m. What were the actual hours that this range was utilized in FY1993?

1480 Hours (Customer scheduled & used).

n. Who are the customers of the range?

LAKE FACILITY CUSTOMERS (FY 1991-93)			
SPONSOR	TEST ITEMS	TEST DAYS (FY91-93)	UTILIZATION (%)
PMA-264	Sonobuoys	229	43
NSEA-91T	Sonar Acoustic Target Source	131	25
PMS-425	Ship Sonars	61	12
PMO-407	Mine Warfare Sonars	50	9
PMS-415	Acoustic Countermeasures	36	7
NSEA-91W	Special Munitions	21	4
Notes: a) Utilization represents % of actual used test days by each customer			

o. Of the actual hours utilized what percentage of utilization time was provided to which customers?

See chart above.

p. Provide a sketch, drawing or map of the range.

See attached.

2. Are any of your ranges part of the DoD Major Range and Test Facility Base (MRTFB)? (yes/no) If yes, which ones?

No

3. Are there any limiting (current or future) environmental and/or enroachment characteristics that are associated with this range.

The area where the lake is located was previously a strip coal mine, which is now going through the various phases of land reclamation. This is still the responsibility of the coal mining company. One environmental assessment has already been conducted on the area for construction, with **no significant findings**. Another is in process for conducting higher level explosive testing, which is much less than the levels the area was subjected to during mining operations. There are **no endangered species** living in the area and the lake has not been stocked with fish. The government owns the area surrounding the lake and **controls all access** to the lake. The land adjacent to the government's property is owned by the coal company and will eventually be managed by the Indiana Department of Natural Resources. There are no plans to sell the adjacent real estate for residential or commercial development.

NSWC CRANE DIVISION, CRANE
DATA CALL #5

JL
SEA 09X
5/12/94

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief. -

NEXT ECHELON LEVEL (if applicable)

NAME (Please type or print

Signature

Title

Date

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

RADM (Sel) D. P. Sargent, Jr.
NAME (Please type of print

Signature

Commander
Title

5/11/94
Date

Naval Surface Warfare Center
Activity

In certify that the information herein is accurate and complete to the best of my knowledge and belief.

MAJOR CLAIMANT LEVEL

G. R. STERNER
NAME (Please type or print

Signature

Title

5-13-94
Date

Commander
Naval Sea Systems Command
Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

J.B. Greene, Jr.
NAME (Please type of print

Signature

Acting
Title

23 May 1994
Date

BRAC-95 CERTIFICATION

Reference: SECNAVNOTE 11000 of 08 December 1993

In accordance with policy set forth by the Secretary of the Navy, personnel of the Department of the Navy, uniformed and civilian, who provide information for use in the BRAC-95 process are required to provide a signed certification that states "I certify that the information contained herein is accurate and complete to the best of my knowledge and belief."

The signing of this certification constitutes a representation that the certifying official has reviewed the information and either (1) personally vouches for its accuracy and completeness or (2) has possession of, and is relying upon, a certification executed by a competent subordinate.

Each individual in your activity generating information for the BRAC-95 process must certify that information. Enclosure (1) is provided for individual certifications and may be duplicated as necessary. You are directed to maintain those certifications at your activity for audit purposes. For purposes of this certification sheet, the commander of the activity will begin the certification process and each reporting senior in the Chain of Command reviewing the information will also sign this certification sheet. This sheet must remain attached to this package and be forwarded up the Chain of Command. Copies must be retained by each level in the Chain of Command for audit purposes.

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

ACTIVITY COMMANDER

S. HOWARD
NAME (Please type or print)

Signature

COMMANDER
Title

6 May 94
Date

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
Activity

REPRODUCED AT GOVERNMENT EXPENSE

202

DATA CALL #5
CRANE SITE

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

NAME (Please type or print

Signature

Title

Date

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

RADM (Sel) D. P. Sargent, Jr.
NAME (Please type of print

Signature

Commander
Title

8/17/94
Date

Naval Surface Warfare Center
Activity

In certify that the information herein is accurate and complete to the best of my knowledge and belief.

MAJOR CLAIMANT LEVEL

E. S. McGINLEY, II
NAME (Please type or print

Signature

ACTING
Title

8/21/94
Date

Rear Admiral, U.S. Navy
Commander
Naval Sea Systems Command

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type of print

Signature

Title

8/25/94
Date

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
DATA CALL #5

BRAC-95 CERTIFICATION

Reference: SECNAVNOTE 11000 of 08 December 1993

In accordance with policy set forth by the Secretary of the Navy, personnel of the Department of the Navy, uniformed and civilian, who provide information for use in the BRAC-95 process are required to provide a signed certification that states "I certify that the information contained herein is accurate and complete to the best of my knowledge and belief."

The signing of this certification constitutes a representation that the certifying official has reviewed the information and either (1) personally vouches for its accuracy and completeness or (2) has possession of, and is relying upon, a certification executed by a competent subordinate.

Each individual in your activity generating information for the BRAC-95 process must certify that information. Enclosure (1) is provided for individual certifications and may be duplicated as necessary. You are directed to maintain those certifications at your activity for audit purposes. For purposes of this certification sheet, the commander of the activity will begin the certification process and each reporting senior in the Chain of Command reviewing the information will also sign this certification sheet. This sheet must remain attached to this package and be forwarded up the Chain of Command. Copies must be retained by each level in the Chain of Command for audit purposes.

