"LAB" JOINT CROSS-SERVICE GROUP DATA CALL #12

167

TECHNICAL CENTERS

Complete Revision 8-8-94

Category	Technical Center
Technical Center Site	NAWCWPNS, China Lake
Location/Address	China Lake, Calif.

PLUS REVISIONS DATED
8-14-94
8-21-94
9-12-94
9-13-94
9-15-94

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INTRODUCTION

NAVAL AIR WARFARE CENTER WEAPONS DIVISION, MISSION AND SITES

The Naval Air Warfare Center Weapons Division (NAWCWPNS) is a full-spectrum research, development, test, evaluation, and in-service engineering center for weapon systems associated with air warfare (except antisubmarine warfare systems), missiles and missile subsystems, aircraft weapons integration, and assigned airborne electronic warfare systems. In addition, NAWCWPNS maintains and operates DOD's largest and most completely instrumented air, land, and sea test range complex.

NAWCWPNS was formed through the combination of four Navy shore facilities: the Naval Weapons Evaluation Facility, Albuquerque, New Mexico; the Naval Ordnance Missile Test Station, White Sands, New Mexico; the Pacific Missile Test Center, Point Mugu, California; and the Naval Weapons Center, China Lake, California. Integrating the full-spectrum activities of these four organizations provides an expanded capability for research, development, test, evaluation, and support throughout the weapon-system life cycle. The current structure of NAWCWPNS includes an overall Command function; laboratory (R&D) functions concentrated within the R&D Pillar, reporting to the Deputy Commander for R&D; T&E functions in the T&E Pillar, reporting to the Deputy Commander for T&E; a single Services and Information Directorate; and Naval Air Weapons Stations at Point Mugu and China Lake as "base-keepers."

The primary sites of NAWCWPNS are at China Lake, California, located in the high desert approximately 150 miles northeast of Los Angeles, and at Point Mugu, California, located on the coast approximately 60 miles northwest of Los Angeles. A major detachment is operated at White Sands, New Mexico (as a tenant at the White Sands Missile Range (WSMR)), and another smaller group is located at Albuquerque, New Mexico (as a tenant at Kirtland AFB).

NAWCWPNS is a truly integrated structure. Many organizational entities are spread across multiple sites. For example, the Aircraft Weapon Systems programs at the China Lake and Point Mugu sites have been consolidated into a single organization with facilities and capabilities at both sites, and the personnel work as an integrated team. Similar consolidations at NAWCWPNS have been made in the areas of Engineering and In-Service Engineering, Targets and Threat Simulations, Information and Electronic Warfare, Air Intercept Weapons and Attack Weapons, and most base support functions. Additionally, this integration has resulted in the Naval Western Test Range Complex, which is composed of the Point Mugu sea range and test facilities combined with the land ranges and test facilities at China Lake and White Sands. The Complex provides complementary, full-spectrum test capability for weapon systems and aircraft. Additionally, the Major Range and Test Facility Base (MRTFB) portion of the funding is managed through a consolidated centralized program office.

NAWCWPNS as a total entity represents the work of more than 8,000 civilian employees and 1,300 military personnel. It is the Navy's complete sector of scientific and technical knowledge for air warfare systems, guided missiles, and aircraft weapon integration. Existence at China Lake of DOD's largest weapons R&D laboratory in immediate proximity to the land test range has repeatedly been shown to be of great significance in furthering the air weapons development function. Equally significant is NAWCWPNS Point Mugu's role as the Navy's primary weapons T&E site and air weapons in-service engineering support site with its contiguous Sea Test Range and its air weapons in-service engineering support, which complements the China Lake R&D role.

Since NAWCWPNS is an integrated organization at multiple sites, an artificial split is being made to respond to BRAC data calls. The organization is completely integrated across sites and functional areas and pursues work with the philosophy that RDT&E is a seamless process. In addition, many support functions are provided through a single, central, consolidated organizational element. Although the data calls are provided separately as requested, the capabilities of the NAWCWPNS sites must be treated as an integrated whole. As an example, the Threat Simulation Directorate is a single organization with personnel at both major sites supporting both Laboratory and T&E functions. The Directorate has a consolidated budget administered by a single comptroller, and a consolidated position management structure administered by a single Human Resources Department.

NAWCWPNS LABORATORY FUNCTIONS

The laboratory functions at NAWCWPNS are performed in the R&D Pillar, reporting to the Deputy Commander for Research and Development. The vast majority of data provided in this data call response reflect the operations of that organization.

SECTION I: TASKINGS

In accordance with the Deputy Secretary of Defense memorandum dated 7 Jan 94, the Laboratory Joint Cross-Service Group (LJCSG) with DOD components should, where operationally and cost effective, strive to: retain in only one Service militarily unique capabilities used by two or more Services; consolidate workload across the Service to reduce capacity; and assign operational units from more than one Service to a single base. Specifically, the purpose of the LJCSG is:

- *Determine common support functions and bases to be addressed by LJCSG*
- *Establish guidelines, standards, assumptions, measures of merit, data elements and milestone schedules for DOD Component conduct of cross-service analysis of common support functions*
- *Review excess capacity analysis*
- *Develop closure or realignment alternatives*
- *Analyze cross-service trade-offs*

The following information identifies to the Services common support functions and data element requirements necessary to support the cross-service analysis of these common support functions.

1.1 Guidelines. *Because the DOD components are organized differently, "Lab" activities are considered to be those involved in the following life cycle efforts: Science and technology, and/or engineering development, and/or in-service engineering.*

Service missions and force structure will be as stipulated in the FY1995-2000 Defense Planning Guidance and Interim Force Structure Plan.

The Military Departments will use the projected funding in the FY95 President's Budget Submission (Future Years Defense Plan--FYDP) and an estimate of funds that will be received from outside the military department for execution.

If "lab" excess capacity exists, the Military Departments will start to reduce it where operationally and cost effective through a combination of downsizing in place within the departments, internal service consolidation, and cross service alternatives.

The Military Departments will gather, exchange, and analyze data collected per this guidance call for Common Support Functions (Appendix C) at "lab" activities (Appendix B) in accordance with the milestones and schedule dates identified in Appendix A.

Cross-service alternatives will result in an aggregate reduction in the overall "lab" infrastructure across the Military Departments—personnel/funding/facilities and equipment.

Common cross-service Measures of Merit will be consistently applied for all cross-service alternatives.

Integration of weapon systems/components into operational forces will remain with the individual Military Departments responsible for those forces.

1.2 Standards. *Evaluation of cross-service alternatives will be consistent with PL 101-510 (as amended) and the eight BRAC criteria. Only certified data will be used.*

The COBRA cost model will be used to calculate estimated costs, estimated savings, and Return on Investment (ROI) of alternatives leading to proposed closures and realignments. Common inputs will be used for Military COBRA runs incorporating cross-service alternatives.

Military value analysis will be conducted by the Military Departments IAW Title 10, USC responsibilities.

1.3 Assumptions. *"Lab" Common Support Functions and activities identified herein represent the major opportunities for developing cross-service alternatives. The Military Departments are not precluded from proposing other cross-service alternatives to reduce excess capacity as they assess the full complement of "lab" functions.*

Previous BRAC decisions will be factored into cross-service alternatives.

"Lab" capacity will be based on budgeted workyears. A workyear is considered to be 2080 hours adjusted for time not on the job (e.g. sick leave, annual leave, etc.)

1.4 Measures of Merit. *The following Measures of Merit represent the outcome from the DOD component final realignment and closure recommendations that are supported by the capabilities data which will be gathered by activity and common support function in Section III of this guidance.*

- *Reduction of "lab" infrastructure*
- *Return on investment (COBRA)*
- *Military value (BRAC criteria 1-4)—the composite assessment of the quality of the remaining "lab" infrastructure*

1.5 Activities. *The Military Departments will collect capacity data for each "lab" activity identified in Appendix B. The "lab" activities were selected by considering all individual aggregates of personnel and facilities located at one base, under the same commander, performing predominantly science and technology (S&T), engineering development, and/or in-service engineering work. Small subelements of these "lab" activities were included with the activity. Larger subelements were broken out and defined as separate activities. The list of activities was then narrowed down to the list in Appendix B based on a joint Military Department assessment of common support functions with cross-service potential.*

1.6 Common Support Functions. *The common support functions (CSFs) were selected as shown in Appendix C based on a joint Military Department assessment of commonalty and cross-servicing potential. Common support functions which were already consolidated and being cross serviced were not included.*

Common Support Functions are divided into two categories: product and pervasive. Product functions include all S&T, engineering development, and in-service engineering efforts associated with a product from all funding sources. Pervasive functions <u>only include</u> those efforts that are S&T funded, i.e. Technology Base (6.1)/Exploratory Development (6.2)/Advanced Development (6.3).

SECTION II: CAPACITY OF DOD COMPONENTS

2.1 Workload. *Use the following table to describe historic and projected workload at each activity in terms of funding and workyears. Assume previous BRAC closures and realignments are implemented on schedule. Projected funding will be derived from FY95 President's Budget Submission (Then year dollars). Past fiscal year data shall begin with FY86 or at the inception of the activity as it existed on 1 Oct 93. (BRAC Criteria I & IV)*

The laboratory workload data shown are for NAWCWPNS at the China Lake site. NAWCWPNS is a Defense Operating Fund (DBOF) activity. As such, funding is programmed to support a combination of in-house technical efforts; local Scientific, Engineering, and Technical Assistance (SETA) contracts; non-local technical work performed by industrial contractors; and internal infrastructure support (i.e., overhead). Examples of local SETA contractors include Boeing and Comarco, while remote and industrial contractors include Hughes Aircraft Corp. and Texas Instruments.

Data below include financial information for new reimbursable orders and direct cite funding. No Federally Funded Research and Development Center (FFRDC) data are included, because there is no FFRDC colocated with this site. The data below do reflect some non-R&D activity at the China Lake site.

Data are for all life-cycle phases (Science and Technology (S&T), Development and Engineering (D&E), In-Service Engineering (IE), Test and Evaluation (T&E), and Training and Doctrine (T&D)).

Information Required	Fiscal Years											
	86	87	88	89	90	91	92	93	94	95	96	97
Total Funds Programmed ($M)	697	735	720	727	757	774	717	747	830	816	783	761
Total Actual Funds ($M)	657	735	720	744	803	749	824	789				
Programmed Workyears	5,910	5,668	5,720	5,784	5,876	5,867	5,658	5,344	5,130	4,901	4,687	4,526
Actual Workyears	5,910	5,877	5,735	5,787	5,958	5,863	5,670	5,431				

Note 1: The funding data above include funds provided by NAWCWPNS lab to industrial contractors, such as Hughes, McDonnell Douglas, and Motorola (direct cite). The direct cite funding is included because it is a significant element of NAWCWPNS lab management effort. However, the workload data include only in-house workyears and local SETA contractor workyears; industrial contractor workyears are not included because they are not local.

Note 2: Data in the table above include both R&D and T&E work and were taken from BRAC 95 Data Call #4 for NAWCWPNS China Lake.

- *Budgeted workyears are the selected indicator of the "lab" infrastructure's capacity at an aggregate level for each Military Department. They include both workyears funded directly by the Military Department and the workyears funded from organizations outside the Military Department.*

Workyears = government personnel and on-site FFRDCs and SETAs

SECTION II: CAPACITY OF DOD COMPONENTS

2.1 Workload. *Use the following table to describe historic and projected workload at each activity in terms of funding and workyears. Assume previous BRAC closures and realignments are implemented on schedule. Projected funding will be derived from FY95 President's Budget Submission (Then year dollars). Past fiscal year data shall begin with FY86 or at the inception of the activity as it existed on 1 Oct 93. (BRAC Criteria I & IV)*

The laboratory workload data shown are for the R&D Pillar of NAWCWPNS at the China Lake site. NAWCWPNS is a Defense Operating Fund (DBOF) activity. As such, funding is programmed to support a combination of in-house technical efforts; local Scientific, Engineering, and Technical Assistance (SETA) contracts; non-local technical work performed by industrial contractors; and internal infrastructure support (i.e., overhead). Examples of local SETA contractors include Boeing and Comarco, while remote and industrial contractors include Hughes Aircraft Corp. and Texas Instruments.

Data below include financial information for new reimbursable orders and direct cite funding. No Federally Funded Research and Development Center (FFRDC) data are included, because there is no FFRDC colocated with this site. The data below do not reflect non-R&D activity at the China Lake site.

Data are for efforts managed by the R&D Pillar and include all life-cycle phases (Science and Technology, Engineering Development, and In-Service Engineering).

Information Required	Fiscal Years											
	86	87	88	89	90	91	92	93	94	95	96	97
Total Funds Programmed ($M)	697	684	652	622	706	547	693	654	645	635	608	592
Total Actual Funds ($M)	649	637	586	586	666	646	662	613				
Programmed Workyears	2,786	2,660	2,780	2,635	2,669	2,663	2,620	2,495	2,403	2,249	2,154	2,079
Actual Workyears	2,780	2,764	2,697	2,659	2,788	2,713	2,580	2,569				

Note 1: The funding data above include funds provided by NAWCWPNS lab to industrial contractors, such as Hughes, McDonnell Douglas, and Motorola (direct cite). The direct cite funding is included because it is a significant element of NAWCWPNS lab management effort. However, the workload data include only in-house workyears and local SETA contractor workyears; industrial contractor workyears are not included because they are not local.

Note 2: Data in the table above will not correlate with financial and workyear data requested in BRAC Data Call #13 for the same reasons listed in (1), above.

- *Budgeted workyears are the selected indicator of the "lab" infrastructure's capacity at an aggregate level for each Military Department. They include both workyears funded directly by the Military Department and the workyears funded from organizations outside the Military Department.*

Workyears = government personnel and on-site FFRDCs and SETAs

2.2 Excess "Lab" Capacity—Measured at the DOD Component Level

- *Excess "Lab" Capacity = Sum of the Peak Workyears - Sum of the Projected Workyears*
  - *Peak at each activity = Highest value between FY86 (or since inception of organization) and FY93*
  - *Projected at each activity = Estimated at FY97*

Not applicable; measured at the DOD component level.

SECTION III: CAPABILITY OF ACTIVITIES TO PERFORM COMMON SUPPORT FUNCTIONS (CSFs): *Provide the information described for each common support function listed in Appendix C in which you are actively engaged.*

3.0 Mission: *Describe the major capabilities at your activity contributing to the common support function in bulletized format. Describe any relationship and interconnectivity with other functions (common or otherwise) in support of the overall activity mission.*

NAWCWPNS China Lake is a full-spectrum weapons research, development, test, evaluation, in-service engineering, and weapons/aircraft integration center. Therefore, the vast majority of our work is focused in the Weapons and Air Vehicles CSFs. With the exception of that portion pertaining to aircraft survivability RDT&E and Congressionally mandated Live Fire Testing (LFT), the Air Vehicles CSF is a complementary part of our mission in the Weapons CSF. The complementary aspects support the integration of weapons onto Navy aircraft and the fielding of a totally integrated weapon system, including the avionics, weapons, and air vehicle. Aircraft survivability is a unique element of China Lake's mission that provides the Navy, DOD, and the aerospace industry with analysis, engineering, and test capabilities to evaluate and improve the combat survivability of the total weapon system. This entails significant, and integrated, work in all Air Vehicles CSFs. Of lesser scope but of equal importance is the Space Systems CSF. Historically, this CSF has primarily related to the various recovery systems associated with orbital flights and space probes. Requirements exist for salvaging items such as solid rocket boosters, soft landing of space vehicles on terrestrial bodies, and providing space screws with a means of escape under certain emergency evacuation scenarios. In the future, China Lake is expected to become involved in Earth-orbiting satellites through the Selene project as described below. China Lake does very significant work in other CSFs such as C4I and other pervasive functions such as Environmental Research and Development, Advanced Materials, Electronic Devices, Human Systems, and Training.

Accordingly, the following represents the breakout of our major CSFs and shows the capabilities and interconnectivity with other functions at NAWCWPNS China Lake.

CSF: AIR VEHICLES, FIXED WING, STRUCTURE
- Weapon/Aircraft System Integration
- Combat Survivability—Life Cycle and In-Service Analysis, Engineering, and Testing and Live Fire Testing for Navy, DOD, and Industry
  - Analysis, engineering, testing on structures, materials, munitions, crew stations, etc.

CSF: AIR VEHICLES, FIXED WING, PROPULSION
- Design, development, and testing of air breathing propulsion systems for air targets
- Combat Survivability—NAWCWPNS also does some work in Life Cycle and In-Service Analysis, Engineering, and Testing and Live Fire Testing for Navy, DOD, and Industry
  - Analysis, engineering, testing on propulsion systems, however, this is covered under the CSF for Air Vehicles, Fixed Wing, Flight Subsystems

CSF: AIR VEHICLES, FIXED WING, AVIONICS
- Life Cycle System Engineering for Tactical Aircraft Systems
- Tactical System/Software Upgrades
- Avionics System Integration
- Weapon/Aircraft System Integration

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS
- Combat Survivability—Life Cycle and In-Service Analysis, Engineering, and Testing and Live Fire Testing for Navy, DOD, and Industry
  - Analysis, engineering, testing on flight-control system, munitions, crew stations, etc.

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

- Life Cycle System Engineering for Tactical Aircraft Systems
- Tactical System/Software Upgrades
- Avionics System Integration
- Weapon/Aircraft System Integration

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

- Combat Survivability—Life Cycle and In-Service Analysis, Engineering, and Testing, and Live Fire Testing for Navy, DOD, and Industry
  - Analysis, engineering, testing on structures, materials, flight-control system, propulsion, munitions, crew stations, etc. This is a small level of effort so it will all be reported under this CSF.

CSF: WEAPONS, ICBMs/SLBMs

- S&T in Areas Related to Missile Propulsion and Energetic Materials
  - Insensitive munitions analysis and testing
- Provide and maintain the special facilities required for the above functions (facilities are used by both contractors and government program personnel)

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

- Tactical Aircraft Weapons Integration
- Development and Integration of Targeting/Fire Control Systems and Sensors
- Survivability/Lethality Analysis and Testing for Weapons
- Technical Management of Assigned Weapons Programs
- S&T in Areas Related to Missile Systems
  - Energetic Materials
  - Optics
  - Internetting and Advanced Computation
- Development Support to Tactical Missile Systems in Dem/Val and EMD Phases:
  - Technology Development for risk reduction in seekers, proximity fuzing, guidance and control, warheads and ordnance components, airframes, and propulsion.
  - Digital and Hardware-in-the-Loop Simulation
  - Subsystem and System-Level Test, including environmental and E^3 testing.
  - All-up Round And Launch Platform Integration Testing
- Provide and maintain the special facilities required for the above functions (facilities are used by both contractors and government program personnel)
- Antiradiation Guidance

CSF: WEAPONS, CRUISE MISSILES

- Tactical Aircraft Weapons Integration
- Development and Integration of Targeting/Fire Control Systems and Sensors
- Survivability/Lethality Analysis and Testing for Weapons
- Technical Management of Assigned Weapons Programs
- S&T in Areas Related to Missile Systems
  - Energetic Materials
  - Optics
  - Internetting and Advanced Computation
- Development Support to Cruise Missile Systems in Dem/Val and EMD Phases:
  - Technology Development for risk reduction in seekers, proximity fuzing, guidance and control, warheads and ordnance components, airframes, and propulsion.
  - Digital and Hardware-in-the-Loop Simulation

- Subsystem and System-Level Test, including environmental and E^3 testing
- All-up Round And Launch Platform Integration Testing
- Provide and maintain the special facilities required for the above functions (facilities are used by both contractors and government program personnel)

CSF: WEAPONS, GUIDED PROJECTILES

- Survivability/Lethality Analysis and Testing for Weapons
- Technical Management of Assigned Programs
- S&T in Areas Related to
  - Energetic Materials
- Development Support to Systems in Dem/Val and EMD Phases:
  - Technology Development for risk reduction in seekers and propulsion
  - Subsystem and System-Level Test, including environmental and E^3 testing
  - All-up Round And Launch Platform Integration Testing
- Provide and maintain the special facilities required for the above functions (facilities are used by both contractors and government program personnel)
- Antiradiation Guidance
- Rocket-Assisted Projectiles

CSF: WEAPONS, BOMBS

- Tactical Aircraft Weapons Integration
- Development and Integration of Targeting/Fire Control Systems and Sensors
- Survivability/Lethality Analysis and Testing for Weapons
- Technical Management of Assigned Weapons Programs
- S&T in Areas Related to Bomb Systems
  - Energetic Materials
  - Optics
  - Internetting and Advanced Computation
- Development Support to Bomb Systems in Dem/Val and EMD Phases:
  - Technology Development for risk reduction in proximity fuzing, guidance and control, warheads and ordnance components, and airframes.
  - Digital and Hardware-in-the-Loop Simulation
  - Subsystem and System-Level Test, including environmental and E^3 testing
  - All-up Round And Launch Platform Integration Testing
- Provide and maintain the special facilities required for the above functions (facilities are used by both contractors and government program personnel)

CSF: WEAPONS, GUNS AND AMMUNITION

- Tactical Aircraft Weapons Integration
- Development and Integration of Targeting/Fire Control Systems
- Survivability/Lethality Analysis and Testing for Weapons
- Technical Management of Assigned Weapons Programs
- S&T in Areas Related to Gun Systems
  - Energetic Materials
- Development Support to Gun Systems in Dem/Val and EMD Phases:
  - Subsystem and System-Level Test, including environmental and E^3 testing
  - All-up Round And Launch Platform Integration Testing
- Provide and maintain the special facilities required for the above functions (facilities are used by both contractors and government program personnel)

CSF: WEAPONS, DIRECTED ENERGY

Over the past several decades NAWCWPNS has done significant work in directed energy weapons as follows:

• High-Power Microwave. We have worked closely with the Department of Energy Laboratories at Livermore and Los Alamos in the development of technology for explosively driven, high-power microwave (HPM) warheads, under sponsorship of SPAWARS and the Joint DOD/DOE Conventional Munitions Program. We have also prepared conventional missiles for HPM vulnerability testing.

• Lasers. We have done important science and technology work on optics, mirrors, chemical lasers, laser damage, and large optics characterization. We also are involved with the high-energy laser work at White Sands Missile Range through our Detachment there. Furthermore, the SELENE Project, which is described under the Space Systems CSF below, has the potential to provide a facility that would be amenable to some important technology development for future directed energy weapons.

Therefore, some potentially very valuable and unique facilities and talent are available to provide a capability in directed energy systems at NAWCWPNS even though little work specific to this CSF is currently ongoing.

CSF: WEAPONS, CHEMICAL/BIOLOGICAL

No chemical/biological warfare (CW/BW) offensive programs are active or planned as they would be in violation of the Chemical Weapons Convention and Biological Weapons Convention treaties. As part of its mission to provide full spectrum RDT&E, NAWCWPNS China Lake has the capability to perform CW/BW defensive system support, as allowed by the treaties.

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

• Solid Rocket Booster Recovery
• MARS Environmental Survey
• Shuttle Crew Escape Equipment

CSF: SPACE SYSTEMS, SATELLITES

The Space Laser Energy Project (SELENE) is a proposal to develop a land-based high-power laser to supply electrical power to orbiting satellites. Power can be directly beamed from the Earth to a satellite, or via a space stabilized mirror attached to an aerostat to achieve a greater range of satellite coverage. NASA has selected China Lake as the best site for SELENE.

A dual-use facility will house both the commercially operated primary laser power system and concurrently provide laboratory space for development of the next generation laser system in a second laser laboratory position, as the system evolves from a 200kW to a 10MW laser power beam.

As a directed energy source, the SELENE power beam can be used as a ground-based high-energy power source for atmospheric station keeping vehicles that engage in communications relaying, ground surveillance, weather monitoring, thermal mapping, or laser power relaying.

CSF: SPACE SYSTEMS, GROUND CONTROL SYSTEMS

N/A

CSF: C4I, AIRBORNE C4I

• Signal Exploitation Systems
• Multisensor Fusion Systems
• Radio Link Integration With Tactical Systems
• Testing, Airborne
• Testing, Environmental
• Distributed Databases
• Decision Aids

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CSF: SPACE SYSTEMS, LAUNCH VEHICLES

- Solid Rocket Booster Recovery
- MARS Environmental Survey
- Shuttle Crew Escape Equipment

CSF: SPACE SYSTEMS, SATELLITES

The Space Laser Energy Project (SELENE) is a proposal to develop a land-based high-power laser to supply electrical power to orbiting satellites. Power can be directly beamed from the Earth to a satellite, or via a space stabilized mirror attached to an aerostat to achieve a greater range of satellite coverage. NASA has selected China Lake as the best site for SELENE.

A dual-use facility will house both the commercially operated primary laser power system and concurrently provide laboratory space for development of the next generation laser system in a second laser laboratory position, as the system evolves from a 200kW to a 10MW laser power beam.

As a directed energy source, the SELENE power beam can be used as a ground-based high-energy power source for atmospheric station keeping vehicles that engage in communications relaying, ground surveillance, weather monitoring, thermal mapping, or laser power relaying.

CSF: SPACE SYSTEMS, GROUND CONTROL SYSTEMS

N/A

CSF: C4I, AIRBORNE C4I

- Signal Exploitation Systems
- Multisensor Fusion Systems
- Radio Link Integration With Tactical Systems
- Testing, Airborne
- Testing, Environmental
- Distributed Databases
- Decision Aids

CSF: ELECTRONIC DEVICES

- Microelectronics Fabrication
- III-V Molecular Beam Epitaxy Growth and Characterization
- II-VI Metalorganic Molecular Beam Epitaxy Growth and Characterization

Electronic Device work at China Lake exists to support the mission of NAWCWPNS, thereby supporting the Fleet, DOD, and the nation. We provide basic and applied research in the area of semiconductor and superconducting materials and processes that provide the potential to improve current weaponry or to advance the state of the art in these technologies. Areas of current research include design and growth of III-V semiconductors by Molecular Beam Epitaxy; design and growth of II-VI semiconductors by Metalorganic Molecular Beam Epitaxy; boron nitride on silicon by RF magnetron sputtering; design, testing, and evaluation of two and three terminal semiconducting devices to obtain high-efficiency, high-duty cycle RF and millimeter wave power. We also perform fundamental and applied research in high-temperature superconductive devices in support of superdirectional antennas.

CSF: HUMAN SYSTEMS

- Human engineering support of weapons and weapons integration programs
- Basic research into the performance of the human component of weapons systems
- Design recommendations for displays and controls
- Estimation of human performance feasibility for new or modified systems

CSF: TRAINING SYSTEMS

- Development of hardware and software for Tactical Air Combat Training ranges for Navy and Air Force
- Tactical Weapons Integration/Loading training curriculums
- Computer-aided instruction system for HARM/F/A-18
- Taining curriculum and course work for T&E and OPEVAL evolutions for tactical weapons systems (air/air and air/ground)
- Training curriculum and course work for aircraft battle damage repair for H-46, H-60, A-4, F-18, etc.

CSF: ENVIRONMENTAL QUALITY

- RDT&E
- Integrated environmental quality EQ program
- Reduce and eliminate of environmental impacts on our air, land, and sea complex

CSF: ADVANCED MATERIALS

- Materials Engineering, Synthesis, and Characterization

COLOCATION OF R&D/T&E

The NAWCWPNS China Lake site is unique in that the full spectrum of development and test capability exists at one location. The effectiveness of being able to carry out all phases of both weapon and space recovery systems research, development, testing, and follow-on support at one geographic location has been demonstrated repeatedly.

- Same development and test team involved from program inception to completion
- Colocation of Air Development and Test Squadron NINE (VX-9)*
- Parallel design and test easily accomplished
- Logistics expense of remote testing eliminated
- Time delay caused by remote testing eliminated
- Continued dialogue between R&D customer and T&E performer

* It is planned by COMOPTEVFOR to consolidate the Operational Test and Evaluation Squadrons (VX-5 at China Lake and VX-4 at Point Mugu) into a single squadron (VX-9) headquartered at China Lake. On 29 April 1994, VX-9 officially stood up and VX-5 was disestablished. COMOPTEVFOR has proposed that VX-4 be disestablished as a squadron in September 1994 and transitioned to an F-14 detachment of VX-9 at Point Mugu.

RELATIONSHIP AND INTERCONNECTIVITY WITH OTHER FUNCTIONS

The capabilities listed above are closely connected with each other and with those of the Weapons CSF to ensure fully integrated weapon-system RDT&E, acquisition program support, and in-service engineering support to the Fleet.

Some examples of the interelationships between the various functions performed at NAWCWPNS China Lake and how this serves to enhance the overall mission are as follows:

(a) The close ties between the weapon developers and the integration into the attack aircraft is key to successful employment of current and future complex standoff weapon systems. This is also key to coordinating requirements of various weapon and aircraft systems together, especially those of different contractors.

(b) Having close access to the technologists and original designers as well as test facilities greatly improves the effectiveness of our fleet support and in-service engineering function and it enhances the process of concurrent engineering.

(c) Having human factors engineering and weapons training systems development personnel close to the weapons and aircraft system development is synergistic.

(d) The internetting of the R&D facilities (such as HWIL simulation laboratories) with the outdoor T&E ranges improves the efficiency of development programs and reduces the amount of expensive flight testing.

(e) Much of the same facilities, analysis tools, and skilled and experienced personnel can be used to perform lethality work of our ordnance against aircraft systems or survivability analysis and testing of our aircraft from threat ordnance.

(f) The optics personnel and unique facilities that were used in the past for characterization of large mirrors for laser type directed energy weapons can be employed on the technology development for satellite space systems such as the SELENE project.

(g) The experience of the developers of ordnance and propulsion systems for missiles, bombs, and guns is synergistic with the needs to enhance insensitive munitions performance, reduce signatures of weapon systems (i.e., low smoke rocket motors), and to improve the environmental aspects of the processing or disposal of energetic materials. This is further enhanced by the large open air test ranges and unencroached ordnance processing plant.

(h) Space systems recovery technology and operational concepts are applicable in many aspects with air vehicle, personnel emergency egress, and aircraft stabilization/deceleration design requirements as well as weapons stabilization, deceleration, and recovery.

3.1 Location

3.1.1 Geographic/Climatological Features: *Describe any geographic/climatological features in and around your activity that are relevant to each CSF. Indicate and justify those that are required versus those that just serve to enhance accomplishing the mission of the activity. For example, clear air at high altitude that increases quality of atmospheric, ground-based laser experiments in support of the weapons CSF. (BRAC Criteria I)*

For the two primary areas of work at NAWCWPNS,China Lake–Weapons and Air Vehicles–and specifically for the following CSFs

CSF: AIR VEHICLES
- **Fixed Wing**
  - **Structure**
  - **Propulsion**
  - **Avionics**
  - **Flight Subsystems**
- **Rotary Wing**
  - **Avionics**
  - **Flight Subsystems**

CSF: WEAPONS
- **ICBMs/SLBMs**
- **Conventional Missiles**
- **Cruise Missiles**
- **Guided Projectiles**
- **Bombs**
- **Guns and Ammunition**
- **Directed Energy**

the following statement regarding geographic/climatological features applies:

The primary sites of NAWCWPNS are at China Lake, California, located in the high desert approximately 150 miles northeast of Los Angeles, and at Point Mugu, California, located on the coast, approximately 60 miles northwest of Los Angeles. Major detachments are operated at Albuquerque, New Mexico (as a tenant at Kirtland AFB), and White Sands, New Mexico (as a tenant at the White Sands Missile Range). A smaller detachment is operated at Eglin AFB in Florida to provide joint technical management with the USAF of the Joint Direct Attack Munition (JDAM) program.

In addition, a detachment at Edwards AFB, California, provides joint management of the R-2508 special-use airspace complex, which covers NAWCWPNS China Lake, Edwards AFB, and the U.S. Army National Training Center at Fort Irwin. This airspace complex is relatively unencroached by commercial and general aviation traffic and is used extensively by numerous other military activities, including Edwards AFB, California; Point Mugu, California; NAS Lemoore, California; Naval Strike Warfare Center, Fallon, Nevada; Fresno Air National Guard, California; Nellis AFB, Nevada; NAS Miramar, California; and MCAS Yuma, Arizona.

The location of China Lake is shown on the maps in Figures 1 and 2 in relation to the other activities. As can be seen, the NAWCWPNS complex provides a unique capability to exercise long-range, multiplatform weapon systems that require complementary capabilities of neighboring facilities. As an example (Figure 2) the Tomahawk cruise missile can be launched from the Sea Test Range at Point Mugu from a ship or submarine; fly over water to the desired distance; make a landfall and fly hundreds of miles overland through a special corridor; and impact realistic targets at NAWCWPNS China Lake. In addition, China Lake serves as a waypoint for flights targeted at the Utah Test and Training Range.

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NAWCWPNS China Lake is located within the R-2508 Special Use Airspace Complex, which contains six restricted areas and 13 work areas, made up of combinations of Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace Areas (ATCAAAs), and Restricted Area R-2508. The internal restricted airspaces (excludes R-2508) are independently managed by one of three military commands located within the Complex. Besides NAWCWPNS China Lake, which manages R-2505, R-2506, and R-2524, AFFTC Edwards AFB manages R-2515 and NTC Fort Irwin manages R-2502 (which is further subdivided into north and east areas). These commanders combine as the R-2508 Joint Policy and Planning Board to jointly manage R-2508 and the associated work areas. Although the areas are jointly managed, the Federal Aviation Administration (FAA) assigns NAWCWPNS China Lake as the Using Agency for R-2508, and this Command has annual reporting responsibilities for that airspace and the associated MOAs.

Of those airspaces under independent management of NAWCWPNS China Lake, R-2505 and R-2524 are active from the surface to infinity on a continuous basis, and R-2506 is active from the surface to 6,000 feet MSL Monday through Friday, sunrise to sunset. These areas segregate non-participating military and civil traffic from the hazardous activity that is conducted over the land ranges located beneath them. NAWS China Lake owns or has control over most of the land areas beneath R-2505 and R-2524. Use of bordering restricted and work area airspace is normally required to support the mission. R-2508 is published active from 20,000 feet MSL to infinity; however, when combined with the underlying MOAs and ATCAAAs it can extend down to 200 feet AGL in most areas. The work areas (combined R-2508, MOAs, and ATCAAAs) are normally active Monday through Friday, 0800 to 2200, but can be coordinated for activation at any time for military use.

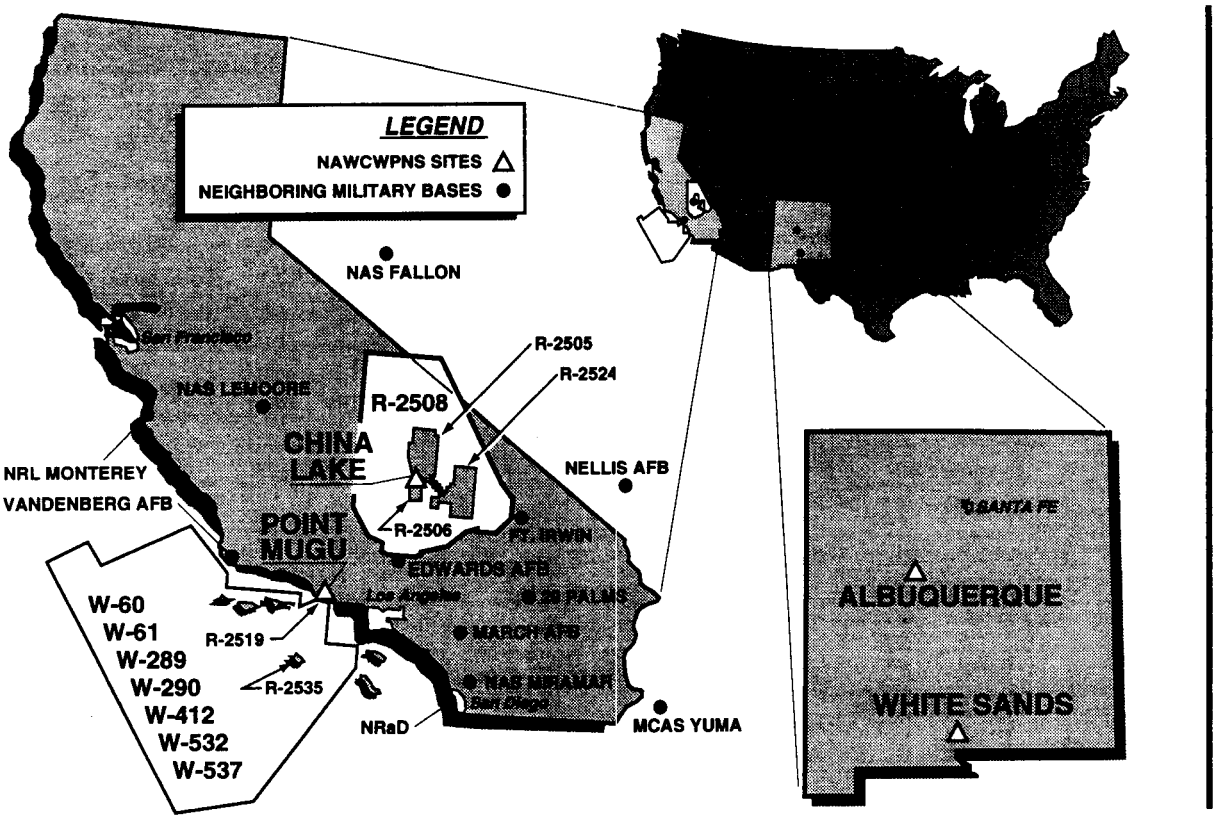
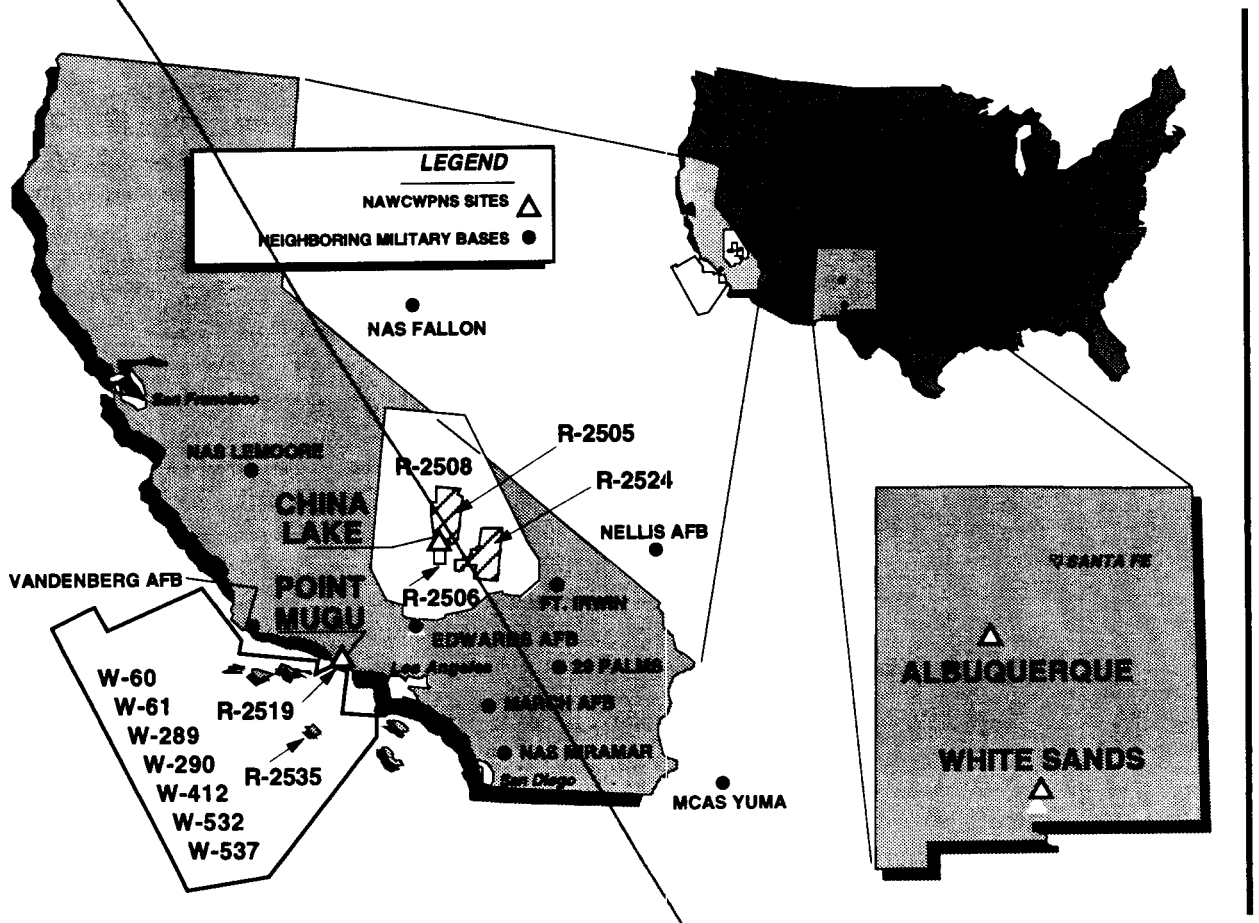


FIGURE 1. NAWCWPNS Site Locations.



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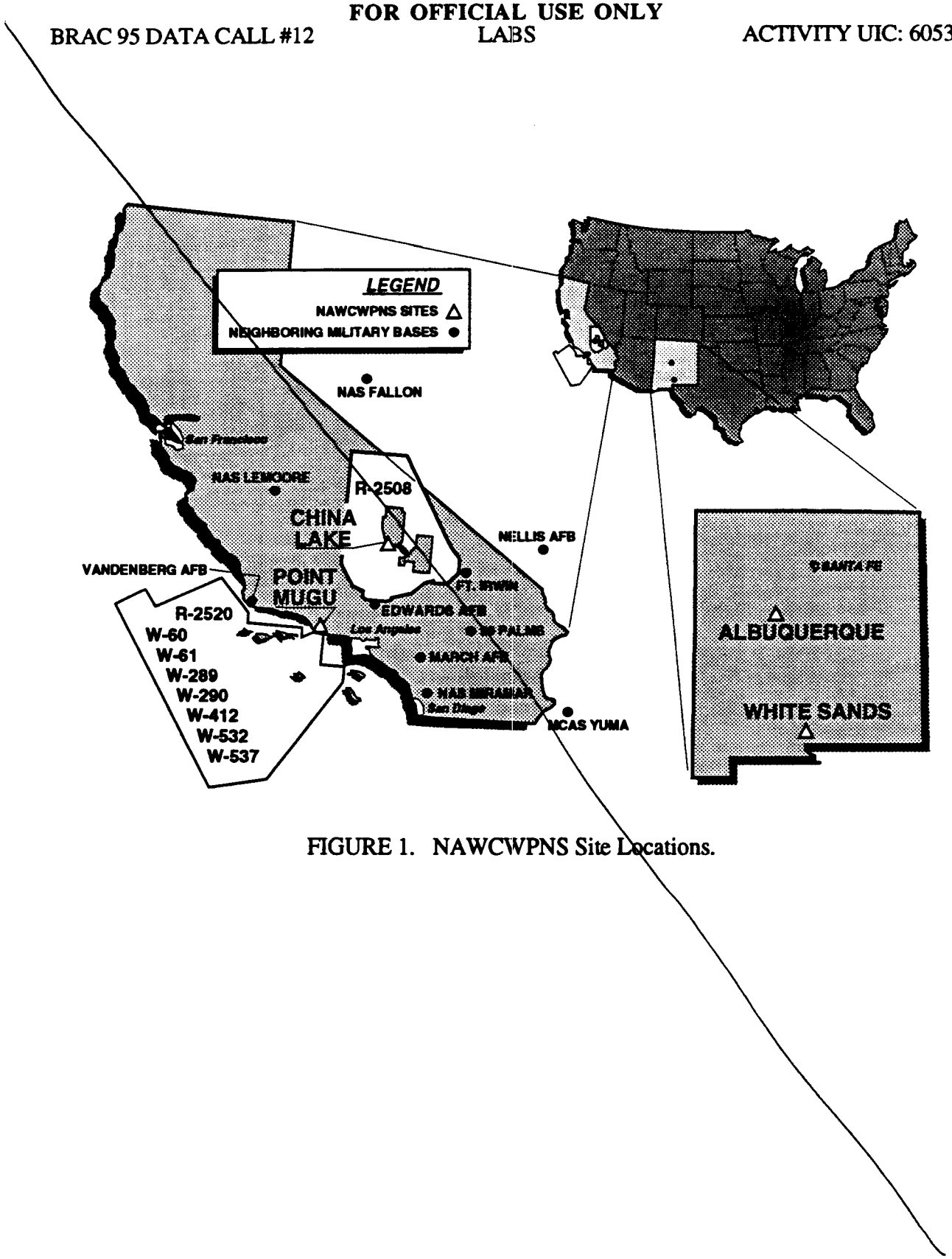

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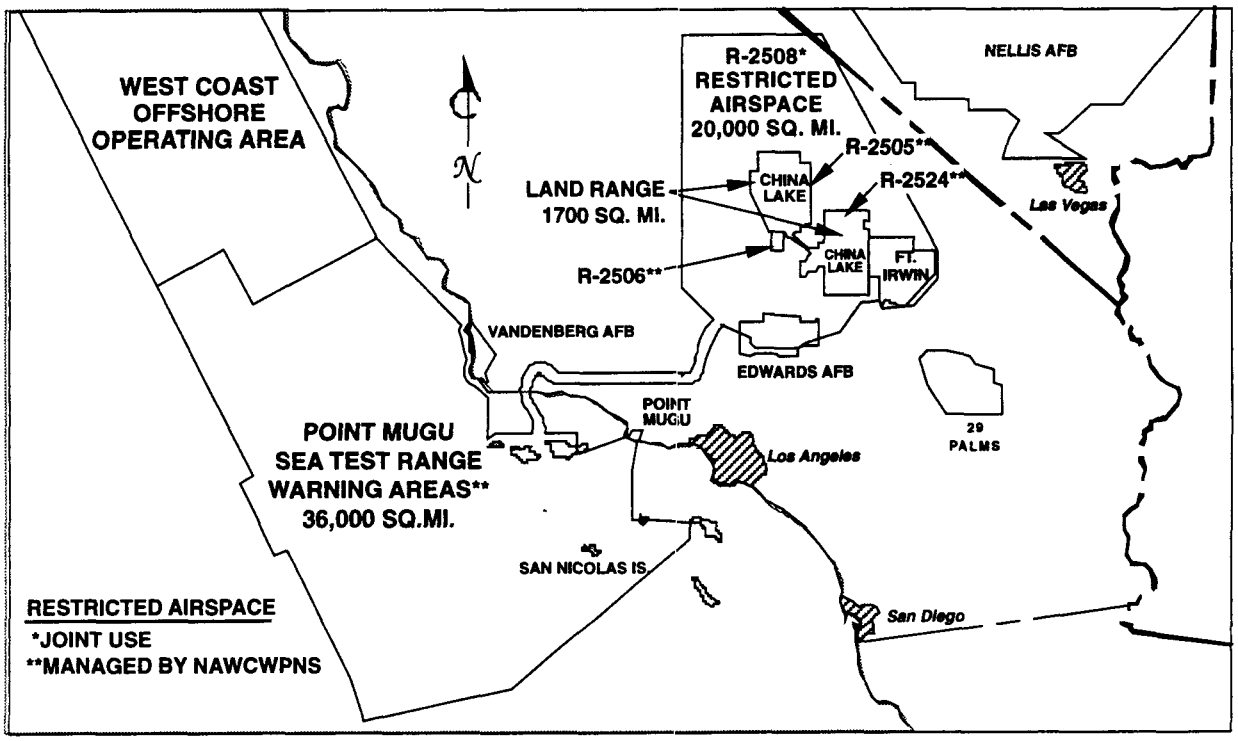


FIGURE 2. NAWCWPNS Air/Land/Sea Ranges.

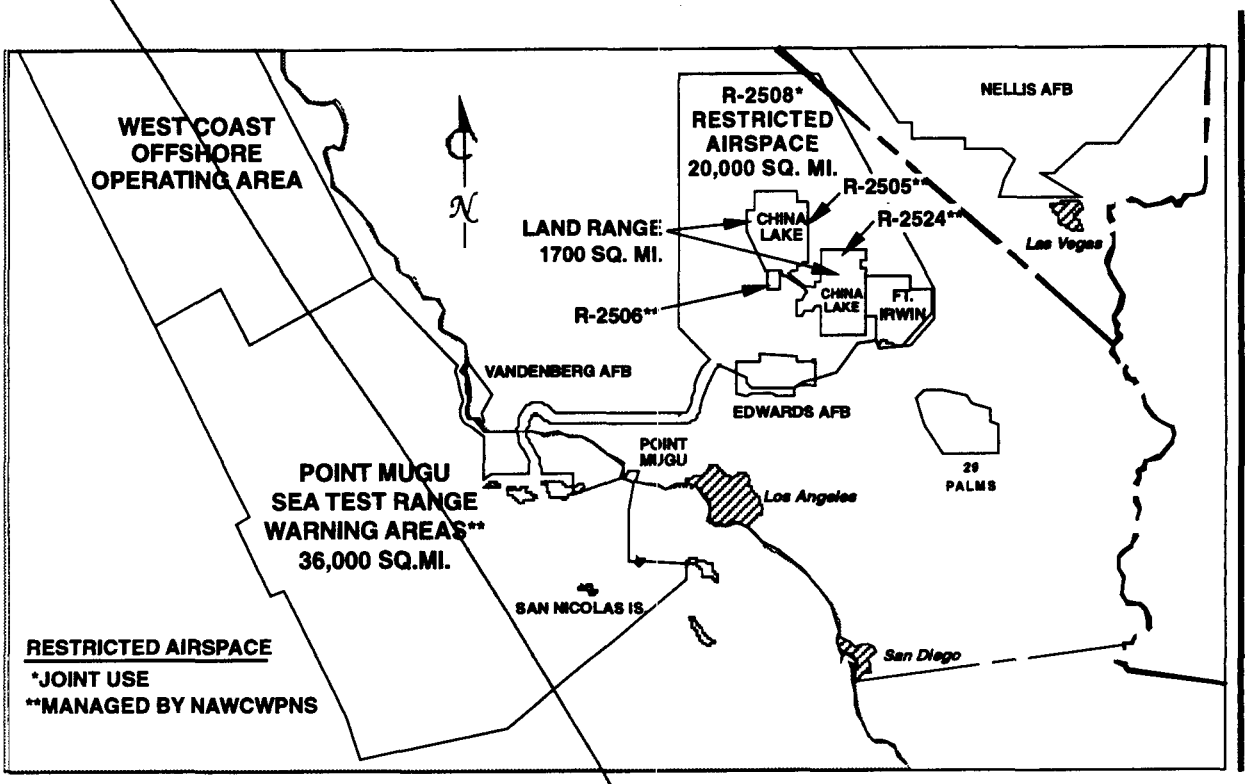
The size, remoteness, and isolation of the China Lake land areas are absolutely essential for accomplishment of its mission in all CSFs, for several reasons.

(a) Attack and fighter aircraft operational requirements are accommodated by the 20,000-square-statute-mile restricted R-2508 airspace. This airspace is used to conduct evaluation and training operations. In the large land areas low-altitude, high-speed operations are permissible. The airspace provides the capability to launch standoff weapons with associated employment of missile propulsion and the use of live warheads, and to conduct air-to-air missile firings against full-scale maneuvering targets. The Desert Protection Act, discussed in Section 3.1.3, has minimal impact on current and future test operations.