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

ACTIVITY COMMANDER

S. HOWARD
NAME (Please type or print)

Signature

COMMANDER
Title

8/12/94
Date

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
Activity

TAB B:

1. Page 15 of 172, Question 2. Due to the error in question 4, the percentages of "fixed" and "moveable" equipment are incorrect. 30% for fixed should be 35%, and 40% for moveable should also be 35%.

2. Page 16 of 172, Question 4. Weight and cube entries for the Failure and Materials Analysis Facility were transposed when summed. 414,150 should be 443,200; and 255,650 should be 226,600.

3. Page 38 of 172, Table 2. Micro-Electronics Technology Facility line should read 226,600 and 221.6 instead of 255.6 and 207.0, respectively.

4. Page 47 of 172, Question 4. 14,280 cubic feet should be 54,280.

5. Page 56 of 172, Question 4. 369,500 pounds should be 382,085.

(CONTINUED ON REVERSE SIDE)

DATA CALL #5
CRANE SITE

~~I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.~~

~~NEXT ECHELON LEVEL (if applicable)~~

~~NAME (Please type or print~~ ~~Signature~~

~~Title~~ ~~Date~~

~~Activity~~

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

RADM (Sel) D. P. Sargent, Jr. — D P Sargent
NAME (Please type of print — Signature

Commander — 8/10/94
Title — Date

Naval Surface Warfare Center
Activity

In certify that the information herein is accurate and complete to the best of my knowledge and belief.

MAJOR CLAIMANT LEVEL

E.S. MCGINLEY, II, ACTING
NAME (Please type or print — Signature

Commander — 8/16/94
Title — Date

Naval Sea Systems Command

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type of print — Signature

8/25/94
Title — Date

Naval Surface Warfare Center
Crane Division
Crane Site
Data Call #5

BRAC-95 CERTIFICATION

Reference: SECNAVNOTE 11000 of 08 December 1993

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I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

ACTIVITY COMMANDER

S. Howard

NAME (Please type or print)

Signature

COMMANDER

Title

01 AUG 1994

Date

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER

Activity

1. The direct funded workyears from the non-technical program at NSWC Crane is broken out on page 7R as requested.

2. The "Lifecycle Support Code" was changed in TAB A pages 13, 30, 119, 142, and 170 based upon the instructions from the Base Structure Analysis Team guidance.

pg. 19, 20-25
66, 70, 6B, 38B

202 Rev. DATA CALL #5
CRANE SITE

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

NAME (Please type or print

Signature

Title

Date

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

RADM (Sel) D. P. Sargent, Jr.
NAME (Please type of print

Signature

Commander
Title

9/15/94
Date

Naval Surface Warfare Center
Activity

In certify that the information herein is accurate and complete to the best of my knowledge and belief.

MAJOR CLAIMANT LEVEL

NAME (Please type or print

Signature

G. R. STERNER
Title
Commander
Naval Sea Systems Command

9-22-94
Date

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

NAME (Please type of print

Signature

Title

10/1/94
Date

NAVAL SURFACE WARFARE CENTER
CRANE DIVISION
DATA CALL #5

BRAC-95 CERTIFICATION

Reference: SECNAVNOTE 11000 of 08 December 1993

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I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

ACTIVITY COMMANDER

J. M. CARNEY
NAME (Please type or print)

Signature

COMMANDER
Title

9/9/94
Date

CRANE DIVISION, NSWC
Activity

1. In regards to the BSAT request for clarification dated 9 September 94, the response to question #23 (Crime Rate) is provided for the local community of Martin County.

R crime data

202

DATA CALL #5
CRANE SITE

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief. -

NEXT ECHELON LEVEL (if applicable)

NAME (Please type or print

Signature

Title

Date

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

RADM (Sel) D. P. Sargent, Jr.
NAME (Please type of print

Signature

Commander
Title

9/14/94
Date

Naval Surface Warfare Center
Activity

In certify that the information herein is accurate and complete to the best of my knowledge and belief.

MAJOR CLAIMANT LEVEL

NAME (Please type or print

Signature

G. R. STERNER
Commander
Naval Sea Systems Command

9-19-94
Date

Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

NAME (Please type of print

Signature

Title

10/1/94
Date

NAVAL SURFACE WARFARE CENTER
CRANE DIVISION
DATA CALL #5
BRAC-95 CERTIFICATION

Reference: SECNAVNOTE 11000 of 08 December 1993

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ACTIVITY COMMANDER

J. M. CARNEY
NAME (Please type or print)

J.M. Carney
Signature

COMMANDER
Title

9/14/94
Date

CRANE DIVISION, NSWC
Activity

Pages 19R through 25R. As per the guidance provided in a phone conversation with Major Cone of the Base Structure Analysis Team, the response to question 5e is revised to list only those technical books and chapters published for an audience wider than the Department of Defense.

Page 66R. Percent Occupancy Rate for Efficiency rentals added.

Page 70R. Annual Enrollment Cost per Student for Loogootee High School added.

Tab B, Page 6R. Question 4 revised.

Tab B, Page 38R. Micro-Electronics Technology Facility cube feet revised.