(b) High hazard operations are inherent in R&D work on energetic materials used in rocket motors and warheads as well as the testing of weapons. Rocket motors that have the explosive power of over 100,000 pounds of TNT must be test-fired. Other tests have required more than three-quarters of a million pounds of high explosives to be detonated. Experimental warheads must be detonated to test their effectiveness. The remoteness of China Lake greatly reduces the chances of accidental damage to surrounding life or property.

(c) This isolation provides a high degree of natural security as well. Highly classified tests can be conducted in the remote areas of China Lake with little chance of compromise.

(d) An important advantage of China Lake's isolation is relative freedom from encroachment. China Lake's encroachment problems are minor compared to other more populated areas, and it is



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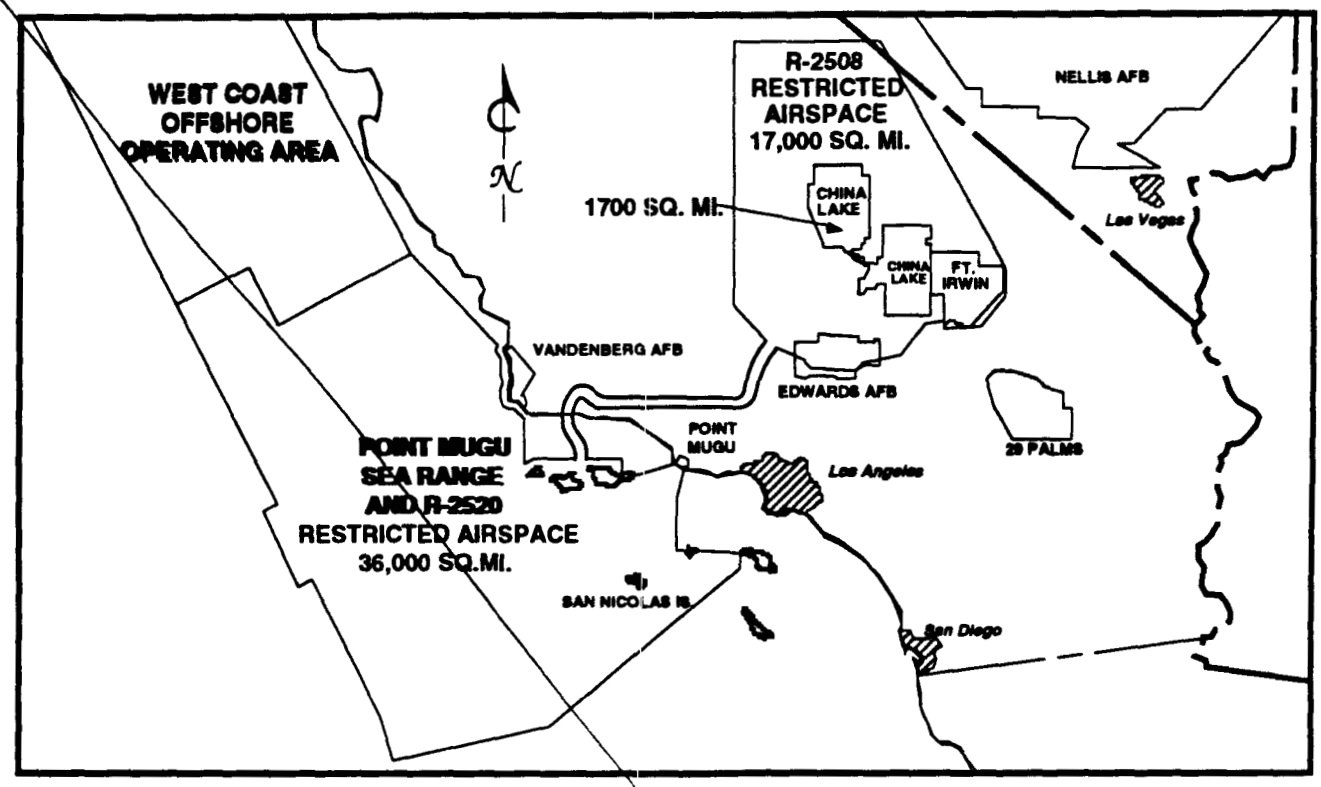

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outside the high-cost living area of Los Angeles, thereby not necessitating the "locality pay" increase for its employees.

Two additional factors important for mission accomplishment at the China Lake location are the desert weather and air clarity. Both are necessary to permit evaluation of optical seekers and fuzing and to allow the extensive use of optical instrumentation that is necessary for precise trajectory and miss-distance information in missile testing. Clear air is essential to enable high-speed photography of critical test events. The calm and sunny mornings also allow for parachute testing nearly year round. This is a definite benefit because parachute qualification programs require many repetitive tests to satisfy reliability and maintainability requirements. The desert weather is rarely bad enough to adversely affect the outdoor testing (China Lake enjoys 357.7 days per year with the ceiling and visibility above 5,000 feet and/or 3 miles), and the air quality is not endangered from population buildup.

The combination of nearby high mountain terrain, in association with the clear desert air, creates a scenario in which it is easy to do ground-based measurements of airborne electro-optical devices. A test series to do just this, named Long Jump, has been instituted on a semiannual basis. This test, conducted at a ground site at 12,000-foot elevation, has high attendance by government and contractor activities. There is no other known location where this test series could be conducted at an elevation this high.

The combination of size, remoteness, freedom from encroachment, and minimal interference from nonmilitary air traffic enables China Lake to sustain a test-range workload of over 3,000 events per year. These factors permit maintenance of numerous major test facilities, including an array of air and ground ranges where total weapon systems can be tested under realistic conditions; an electronic warfare combat range; the Navy's only supersonic ground test track; radar cross-section facilities that include a unique long-range look-down capability with particular implications for future work in stealth technology; the Navy's largest and most heavily instrumented complex for rocket motor testing; a remote firing facility for testing very large rocket motors (Trident ICBM); and many other special-purpose and general-purpose facilities. The geographic and climatological features are also valuable for directed energy weapons where high-energy electromagnetic pulses must not interfere with commercial air traffic radio transmission. The proximity of these facilities to the R&D laboratory greatly enhances effectiveness and productivity.

The remote location of China Lake allows for R&D of energetic materials. Because of the hazardous nature of experimental explosives and propellants, all work must be performed in areas that have no impact on populated areas or the environment.

China Lake encompasses 38% of all Navy-owned land (85% of the land area of the Navy's RDT&E activities). It is nearly the size of the State of Delaware. China Lake could provide the necessary operating environment for high-performance aircraft and weapons testing in future years. Figure 3 shows the China Lake complex and adjoining areas.

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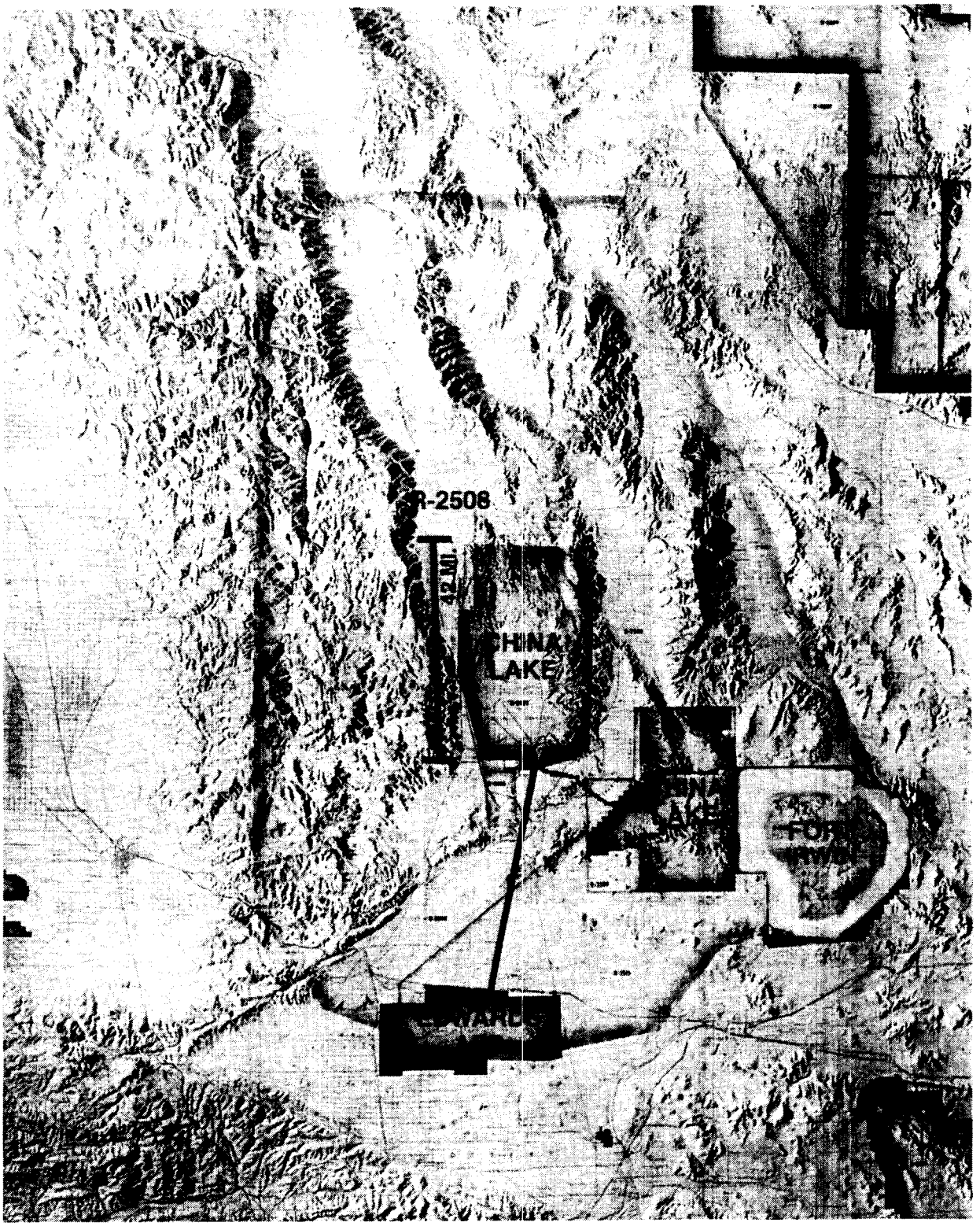

FIGURE 3. China Lake Complex and Restricted Areas.

NAWCWPNS China Lake has a unique "surge" capability to respond rapidly to national crises such as Desert Shield/Storm with total-system solutions. This capability depends on the colocation of a number of critical assets:

- Scientists and engineers within the Lab with expertise in both weapons and weapons integration/avionics
- The proximity of the Lab function to the NAWCWPNS T&E facilities
- Proximity to other service and industry organizations with complementary capabilities

This was well demonstrated in the rapid fielding of equipments, computer software, technical data, and technical assistance to support the operating forces in Desert Shield and Desert Storm. For instance, the China Lake Sidewinder Team was able to take a Sidewinder modification from design concept to production in 5 months (August to January). This evolution occurred almost solely at the China Lake site, including producing the first 40 missiles at the site. Aircrew chemical/biological/radiation (CBR) equipment was also expeditiously evaluated for clearance with the ejection seat recovery system.

A systems approach is vital for all present and future weapon systems, especially as weapon systems become more complex and integrated with the platform. China Lake, as a full-spectrum R&D and T&E facility, has the unique qualities to ensure that full system potential is attained. Weapons expertise, from seeker to propulsion/control, combined with technology ranging from research (6.1) through in-service engineering, all of which co-reside with a strong Aircraft integration and software support capability, means that all aspects of the total weapons system can be developed and training systems updated and/or monitored and tested at one location.

Due to location of geothermal resources, NAWCWPNS China Lake is the site of the Coso Geothermal Electric Power Plant (developed with private capital), which provides 320 megawatts of power. The Coso Geothermal plant provides low-cost electric power to China Lake and royalties to the Navy. This could be very useful for CSFs such as Directed Energy Weapons and Space Systems, Satellites.

The White Sands Detachment is a tenant activity at the Army's White Sands Missile Range (WSMR). It provides (a) test support for ship-launched missiles; (b) support for suborbital space rockets; and (c) support to high-energy-laser RDT&E. WSMR is the only place where sufficient land and airspace exist to accommodate the Navy's Standard Missile launch envelope and associated target test scenarios. Further, WSMR is the only land test range large enough to accommodate safety footprints for suborbital space rocket launch. The White Sands Detachment is thus appropriately situated at that location for very specific purposes, which could not be accomplished elsewhere.

The NAWCWPNS detachment at Albuquerque conducts liaison with the Department of Energy and Sandia National Laboratories. The ability to remain in the geographic center of the U.S. nuclear community will enable continued effective accomplishment of this mission. In fact, for the past decade NAWCWPNS has cooperated with the Department of Energy Laboratories at Livermore, Los Alamos, and Sandia, Albuquerque, in the "Joint DOE/DOD Conventional Weapons Program," wherein numerous technology transfer projects have been completed. An example of this is the use of sophisticated DOE hydra codes for computation of high-explosive wave propagation in conventional ordnance.

Specific comments regarding the other CSFs are as follows.

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Specific comments regarding the other CSFs are as follows.

CSF: SPACE SYSTEMS, LAUNCH VEHICLES (RECOVERY SYSTEMS)

Cleared drop zones are required for testing of all sizes and configurations of parachute systems and ordnance stabilization/deceleration and recovery devices. Point Mugu serves as a saltwater drop zone and Lake Isabella (50 miles west of China Lake) as a fresh water test facility. A dirt runway at the China Lake Electronic Combat Range is under construction to support parachute test operations. Large test areas are required due to test altitudes, test vehicles of different sizes, wind drift, etc.

CSF: SPACE SYSTEMS, SATELLITES

Because of its unique location, geography, and clear air, NAWCWPNS China Lake has been identified as the optimum site for construction of Selene, a joint NASA/DOE project to install a high-energy ground-based laser system for recharging satellite battery packs in space. Seventy-five percent of the current satellite constellation can be reached from China Lake, and the remainder can be reached by an optical relay.

The China Lake site contains a geologically stable monolithic granite structure located within a 2-mile-long west-to-east mesa at approximately 6,000 feet above sea level. The location and shape of the surrounding mountains provide favorable wind protection to reduce atmospheric distortion of the laser beam.

Southern sight angles provide direct line-of-sight access to most of the geosynchronous and geostationary satellites orbiting Earth that service the United States.

China Lake has 260 days a year of the particular clear sky conditions suitable for the SELENE laser system. The quality of the atmospheric window provided for laser power beam transmissions minimizes beam dispersion by providing minimum beam diffraction. At China Lake, atmospheric seeing quality is among the best in North America.

CSF: C4I SYSTEMS, AIRBORNE C4I

The access to the Electronic Combat Range is an important factor.

CSF: ELECTRONIC DEVICES

This CSF is synergistic with the weapons and avionics work at China Lake but is not directly impacted by the geographic/climatological features.

CSF: HUMAN SYSTEMS

Attack and fighter aircraft operational requirements are accommodated by the 17,000-square-mile R-2508 airspace. This airspace is used to conduct man-in-the-loop testing of airborne systems.

CSF: TRAINING SYSTEMS

Flight testing of improvement to Navy Tactical Aircrew Combat Training Systems (TACTS) and Air Force Air Combat Training Systems (ACTS) are made possible by the location of the Tactical Air Ranges Integration Facility (TARIF) at China Lake. The unique combination of controlled instrumented ranges and air space with test aircraft provide the necessary environment to develop and evaluate these improvements. The location of weapons training with weapon systems development at China Lake is very synergistic.

CSF: ENVIRONMENTAL QUALITY

Many of the programs under the Environmental Quality CSF involve explosives and propellants or other high energy sources, such as heat. This demands that they be located in remote isolated locations for obvious safety reasons. The vast land space of China Lake offers the opportunity to perform work in guarded, isolated locations away from public encroachment or interference with existing work.

CSF: ADVANCED MATERIALS

The remote location of China Lake allows for the research and development of energetic materials. Because of the hazardous nature of experimental explosives and propellants, all work must be performed in areas that have no impact on populated areas of the environment.

3.1.2 Licenses and Permits: *Describe and list the licenses or permits (e.g., environmental, safety, etc.) that your activity currently holds and justify why they are required to allow tests, experiments, or other special capabilities at your location for each CSF. For example, permit to store and use high explosives. (BRAC Criteria I)*

Permit/License Type	Description*	Why Required	CSF Impact
Environmental	1. Air Emissions permits: 318	1. California and U.S. EPA	1. Supports all CSFs. No negative performance impacts. It also permits biodegradation of explosive and propellant sludge experiment to be conducted and construction of experimental rocket motor demil plume firing bay.
	2. Hazardous Waste Operations permits: 18	2. California hazardous waste regulations; U.S. Resource Conservation and Recovery Act	2. Supports all CSFs. No negative performance impacts. We are permitted for storage and disposal of hazardous material.s
	3. Waste Discharge permits: 4	3. California Regional Water Quality Control Board	3. Supports all CSFs. No negative performance impacts.
	4. Underground Storage Tank permits: 5	4. County regulation of fuel support to aircraft and support equipment	4. Supports all CSFs. No negative performance impacts.
Airfield Safety	1. Airfield Safety waivers: 1 permanent waiver	1. Airfield centerline/height criteria	1. Some indirect support to all CSFs. No negative performance impacts.
Explosive Operations	1. Explosives Operations waivers: 1 CNO waiver	1. Operations in Bldg. 15640 are unrelated to adjacent operations.	1. Supports all the elements of the Weapons CSF and the Advanced Materials CSF. No negative performance impacts. 2. Advanced Materials CSF. We are permitted for handling, transportation, and storage of experimental explosives and propellants.

TABLE (Contd.)

Permit/License Type	Description*	Why Required	CSF Impact
Real Estate	1. The City of Ridgecrest long-term lease to operate its sewer plant on Station land	1. Station sewage is discharged to this plant through a contract with the city. Discharge fees are determined by metered flows.	1. Supports all CSFs. No negative performance impacts. 2. Supports Space Systems. Access rights to the SELENE site across BLM managed land outside of NAWC China Lake boundaries have been reviewed and can be made available. The proposed SELENE site will cover approximately 200 acres inside the eastern NAWS boundary. This site is located in undisturbed mountainous terrain void of any site improvements and resides on withdrawn public lands on fee-simple acquired land owned by the U.S. and held for a period of 50 years by the Dept. of the Navy.
Other	1. Qualified Navy test parachutists Number of qualified Navy test parachutists: 11	1. Live jump testing of personnel parachutes	1. Required for qualification and Fleet support actions; supports Space System and Air Vehicle CSFs.

* Additional descriptive material is provided below.

DISCUSSION OF LICENSES AND PERMITS

Air Emissions. Most operations at China Lake produce some air emissions. Certain types of emissions require permits and annual reporting measures to comply with the rules and regulations of the three overseeing Air Pollution Control Districts. These local permits are renewed yearly. The Districts receive their directives from the California Air Resources Board, which in turn receives its authority from the California Clean Air Act and the United States Environmental Protection Agency (EPA). The EPA was delegated by the Congress of the United States to enforce the Clean Air Act. Along with most DOD installations, China Lake will be submitting applications for one or more "umbrella" Operating Permits in late 1995 as required under Title V of the federal Clean Air Amendments of 1990. Once issued, these permits will have a life of 5 years.

CSF Operation	Number of Permits
Environmental quality	2
Airfield operations	80
ICBM motor testing	3
Conventional freefall and guided rockets, missiles, and bombs	138
Microwave detection, C4I systems, and directed energy support	17
Infrastructure operations and maintenance	80
Total	320

Hazardous Waste Operations. Most operations at China Lake generate some amount of hazardous waste. California and federal laws have very specific requirements for hazardous waste operations. China Lake holds a Resource Conservation and Recovery Act (RCRA) Part B permit for storage of up to 27,720 gallons of hazardous wastes for 1 year. The permit currently allows for storage of most types of hazardous wastes except PCBs and biological and reactive wastes. The long storage time allows for collecting various types of wastes until full shipments are accumulated, resulting in lower costs.

China Lake also holds a RCRA interim status permit for treatment of 300,000 pounds of reactive wastes (explosives) by open burning and open detonation. An interim status permit modification to increase the quantity of wastes treated at the facility to 500,000 pounds per year was requested from the regulatory agencies and is being actively pursued.

A revised Part B permit application for storage of PCB wastes at the PCB Storage Building is currently under regulatory review. The permit should be issued in the near future for 1-year storage of PCB wastes. The permit limits the quantity of PCB wastes for storage to the maximum size of the building (approximately 1,300 gallons of PCB waste fluid). Expansion of the building is not possible. However, another existing building could be designated and permitted for PCB waste storage.

California regulation requires permits for treatment of hazardous wastes that are exempt under federal regulation, e.g., treatment of hazardous wastes prior to discharge into the domestic sewer system. Treatment systems for the following facilities operate under this type of permit: Plating Shop, Photoprocessing Labs, Printed Wiring Board Shop, acid neutralization for explosive scale-up facility, silver recovery units, and oil/water separators.

Location	Number of Permits
Hazardous Waste Transfer and Storage Facility	1
Burro Canyon open detonation/open burning (ordnance disposal)	1
PCB storage facility	1
California-only treatment permit (various facilities)	15
Total	18

Waste Discharge Requirements. Several operations at China Lake discharge waste water. If this water is not a hazardous waste, it requires a permit from the California Regional Water Quality Control Board (CRWQCB). This type of waste water is not hazardous but may contain some contamination that can degrade nearby surface or ground water. China Lake currently has permits for the following operations.

Location	Number of Permits
Michelson Laboratory ponds	1
Salt Wells ponds	1
Fire fight training facility	1
Hydrocarbon recovery facility	1
Total	4

Underground Storage Tanks. This type of permit allows China Lake to provide fuel support to operations on the base. The fuel is mainly used for aircraft and various types of support equipment. Permits are issued by the counties and are renewed annually.

Location	Number of Permits	Number of Tanks
NAF fuel farm	1	6
FH pump house generator	1	1
Mainsite gas station	1	2
Exchange gas station	1	2
SNORT Track water brake	1	1
Total	5	12

Airfield Safety. Presently China Lake has 20 buildings and eight structures that are covered by a permanent airfield safety waiver issued as NAVAIR CL-3 (of 5 June 1985). This waiver addresses object elevation violations of airfield centerline/height criteria. Violations are required to be properly marked and lighted.

3.1.3 Environmental Constraints: *Describe and list the environmental or land use constraints present at your activity which limit or restrict your current scope for each CSF, i.e., would not allow increased "volume" or "spectrum" for the CSF. Example -- Volume: frequency of a type of experiment. Example—Spectrum: Current permit to detonate high explosives will not allow detonation or storage of increased quantity of explosives without legal waiver (state law) or relocation of surrounding (non-govt) buildings. (BRAC Criteria II)*

General Summary. Several types of environmental permits are required for most activities at China Lake: air emission, hazardous waste, fuel storage, and waste water. Generally, any existing permit can be modified to account for changing conditions; permits for new operations may involve additional effort but are usually obtainable. The effort required can be provided by supplying additional labor and thus should place no direct restriction on the current scope for any CSF. The Naval Air Weapons Station China Lake, referred to below as "the Station," performs the base-keeper functions for NAWCWPNS and as such prepares and administers environmental permits and requirements.

Air Emissions. No direct limitation or restriction exists on the current scope for any CSF, although air emission permits may be required based on the quantity and toxicity of the emissions. These requirements are driven by the Federal Clean Air Act, so they apply nationwide.

Hazardous Waste. No direct limitation or restriction exists on the current scope for any CSF. Hazardous waste management at China Lake operates around a large (11,000 square foot) treatment, storage, and disposal facility (TSD). This TSD operates under a Resource Conservation and Recovery Act (RCRA) Part B permit. This facility affords China Lake the storage capacity and flexibility needed to properly manage the more than 35,000 different chemicals that pass through it. We are presently working at or below 60% of its throughput capacity and could easily expand the workload. Presently, the RCRA Part B permit does not allow for biological wastes to be stored in the TSD, although the permit could easily be modified to do so if needed. The permit also does not address storage of PCB and reactive wastes (energetic materials, such as explosives), which are covered by other permits.

The Burro Canyon Facility is used for treatment of reactive wastes by open burning or open detonation. The facility operates under an RCRA interim status permit for treatment of 300,000 pounds of reactive wastes a year. An interim increase to 500,000 pounds per year is being actively pursued.

Wastewater Discharge. No direct limitation or restriction exists on the current scope for any CSF. Any facility that discharges wastewater that can potentially degrade ground water must be permitted by the California Regional Water Quality Control Board, which allows for internal control and monitoring of wastewater discharges. Permits are in place.

Fuel Storage. No direct limitation or restriction exists on the current scope for any CSF. Fuel storage permits are normally non-controversial. No constraints are expected in this area.

NEPA Requirements. The National Environmental Policy Act (NEPA) requires that all factors and possible impacts be examined prior to project commitment. The majority of projects at China Lake qualify for a Categorical Exclusion under NEPA.

China Lake does not have a baseline Environmental Impact Survey (EIS) to address current ongoing operations; NEPA documentation is currently prepared on a project-by-project basis. In response to increased emphasis by the Navy on NEPA documentation requirements, China Lake has developed and is implementing an institutionalized approach to comply with NEPA requirements via a Station instruction, to be implemented in FY94, which will provide the administrative framework for compliance with NEPA.

CSF: Air Vehicles (Fixed Wing Structure, Propulsion, Avionics, and Flight Subsystems; Rotary Wing Avionics and Flight Subsystems). It is unlikely that existing fixed and rotary air vehicle programs at China Lake would be constrained by NEPA, unless these programs were significantly increased or redirected.

New air vehicle programs at China Lake will be subject to the NEPA process. The extent of the NEPA review and detail of the process will depend upon whether the new program will use existing facilities or will require construction of new facilities. Although most new construction qualifies as Categorically Excluded, depending upon the extent, new facilities could require an Environmental Assessment (EA) and, on rare occasions, an EIS.

CSF: Weapons (ICBMs/SLBMs, Conventional Missiles/Rockets, Cruise Missiles, Guided Projectiles, Bombs, Guns and Ammunition, and Directed Energy). Existing and new weapons programs that require a physical impact would require NEPA review. The potential effects identified would determine the extent of the NEPA process required.

CSF: Space Systems, Launch Vehicles. There are no environmental or land constraints for the Space Systems CSF. In 1979 China Lake was designated the National Parachute Test Range. El Centro, California, had previously had the National Parachute Test Range.

CSF: Space Systems, Satellites. An environmental impact study is planned for SELENE.

CSF: C4I Systems, Airborne C4I. No impact is expected unless significantly increased or redirected.

CSF: Electronic Devices. No impact is expected.

CSF: Training Systems. Expansion of the TARIF aircraft tracking system may be impacted by NEPA. An expansion is not anticipated at this time.

CSF: Environmental Quality. The Fluid Energy Mills are an example of equipment that has been purchased and installed in order to meet future environmental regulations and laws. These mills are used to grind energetic material to precise particle size for propellant and explosive formulations. The past method of performing this work was to grind the materials in large vibrating vats, ("Sweco" grinders) under an inert atmosphere. For ammonium perchlorate (AP), used in almost all propellants, freon was the only medium available because AP is soluble in most other materials, especially water. The fluid energy mill replaces the Sweco grinders and is used for reducing not only AP but also certain explosives particles to precise particle size for use in propellant and explosive formulations.

CSF: Human Systems. No impact is expected.

CSF: Advanced Materials. There are currently no environmental constraints on the development of advanced materials at China Lake. Because of the small quantities used in research and development, permits listed in 3.1.2 allow uninterrupted work. Downsizing over the past several years would allow for expansion of tasks with no environmental impact.

Endangered Species and Historic Resources Management. China Lake has four animal species on Station that are listed as threatened or endangered and that are afforded protection under the terms of the Endangered Species Act: the Desert Tortoise (listed as threatened in 1990), the California Inyo Brown towhee (listed as threatened), the Mohave tui chub (listed as endangered), and the Mohave ground squirrel (currently the subject of litigation for a proposed de-listing action). In addition, the Coso Geothermal Project has entered into an agreement with the Bureau of Land

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Management and the California Department of Fish and Game for a long-term management plan for offsetting potential adverse impacts to the Mohave ground squirrel resulting from geothermal development.

Historic Resources. China Lake currently has two designated properties on the National Register of Historic Places, both of which are located on the North Range. The designated properties include the Coso Hot Springs National Register Historic District and the Big and Little Petroglyph Canyon National Register Historic Landmark. The Station has a programmatic management agreement with the State Historic Preservation Office for the Coso Hot Springs District.

Inventory is conducted on a case-by-case basis as resources become available.

CSF: Air Vehicles (Fixed Wing Structure, Propulsion, Avionics, and Flight Subsystems; Rotary Wing Avionics and Flight Subsystems). No restrictions to these CSFs are expected.

CSF: Weapons (ICBMs/SLBMs, Conventional Missiles/Rockets, Cruise Missiles, Guided Projectiles, Bombs, Guns and Ammunition, and Directed Energy). Restrictions are possible in two areas: target recovery and weapon impact areas.

Target recovery: In many cases, when a drone target comes down there is a need to recover it. The most significant impacts are usually the result of these recovery efforts. Impacts are minimized by ensuring that the resource management protocols are followed.

Ground target areas: Repeated use of ground target test sites may result in incremental damage to surrounding areas. Again, impacts are minimized by ensuring that the resource management protocols are followed.

CSF: Space Systems, Satellites. System design and operation will have to ensure that manned aircraft over-flight will not come in contact with the high energy laser power beam. For SELENE this will be accomplished by use of a LIDAR sensing system to detect intrusion and shut down the laser beam when an over-flight condition exists. An optical detection system is planned for stealth vehicles.

CSF: C4I Systems, Airborne C4I. No restrictions are expected.

CSF: Training Systems. No restrictions to these CSFs are expected.

Ground and Surface Water Management. No direct limitation or restriction exists on the current scope for any CSF. Virtually all potable water consumed at China Lake is ground water drawn from a complex aquifer system located in the Indian Wells Valley. Findings of the multiagency Ground Water Characterization Study (1994) determined that high-quality ground water reserves are available in the watershed to sustain current consumption rates well into the 22nd century.

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China Lake has more than two hundred permanent and ephemeral springs located within the Station boundaries, plus a wetland area (approximately 8 acres) that has been artificially established over the past forty years by subsurface runoff from a variety of industrial, residential, and recreational areas. The wetland area (Lark Seep) provides habitat for the Station's only endangered species, the Mohave tui chub. These wetland and riparian areas are afforded protection through the Station's Natural Resources Management Program and are designated as the highest priority resources in the desert ecosystem. These areas are also afforded protection under a variety of legislation including the Clean Water Act and Executive Order 11990, Protection of Wetlands. Ground water management does not place any constraint on any specific CSF. Surface water management constrains only new construction in certain localized areas.

California Desert Protection Act. The California Desert Protection Act, which proposes to establish more than 6.3 million acres of National Parks and wilderness areas in the California desert, was passed by the U.S. Senate on 13 April 1994. The Bill now goes the U.S. House of Representatives where it is expected to be approved in a similar form. In the past, China Lake and other DOD facilities in the region had concerns regarding overflight restrictions, the potential for prohibition of future expansion of test ranges, and the potential for increased public pressure to use DOD test and training ranges for other purposes. (A positive impact of the Bill is prohibition of private development on land around our ranges in protected areas.) However, the language of the document passed by the Senate addressed all of China Lake's major concerns. The Desert Protection Act has minimal impact on current and future test operations.

Development and Growth of the City of Ridgecrest. No direct limitation or restriction exists on the current scope for each CSF. The Navy has purchased private lands and established restrictive land development agreements and right-of-way reservations with the Bureau of Land Management and North American Chemical to provide a land/air corridor both east and west of Ridgecrest for ingress/egress to the airfield and ranges.

Atmospheric Degradation (Visibility). No direct limitation or restriction exists on the current scope for each CSF. Unrestricted visibility prevails in the area more than 340 days in the year. China Lake manages a ten-year interservice program, the Air Visibility Program (AVP), in partnership with Edwards Air Force Base, to identify and mitigate air visibility impacts in the R-2508 airspace. The AVP actively participates with local/regional regulatory agencies and industries for cooperative technical and planning studies.

China Lake has been chosen by NASA as the best site for construction of the SELENE Ground Based Laser for powering satellites in earth orbit, largely because of its excellent atmospheric "seeing" conditions.

CSF: Environmental Quality. There are no environmental constraints to our present operation or any future expanded operations.

3.1.4 Special Support Infrastructure: *List and describe the importance of any mission related special support infrastructure (e.g. utilities) present at your location for your activity. (BRAC Criteria I)*

General Summary. The Naval Air Weapons Station China Lake, referred to below as "the Station," performs the base-keeper function for NAWCWPNS and as such administers special support infrastructure. The existing infrastructure not only is capable of handling the current demand but also has sufficient reserves to handle expansion of mission. Expansion of existing utility systems can be accommodated by expansion of the distribution systems. From an infrastructure standpoint, future expansion and growth within the Center can be accommodated without large expenditures of funds.

Electrical. Electrical services are provided to the Center by Southern California Edison (SCE) through two active 34,500-volt circuits and one inactive 34,500-volt circuit. China Lake is the site of the Navy's largest geothermal power plant. The geothermal potential of the Coso area has been developed under contract by private industry (California Energy Company), generating electrical power that is distributed throughout the SCE distribution network. The sale of the electrical power generates revenue for the Navy (an estimated $15 million in FY95). The Center also receives reduced-rate electrical power through the contract. The Center saved approximately $3 million during FY93 due to the reduced rate. Currently, the Coso site develops approximately 320 megawatts (MW) of power. Current peak electrical demand at China Lake is approximately 23.7 MW. The current contract for the reduced electrical rate structure limits the Center to 30 MW. Approximately 6.3 MW of electrical power is available for additional load at the Center at reduced electrical rate. However, the electrical circuits into the Indian Wells Valley and the circuits onto the Center can supply more electrical power to the Center. The additional electrical load would be billed at the normal commercial rate from SCE. With respect to adequate electric power for the SELENE project under the CSF: Space Systems, Satellites, two major power generation sites are available in the immediate area that feed into the primary area substation at Inyokern, Calif. The Coso Geothermal power site on NAWS China Lake can generate over 250 megawatts. The calendar year 1993 base power allocation to NAWS China Lake is only 28 MW; therefore more than adequate electric power is available for SELENE. An alternate or backup electrical power source is the North American Chemical Co. co-generation facility in nearby Trona, Calif. It is capable of producing 140 MW of power, of which 100 MW is available for an external customer base. These two close-by power generation sites and power lines are unique capabilities for providing the 110 MW power base required to support the SELENE Free Electron Laser power beaming facility.

Potable Water. Potable water is furnished to the Center through the Center's own State-permitted Potable Water System. The State of California, Department of Health Services, issued Water Permit No. 03-91-029 on 5 August 1991 for the operation of the water system on China Lake. Potable water is provided to the Center from ground water sources on the western side of the Indian Wells Valley. The quality and quantity of the ground water are both good. The existing water distribution to the Center is in good condition with adequate capacity to accept addition water consumption and growth. Potable water is provided to the City of Ridgecrest by the Indian Wells Valley Water District. The water district and the Center have an intertie connection between the two water systems to provide emergency water use by either party as needed.

Natural Gas. Natural gas is provided to the Center through contract with Pacific Gas and Electric (PG&E) for housing core services and transportation of gas purchased through the Defense Fuel Supply Center (DFSC) for commercial use. The gas distribution systems to and throughout the Center have sufficient capacity to accept addition growth with minimum expenditures. All gas mains and distribution lines on Center are owned by the Navy. Both PG&E and DFSC have

indicated that additional gas supplies can be delivered to China Lake without additional construction of distribution lines.

Sewage Treatment. The China Lake and Ridgecrest community sewage treatment plant is owned by the City of Ridgecrest on land leased to the City by the Navy. The plant is located on China Lake property. The existing plant is near its capacity and the City of Ridgecrest is planning the expansion of the plant's capacity. The expanded plant is expected to be operational within the next few years and will also serve a large portion of the City of Ridgecrest. A second smaller sewage treatment plant serves the community of Inyokern. This plant is also near its capacity but could be expanded to serve a larger population. The Center contracts for its sewage treatment with the City of Ridgecrest. The Center has approximately 260,000 gallons per day of sewage capacity of additional sewage capacity remaining on the contract.

For the CSF: Advanced Materials, in addition to the general utilities available at China Lake, additional support infrastructure is also utilized. Unique waste treatment facilities for the disposal of hazardous materials and air scrubbers to remove toxic chemicals from ventilation systems support the chemical laboratories as required. Vacuum systems and high-pressure gas lines are also available.

Police, Fire Protection, and Emergency Services. On Center Police and fire protection are provided by Center personnel. Police and fire protection agreements with the City of Ridgecrest and the County of Kern provide for mutual support as needed. Within approximately 30 miles of the Center are five additional fire stations: two operated by the County of Kern in Ridgecrest, one operated by The County of Kern in Inyokern, one operated by the County of Kern in Randsburg, and one operated by Bureau of Land Management just east of the City of Ridgecrest. Volunteer groups also support the local police and fire departments. In addition to regular reserve units, there are the Indian Wells Valley Search and Rescue and China Lake Mountain Rescue Group. All of these groups train and support one another. In the event of any emergency or mobilization, all of these organizations would be valuable resources to the Navy and/or the community.

Communication. The Center's Integrated Corporate Network supports voice telecommunications and data, video, and imaging transmissions throughout the site using a primary backbone composed of fiber-optic cable loops among the major population centers. The corporate data network portion is a transparent, multiprotocol digital network. It has a DREN node connection with the DDN MILNET node connection as a backup, a dedicated NAVNET (IDNX 90) T-1 connection to Point Mugu, and a dedicated data connection to the NAVAIR/NAVWAN. The network has significant expansion capacity. The video portion of the network is composed of an analog broadband transmission system over fiber optics, video switching systems, two video teleconferencing centers, and the training video distribution system. Four satellite earth station receivers are on site from which video is fed into the network. The voice portion consists of an all new telecommunications plant including ISDN capable digital switches, new inside and outside cabling, telephone sets, and voice mail system. As well as voice, the telecommunications system can handle low-speed data and compressed video. The system is connected to the Defense Switched Network and FTS-2000 as well as to the commercial telephone system. The telecommunications system has significant expansion capacity.

Medical and Dental Facilities. Medical facilities on Center include a full-service medical/dental facility. Medical facilities in the community include a full-service community hospital with a 24-hour emergency room. Most private medical care is provided through Drummond Medical Clinic. There are also several other private providers in the community. Emergency ambulance service is provided on Center by the Fire Department. A private ambulance service serves the local communities with stations in both Ridgecrest and Inyokern. Long-term elderly care and mental health facilities are available in Ridgecrest.

Common Support Function	Infrastructure Features									
	Air-space	Land range	Electrical	Geo-thermal	Potable water	Natural gas	Sewage treat-ment	Police Fire Emer-gency	Commun-ication	Medical and dental
Air Vehicles, Fixed Wing, Structure	XX	XX	X	X	X	X	X	X	X	X
Air Vehicles, Fixed Wing Avionics	XX	XX	X	X	X	X	X	X	XX	X
Air Vehicles, Fixed Wing Propulsion	XX	XX	X	X	X	X	X	X	X	X
Air Vehicles, Fixed Wing Flight Subsystems		XX	X	X	X	X	X	X	X	X
Air Vehicles, Rotary Wing Avionics	XX	XX	X	X	X	X	X	X	XX	X
Air Vehicles, Rotary Wing, Flight Subsystems		XX	X	X	X	X	X	X	X	X
Weapons, Icbms/Slbms		XX	X	X	X	X	X	X	X	X
Weapons, Conventional Missiles/Rockets	XX	XX	X	X	X	X	X	X	XX	X
Weapons, Cruise Missiles	XX	XX	X	X	X	X	X	X	X	X
Weapons, Guided Projectiles	XX	XX	X	X	X	X	X	X	X	X
Weapons, Bombs	XX	XX	X	X	X	X	X	X	X	X
Weapons, Guns And Ammunition	XX	XX	X	X	X	X	X	X	X	X
Weapons, Directed Energy	XX	XX	X	XX	X	X	X	X	X	X
C4I, Airborne	XX	XX	X	X	X	X	X	X	X	X
Advanced Materials	X	X	X	X	X	X	X	X	X	X
Electronic Devices	X	X	X	X	X	X	X	X	X	X
Environmental	X	XX	X	X	X	X	X	X	X	X
Human Systems		X	X	X	X	X	X	X	X	X
Space Systems, Launch Vehicles	XX	XX	X	X	X	X	X	X	X	X
Space Systems, Satellites	XX	XX	X	XX	X	X	X	X	X	X
Training Systems	X	X	X	X	X	X	X	X	X	X

X = These infrastructure features are necessary to support this CSF.
XX = These infrastructure features are uniquely suited to enable this CSF to be performed specifically at the China Lake site.

Common Support Function	Infrastructure Features									
	Air-space	Land range	Electrical	Geo-thermal	Potable water	Natural gas	Sewage treat-ment	Police Fire Emer-gency	Commun-ication	Medical and dental
Weapons, Icbms/Slbms		XX	X	X	X	X	X	X	X	X
Weapons, Conventional Missiles/Rockets	XX	XX	X	X	X	X	X	X	XX	X
Weapons, Cruise Missiles	XX	XX	X	X	X	X	X	X	X	X
Weapons, Guided Projectiles	XX	XX	X	X	X	X	X	X	X	X
Weapons, Bombs	XX	XX	X	X	X	X	X	X	X	X
Weapons, Guns And Ammunition	XX	XX	X	X	X	X	X	X	X	X
Air Vehicles, Fixed Wing Structure	XX	XX	X	X	X	X	X	X	X	X
Air Vehicles, Fixed Wing Avionics	XX	XX	X	X	X	X	X	X	XX	X
Air Vehicles, Fixed Wing Propulsion	XX	XX	X	X	X	X	X	X	X	X
Air Vehicles, Fixed Wing Flight Subsystems		XX	X	X	X	X	X	X	X	X
Air Vehicles, Rotary Wing Avionics	XX	XX	X	X	X	X	X	X	XX	X
Air Vehicles, Rotary Wing, Flight Subsystems		XX	X	X	X	X	X	X	X	X
C4I, Airborne	XX	XX	X	X	X	X	X	X	X	X
Advanced Materials	X	X	X	X	X	X	X	X	X	X
Electronic Devices	X	X	X	X	X	X	X	X	X	X
Environmental	X	XX	X	X	X	X	X	X	X	X
Human Systems		X	X	X	X	X	X	X	X	X
Space Systems, Launch Vehicles	XX	XX	X	X	X	X	X	X	X	X
Space Systems, Satellites	XX	XX	X	XX	X	X	X	X	X	X
Training Systems	X	X	X	X	X	X	X	X	X	X

X = These infrastructure features are necessary to support this CSF.
XX = These infrastructure features are uniquely suited to enable this CSF to be performed specifically at the China Lake site.

3.1.5. Proximity to Mission-Related Organizations: *List and describe the importance and impact of not having nearby organizations which facilitate accomplishing or performing your mission -- e.g. operational units, FFRDCs, universities/colleges, other government organizations, and commercial activities. Restrict your response to the top five. Complete the following: (BRAC Criteria I)*

NAWCWPNS China Lake is located in the center of a complex of military activities in the western United States, all of which are important to the NAWCWPNS mission. The Naval Strike Warfare Center, Fallon, Nevada, and the Naval Postgraduate School in Monterey, California, are to the north; NAS Lemoore is to the west; the NAWCWPNS Sea Test Range, Point Mugu, and the Naval Surface Warfare Center (NSWC), Port Hueneme, are to the southwest; Edwards AFB and the Fleet operating base at San Diego are to the south; MCAS, Yuma, Arizona, is to the southeast; and Nellis AFB, Nevada, is to the northeast and Fort Irwin and USMC Logistic Base at Barstow to the east. Regular interactions and interchanges take place with all these organizations. In addition, the proximity to the complex of aerospace industries, colleges, and universities in the Los Angeles, Phoenix, and Tucson areas facilitates coordination and cooperative efforts with industry and academia.

Close proximity to Edwards AFB and NAWC Point Mugu result in collaboration because of unique capabilities at each site. Several universities and DOD contractors within easy driving distance allow for the use of specialized equipment and facilities. This results in expeditious completion of tasks in a cost-efficient manner.

The tables below indicates five of the highest-priority relationships with other organizations for each CSF. Not being in proximity to these organizations would severely impact NAWCWPNS Lab programs and in most instances would adversely affect the organizations listed. For instance, 30% of the usage of the China Lake Electronic Combat Range is accounted for by aircraft from Edwards Air Force Base and other Air Force installations. Figure 4 shows the geographical relationship of NAWCWPNS China Lake to other major military installations and urban areas.

The NAWCWPNS Training Center brings technical and business classes to China Lake from four universities, making it possible to obtain both BS and MS degrees on site. California State University, Bakersfield, offers courses leading to BS and MS degrees in computer science; California State University, Chico, offers courses leading to an MS in engineering (electrical, mechanical, or systems); California State University, Northridge, offers courses leading to a bachelor's degree in business administration and a master's degree in administration; and the University of La Verne offers courses in business administration. In addition, there is a program with a local 2-year college for technical training. A fellowship program also sponsors 12 to 15 personnel each year to attend on-campus advanced degree programs at universities around the country.

Furthermore, NAWCWPNS China Lake possesses a unique surge capability to respond to national crises such as Desert Shield/Storm, due to colocation of the Lab with NAWCWPNS T&E facilities and with the organizations listed below. Breaking of either link, either with the NAWCWPNS T&E facilities or with the nearby organizations, would severely damage that capability.

Almost every effort under the Environmental Quality CSF is unique and has completedly different labs and industry doing similar work.

China Lake, NRaD, and NRL are the only Navy facilities that perform basic research (6.1) in the area of semiconductor processes and materials. Industries' current focus is on devices for the commercial market; they have little interest, desire, or commitment to spend large amounts of IR&D dollars for military devices that do not have a large potential return-on-investment (ROI).

The end result of our research efforts will be improvements in communication, laser, radar, optics, and avionics systems. We also perform exploratory development (6.2) and advanced development (6.3A) work using these devices and feed requirements for next generation devices and materials to our 6.1 researchers. It is very important that researchers, engineers, and end users (Navy pilots) be collocated so that the research and application for the devices meets the requirements of the service and we obtain additional input from fleet operators. Our Air Test & Evaluation Squadron (VX-9) is an integral part of this coordinated effort.

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Air Vehicles, Fixed Wing, Structure	Edwards AFB	USAF Flight Test Center	60	18 at present	None; workyears direct-funded by Edwards AFFTC
	Naval Strike Warfare Ctr	Tactics development and training	200	As required, based on Fleet needs.	As required, based on Fleet needs.
	NAS, Lemoore	Tactics and training	150	As required	As required
	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Air Vehicles, Fixed Wing, Avionics	Edwards AFB	USAF Flight Test Center	60	18 at present	None; workyears direct-funded by Edwards AFFTC
	Naval Strike Warfare Ctr	Tactics development and training	200	As required, based on Fleet needs.	As required, based on Fleet needs.
	NAS, Lemoore	Tactics and training	150	As required	As required
	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Air Vehicles, Rotary Wing, Avionics	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Air Vehicles, Fixed Wing, Propulsion	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range	180	0	0
	Philips Lab, Edwards AFB	USAF Propulsin R&D	60	0	0

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Air Vehicles, Fixed Wing, Flight Subsystems	Edwards AFB	Flight Test	60	0	0

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Air Vehicles, Rotary Wing, Flight Subsystems	Edwards AFB	Flight Test	60	0	0

CSF: WEAPONS, ICBMs/SLBMs

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, ICBMs/SLBMs	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Conventional Missiles/Rockets	Edwards AFB	USAF Flight Test Center	60	18 at present	None; workyears direct-funded by Edwards AFFTC
	Naval Strike Warfare Ctr	Tactics development and training	200	As required, based on Fleet needs.	As required, based on Fleet needs.
	NAS, Lemoore	Tactics and training	150	As required	As required
	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization
	NSWC, Port Hueneme	Navy in-service engineering activity for surface-launched missiles	180	As required by program sponsors	As required by program sponsors

CSF: WEAPONS, CRUISE MISSILES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Cruise Missiles	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization
	UTTR	Test Range	400 (est.)	None	None

CSF: WEAPONS, GUIDED PROJECTILES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Guided Projectiles	None				

CSF: WEAPONS, BOMBS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Bombs	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Conventional Missiles/Rockets	Edwards AFB	USAF Flight Test Center	60	18 at present	None; workyears direct-funded by Edwards AFFTC
	Naval Strike Warfare Ctr	Tactics development and training	200	As required, based on Fleet needs.	As required, based on Fleet needs.
	NAS, Lemoore	Tactics and training	150	As required	As required
	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization
	NSWC, Port Hueneme	Navy in-service engineering activity for surface-launched missiles	180	As required by program sponsors	As required by program sponsors

CSF: WEAPONS, CRUISE MISSILES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Cruise Missiles	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization
	UTTR	Test Range	400 (est.)	None	None

CSF: WEAPONS, BOMBS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Bombs	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: WEAPONS, GUNS AND AMMUNITION

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Guns and Ammunition	NAWC-WPNS, Pt Mugu	RDT&E and ISE	180	0	0

CSF: WEAPONS, GUNS AND AMMUNITION

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Guns and Ammunition	NAWC-WPNS, Pt Mugu	RDT&E and ISE	180	0	0

CSF: WEAPONS, DIRECTED ENERGY

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Directed Energy	University of Arizona	Educational R&D	500	0	0.7
	Optical Coating Lab	R&D, Laser Component Mfgr	400	0	0.5
	TRW	RDT&E Aerospace	160	0	0.5
	Rocketdyne	RDT&E Aerospace	150	0	0
	Phillips Lab, Kirtland AFB	R&D	700	0	0

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Space Systems, Launch Vehicles	Edwards AFB	USAF Flight Test Center	60	None at present	None at present
	NASA JPL	Unmanned space exploration	140	2	None

CSF: WEAPONS, GUIDED PROJECTILES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Weapons, Guided Projectiles	None				

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Space Systems, Launch Vehicles	Edwards AFB	USAF Flight Test Center	60	None at present	None at present
	NASA JPL	Unmanned space exploration	140	2	None

CSF: SPACE SYSTEMS, SATELLITES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Space Systems, Satellites	NAWC-WPNS, China Lake laboratories	R&D Lab. The SELENE program is currently being led by a senior physicist in the Research Dept. A talent pool of physicists at NAWCWPNS China Lake is available to provide technical support in the development of the SELENE facility and to participate in subsequent research and technology within the facility. Civil engineers and public works personnel at China Lake are currently developing the facility plans and infrastructure requirements in support of SELENE.	30	2	None
	Jet Propulsion Laboratories, Pasadena, California	R&D Lab. JPL is developing the National Advanced Optics Mission Initiative (NAOMI) adaptive optics system, which provides for directing the power beam and compensates for atmospheric diffraction of the beam as it is focused on space vehicles or satellites for power delivery.	150	None	None

CSF: SPACE SYSTEMS, SATELLITES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Space Systems, Satellites	NAWC-WPNS, China Lake laboratories	R&D Lab. The SELENE program is currently being led by a senior physicist in the Research Dept. A talent pool of physicists at NAWCWPNS China Lake is available to provide technical support in the development of the SELENE facility and to participate in subsequent research and technology within the facility. Civil engineers and public works personnel at China Lake are currently developing the facility plans and infrastructure requirements in support of SELENE.	30	2	None
	Jet Propulsion Laboratories, Pasadena, California	R&D Lab. JPL is developing the National Advanced Optics Mission Initiative (NAOMI) adaptive optics system, which provides for directing the power beam and compensates for atmospheric diffraction of the beam as it is focused on space vehicles or satellites for power delivery.	150	None	None

CSF: C4I SYSTEMS, AIRBORNE C4I

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
C4I Systems, Airborne C4I	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: ELECTRONIC DEVICES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Electronic Devices	NRL	Research	2,300	0.5	0
	NVEL	Army Night Vision Laboratory	2,300	0.33	0
	NRaD	C4I for the Navy	250	0.5	0
	UCLA	University	160	1.0	0
	USC	University	170	1.0	0

CSF: C4I SYSTEMS, AIRBORNE C4I

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
C4I Systems, Airborne C4I	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization

CSF: ELECTRONIC DEVICES

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Electronic Devices	NRL	Research	2,300	0.5	0
	NVEL	Army Night Vision Laboratory	2,300	0.33	0
	NRaD	C4I for the Navy	250	0.5	0
	UCLA	University	160	1.0	0
	USC	University	170	1.0	0

CSF: TRAINING SYSTEMS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Training Systems	Naval Strike Warfare Center, Fallon, Nev.	Tactics Development and Training	150	As required based on fleet needs	As required based on fleet needs
	Strike Fighter Wpns School Pac, Lemoore, Ca.	Tactics and Training	150	As required based on fleet needs	As required based on fleet needs
	Fighter Wpns School (TOP GUN), Miramar, Ca.	Tactics and Training (air-to-air)	200	As required based on fleet needs	As required based on fleet needs
	AWTU-II MCAS El Toro, Ca. (USMC)	Tactics and Training	165	As required based on fleet needs	As required based on fleet needs
	MAWTS MCAS Yuma, Az. (USMC)	Tactics Development and Training	260	As required based on fleet needs	As required based on fleet needs

CSF: TRAINING SYSTEMS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Training Systems	Naval Strike Warfare Center, Fallon, Nev.	Tactics Development and Training	150	As required based on fleet needs	As required based on fleet needs
	Strike Fighter Wpns School Pac, Lemoore, Ca.	Tactics and Training	150	As required based on fleet needs	As required based on fleet needs
	Fighter Wpns School (TOP GUN), Miramar, Ca.	Tactics and Training (air-to-air)	200	As required based on fleet needs	As required based on fleet needs
	AWTU-II MCAS El Toro, Ca. (USMC)	Tactics and Training	165	As required based on fleet needs	As required based on fleet needs
	MAWTS MCAS Yuma, Az. (USMC)	Tactics Development and Training	260	As required based on fleet needs	As required based on fleet needs

CSF: HUMAN SYSTEMS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
	None				

CSF: ENVIRONMENTAL QUALITY

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
	None				

R

CSF: ADVANCED MATERIALS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Advanced Materials	Phillips Lab Edwards AFB	RDT&E	60	As required	As required
	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization
	Rocketdyne	Commercial	180	2	2
	University of Southern California	University	150	As required	As required
	University of California at Los Angeles	University	150	As required	As required

CSF: HUMAN SYSTEMS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
	None				

CSF: ENVIRONMENTAL QUALITY

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
	None				

CSF: ADVANCED MATERIALS

Common Support Function	Name	Type of Organization	Distance, miles	Workyears Performed by Your Activity	Workyears Funded by Your Activity
Advanced Materials	Phillips Lab Edwards AFB	RDT&E	60	As required	As required
	NAWC-WPNS, Pt Mugu	Navy RDT&E center, sea test range complex	180	N/A; part of NAWCWPNS organization	N/A; part of NAWCWPNS organization
	Rocketdyne	Commercial	180	2	2
	University of Southern California	University	150	As required	As required
	University of California at Los Angeles	University	150	As required	As required

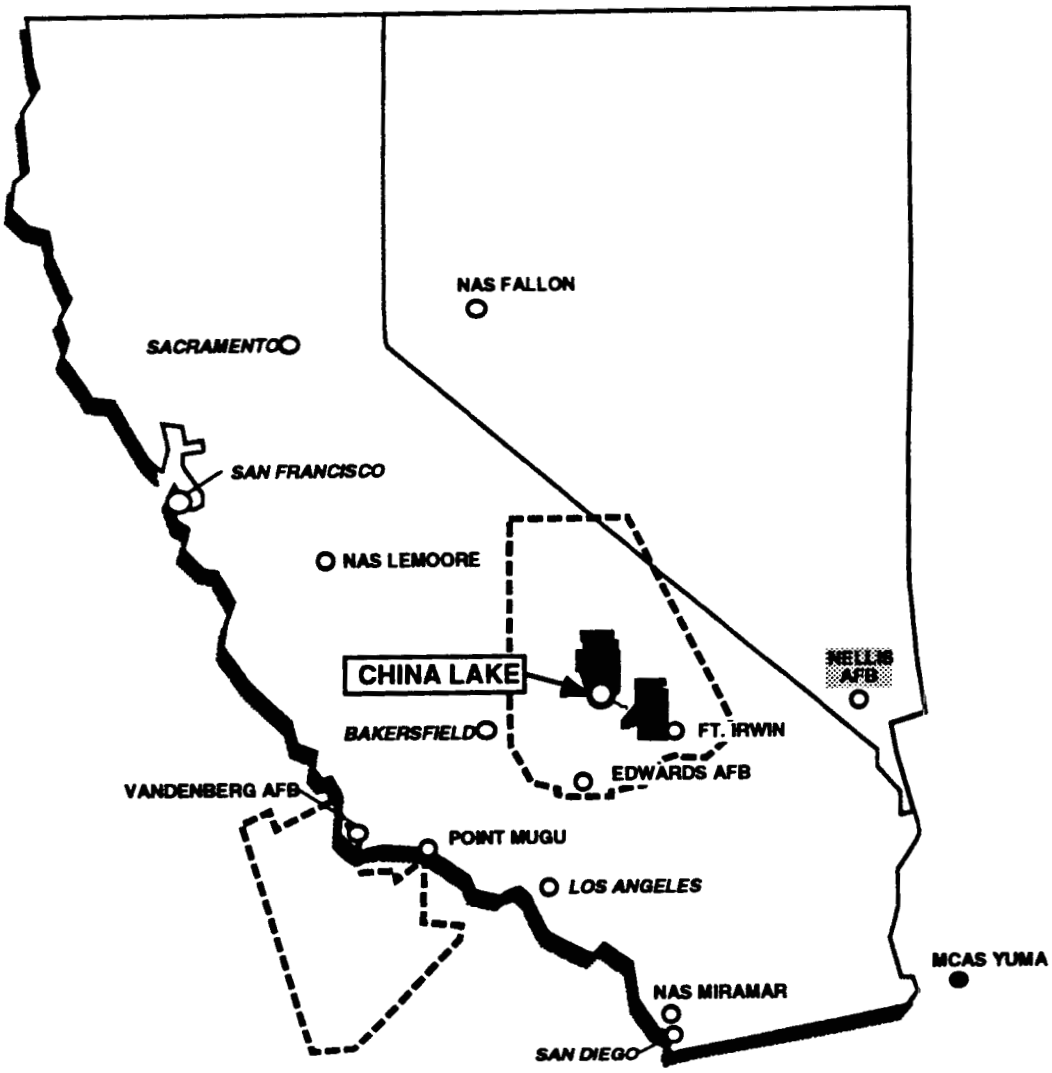

Figure 4. Proximity to Other Military Installations.

3.2 Personnel

3.2.1 Total Personnel: *What is the total number of government (military and civilian), on-site federally funded research and development center (FFRDC), and on-site system engineering technical assistance (SETA) personnel engaged in science and technology (S&T), engineering development and in-service engineering activities as of end FY93? For individuals that predominantly work in CSFs, involved in more than one CSF, account for those individuals in the CSF that represents the preponderance of their effort. (BRAC Criteria I)*

NAWCWPNS operates as an integrated military/civilian/contractor team. Approximately 25% of the total "Lab" workforce at the China Lake site is contractor. For the entire base, contractors represent approximately 38% of the total workforce. There is no collocated FFRDC.

The data below for civilians are from the Personnel Data Access System (PDAS) database, which originates as a download from the Defense Civilian Personnel Data System (DCPDS) and reflects end of FY93. Civilians are Full Time Permanent.

Military data are from on-board-counts as of 30 September 1993. Navy Chiefs and above were designated "Management(Supv)."

The SETA totals were provided by the respective contractors. The "Technical" category includes part-time and consultant personnel, in addition to Full Time Permanent. Subcontractor personnel are included in the "Technical" category but not in "Management" or "Other."

Proposed activity within the Space Systems CSF is in the concept formulation phase. Only planning personnel are currently engaged in activity at NAWCWPNS China Lake. One senior physicist maintains direction and continuity of effort. System engineering, public works, environmental specialists, and other technical support areas are engaged as required to support ongoing planning.

The personnel numbers found in Environmental Quality are misleading. This is a growth area for China Lake, and the number of people involved at the end of fiscal year 1993 is relatively low compared to the expected growth in the out years.

The Electronic Devices CSF data reported below are from the PDASS and reflect the end of fiscal year 1993. Civilians are Full Time Permanent.

In many cases the numbers had to be estimated.

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	17	0	0	10
Management (Supv)	1	1	0	2
Other	3	0	0	0

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	10	0	0	0
Management (Supv)	1	0	0	0
Other	3	0	0	0

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	338	0	0	217
Management (Supv)	49	16	0	41
Other	76	0	0	8

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	47	0	0	0
Management (Supv)	9	0	0	0
Other	7	0	0	0

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	14	0	0	10
Management (Supv)	2	1	0	2
Other	3	0	0	0

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	10	0	0	0
Management (Supv)	1	0	0	0
Other	0	0	0	0

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	243	0	0	217
Management (Supv)	42	16	0	41
Other	51.5	0	0	8

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	46	0	0	0
Management (Supv)	5	0	0	0
Other	5	0	0	0

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	12	0	0	12
Management (Supv)	3	1	0	2
Other	3	0	0	1

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	2	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: WEAPONS, ICBMs/SLBMs

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	31	0	0	13
Management (Supv)	4	0	0	0
Other	6	0	0	0

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	17	0	0	12
Management (Supv)	3	1	0	2
Other	3	0	0	1

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	2	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: WEAPONS, ICBMs/SLBMs

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	31	0	0	13
Management (Supv)	4	0	0	0
Other	6	0	0	0

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	1,237	0	0	517
Management (Supv)	174	15	0	3
Other	267	0	0	8

CSF: WEAPONS, CRUISE MISSILES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	141	0	0	57
Management (Supv)	20	2	0	1
Other	29	0	0	1

CSF: WEAPONS, GUIDED PROJECTILES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	6	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: WEAPONS, BOMBS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	94	0	0	38
Management (Supv)	13	1	0	0
Other	19	0	0	1

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	1,223	0	0	514
Management (Supv)	172	15	0	3
Other	260	0	0	8

CSF: WEAPONS, CRUISE MISSILES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	141	0	0	57
Management (Supv)	20	2	0	1
Other	29	0	0	1

CSF: WEAPONS, GUIDED PROJECTILES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	6	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: WEAPONS, BOMBS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	94	0	0	38
Management (Supv)	13	1	0	0
Other	19	0	0	1

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	1,227	0	0	515
Management (Supv)	173	15	0	3
Other	260	0	0	8

CSF: WEAPONS, CRUISE MISSILES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	141	0	0	57
Management (Supv)	20	2	0	1
Other	29	0	0	1

CSF: WEAPONS, GUIDED PROJECTILES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	6	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: WEAPONS, BOMBS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	94	0	0	38
Management (Supv)	13	1	0	0
Other	19	0	0	1

CSF: WEAPONS, GUNS AND AMMUNITION

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	16	0	0	6
Management (Supv)	2	0	0	0
Other	3	0	0	0

CSF: WEAPONS, DIRECTED ENERGY

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	4	0	0	1
Management (Supv)	1	0	0	0
Other	0	0	0	0

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	3	1	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: SPACE SYSTEMS, SATELLITES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	2	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: WEAPONS, GUNS AND AMMUNITION

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	16	0	0	6
Management (Supv)	2	0	0	0
Other	3	0	0	0

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	3	1	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: SPACE SYSTEMS, SATELLITES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	2	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: C4I AIRBORNE

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	12	0	0	5
Management (Supv)	1	0	0	0
Other	0	0	0	0

CSF: C4I AIRBORNE

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	12	0	0	5
Management (Supv)	1	0	0	0
Other	0	0	0	0

CSF: ELECTRONIC DEVICES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	18	0	0	0
Management (Supv)	3	0	0	0
Other	0	0	0	0

CSF: HUMAN SYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	3	0	0	0
Management (Supv)	1	0	0	0
Other	0	0	0	0

CSF: TRAINING SYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	1	0	0	0
Management (Supv)	0	0	0	0
Other	0	0	0	0

CSF: C4I AIRBORNE

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	12	0	0	5
Management (Supv)	1	0	0	0
Other	0	0	0	0

CSF: ELECTRONIC DEVICES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	18	0	0	0
Management (Supv)	3	0	0	0
Other	0	0	0	0

CSF: HUMAN SYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	8	0	0	0
Management (Supv)	1	0	0	0
Other	0.5	0	0	0

CSF: TRAINING SYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	93	0	0	3
Management (Supv)	8	0	0	0
Other	29	0	0	0

CSF: ELECTRONIC DEVICES

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	18	0	0	0
Management (Supv)	3	0	0	0
Other	0	0	0	0

CSF: HUMAN SYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	8	0	0	0
Management (Supv)	1	0	0	0
Other	0.5	0	0	0

CSF: TRAINING SYSTEMS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	93	0	0	3
Management (Supv)	8	0	0	0
Other	29	0	0	0

CSF: ENVIRONMENTAL QUALITY

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	9	0	0	0
Management (Supv)	1	0	0	0
Other	1	0	0	0

CSF: ENVIRONMENTAL QUALITY

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	5	0	0	0
Management (Supv)	1	0	0	0
Other	1	0	0	0

CSF: ADVANCED MATERIALS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	20	0	0	0
Management (Supv)	2	0	0	0
Other	3	0	0	0

CSF: ENVIRONMENTAL QUALITY

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	9	0	0	0
Management (Supv)	1	0	0	0
Other	1	0	0	0

CSF: ADVANCED MATERIALS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	27	0	0	0
Management (Supv)	3	0	0	0
Other	5	0	0	0

CSF: ADVANCED MATERIALS

Types of personnel	Number of Personnel			
	Government		On-Site FFRDC	On-Site SETA
	Civilian	Military		
Technical	27	0	0	0
Management (Supv)	3	0	0	0
Other	5	0	0	0

3.2.2 Education: *What is the number of government personnel actively engaged in S&T, engineering development and in-service engineering activities by highest degree and type of position? Provide the data in the following table: (BRAC Criteria I)*

NAWCWPNS China Lake is the site of the first Personnel Demonstration Project. Under Title VI of the Civil Service Reform Act (CSRA) of 1978, and as confirmed by the National Performance Review, there are provisions for Federal agencies to conduct personnel management demonstration projects. Such projects allow changes to personnel regulations to increase effectiveness and efficiency in the workforce. The first project approved was the Department of Navy's Personnel Demonstration Project initiated in July 1980 at the then-Naval Weapons Center, China Lake, and Naval Ocean Systems Center, San Diego. This system is a revised personnel management system providing simplified position classification, performance-linked pay, and performance-based retention.

The Demonstration Project is the current operating civilian personnel system at the Naval Air Warfare Center Weapons Division's China Lake, Point Mugu, and White Sands sites. The system currently covers all non-bargaining unit employees at these three sites. A general description of the Project and an evaluation of its results are summarized below.

Evaluation of the Project is performed by the Office of Personnel Management (OPM). Factors such as recruitment success, turnover, pay and job satisfaction, line management's and the personnel function's effectiveness, and retention of high performers are used to evaluate the success of the Project. OPM has published 15 management reports on the Project pointing to its success in achieving the above objectives.

With this Project, China Lake has created a personnel system tailored for an R&D laboratory. The David Packard Commission in the 1980s, in its study of federal laboratories, highlighted this Project for its effectiveness. Through its pay-for-performance features, the Project

- Facilitates recruiting by making it possible to offer industry-standard starting salaries*
- Encourages attrition of low performers
- Encourages retention of high performers

As a result, the operation of this system over the past decade has resulted in a higher-quality, more highly qualified workforce.

* In the first year of the Project's operation, the grade-point average of new hires jumped from an average of 2.7 to 3.3.

The data below for civilians are from the PDAS database, which originates as a download from DCPDS and is end of FY93. Civilians are Full Time Permanent. The data in the table refer only to civilian personnel. However, in order to break the data out by CSF, most numbers had to be estimated.

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CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	3
Associates	0	0	0
Bachelor	14	1	0
Masters	3	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	3
Associates	0	0	0
Bachelor	8	0	0
Masters	2	0	0
Doctorate (include Med/Vet/etc.)	1	0	0

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	86	10	50
Associates	9	3	9
Bachelor	178	19	12
Masters	47	17	5
Doctorate (include Med/Vet/etc.)	18	0	0

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	3
Associates	0	0	0
Bachelor	14	1	0
Masters	3	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	3
Associates	0	0	0
Bachelor	8	0	0
Masters	2	0	0
Doctorate (include Med/Vet/etc.)	1	0	0

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	82	10	44
Associates	9	3	3
Bachelor	160	17	6
Masters	44	16	3
Doctorate (include Med/Vet/etc.)	17	0	0

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	7	0	4
Associates	0	0	0
Bachelor	26	7	3
Masters	11	2	0
Doctorate (include Med/Vet/etc.)	3	0	0

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	4	0	3
Associates	0	0	0
Bachelor	7	0	0
Masters	1	1	0
Doctorate (include Med/Vet/etc.)	0	2	0

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	2	0	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: WEAPONS, ICBMs/SLBMs

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	9	1	4
Associates	1	0	1
Bachelor	14	2	1
Masters	5	1	0
Doctorate (include Med/Vet/etc.)	2	0	0

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	360	26	204
Associates	34	7	25
Bachelor	561	74	29
Masters	207	50	9
Doctorate (include Med/Vet/etc.)	75	17	0

CSF: WEAPONS, CRUISE MISSILES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	40	3	20
Associates	4	1	3
Bachelor	65	8	3
Masters	24	6	3
Doctorate (include Med/Vet/etc.)	8	2	0

CSF: WEAPONS, ICBMs/SLBMs

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	9	1	4
Associates	1	0	1
Bachelor	14	2	1
Masters	5	1	0
Doctorate (include Med/Vet/etc.)	2	0	0

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	350	26	179
Associates	34	7	21
Bachelor	554	72	23
Masters	202	50	9
Doctorate (include Med/Vet/etc.)	71	16	0

CSF: WEAPONS, CRUISE MISSILES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	41	3	20
Associates	4	1	3
Bachelor	65	8	3
Masters	24	6	3
Doctorate (include Med/Vet/etc.)	8	2	0

CSF: WEAPONS, ICBMs/SLBMs

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	9	1	4
Associates	1	0	1
Bachelor	14	2	1
Masters	5	1	0
Doctorate (include Med/Vet/etc.)	2	0	0

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	350	26	179
Associates	34	7	21
Bachelor	555	72	23
Masters	204	50	9
Doctorate (include Med/Vet/etc.)	72	17	0

CSF: WEAPONS, CRUISE MISSILES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	41	3	20
Associates	4	1	3
Bachelor	65	8	3
Masters	24	6	3
Doctorate (include Med/Vet/etc.)	8	2	0

CSF: WEAPONS, GUIDED PROJECTILES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	6	0	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: WEAPONS, BOMBS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	27	2	13
Associates	3	0	2
Bachelor	42	5	2
Masters	16	4	2
Doctorate (include Med/Vet/etc.)	6	2	0

CSF: WEAPONS, GUNS AND AMMUNITION

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	5	0	3
Associates	1	0	0
Bachelor	7	1	0
Masters	3	1	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: WEAPONS, DIRECTED ENERGY

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	1	0	0
Masters	2	0	0
Doctorate (include Med/Vet/etc.)	1	1	0

CSF: WEAPONS, GUIDED PROJECTILES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	6	0	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: WEAPONS, BOMBS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	27	2	13
Associates	3	0	2
Bachelor	42	5	2
Masters	16	4	2
Doctorate (include Med/Vet/etc.)	6	2	0

CSF: WEAPONS, GUNS AND AMMUNITION

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	5	0	3
Associates	1	0	0
Bachelor	7	1	0
Masters	3	1	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	1	0	0
Associates	2	0	0
Bachelor	0	0	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: SPACE SYSTEMS, SATELLITES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	1*	0	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	1	0	0

*Part time engineering support from 3 engineers.

CSF: C4I SYSTEMS, AIRBORNE C4I

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	1	0	0
Associates	1	0	0
Bachelor	4	0	0
Masters	5	1	0
Doctorate (include Med/Vet/etc.)	1	0	0

CSF: ELECTRONIC DEVICES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	1	0	0
Associates	1	0	0
Bachelor	5	0	0
Masters	4	1	0
Doctorate (include Med/Vet/etc.)	7	2	0

CSF: HUMAN SYSTEMS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	2	0	0
Masters	1	1	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: TRAINING SYSTEMS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	0
Associates	0	0	0
Bachelor	1	0	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: ELECTRONIC DEVICES

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	1	0	0
Associates	1	0	0
Bachelor	5	0	0
Masters	4	1	0
Doctorate (include Med/Vet/etc.)	7	2	0

CSF: HUMAN SYSTEMS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	3	0	0
Associates	0	0	0
Bachelor	4	0	0
Masters	1	1	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: TRAINING SYSTEMS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	4	0	1
Associates	0	0	0
Bachelor	1	1	0
Masters	0	0	0
Doctorate (include Med/Vet/etc.)	0	0	0

CSF: ENVIRONMENTAL QUALITY

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	1
Associates	1	0	0
Bachelor	2	1	0
Masters	1	0	0
Doctorate (include Med/Vet/etc.)	1	0	0

CSF: ADVANCED MATERIALS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	2
Associates	0	0	0
Bachelor	2	0	1
Masters	2	0	0
Doctorate (include Med/Vet/etc.)	16	2	0

CSF: ENVIRONMENTAL QUALITY

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	3	0	1
Associates	1	0	0
Bachelor	2	1	0
Masters	2	0	0
Doctorate (include Med/Vet/etc.)	1	0	0

CSF: ADVANCED MATERIALS

Type of Degree/ Diploma	Number of Government Personnel by Type of Position		
	Technical	Management (Supv)	Other
High School or Less	0	0	4
Associates	0	0	0
Bachelor	3	0	1
Masters	3	0	0
Doctorate (include Med/Vet/etc.)	21	3	0

3.2.3 Experience: *What is the experience level of government personnel? Fill in the number of government personnel in the appropriate boxes of the following table. (BRAC Criteria I)*

As mentioned above, NAWCWPNS China Lake is the site of the first Personnel Demonstration Project. A pay-for-performance system coupled with broad pay-banding replaces the normal GS/GM system. The flexibility inherent in this system has greatly aided retention of qualified technical personnel, as shown in the following table. The small population in the "Less Than 3 Years" category is a direct result of the DOD hiring freeze for the last 4 years.

The data below for civilians are from the PDAS database, which originates as a download from DCPDS and is end of FY 93. Civilians are Full Time Permanent.

Data in the table refer only to civilian employees. To break the data out by CSF, in most cases the numbers were estimated.

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	3	9	2	3
Management (Supv)	0	0	1	0	0
Total	0	3	10	2	3

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	6	3	1	
Management (Supv)	0	0	0	0	1
Total	0	6	3	1	1

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	13	143	69	51	62
Management (Supv)	1	9	3	8	28
Total	14	152	72	59	90

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	20	6	5	18
Management (Supv)	0	1	3	2	0
Total	1	21	9	7	18

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	3	5	3	3
Management (Supv)	0	0	0	0	1
Total	0	3	5	3	4

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	2	0	0	0
Management (Supv)	0	0	0	0	0
Total	0	2	0	0	0

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	12	128	61	48	58
Management (Supv)	1	9	3	8	30
Total	13	137	64	56	88

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	20	6	5	18
Management (Supv)	0	1	3	2	0
Total	1	21	9	7	18

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	3	5	3	3
Management (Supv)	0	0	0	0	1
Total	0	3	5	3	4

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	2	0	0	0
Management (Supv)	0	0	0	0	0
Total	0	2	0	0	0

CSF: WEAPONS, ICBMs/SLBMs

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	8	10	10	3
Management (Supv)	0	0	1	2	1
Total	0	8	11	12	4

All values are estimated.

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	24	420	248	160	385
Management (Supv)	0	24	23	22	105
Total	24	444	271	182	490

All values are estimated.

CSF: WEAPONS, CRUISE MISSILES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	3	48	28	18	44
Management (Supv)	0	3	3	2	12
Total	3	51	31	20	56

All values are estimated.

CSF: WEAPONS, GUIDED PROJECTILES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	1	3	0	2
Management (Supv)	0	0	0	0	0
Total	0	1	3	0	2

CSF: WEAPONS, ICBMs/SLBMs

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	8	10	10	3
Management (Supv)	0	0	1	2	1
Total	0	9	11	12	4

All values are estimated.

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	24	410	242	156	375
Management (Supv)	0	24	23	22	102
Total	24	436	265	180	478

All values are estimated.

CSF: WEAPONS, CRUISE MISSILES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	3	48	28	18	44
Management (Supv)	0	3	3	2	12
Total	3	51	31	20	56

All values are estimated.

CSF: WEAPONS, GUIDED PROJECTILES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	1	3	0	2
Management (Supv)	0	0	0	0	0
Total	0	0	0	0	0

CSF: WEAPONS, ICBMs/SLBMs

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	8	10	10	3
Management (Supv)	0	0	1	2	1
Total	0	9	11	12	4

All values are estimated.

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	24	412	242	158	375
Management (Supv)	0	24	23	22	103
Total	24	436	265	180	478

All values are estimated.

CSF: WEAPONS, CRUISE MISSILES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	3	48	28	18	44
Management (Supv)	0	3	3	2	12
Total	3	51	31	20	56

All values are estimated.

CSF: WEAPONS, GUIDED PROJECTILES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	1	3	0	2
Management (Supv)	0	0	0	0	0
Total	0	0	0	0	0

CSF: WEAPONS, BOMBS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	32	19	12	29
Management (Supv)	0	2	2	2	7
Total	2	34	21	14	36

All values are estimated.

CSF: WEAPONS, GUNS AND AMMUNITION

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	5	3	2	5
Management (Supv)	0	0	0	0	2
Total	1	5	3	2	7

All values are estimated.

CSF: WEAPONS, DIRECTED ENERGY

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	2	0	2	0
Management (Supv)	0	0	0	0	1
Total	0	2	0	2	1

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	1	1	1	0
Management (Supv)	0	0	0	0	0
Total	0	1	1	1	0

CSF: WEAPONS, BOMBS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	32	19	12	29
Management (Supv)	0	2	2	2	7
Total	2	34	21	14	36

All values are estimated.

CSF: WEAPONS, GUNS AND AMMUNITION

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	5	3	2	5
Management (Supv)	0	0	0	0	2
Total	1	5	3	2	7

All values are estimated.

CSF: WEAPONS, DIRECTED ENERGY

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	2	0	2	0
Management (Supv)	0	0	0	0	1
Total	0	0	0	0	0

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	1	1	1	0
Management (Supv)	0	0	0	0	0
Total	0	1	1	1	0

CSF: WEAPONS, BOMBS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	32	19	12	29
Management (Supv)	0	2	2	2	7
Total	2	34	21	14	36

All values are estimated.

CSF: WEAPONS, GUNS AND AMMUNITION

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	5	3	2	5
Management (Supv)	0	0	0	0	2
Total	1	5	3	2	7

All values are estimated.

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	1	1	1	0
Management (Supv)	0	0	0	0	0
Total	0	1	1	1	0

CSF: SPACE SYSTEMS, SATELLITES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	0	0	0	2
Management (Supv)	0	0	0	0	0
Total	0	0	0	0	0

CSF: SPACE SYSTEMS, SATELLITES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	0	0	0	2
Management (Supv)	0	0	0	0	0
Total	0	0	0	0	2

CSF: C4I SYSTEMS, AIRBORNE C4I

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	6	2	3	1
Management (Supv)	0	1	0	0	0
Total	0	7	2	3	1

CSF: ELECTRONIC DEVICES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	3	3	0	6
Management (Supv)	0	2	0	0	1
Total	1	10	3	0	7

CSF: HUMAN SYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	0	1	1	1
Management (Supv)	0	0	0	0	1
Total	0	0	1	1	2

All values are estimated.

CSF: SPACE SYSTEMS, SATELLITES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	0	0	0	2
Management (Supv)	0	0	0	0	0
Total	0	0	0	0	0

CSF: C4I SYSTEMS, AIRBORNE C4I

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	6	2	3	1
Management (Supv)	0	1	0	0	0
Total	0	7	2	3	1

CSF: ELECTRONIC DEVICES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	3	3	0	6
Management (Supv)	0	2	0	0	1
Total	1	10	3	0	7

CSF: HUMAN SYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	3	1	1	3
Management (Supv)	0	0	0	0	1
Total	0	3	1	1	4

All values are estimated.

CSF: C4I SYSTEMS, AIRBORNE C4I

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	6	2	3	1
Management (Supv)	0	1	0	0	0
Total	0	7	2	3	1

CSF: ELECTRONIC DEVICES

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	1	3	3	0	6
Management (Supv)	0	2	0	0	1
Total	1	10	3	0	7

CSF: WEAPONS, HUMAN SYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	3	1	1	3
Management (Supv)	0	0	0	0	1
Total	0	3	1	1	4

All values are estimated.

CSF: WEAPONS, TRAINING SYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	32	19	11	29
Management (Supv)	0	1	1	1	5
Total	2	33	20	12	34

All values are estimated.

CSF: TRAINING SYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	0	0	0	0
Management (Supv)	0	0	0	1	0
Total	0	0	0	1	0

All values are estimated.

CSF: ENVIRONMENTAL QUALITY

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	0	3	2	0
Management (Supv)	0	0	0	0	1
Total	0	0	3	2	1

CSF: ADVANCED MATERIALS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	4	4	2	7
Management (Supv)	0	3	0	0	0
Total	2	7	4	2	7

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CSF: TRAINING SYSTEMS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	32	19	11	29
Management (Supv)	0	1	1	1	5
Total	2	33	20	12	34

All values are estimated.

CSF: ENVIRONMENTAL QUALITY

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	2	3	2	2
Management (Supv)	0	0	0	0	1
Total	0	2	3	2	3

CSF: ADVANCED MATERIALS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	13	6	2	9
Management (Supv)	0	3	0	0	0
Total	2	16	6	2	9

CSF: ENVIRONMENTAL QUALITY

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	0	2	3	2	2
Management (Supv)	0	0	0	0	1
Total	0	2	3	2	3

CSF: ADVANCED MATERIALS

Type of Position	Years of Government and/or Military Service				
	Less Than 3 Years	3-10 Years	11-15 Years	16-20 Years	More Than 20 Years
Technical	2	13	6	2	9
Management (Supv)	0	3	0	0	0
Total	2	16	6	2	9

3.2.4 Accomplishments During FY91-93: *For government personnel answer the following questions.*

NAWCWPNS is a full-spectrum laboratory whose primary products are hardware and software for the Fleet. The following is brief synopsis of contributions to the Fleet. A more complete listing is provided in Appendix D.

AIR VEHICLES, FIXED WING, PROPULSION

NAWCWPNS performed the Supersonic Sea Skimming Target (SSST) feasibiity assessment in October 1992. Airbreathing propulsion supports the SSST program for several product functions: propulsion, structures/airframe, guidance and control, systems engineering, and cost analyzing. Past involvement with SSST related programs include Firebrand and Supersonic Low Altitude Target (SLAT).

NAWCWPNS acted as the government technical design consultant for the SLAT Integral Rocket Ramjet (IRR) propulsion system. The propulsion system was qualified prior to cancellation of the program. We provided engineering support in the following areas: inlet performance, alternate ramjet fuels, solid propellant booster, insensitive munitions tests, autoignition test for fuel, recovery system, ramjet simulations, and flight tests.

NAWCWPNS provided solid propellant and ramjet propulsion and structural technical support for the SSST and related programs, including a review of foreign comparative test (FCT) candidates and Russian M-31 propulsion system.

NAWCWPNS provided propulsion technical support to other target systems, such as AQM-37C (Challenger) and analyzed alternative fuels for MQM-8 (Vandal).

AIR-TO-AIR WEAPONS

NAWCWPNS China Lake is the leader in the design, development, and test and evaluation of air-to-air systems, subsystems, and components. Weapon systems examples include Sidewinder AIM-9M and AIM-9M-8/9 countermeasures upgrade, Sparrow AIM/RIM-7P and 7R, and Phoenix AIM -54C. Technology examples include infrared seekers, tube and solid-state radar seekers, missile-borne computers, missile signal processing, guidance algorithms, control surface actuators, air frames, target detecting devices, propulsion, and aircraft interfaces/integration.

China Lake is the only laboratory in the Navy with "nose-to-tail" full-spectrum capability for antiair weapons. Therefore, our contributions in this area have included guidance, control, fuzing, warhead, propulsion, and airframe.

In addition, with the existence of the various tactical aircraft Weapon System Support Facilities (WSSFs) at the China Lake site, our involvement also extends into the all-important area of weapons integration. Weapons such as Advanced Medium-Range Air-to-Air Missile (AMRAAM), and virtually all future air-to-air weapons, will realize full effectiveness only if the integration is done properly. A successful integration requires full systems knowledge, all of which is in residence at the China Lake site.

AIR-TO-SURFACE WEAPONS

NAWCWPNS China Lake has an extremely successful track record in the fielding of air-to-surface systems, subsystems, and components. Fielded systems include the 2.75-inch Folding Fin Aircraft Rocket, Zuni, Shrike, fuel-air explosive (FAE), Walleye, and High-Speed Antiradiation Missile (HARM). In addition, the laboratory played a major technical role in air-launched Harpoon. China Lake developed the basic technology of the body-fixed antiradiation seeker, used in Shrike and HARM.

For the same reasons listed above under Air-to-Air Weapons, China Lake has full-spectrum competence for air-to-surface weaponry. Antiradiation guidance was proved feasible at China Lake and took shape in the form of the original Shrike; many advanced warheads have been developed, a host of air-to-ground fuzes have been developed, and propulsion schemes from rockets to turbines to ramjets have all been developed at the China Lake site.

AIRCRAFT SOFTWARE AND AVIONICS SYSTEMS AND OTHER AIRCRAFT SYSTEMS

China Lake has a long-term commitment to develop and upgrade aircraft weapon systems and tactical software for an array of military aircraft, including A-6, F/A-18, AV-8B, AH-1, and others. Each aircraft has a Weapon System Support Activity (WSSA), each facility being a computer-intensive hardware-in-the-loop development laboratory designed for system/weapon integration and software development and test. All software and weapons integration enhancements for the aircraft listed above, and for the A-7E and A-4M, have come from the China Lake WSSAs since the early 1980s. The Aircraft Survivability capability is used to analyze and develop detailed design specifications, support cost and operational effectiveness analyses (COEAs), validate design performance and specification compliance, conduct Congressionally mandated Live Fire Testing (LFT) for the Navy and other services, and conduct Joint Service and OSD-sponsored survivability RDT&E. This is accomplished on an ongoing basis for developmental and in-service air vehicles. Analysis and/or LFT of the Navy's unmanned air vehicles (UAVs), F/A-18, AV-8B, and V-22 aircraft and the Air Force's F-15 aircraft have been conducted over the last 3 years. V-22 and F/A-18E/F LFT is ongoing. Technology demonstrations such as Cheap Night, made possible by the close proximity of our test ranges to our laboratories, have led to significant upgrades in weapons-delivery capability of attack aircraft.

Again, the total system performance aspect of modern weapon systems needs to be emphasized. With the location at the China Lake site of the weapons technology experts, combined with the aircraft avionics and fire-control experts associated with the WSSFs, the ability exists to optimize the total systems performance. This is a capability not present anywhere else in the Navy lab system (or within the lab system of either of the other services). Future weapon systems are going to depend more and more heavily on the ability to demonstrate system performance early in the program. Colocation of all facilities at one location will greatly facilitate that evolution.

FLARES / COUNTERMEASURES

NAWCWPNS has been involved in all aspects of the design and evaluation of countermeasures flares (both foreign and domestic) and in the development of flare counter-countermeasures techniques for today's missile systems.

RECOVERY SYSTEMS

NAWCWPNS has developed and deployed a series of ejection seats and parachute systems, most recently the SEAWARS over-water release system.

Fleet Support

- Provided logistic and design engineering support for 19 models of in-service personnel parachute assemblies representing some 19,000 items of supply and related hardware (NAVAIR).
- Provided logistic and design engineering support to the SPECWARFARE and EOD community (NAVSEA); qualified and placed in service a convertible static line/free-fall ram-air parachute assembly; and certified the C-2 aircraft as a jump platform (SEALS).
- Developed SEAWARS devices to automatically release a pilot from the canopy when the pilot lands in saltwater. Several thousand of these devices are in service use.
- Qualified the MC-5 ram-air parachute for Marines Desert Storm support.

R&D—Navy

- Completed qualification testing of Naval Aircrew Common Ejection Seat (NACES).
- Developed new thin pack, and environmentally sealed backpack array.
- Involved in development of fourth-generation ejection seat and evaluation of Russian K-36 ejection seat.
- Developed dual-mode recovery system.

Non-Navy

- MARS Project, RDT&E, NASA/JPL
- Single-stage rocket technology, T&E, Army
- F-111 Crew Escape Module, RDT&E, Air Force
- Advanced Personnel Recovery System, T&E, Army
- Solid Rocket Booster Recovery, T&E, NASA

HUMAN FACTORS

The mission of NAWCWPNS Human Systems work is to develop and apply psychological and human performance principles, models, and measurements, to the acquisition, design, test, and evaluation of current and future weapon and support systems. Our primary objectives are to increase man/machine system performance, reduce life-cycle costs, enhance safety, and reduce errors throughout system development. NAWCWPNS has made substantial contributions to the pilot–vehicle interface for the AV-8B, F/A-18, and A-6 weapon systems; the user interface for the TAMPS mission planning system; and basic research into how aircrew combines information from multiple sources.

SURFACE-TO-AIR WEAPONS

NAWCWPNS participates in all aspects of design, development, test, evaluation, and production support of systems such as Rolling Airframe Missile (RAM), Sea Sparrow, and Standard Missile. Technology examples include radar, infrared, and dual-mode seekers; propulsion, guidance control systems, low-altitude and anti-TBM proximity fuzing; propulsion; and missile system integration technologies.

SURFACE-TO-SURFACE WEAPONS

NAWCWPNS is involved in the design, development, test , evaluation, and production support of systems such as Harpoon, Standoff Land-Attack Missile (SLAM), and Tomahawk.

GUIDED PROJECTILES

NAWCWPNS China Lake has had a long and distinguished history of conceiving, designing, building, evaluating, and documenting antiradiation sensors for such air-launched missiles as Shrike, Standard ARM, HARM, and Sidearm. With this experience, China Lake also had the opportunity to invent, design, build, and test a novel seeker for a projectile fired from an 8-inch self-propelled Howitzer. This original Army fire-and-forget weapon, XM837, was able to locate home in on, and destroy a variety of RF emitters at extended ranges. Such threat targets near the front line were thought to be very difficult to kill by conventional ARMs because of high target densities and very short radiation times.

NAWCWPNS China Lake was responsible for the seeker design while the Army's Harry Diamond Lab was gun-hardening the proven electrical design. Much of the original experimental hardware is still in storage at China Lake.

For nearly a decade seeker design work was focused toward RPVs and conventional missiles rather than projectiles. With renewed interest in guided projectiles, it is hoped that previously utilized design talent and lab resources—both of which still reside at China Lake—will again be employed.

NAWCWPNS China Lake has done all of the Navy development work in the area of rocket propulsion for gun launched guided and unguided projectiles. It started in the 1960s with the development and transition to production of 5-inch Rocket Assisted Projectiles (RAPs).

In the 1970s China Lake developed and transitioned to production of rocket propulsion for the 5-inch guided projectile. We also demonstrated an 8-inch anti-radar guided projectile. Propulsion includes rocket motor, folding fins, pyrotechnic delayed ignitor, and slip obturator. The completely successful 5-inch guided projectile program was cancelled in 1984.

Presently NAWCWPNS is supporting the Navy's Fire Support Mission. China Lake is working in the areas of mission analysis, weapons analysis (both gun launched and missiles), GPS control, seekers, guidance, gun hardening of components, materials, and all aspects of gun launched high performance rocket propulsion.

NAWCWPNS China Lake has the Navy's only ongoing technology program for high performance gun launched rocket propulsion. This propulsion technology will be applied to both the 5-inch- and 155mm-diameter gun launched projectiles. This is a 4-year propulsion technology program that will culminate with firing a long range rocket propelled flight vehicle out of a new advanced high performance gun.

DIRECTED ENERGY SYSTEMS

The earliest work here was in the optics of metals at elevated temperatures with ARPA support. We had direct and substantial involvement in the optics portion of the very first high energy military laser - the Baseline Demonstration Laser (BDL) and in the Navy Army Chemical Laser (NACL) and performed the beginnings of decades long work in HEL optics development especially in

precision measurement of optical properties such as reflectance and surface roughness and scatter, and in laser induced damage. We also contributed our growing HEL optics expertise in thin films for harsh environments, fabrication, and characterization to the Mid IR Chemical Laser (the MIRCL system now at White Sands), to the optics for the Air Force Airborne Laser Laboratory (ALL), and to the ARPA sponsored Alpha Laser (space based laser). Critical and enabling technologies such as the development of uncooled HEL optics came directly from our efforts. Unique equipment and expertise not found in any other Government or private laboratory exists at China Lake as a result of these two plus decades of contribution. Upwards of 500 scientific and engineering papers were written by China Lake personnel from this work and form the basis for an International reputation in precision optics - not only related to HEL application but to the spin off areas of laser hardening, environmentally durable coatings for space, and in electro-optics.

SPACE SYSTEMS, SATELLITES

1. NAWCWPNS. *Analysis of Beam Path Power Transfer From a Ground Based Laser Power System to Earth Satellites*, by Richter, Malik, and Hislop. China Lake, Calif., NAWCWPNS, November 1993.
2. _____. SELENE *Atmospheric Survey*, by David Richter. China Lake, Calif., NAWCWPNS, 23 August 1993.
3. _____. SELENE *Site Study* (21st ed.), by NAWCWPNS Public Works. China Lake, Calif., NAWCWPNS. 21 May 1994.
4. _____. *Stationary Aerostat for Atmospheric Sensing, Surveillance, and Power Transfer to Space*, by Dr. H. E. Bennett. China Lake, Calif., NAWCWPNS, 19 May 1994.
5. _____. *Utilities SELENE Water Works*, by Hislop and Malik. China Lake, Calif., NAWCWPNS, 26 April 1993.

TRAINING SYSTEMS

NAWCWPNS is the lead field activity for air launched weapon systems training, including all air-to-air, air-to-ground, and support equipment. This covers the following:

- TECH EVAL
- OPEVAL
- Introduction to Fleet
- Introduction to Navy Training Commands
- FMS

Training covers maintenance (all levels), operations, loading, handling, servicing, release, and control.

The TARIF provides an environment conducive to high productivity, high reliability, high quality, and repeatable EWTS development and integration, and software development process. Engineers and software developers can work with fully instrumented laboratory and integration facilities and a modern user friendly high speed computer system utilizing development and diagnostic tools not available in the real time computer systems used at the ACTS/TACTS operational ranges. However, upon completion of development and unit level testing, the new software is transferred from the development computer to the target system collocated at the TARIF for integration and testing on a fully functional ACTS/TACTS range.

A similar support environment is provided for the integration and testing of EWTSs. Subsystems are brought to the TARIF Highbay Integration facility and integrated as an EW threat. When ready it is moved to the free space radiation pad and tested at full effective radiated power as a stand alone system. Upon acceptance as a validated EW threat, it is then integrated with the ACTS/TACTS and transferred to the operational ranges.

ANTISUBMARINE WARFARE (ASW) WEAPONS

NAWCWPNS has been involved in the development and fielding of ASW missile technology since the early 1960s. Examples include ASROC (Anti-Submarine Rocket) and propulsion development for Extended Range ASROC.

UNIQUE OR SPECIAL APPLICATION SYSTEMS AND MISCELLANEOUS ITEMS

NAWCWPNS China Lake is a full-spectrum RDT&E laboratory, and has continually been called upon to apply its science in support of Fleet objectives. Examples include chemiluminescence systems (for which China Lake holds the basic patents) for night applications, weather modification devices, a deep-diving submersible for oceanographic research, fuel gelling technology to reduce fire hazard, a man-portable gyrocompass, automatic test equipment, and low-cost Fleet telemetry. China Lake personnel apply their knowledge of weapons to the Joint Munitions Effectiveness Manuals (JMEM), used extensively by the Fleet. Shuttered video is a China Lake invention.

RESEARCH CONTRIBUTIONS

China Lake researchers continue to make major contributions to weapon systems in areas such as microwave technology, lasers, optics, advanced materials, semiconductors, detectors, explosives, propulsion, combustion, and incineration. The full-spectrum aspect of our organization allows application of leading-edge technology directly to military systems in development or in the Fleet.

ELECTRONIC DEVICES

China Lake scientists have made considerable progress in the area of electronic devices. Some of our accomplishments include epitaxial growth of metals upon gallium arsenide in support of high power devices, synthesis of metalorganic precursors for growth of compound semiconductors and site specific doping, growth of GaAs based long wavelength quantum well detectors for inclusion in a demonstration focal plane array, demonstration of a 250-watt short pulse IMPATT transmitter with 300-ns pulse width and 30% duty cycles, demonstration of a super directive array, and preliminary demonstration of n- and p- type doping of zinc selenide.

ORDNANCE TECHNOLOGY

China Lake has 50 years of experience in utilizing technology to enhance the effectiveness of ordnance. Improvements include reactive cases, aimable ordnance, fuel-air explosives, linear shaped charges, multifragment effects, continuous rod warheads, incendiary effects, in-line electronic safe-arm devices, mechanical interrupters, laser initiation, explosive logic, and a host of other technologies.

ENERGETIC MATERIALS

Major research contributions have been made by China Lake scientists in the theory of nonlinear thermodynamics, statistical validation of testing procedures, programs for predicting the results of combustion processes, and other basic research achievements in the fields of explosives and

propellants. A considerable part of today's industrial manufacturing procedures for explosives and propellants was originated at China Lake. Major contributions were made in the development of shaped charge warheads. Controlled fragmentation warhead technology originated at China Lake. The first plastic bonded explosives (PBX), and most that are now in use, were originally formulated at China Lake. China Lake has done extensive work in developing and evaluating insensitive munitions systems. China Lake developed techniques for explosive bonding of metals, which subsequently resulted in the widely used industrial technique of explosive welding.

Dr. Arnold Nielson of China Lake was the inventor of CL-20, the most significant advancement in explosive formulation chemistry in the past 50 to 100 years. This molecule represents a breakthrough in that it is the first "caged" molecule, thereby allowing higher packing density and greater energy (or better insensitive munitions performance). CL-20 is economical to produce, and its development is being pursued by the Department of Energy National Labs and by industry as well as by the Navy.

China Lake contributions to propulsion have been extensive over the past 50 years. These include the design and development of the original Sidewinder rocket motor, the Vertical Launch ASROC propulsion system, along with many other rocket and missile propulsion systems. This technology has been applied to the vertical-seeking ejection seat. Propulsion technology has also advanced at China Lake, with items such as the preferential insulation technique, the thermally initiated venting system, multiple thrust vector control techniques, and thrust control systems. China Lake propellant technology has advanced the state of the art.

EXPLOSIVE DEVICES

China Lake has made extensive contributions to weapon systems by developing devices used by most air-launched weapons. China Lake-designed igniters are used in Sidewinder, BOMROC, Tomahawk, and other systems. China Lake-designed arm-fire devices are being used in virtually all propulsion applications in the Fleet. The Sidewinder gas generator is a China Lake development. Liquid fuels developed at China Lake are used by nearly all air-breathing missiles.

SAFETY-ARMING DEVICE TECHNOLOGY

China Lake-developed safety-arming devices are used in the great majority of Navy and Air Force air-launched weapons. These include the early air-launched weapons, such as the 2.75-inch FFAR; the General Purpose bombs; and a host of guided weapons, from Sidewinder and Sparrow to Maverick and Tomahawk.

WARHEADS

China Lake-developed warheads are used in the great majority of Navy and Air Force air-launched weapons. These include rockets such as Zuni, bombs such as FAE, and guided missiles such as Sidewinder and Shrike.

MAJOR PROTOTYPES / PRODUCTS / PROCESSES IN PRODUCTION OR TRANSFERRED TO INDUSTRY

China Lake has a long history of cooperative developments with industry. Typical cases in which technology developed at China Lake has been transferred to industry are

- Optical target detection devices for proximity fuzing (Sidewinder, RAM, Shrike, HARM)
- Short-pulse RF with multiple-hollow cone antennas for proximity fuzing: Phoenix, Tartar, Terrier, Standard Missile, Sparrow, AMRAAM.
- Low-altitude proximity fuzing systems: Sparrow, Standard Missile.
- Advanced monopulse ECCM techniques, applied in Standard Missile.
- Electro-optical and infrared seeker technology for Sidewinder
- Rocket motors for Sidewinder, Shrike, HARM
- Insensitive munitions rocket motor technology
- Trapped-ball thrust-vector control nozzle: Standard Missile
- Jet-vane thrust vector control: Sparrow
- Many propellant formulations
- Most of the safe/arm devices in current production

PROCESSES AND PRODUCTS UTILIZED BY INDUSTRY AND MILITARY SERVICES

NAWCWPNS China Lake has made many contributions toward the physical improvement of fielded systems and in the processes necessary to produce and repair those systems. Examples of system improvements include development of Sidewinder coupling ring screws, which eliminated field stress corrosion cracking; development of Stealth technology and manufacturing processes; and development of a replacement oidant injector for the Mk 50 torpedo boiler, which significantly reduced failure rates. Examples of production and repair process improvements include development of gages for Sidewinder Rocket Motor Safe and Arm Inspection; development of non-ozone-depleting chemical soldering and electronics fabrication technology; development of a wing thermal recoating process, which allowed the repair and return to the Fleet of hardware that would have previously been scrapped; and development of soldering technology processes that are now applied throughout DOD and industry.

ENVIRONMENTAL QUALITY

There are many and varied efforts being pursued at China Lake in this CSF. Examples of work include the following: becoming a certified chemical testing lab; environmentally friendly demil; formulating propellants and explosives with binders that will allow demil with full recovery of ingredients; bioremediation of sludge; replacement of ozone depleting chemicals; reducing or replacing some chemicals with less harmful ones; and minimizing the quantities of hazardous materials that are being used and therefore must be disposed.

ADVANCED MATERIALS

The mission of the NAWCWPNS China Lake avanced materials group is to provide research, development, test, and evaluation of organic, inorganic, metallic, and polymeric materials and

related processes for all Naval air weapon systesm. This is accomplished by maintaining programs and expertise in the following areas:

- Materials Engineering in the fields of corrosion control, ceramics, composite structures, metals, nonmetals, polymers, adhesives, paints, and coatings
- Materials Synthesis in the areas of organic, inorganic, and polymeric materials; ceramics, diamond, optical materials (includes window and nonlinear optical materials), thermoelectrics, explosives, propellants, semi-conductors, sensor materials, low observables, and environmentally compliant materials
- Materials Characterization techniques to develop and analyze the full spectrum of advanced materials required in Naval weapon systems

3.2.4.1 Patents and Disclosures: *How many patents were awarded and patent disclosures (only count disclosures with issued disclosure numbers) were made? (BRAC Criteria I)*

A total of 147 patent awards and 273 patent disclosures were made during this period. An asterisk indicates a patent is listed for more than one CSF; it is included in the total for the first CSF only.

CSF	Disclosures	Awarded	Patent Titles (List)
Air Vehicles, Fixed Wing, Structure (1 disclosure, 0 awards)	74868		Device for Protection of Aircraft Fuel Tanks From Hydrodynamic Ram and Ullage Explosions
Air Vehicles, Fixed Wing, Avionics (4 disclosures, 3 awards)	71742	Issued	Ribless Ram Air Parachute
	73019	Secrecy	(Multiflare Simulator) Infrared Countermeasure Flare Simulation Method (U)
	73108	Issued	Rapid Inflation Low Shock Parachute
	74903		Aircraft Ranging and Direction Set
Weapons, Conventional Missiles/Rockets (176 disclosures, 98 awards)	50533	Issued	Broad Band. Polarization Diversity Monopulse Antenna
	52370	Issued	Selectively Aimable Warhead Initiation System
	53715	Issued	Adaptive Autopilot
	53822	Issued	Command Guidance Technique for Line-Of-Sight Missile
	55448	Issued	Improved Shaped Charge
	56370	Issued	Droppable Jet Vane TVC
	56594	Issued	Dual Gate TDD
	57066	Issued	Laser Radiation Detection System
	57534	Issued	Preparing an Elastomeric Bound Explosive
	58235	Issued	Frequency Obtained Range Definition and Control Proximity Fuze
	58584	Issued	High Energy Case Explosives Based On Dinitropropylacrylate
	58620	Issued	Acousto-Optical Classifier
	59487	Issued	Controlled Fragmentation with Fragment Mix
	59494	Issued	Plastic Bonded Explosives Which Exhibit Mild Cook-Off
	64572	Issued	Insensitive High Density Explosive
	65123	Issued	Resonant Probe and Radio Frequency Coupler
	65469	Issued	Micro-T Telemetry System
	65525	Issued	Cross Switched Micrad Seeker
	65627	Issued	Inhibitor and Barrier for Use With High Energy Rocket Propellants
	65628	Issued	Insensitive High Energetic Explosive Formulations
	65629	Issued	Additives Which Prevent Gasing of Energetic Binder Containing Propellant
	65763	Issued	Non-Continuous Ignition Train
	65967	Issued	High Nitrogen Smoke Compositions
	66208	Issued	Gas Generant Compositions Containing Energetic High-Nitrogen Binders
	66218	Issued	Radar Target Simulator
	66465	Issued	Shear Type Ordnance Venting Device
	66576	Issued	Bending Type Ordnance Venting Device
	67591	Issued	Solid State Time Base Corrector (TBC)
	67634	Secrecy	Adaptive Radar Transponder for Guided Missile (U)

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
Weapons, Conventional Missiles/ Rockets (contd.)	68543	Issued	Thermosensitive Pop-out Device
	68586	Issued	Plastic Bonded Explosives Using Fluorocarbon Binders
	68790	Issued	Spherical Warhead
	69072	Issued	Dump Combustor With Noncoherent Flow
	69168	Issued	Linear Power Regulator With Current Limiting and Thermal Shutdown and Recycle
	69360	Secrecy	Stores Storage and Release System (U)
	69402	Secrecy	Coaxial Dual Mode EO/RF Seeker (U)
	69960	Issued	A Non-linear Data Conversion System for Wide Dynamic Range Signal Processing
	70110	Issued	High Efficiency, Low Weight and Volume Energy Absorbent Seam
	70166	Issued	Externally Heated Thermal Battery
	70764	Secrecy	Bore-rider Canister Initiator (U)
	70765	Issued	Bonding Agents for Thermite Compositions
	70849	Issued	Castable, Insensitive Energetic Compositions
	71023	Issued	Fire, Temperature and Shock Resistant Explosives
	71137	Issued	Microstructure Correlation Counter
	71172	Secrecy	Multi-Step Fuel Grain
	71175	Secrecy	High Isolation Radome
	71231	Issued	Equal Stub Length Diplexing Microwave Frequency Discriminator Circuit
	71325	Secrecy	Mono Static System for Generating Pseudo-Holographic Image
	71328	Issued	Progressive Phase Rotman-Turner-Turner Lens Feed Transmission Line Network
	71410	Secrecy	Fiber Optics Rotary-Controller Payout System (U)
	71413	Secrecy	Multiple Concentric Shaped Charge 9U0
	71473	Issued	Electrorheologically Damped Impact Switch
	71653	Issued	Missile Seeker Angle of Attack Issued Measurement System
	71713	Issued	Weapons Storage Container to Prevent Sympathetic Detonation
	71764	Issued	Pyrofuze Pin for Ordnance Activation
	71765	Issued	Pyrofuze Aircraft Ordnance Arming System
	71778	Issued	Armored Optical Fiber Cable Interconnect for Dual Payout Systems
	71910	Secrecy	Continuous Circular Flexure Mirror Mount (U)
	72046	Issued	Radiator of Microwave and Infrared Energy To Simulate Target
	72047	Issued	Compact Metallic Bellows
	72083	Secrecy	Tracking Radar (U)
	72301	Secrecy	Integrated Aerodynamic Fin and Stowable TVC Vane System (U)
	72414	Secrecy	Method and Apparatus for Tracking Peaks in an Optical Correlator
	72499	Issued	Precision Digital Phase Lock Loop Circuit
	72618	Issued	Fiber Optic Polishing System
	72621	Secrecy	A Combined Monopulse System (U)
	72644	Secrecy	Rocket Having an Arrangement for Internal Ducted Bypass Air Injection (U)
	72645	Issued	A Measurement of Peel Force During Fiber "Pay Out"
	72786	Secrecy	Safe and Arm Device Using Liquid Explosive (U)
	72802	Issued	Rotary Bellows

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
Weapons, Conventional Missiles/ Rockets (contd.)	72835	Issued	Method and Apparatus for Passive Direction Finding with Sideband Determination
	72907	Issued	Telemetry Data Work Selector and Processor
	73020	Issued	SLIC Power Converter
	73057		Communications Link Between Two Moving Bodies Using A Dual Payout Fiber
	73083	Secrecy	High Strength Optical Fiber Pay Out Splice and Service Loop and Method of Fabrication (U)
	73212		Reactive Nickel Aluminum Shaped Charge Liner
	73214	Issued	Ordnance Heated Battery Reactor
	73222		Wide Band Imaging Infrared Focal Plane Array Seeker
	73223	Issued	Shutter Apparatus
	73253	Issued	Precision Digitally Controlled Variable Attenuation Circuit
	73303		A Fast Frequency Hopping Radio Frequency Data Link
	73304		Scan Converter
	73332		Filler Arrangement
	73340	Issued	Castable, Insensitive Energetic Compositions
	73355		Select Glide Mode/Extended Wing Airfoil
	73362		AGM-136/A Single Hoist Ordnance Loading System (SOLS) Adapter
	73393	Issued	Pyrofuze Pin for Ordnance Device Activation
	73401	Issued	Method of Correcting Rotational Motion Error in SAR and ISAR Imagery
	73468	Issued	Thermally Activated Case Venting Safety Apparatus
	73470		Explosive Sensitization for Increased Booster Performance
	73502		Optic Fiber Payout Test Apparatus Having A Projectile Track System with Dual Rails
	73575	Issued	Fluidic Laser Calorimeter
	73576		Fire Ram
	73580		Integral Dome Skirt Gimbal
	73592	Issued	Video Scan Rate Conversion Method and Apparatus for Achieving Same
	73593	Issued	Radar Target Discrimination by Spectrum Analysis
	73594	Issued	Radar Target Discrimination Systems Using Artificial Neural Network Topology
	73601		Triaxial Magnetic Heading Sensing Apparatus
	73631		Reel Payout System
	73641		Inert Thermally Activated Burster
	73642		Discrete Fourier Transform Processing Using Neural Networks
	73679		Internal Fiber Optics Payout System with Rotary Drive and Control
	73695	Issued	Memory Modification of Artificial Neural Networks
	73703	Issued	Generic Drone Control System
	73704		Laser Doppler Velocimeter
	73734		A Means To Calibrate A Robotic Manipulator Using A Ball Bar
	73737	Issued	Video Signal Filter Method and Circuit
	73738		Bi-refringent Waveguide Rotational Alignment System
	73739		Convolutional Filtering Via the Use of Neural Networks
	73751		Gator Battery Firing Device
	73805		Integrated Roll Control and Power Supply System and Method

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
Weapons, Conventional Missiles/ Rockets (contd.)	73806		Parallel Wrapped Push-Pull Ellipsoidal Shell Acoustic Transducer
	73852		High Speed Controller Functionality From A Slower Speed Clock
	73853		Pulse On Pulse Angle of Arrival Processing
	73870	Issued	Safe and Arm Device with Variable Arming Delay By Liquid Explosive
	73871	Issued	Safe and Arm Device with Expansible Element in Liquid Explosive
	73888		Doped Diamond Anemometer
	73889		Symmetric Demodulation for Optical Interferometers W/(3x3) Outputs
	73927	Secrecy	Infrared Counter Measure Flare Simulation Apparatus
	73932		Fluid Liner for Explosive Warheads
	74049	Issued	Compact Metallic Bellows Welding Fixture
	74054		MUX Simulator
	74073		Intermetallic Thermal Sensor
	74074	Secrecy	Apparatus with Juxtapositioned and Relatively Moving Optical Apertures
	74110	Issued	A Method of Polishing Optical Fibers
	74111		Signal Feature Alignment Using Wavelets
	74121		H-Infinity Controller for an Electro-Mechanical Actuator
	74172		Rechargeable Lithium Thermal Battery
	74174		Video Image Tracking Window Positioning
	74241		Method of Producing A Controlled Fragmentation Warhead Case
	74289	Issued	Method for Preparing Filler Material for Explosive Round Storage Container
	74293		Method and Apparatus for Active Control of Combustion Devices
	74294		Rate Controller
	74314		Multiple Output Blackbody Simulator
	74332		Rate Controller
	74333		Infrared Scene Simulation
	74345	Issued	Integral Pressure Sensor
	74358		Pressure Activated Flow Regulator
	74377		Suppressor of Oscillations in Aerodynamic and Hydrodynamic Structural Cavities
	74444		Digital Monopulse
	74445		Optical Fiber Tester
	74587		Resistor Based Binary Weighted Artificial Neural Network
	74588		Digitally Weighted Neuron for Artificial Neural Network
	74626		High Rate Flywheel Tensile Testing Apparatus for Viscoelastic Materials
	74646	Secrecy	High-Performance Reduced Smoke Propellant
	74647		Digital Programmable AGC with Microcontroller and Digital Potentiometer
	74649		Optical Component Positioner
	74651		Shared Aperture RF Guidance Integrated Fuze
	74656		System Architecture for Implementing A Multiple Layer Neural Network Computer
	74657		Diamond Machining and Polishing By Exciter Laser Ablation

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
Weapons, Conventional Missiles/ Rockets (contd.)	74773		Low Cost S/A
	74774		Close Combat Air To Air Weapon Effectiveness Evaluation
	74866		Monopropellant for Missile Propulsion
	74902		Video Annotator
	74917		Wire Table
	74939		Simulation of Infrared Background Scene
	74986		Optical Component Positioner
	75014		Data Base Tomography
	75028		Charge Amplifier Circuit for Blast Gauges
	75088	Secrecy	Method and Apparatus for Fuel Injection and Controlled Fuel Distribution in A Combustion Device (U)
	75090		Clutter Rejection Through Edge Integration
	75110		Radar Video Encoder and Decoder
	75111		Inverted Pitch Torquer Motor Roll/Pitch Gimbal
	75240		Planetary Data Distribution System
	75309		A Signal To Noise Indicator Circuit
	75310		Microchannel-Plate Photomultiplier Noise Quenching Circuit
	75326		Thermally Initiated Venting System
	75539		Spatial Frequency Feature Extraction for A Classification System Using Wavelets
	75557		Method and Apparatus for Maintaining Linearity and Frequency of an FM Chirp Waveform
	75669		Confocal Ellipsoidal Mirrors for Wide Field Imaging
	75673		Flame Extinguishing Pyrotechnic and Explosive Compositions
	75720		Method of Making and Using Excess Enthalpy Electrochemical Reactor
	75771		IR Jammer Simulator
	75845		Fiber Optic Accelerometer with Supported Flexural Disk
	75846		Passive Control of Compressible Mixing in High Speed Shear Flows Using Frequency Tunable Cavities
	76054		Method of Producing A Controlled Fragmentation
Weapons, Cruise Missiles (2 disclosures, 2 awards)	69084	Issued	Solid Fuel Ramjet Combustor
	71583	Secrecy	Optical Correlator for Terrain Identification (U)
Weapons, Bombs (1 disclosure, 0 awards)	73469		Improved Fuel Air Explosive, Hexyl Nitrate/Aluminum Mixture
Weapons, Guns and Ammunition (4 disclosures, 2 awards)	58224	Issued	Solution Monopropellant for Liquid Propellant Gun
	73640		Rifle, Pistol, Mortar, Barrel Environmental Protector
	73861	Issued	Combustion Instability Suppression in Regenerative Liquid Gun
	74867		Liquid Monopropellant for A Gun

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
*Space Systems, Air Vehicles (0 disclosures, 0 awards)	71742	Issued	Ribless Ram Air Parachute
*	73108	Issued	Rapid Inflation Low Shock Parachute
*	70110	Issued	High Efficiency, Low Weight and Volume Energy Absorbent Seam
C4I Systems, Airborne C4I (3 disclosures, 1 award)	71156	Issued	Telecommunications System and Method
	73717		Telemetry Data Word Selector and Processor
	73718		Telemetry Data Selector Method
Electronic Devices (27 disclosures, 25 awards)	55847	Issued	Destructive Device for Metal Oxide-Semiconductors
	70646	Issued	Methyl Allyl Telluride
	70720	Issued	Synthesis of Aminonitrobenzodifuroxan
	71088	Issued	Lane Marker II
	71122	Issued	Multiple Quantum Well Device
	71138	Issued	MOSFET Switching Arrangement in a Power Converter Unit
	71409	Secrecy	Microcontroller-Based Pulse Decoder (U)
	71477	Issued	Thermomagnetic Safe Arm Device
	71503	Issued	Optical Fingerprint Correlator
	71741	Issued	Video Delta Modulation Encoder
	72020	Secrecy	High Temperature Superconductor Readout for Infrared Focal Plane Detector (U)
	72063	Issued	Memory Modification of Artificial Neural Networks
	72204	Issued	Tetra(Organyl) Tellurium Compounds & Process for Preparing Same
	72205	Issued	Monomeric Organometallic Compounds and Method of Preparing Same
	72223	Issued	Feedthrough Radio Frequency Filter
	72233	Issued	Preparation of Dineopentylcadmium
	72616	Issued	Current Limiting Arrangement in a Power Converter
	72716	Issued	Methods and Circuits for Neuron Perturbation in ANN Memory Modification
	73053	Secrecy	Electrically Small Superconducting Antenna and Matching Network (U)
	73364		Electronic Warfare Airborne Signal Repeater (EWASP)
	73508	Secrecy	Superconducting Microwave Antenna and Mounting (U)
	73595	Issued	Synthesis of Diorgano Tellurides
	73598	Issued	Monomeric Organometallic Compounds and Method of Preparing Same
	73599	Issued	Method of Using Monomeric Organometallic Compounds
	73600	Issued	Methyl Allyl Telluride and Synthesis of Unsymmetric Allyl-(Alkyl) Telluride
	73803		Preparation of Tertiarybutyl-Dimethylantimony and Use Thereof
	73804		Low Side Lobe Series Fed Microstrip Short Array with Cover
	74025	Issued	Process for Preparation of Tetra(Organyl) Tellurium Compounds
	74042		Buried Metal Quantum Well
	74627		Vatriisoprophylindium: Use As A Precursor in the Chemical for Deposition of Semiconductor Materials
	74628		Low Side Lobe Series Fed Microstrip Short Array with Cover

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
Electronic Devices (27 disclosures, 25 awards) (contd.)	74648		Low Side Lobe Series Fed Microstrip Short Array with Cover
	74650		Low Temperature Process for Producing Induim Containing Semiconductor Materials
	74938		Conformal Forward Steered Antenna (CFSA) Technology
*	75325		Triisopropylindium Diisopropyltelluride Adduct
	75404		Shielded Rectangular Connector Assembly
	76217		Low Side Lobe Series-Feed Microstrip Short Array with Dielectric Cover Layer and Method
Environmental Quality (2 disclosures, 1 award)	74293	Issued	Pulse Actuator
	75388		Development of A Solar-Based Hazardous Waste Incinerator
	75632		Method and Apparatus for the Active Control of A Compact Waste Incinerator
Advanced Materials (53 disclosures, 15 awards)	70372	Issued	Diallyl Telluride
	70630	Issued	Improved Synthesis of Nitratomethylmethyl Oxetane
	70645	Issued	Diallyl Telluride and Synthesis of Diorgano Tellurides
*	70646	Issued	Methyl Allyl Telluride
*	70720	Issued	Synthesis of Aminonitrobenzodifuroxan
	71412	Secrecy	Protective Coatings for Structural Materials (U)
	71438	Issued	Dielectric Constant Measurement Probe Assembly & Apparatus
*	72204	Issued	Tetra(Organyl) Tellurium Compounds & Process for Preparing Same
*	72205	Issued	Monomeric Organometallic Compounds and Method of Preparing Same
	72224	Issued	Main Chain Chromophoric Polymers with Second Order Optical Properties
*	72233	Issued	Preparation of Dineopentylcadmium
	72525	Issued	New Synthesis of 5,7-Diamino-4,6-Dinitro Benzofuroxan
	72899	Issued	A New Polymer with Electrical and Nonlinear Optical Properties
	72900	Issued	Low Temperature Process for Producing Antimony-Containing Semiconductor Materials
	72950	Issued	Accordion Like Polymers for Non-Linear Optical Applications
	73112	Issued	Dye-Substituted Polymers Containing Hydrophobically Terminated Stilbazolium Radicals
	73113	Issued	Polarized Thin Films Dye-Substituted Polymers Containing Hydrophobically Terminated Stilbazolium Radicals
	73273		Azo Dye-Substituted Polymers with Non-Linear Optical Properties
	73274		Stilbene Dye-Substituted Polymers with Non-Linear Optical Properties
	73275		Excess Enthalpy Electrochemical Reaction
	73310		High Temperature Oxygen Resistive Coating for Carbon-Carbon Substrates
	73354		Synthesis of Vinyl-Terminated Polymers Using Acid Chlorides
	73361		Solid State 455 Nm Blue Laser
	73506	Issued	Control of Crystallite Size in Diamond Film Chemical Vapor Deposition

TABLE (contd.)

CSF	Disclosures	Awarded	Patent Titles (List)
Advanced Materials (contd.)	73507		Selection of Crystal Orientation in Diamond File Chemical Vapor Deposition
*	73595	Issued	Synthesis of Diorgano Tellurides
*	73598	Issued	Monomeric Organometallic Compounds and Method of Preparing Same
*	73599	Issued	Method of Using Monomeric Organometallic Compounds
*	73600	Issued	Methyl Allyl Telluride and Synthesis of Unsymmetric Allyl-(Alkyl) Telluride
	73677		Development of A Polymer-Based, Rare Earth Phosphor Material
	73678		High Gain Polymer-Dye Based Laser Media
	73736		Chemical Vapor Deposition Diamond Hot Film Probe Coating Material
	73777		A New Polymer with Electrical and Non-Linear Optical Properties
*	73803		Preparation of Tertiarybutyl-Dimethylantimony and Use Thereof
	73851		Sm (3+): TGG Solid State Orange-Red Laser
	73963		Refractory Antireflection/Antioxidation Coating for Diamond
	73964		Metal Initiated Nucleation of Diamond
	73965		Sol-Gel Bonding Process For Diamond
	74015		Piezoelectric Properties Induced in Polymers At Room Temperature Using
	74016		Voltage Generation By Polymer Based Piezoelectric Films Functioning
*	74025	Issued	Process for Preparation of Tetra(Organyl) Tellurium Compounds
	74034		Method for Diamond Deposition At High Growth Rates
	74171		Mainchain Syndioregic Non-Linear Optical Polymers with Increased Thermal Stability
	74376	Issued	Coatings for SIO_2 Optical Coatings
	74520		Synthesis of 5,7-Diamino-4,6-Dinitro Benzofuroxan
	74586		Silicate Gel Dye Laser
*	74627		Vatriisoprophylindium: Use As A Precursor in the Chemical for Deposition of Semiconductor Materials
*	74650		Low Temperature Process for Producing Induim Containing Semiconductor Materials
	74746	Issued	Bis-Sulfonium Solids of 2,5-Dimethyl Stilbene
	74789		Preparation of Diisopropyl Stibines and Use Thereof
	75089		Bis (Polybamo) Oxetane and Copolymers
*	75325		Triisopropylindium Diisopropyltelluride Adduct
	75332		Enhanced Cycle Lifetime Electrochromic System
	75438		Synthesis and Characterization of Barium Aluminosilicate (BAS) Ceramics
	75770		Radiation Cross-Linking of Poly and Methoxy-Linked Polylethylene Oxide
	75863		Energetic Macromer Thermoplastic Elastomers As Binders for Explosives and Propellants
	75864		Macromer Thermoplastic Elastomers
Total	273	146	

3.2.4.2 Papers Published: *How many papers were published in peer reviewed journals? (BRAC Criteria I)*

A total of 350 publications were made in peer-reviewed journals and in peer-reviewed proceedings of technical symposia and meetings.

Refereed Publications

CSF	Published	Paper Titles
Weapons, ICBMs/SLBMs	Current Assessment Methodology for Electrostatic Discharge Hazards of Energetic Materials	Journal of Propulsion and Power **7**, No. 6
Weapons, Conventional Missiles/Rockets	Mitigation of Pressure Oscillations Induced by Supersonic Flow Over Slender Cavities	Journal of Aircraft **29**, No. 6, Nov-Dec 1992
	Mixing and Combustion in a Spinning Circular Combustor	Journal of Propulsion and Power **8**, No. 4, July-August 1992
	Spatial Fragment Mass and Velocity Distributions for Ordnance and Ultra-Ordnance Speed Impacts	International Journal of Impact Engineering **10**, No. 1-4,1990
	Stabilization of a Premixed Flame by Shear Flow Excitation	Combustion Science & Technology **73**, pp. 521-535, 1990
	Noncircular Inlet Duct Cross-Section to Reduce Combustion Instabilities	Combustion Science & Technology **73**, pp. 537-553, 1990
	Coherent and Random Structures in Reacting Jets	Experiments in Fluids **10**, pp. 147-156, 1990
	Compressible Spreading Rates of Supersonic Coaxial Jets	Experiments in Fluids **10**, pp. 161-169, 1990
	Effect of Convective Mach Number on Mixing of Coaxial Circular and Rectangular Jets	Physics of Fluids A, January 1991
	Interaction Between Fluid-Dynamic and Acoustic Instabilities in Combusting Flow Within Ducts	Combustion Science & Technology **79**, pp. 161-166, 1991
	Subsonic and Supersonic Combustion Using Noncircular Injectors	Journal of Propulsion and Power, March-April 1991
	Low Frequency Pressure Oscillations in a Model Ramjet Combustor	Journal of Fluid Mechanics, **232**, pp. 47-72, 1991.
	Thermal Imaging of Afterburning Plumes	Journal of Propulsion and Power, Nov.-Dec. 1991
	Closed-Loop Amplitude Modulation Control of Reacting Premixed Turbulent Jet	AIAA Journal **29**, No. 12, pp. 2155-2162, December 1991
	Simultaneous OH and Schlieren Visualization of Premixed Flames at the Lean Blow-Out Limit	Experiments in Fluids, No. 12, pp. 10-16, 1991
	Combustion Instability Related to Vortex Shedding in Dump Combustors and Their Passive Control	Progress in Energy and Combustion Science **18**
	Flow and Acoustic Features of a Supersonic Tapered Nozzle	Experiments in Fluids **13**, 1992
	Active Combustion Control in a Coaxial Dump Combustor	Combustion, Science & Technology **81**, 1992

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3.2.4.2 Papers Published: *How many papers were published in peer reviewed journals? (BRAC Criteria I)*

A total of 514 publications were made in peer-reviewed journals and in peer-reviewed proceedings of technical symposia and meetings.

CSF	Published	Paper Titles
Weapons, ICBMs/SLBMs	2	Pressure Oscillations in Post-Challenger SRM's
		Space Environmental Effects on Coated Optics
Weapons, Conventional Missiles/Rockets	194	1992 JANNAF Propulsion Systems Hazards Subcommittee Meeting Cook-off Workshop Summary: Mechanistic Understanding and Predictive Capabilities
		Aberration Reduction Using Binary Optics
		Absorption Measurements in Propellant Flames
		Accurate Null Polarimetry for Measuring the Refractive Index of Transparent Materials
		Acoustic Motor Data Reduction and Analysis
		Active Control of Simulated Instabilities in a Dump Combustor Shear Layer
		ADN Combustion Studies
		ADN Propellant Diffusion Flame Structure
		Aerogrid Fuel Injector Demonstration in a Liquid Fueled Ramjet
		Agile Beam-Steering Technologies for Laser Radar Transceivers
		Airbreathing Propulsion Overview Ramjets and Ducted Rockets
		Anomalous Scattering From Optical Surfaces With Roughness and Permittivity Perturbations
		Application of a Transient Hot Electron Transport Green's Function Approach to a Two Dimensional Model of a GaAs/$Al_xGa_{1-x}As$ Heterojunction
		Application of Time-Array Detection to Capillary Column Gas Chromatography/Conventional Time-of-Flight Mass Spectrometry
		Artificial Neural Networks and Their Application to Weapons
		Benchmark Radar Targets for the Validation of Computational Electromag Programs
		Bessel-Gauss Pulses
		Birefringence Characterization Using Transmission Ellipsometry
		Birefringence Characterization Using Transmission Ellipsometry in Polarization Analysis and Measurement
		Bonded Mirror Mounts in Miniature Seeker Optics
		Broadband Coupling Structures for Microwave Arithmetic Circuits and Phased Array
		Bromine Trifluoride as an Oxidizing Solvent for Lithium Batteries
		Calculation of Single Scattering Effects in an Idealized Bi-Static Lidar
		The Characterization of Gas Chromatography-Mass Spectrometry Using Ion Flight Time and Time-Array Detection, A Dissertation
		Characterization of Optical Black by Infrared Ellipsometry and Reflectometry
		Characterization of Passive Metallic Filament Technology
		Chemiluminescent Light Sticks
		Coherent Array Optical Imaging
		Combustion and Safety of Solid Propellant Rocket Motors

3.2.4.2 Papers Published: *How many papers were published in peer reviewed journals? (BRAC Criteria I)*

A total of 493 publications were made in peer-reviewed journals and in peer-reviewed proceedings of technical symposia and meetings.

CSF	Published	Paper Titles
Weapons, ICBMs/SLBMs	2	Pressure Oscillations in Post-Challenger SRM's
		Space Environmental Effects on Coated Optics
Weapons, Conventional Missiles/Rockets	194	1992 JANNAF Propulsion Systems Hazards Subcommittee Meeting Cook-off Workshop Summary: Mechanistic Understanding and Predictive Capabilities
		Aberration Reduction Using Binary Optics
		Absorption Measurements in Propellant Flames
		Accurate Null Polarimetry for Measuring the Refractive Index of Transparent Materials
		Acoustic Motor Data Reduction and Analysis
		Active Control of Simulated Instabilities in a Dump Combustor Shear Layer
		ADN Combustion Studies
		ADN Propellant Diffusion Flame Structure
		Aerogrid Fuel Injector Demonstration in a Liquid Fueled Ramjet
		Agile Beam-Steering Technologies for Laser Radar Transceivers
		Airbreathing Propulsion Overview Ramjets and Ducted Rockets
		Anomalous Scattering From Optical Surfaces With Roughness and Permittivity Perturbations
		Application of a Transient Hot Electron Transport Green's Function Approach to a Two Dimensional Model of a GaAs/$Al_xGa_{1-x}As$ Heterojunction
		Application of Time-Array Detection to Capillary Column Gas Chromatography/Conventional Time-of-Flight Mass Spectrometry
		Artificial Neural Networks and Their Application to Weapons
		Benchmark Radar Targets for the Validation of Computational Electromag Programs
		Bessel-Gauss Pulses
		Birefringence Characterization Using Transmission Ellipsometry
		Birefringence Characterization Using Transmission Ellipsometry in Polarization Analysis and Measurement
		Bonded Mirror Mounts in Miniature Seeker Optics
		Broadband Coupling Structures for Microwave Arithmetic Circuits and Phased Array
		Bromine Trifluoride as an Oxidizing Solvent for Lithium Batteries
		Calculation of Single Scattering Effects in an Idealized Bi-Static Lidar
		The Characterization of Gas Chromatography-Mass Spectrometry Using Ion Flight Time and Time-Array Detection, A Dissertation
		Characterization of Optical Black by Infrared Ellipsometry and Reflectometry
		Characterization of Passive Metallic Filament Technology
		Chemiluminescent Light Sticks
		Coherent Array Optical Imaging
		Combustion and Safety of Solid Propellant Rocket Motors

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Structure of a Controlled Ducted Flame	Combustion Science & Technology **87**., pp. 217-239, 1992
	Transmittance and Mechanical Properties of PMMA-Fumed Silica Composites	Journal of Applied Polymer Science, Dec 1992
	Pressure Oscillations in Post-Challenger Space Shuttle Redesigned Solid Rocket Motors	Journal of Propulsion and Power, March-April 1993
	A Review of Rijke Tubes, Rijke Burners and Related Devices	Progress in Energy and Combustion Science, Pergamon Press **19**, No. 4, pp. 313-364, 1993
	Study of Combustion Dynamics for Passive and Active Control	Progress in Astronautics and Aeronautics **151**, p. 365, 1993
	Feedback Control of an Unstable Ducted Flame	Journal of Propulsion and Power, July-August 1993
	Shock Induced Splitting of the Triply Degenerate Raman Line in Diamond	Physical Review Letters **71**(21), 3497, 1993
	Accurate Null Polarimetry for Measuring the Refractive Index of Transparent Materials	J. Opt. Soc. Am., March 1993
	Application of a Transient Hot Electron Transport Green's Function Approach to a Two Dimensional Model of a $GaAs/Al_xGa_{1-x}As$ Heterojunction	Phys Rev B, **44**, 1991
	Bessel-Gauss Pulses	Phys Rev A, **44**, September 1991
	Calculation of Single Scattering Effects in an Idealized Bi-static Lidar	J. Modern Opt., **37**, 1990
	Coherent Array Optical Imaging	Appl. Opt., **30**, 1991
	Comparison of Incident Fields on a Circular Aperture in a Plane Screen Using Scalar Kirchhoff Diffraction	J. Opt. Soc. Am. A, **8**, May 1991
	Comparison of the Propagation Characteristics of Bessel, Bessel-Gauss, and Gaussian Beams Diffracted by a Circular Aperture	J. Opt. Soc. Am. A, **8**, 1991
	Continua of Localized Wave Solutions via a Complex Similarity Tranformation	Phys Rev E, **47**, June 1993
	Diversity Methods in Phase Monopulse Tracking-A New Appraoch	IEEE Trans on Aerospace and Elec. Sys., **27**, November 1991
	Ellipsometric View on Reflection and Scattering From Optical Blacks	Appl. Opt., **31**, April 1992
	Error Reductions for a Serious Compensator Imperfection for Null Ellipsometry	J. Opt. Soc. Am., February 1991
	An Exact Markovian Analysis of Effusion	Am. J. Phys., **61**, 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		Combustion of Propellants Containing a High Density, Inert Additive
		Combustion Stability of Side-Duel Ramjet Combustors
		Comment on "Test of the Isotropy of the One-Way Speed of Light Using Hydrogen-Maser Frequency Standards"
		Comments on Radar Tracking Alignment Problem
		Comparison of Incident Fields on a Circular Aperture in a Plane Screen Using Scalar Kirchhoff Diffraction
		A Comparison of Radiant Ignition and Ballistic Impact Chamber Results
		Comparison of Technology for High Power Laser Mirrors and Synchrotron Radiation Mirrors
		Comparison of the Propagation Characteristics of Bessel, Bessel-Gauss, and Gaussian Beams Diffracted by a Circular Aperture
		Continue of Localized Wave Solutions via a Complex Similarity Transformation
		Continuous Circular Flexure Mirror Mount
		Cross-Entropy Based Regularization for Phase Derivative Estimation
		Current Assessment Methodology for Electrostatic Discharge (ESD) Hazards of Energetic Materials
		Degradable and Hydrolyzable Binder Explosives
		The Depolarized Fiber-Optic Gyro for Future Tactical Applications
		Design Project Specification for the Remote Data Controller
		Development and IM Testing of a Composite Point Defense Missile Propulsion System
		Development and Testing of Insensitive Energetic Reduced-Smoke (IERS) Propellants
		Development of a Solid Fuel Ramjet for Low-Altitude Flight
		The Development of an Extinguishable Propellant
		Development of Roll-Bonded Composite Motor Cases
		Diagnostic Measurements of 2 By 2 Motor Plumes
		Diamond: The Ultimate Durable Infrared Window Material
		Distributed Combustion Response Mechanisms
		Diversity Methods in Phase Monopulse Tracking–A New Approach
		The Effect of Impact Damage on Solid Propellant Sensitivity to Electrostatic Discharge
		The Effects of Incoherent Scattering on Ellipsometry in Polarization Analysis and Measurement
		The Effects of Incoherent Scattering on Ellipsometry
		Effects of Propellant Shear in Small Test Motors
		Electroless Ni-Induced Wear Morphology of Single Crystal Diamond Tools
		Electromagnetic Scattering from a Two Dimensional Randomly Rough Perfectly Conducting Surfaces: Iterative Methods
		Ellipsometric View on Reflection and Scattering From Optical Blacks
		Empirical Study of Solid Propellant Fire Hazards in Shipboard Compartments, Part 1

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Extinction Theorem Analysis of Diffraction Anomalies in Overcoated Gratings	J. Opt. Soc. Am., 1990
	Fluctuations and Dissipation in Brownian Motion	Am. J. Phys., **61**, 1993
	Fundamentally Discrete Stochastic Model for Wind Ripple Dynamics	Phys Rev. Lett., **71**, 1993
	Impact Sensitivity of Polynitroaromatics	J. Energetic Mater., **9** (4), November 1991
	Interaction Potential and Derived Scattering and Themodynamic Quantities of H_2 with the (001) MgO Surface	Surf. Sci., **247**, 1991
	A Low-Cost pH Meter for the Classroom	J. Chem. Ed. **69**(7), p. 563, July 1992
	Maximum Entropy Regularization in ISAR Imagery	IEEE Trans. Signal Proc., **40**, April 1992
	Measures of Confidence Associated With Combining Classification Results	IEEE Trans. Syst. Man Cybern, **21**, 1991
	On the Nonuniqueness of Uniform Waveguide Eigenvalue Formulas	IEEE Trans. Microwave Theory Tech., **MTT-40**, May 1992
	Optimizing Waveguide Cross Sections with Respect to Power-Handling Capability	IEEE Trans. Electromagnetic Compt., **EMC-34**, August 1992
	A Paradox of Wavelet Analysis	IEEE Trans on Pattern Analysis and Machine Intelligence
	Phase Monopulse Tracking and Its Relationship to Noncooperative Target Recognition	Radar and Sonar, Part II, **39**, 1992
	Powder Diffraction Data for Two Energetic Materials and a Proposed Intensity Figure of Merit	Powder Diffraction **6** (1), pp. 31-35, March 1991
	Power-Handling Capability of the Rhombic Waveguide	IEEE Trans Microwave Theory Tech., **38**, 1990
	Recent Development in Profiling Optical Surfaces	Appl. Opt.
	Recent Developments in Surface Roughness Characterization	Meas. Sci. Tech., **3**, 1992
	Recognition Mechanism for Saturating SIGMOID Neural Networks	Neural Computation
	Reply to Comments "An Exact Method of Integration for Vector Potentials of Thin Dipole Antenna"	IEEE Trans. Antennas Propag., **AP38**, April 1990
	Reply to Comments on "Power-Handling Capability of the Rhombic Waveguide"	IEEE Trans. Microwave Theory Tech., **MTT-40**, August 1992
	Reply to Comments on "TE and TM Modes of Some Triangular Waveguides Using Superposition of Plane Waves"	IEEE Trans. Microwave Theory Tech., **MTT-39**, March 1991
	Requirements for Optimal Glint Reduction by Diversity Methods	IEEE Trans. Aerospace Electron Eng., June 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		Enhanced Down-Range Profiles for Wideband Radar-Based Target Classification Using Phase-Front Derivative Statistics
		Enhancement in Aerothermal Shock Survivability of Lanthana-Strengthened Yttria Windows & Domes
		Erosion and Heating Correlations for Tungsten Subscale and Full Scale Thrust Vector Control (TVC) Vanes Exposed to Aluminized Propellants
		Error Reductions for a Serious Compensator Imperfection for Null Ellipsometry
		ESD Panel Activities Status Report
		An Exact Markovian Analysis of Effusion
		Existence Theorems for Positive Semi-definite and Sign Indefinite Stabilizing Solutions of High Riccati Equations
		Extinction Theorem Analysis of Diffraction Anomalies in Overcoated Gratings
		Extinguishable HTPB Propellant
		Factors Influencing Mechanical Properties of Propellants
		Fast Learning in Feedforward Layered Neural Networks
		Flame Response in Oscillatory Solid Propellant Combustion
		Fluctuation and Dissipation in Brownian Motion
		Fluid Dynamic/Combustion Interactions as Driving Mechanism of Pressure Oscillation
		A Fundamentally Discrete Stochastic Model for Landform Pattern Scale
		Fundamentally Discrete Stochastic Model for Wind Ripple Dynamics
		Generic Modular IIR (Imaging Infra-Red) Signal Processor
		Generic Modular VHSIC Signal Processor
		Guidance Integrated Fuzing Analysis and Simulation
		High Burning Rate High Pressure Non-Aluminized Solid Propellant Combustion Instability
		High Pressure Pulsed Motor Firing Combustion Instability Investigations
		High-Energy Airbreathing Missile Fuels
		High-Performance Reduced-Smoke Propellant Formulations
		High-Rate Flywheel Tensile Tester for Viscoelastic Materials
		Ignition Modeling Program
		Ignition Transient Modeling Program
		Impact Sensitivity of Polynitroaromatics
		Impact-Induced Delayed Reactions in Rocket Motors: Further Studies With a Planar Motor
		Infra-Red Seeker Trade-Off Requirements Model
		Infrared Systems Design From an Operational Requirement Using a HyperCard-Based Program
		Infrared Window and Dome Materials (Book)
		Insensitive Minimum-Signature Propellant Technology
		Insensitive Munitions-Smoke Propellants
		Insensitive, Reduced-Smoke Propellant Formulations for an VFDR Booster
		Interaction Potential and Derived Scattering and Thermodynamic Quantities of H_2 with the (001) MgO Surface

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Rings, Quadratic Forms, and Complete Degeneracy for a Subclass of Highly Overmoded Rectangular Waveguides	J. Math. Phys, July 1993
	Scalar Optical Beams With Helical Symmetry	Phys Rev A, **46**, September 1992
	Scaling Function Identification and Approximation	IEEE Trans Pattern Analysis Machine Intelligence, March 1993
	The Sensitivity of the Algebraic and Differential Riccati Equations	SIAM J. Control Optim., **28**, 1990
	State Space Measures of Robustness of Pole Location for Structured and Unstructured Perturbations	Systems and Control Lett., **16**, June 1991
	Sol-Gel Synthesis on Monoclinic Phase of Barium Aluminosilicate Ceramics	Mat. Res. Bull., Vol. 29, pp. 55-62, 1994
	On Coherent Vortex Formation in Axisymmetric Compressible Shear Layers	Turbulent Shear Flows 9, Springer-Verlag, 1993
	A Simple Approach to Mode Analysis for Parabolic Waveguides	IEEE Trans. Microwave Theory Tech, MTT-**39**, March 1991
	Wavelength and Angular Dependence of Light Scattering From Beryllium: Comparison of Theory and Experiment	Appl. Opt., **32**, July 1993
Electronic Devices	A 100 Element HBT Grid Amplifier	IEEE Trans. MIT, September 1993
	Anisotropic Optical Properties of $YBa_2Cu_3O_7$	J. Appl. Phys, **71**, 1992
	Diisopropylantimonyhydride (DIPSbH) for Low Temperature Epitaxial Growth of InSb	J. Cryst. Growth, **132**, pp. 371-376, 1993
	Idium Doping of HgCdTe Grown by MOCVD-Direct Alloy Growth Using Triisopropylindium and Diisopropyltellurium-Triisopropylindium Adduct	J. Electron, Mater., **22** (8), pp. 853-857, 1993
	Low-Temperature Organometallic Vapor Phase Epitaxy of InSb Using the Novel SbPrecursor Triisopropyantimony	Appl. Phys. Lett., **58** (12), pp. 1311-1313, March 1991
	Metallorganic Molecular Beam Epitaxy Doping of II-VI Compound Semiconductors	J. Cryst. Growth **138**, pp. 425-429, 1994
	A New n-Type Doping Precursor for MOCVD-IMP Growth of Detector Quality MCT	J. Electron. Mater., **22** (8), pp. 859-864, 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		Intermetallic Thermal Sensor for Full-Spectrum Cookoff Mitigation
		Large Diameter Sapphire Dome: Fabrication and Characterization
		Laser Initiation of Energetic Materials
		Laser Initiation of Propellants and Explosives
		Laser Recoil Combustion Response of HMX/GAP and CL-20/GAP Propellants at Atmospheric Pressure
		Light Scattering From Binary Optics
		Limitations of a Simplistic Method, Based Upon Density and Specific Impulse, in Computing the Detonation Pressure in Explosives Containing Metal and Halogen Fluorides
		A Low-Cost pH Meter for the Classroom
		Low-Drag Ramjet Combustor Development
		Mass Dependence of Time-Lag Focusing in Time-of-Flight Mass Spectrometry—An Analysis
		Maximum Entropy Regularization in ISAR Imagery
		Maximum Entropy Regularization of Linear Operator Equations
		Maximum Entropy Regularization With Multiresolution Recursion
		Measurement of Propellant Combustion Response to Sinusoidal Radiant Heat Flux
		Measures of Confidence Associated With Combining Classification Results
		Mechanical Evaluation of Yttria
		Mechanical Strength of Hemispheric Domes of Yttria and Lanthana-Doped Yttria
		A Micro Technique for Determining Graphite Content in Epoxy Composites
		Minimizing Defects in Infrared Coatings on Silicon
		Mitigation of Pressure Oscillations Induced by Supersonic Flow Over Slender Cavities
		Mixing and Combustion in a Spinning Combustor
		Multimission Propulsion Technology (MMPT)-Advanced Technology Demonstration Program Summary and Status
		Multisensor Fusion by Information Entropy Regularization
		Non-Linear Characteristics of Solid Propellant Combustion Instability
		Non-Linear Irritability Test Results of Full Scale Rocket Motors
		Non-Linear Test Results of Full Scale Rocket Motors
		A Note on Double Edge Diffraction for Parallel Wedges
		Numerical Investigations of Laminar Separated Viscous Trailing Edge Flow Using Triple-Deck Theory
		Numerical Techniques to Determine the Complete Creeping Wave Path
		On the Nonuniqueness of Uniform Waveguide Eigenvalue Formulas
		Optical Characterization of Transparent materials using Ellipsometry
		Optimizing Waveguide Cross Sections with Respect to Power-Handling Capability
		Optimizing Waveguide Cross Sections with Respect to Power-Handling Capability

TABLE (contd.)

CSF	Published	Paper Titles
Electronic Devices (contd.)	Synthesis, Characterization, and Reactivity of New Alkylgallium Acetylides	J. Organometallic Chem. **449**, p. 53, 1993
	Synthesis, Characterization, and Structure of Acetylenic Gallium Dialkylphosphides Having the Formula [{t-Bu)($Me_3SiC{=}C$)$GaPr_2$]$_2$ (R=Et,i-Pr, t-Bu)	Organometallics **11**(8), pp. 2816-2821, 1992
	Triisopropylantimony for Organometallic Vapor Phase Epitaxial Growth of GaSb and InSb	Appl. Phys. Lett. **58** (22), pp. 2532-2534, June 1991
	Triisopropylindium: Decomposition Studies and Use for Low Temperature Growth of InAs	Appl. Phys. Lett. **58**, p.2532, 1991
	The Use of Triisopropylantimony for the Growth of InSb and GaSb	J. Appl. Phys. **69**(11), p. 7605-7611, June 1991
Advanced Materials	^{13}C NMR Investigation of CVD Diamond: Correlation of NMR and Raman Spectral Linewidths	J. Mater. Res. **9**(3), pp. 631-635, 1994
	^{27}Al and ^{29}Si MAS NMR Spectroscopy of Mullite	Phys. Chem. Minerals **18**, pp. 47-52, 1991
	^{29}Si and ^{27}Al MAS NMR Spectroscopy of Glasses in the System $CaSiO_3$-$MgSiO_3$-Al_2O_3	Chem. Geo. **96**, pp. 387-397, 1991
	Accordion Polymers for Monolinear Optics	Macromolecules (Comm.) **25**, p. 6075, 1992
	Calorimetric Principles and Problems in Pd-D_2O Electrolysis	Frontiers of Cold Fusion, pp. 1130122, 1993
	Characteristic H-T Boundaries and Dissipation in $YBa_2Cu_3O_{7-d}$ Crystals	Phys. C**185**, Part 4, pp. 2229-2230, 1991
	Characterization of Dinitrobenzimidazoles, Using n.O.e Difference and Hetero-Correlated NMR	Magnetic Resonance Chem. **31**, pp.7-11, 1993
	Convenient One Pot Synthesis of tert-Butyldimethylantimony	Organometallics, pp. 967-969, February 1992
	Construction of an Inexpensive DC Plasma Jet for Diamond Deposition Using Commercially Available Components	Reviews of Scientific Instr. **63**, pp. 2065-2068, 1992
	Cross Polarization to Low-g Nuclei: the First ^{183}W CP MAS Spectra	Solid-State Nucl. Magnetic Resonance **1**(1), pp. 45-47, 1992
	Cross Polarization From ^{19}F to ^{29}Si and ^{19}Sn	J. Magnetic Resonance **96**, pp. 159-164, 1992
	Crosslinking Poly(ethylene oxide) and Poly[oxymethylene-oligo(oxyethylene)] With UV Radiation	Polymer Science, 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		A Paradox of Wavelet Analysis
		Passive Combustion Control in a Ducted Rocket with Side Mounted Inlets
		Phase Monopulse Tracking and Its Relationship to Noncooperative Target Recognition
		Phoenix Propulsion Improvement Investigations
		Plastic Rocket Motor Case
		Plume Energy Change for Airbreathing Engines Using a Low Cost Fuel Additive
		Plume Signature Predictions and Their Comparison With Data for Tactical Rocket Motors
		Polishing Study Using Teflon and Pitch Laps to Produce Flat and Supersmooth Surfaces
		A Porous Bed (DDT) Evaluation of UTP19, 360B Propellant
		Powder Diffraction Data for Two Energetic Materials and a Proposed Intensity Figure of Merit
		Power-Handling Capability of the Rhombic Waveguide
		Prediction and Application of Small-Scale Techniques to Cookoff of Full-Scale Motors
		Probing Behavior in Certain Optimal Perturbation Control Laws
		Propellant Combustion Response to Sinusoidal Radiant Heat Flux at 60 RSI
		Qualification of a Thermal Pulse Resulting from a 50 KG Warhead Detonation in Shipboard Compartment
		Radar Cross Section Extraction from Image Data
		Radiant Heat Flux Combustion Response of Oxidizers ADN, HMX, and RDX at One Atmosphere
		Recent Development in Profiling Optical Surfaces
		Recent Developments in Surface Characterization
		Recognition Mechanism for Saturating SIGMOID Neural Networks
		Reflection, Scattering and Polarization from Very Rough Surfaces
		Reflection, Scattering, and Polarization From a Very Rough Black Surface
		Reflection, Scattering, and Polarization From Very Rough Surfaces
		The Relationship Between Ballistic Impact Damage and Violent Reaction in Cased Propellant
		Reliable Determinations for Thermal Stability of Explosives
		Reply to Comments "An Exact Method of Integration for Vector Potentials of Thin Dipole Antennas"
		Reply to Comments on "Power-Handling Capability of the Rhombic Waveguide
		Reply to "Comments on TE and TM Modes of Some Triangular Waveguides Using Superposition of Plane Waves"
		Requirements for Future Airbreathing Propulsion Systems and Components
		Requirements for Optimal Glint Reduction by Diversity Methods
		Rings, Quadratic Forms, and Complete Degeneracy for a Subclass of Highly Overmoded Rectangular Waveguides
		Scalar Optical Beams with Helical Symmetry
		Scaling Function Identification and Approximation
		The Sensitivity of the Algebraic and Differential Riccati Equations

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	The Crystal Structures of Four Related 4,5,6,7-tetahydro-1,2,5-oxadiazolo[3,4-b] pyrazines	Acta Crystallogr. C**46**, pp.1853-1859, 1990
	Crystal Structure of $ZnGa_2S_4$, A Defect Sphalerite-Derivative	Acta Crystallogr. C**47**, 1991
	Crystalline Dimethylaminomethanediphosphonic Acid: The Existence of Anhydrous and Monohydrate Forms	Phosphorus, Sulfur, and Silicon **56**, pp. 1717-122, 1991
	Decomposition Mechanisms of Trivinylantimony and Reactions with Trimethylgallium	Chem. Mater., **3**(1), p. 96-100, 1991
	Decomposition Studies of Triisopropylantimony and Triallylantimony	J. Electron, Mater., **20**, p. 457-463, 1991
	Diamond Growth in a Direct Current Arcjet Diamond Reactor Using Remote Methane Injection	Appl. Phys. Lett. **63**, pp. 2487-2489, 1993
	Diamond Growth Usmg Carbon Monoxide as a Carbon Source	J. Mater. Res. **7**, pp. 1195-1203, 1992
	Diethyl(di-t-butylphosphino)borane and Related Compounds: The First Stable Monomeric Tetraalkyphosphinoborane	Organometallic **12**, pp. 2904-2910, August 1993
	Efficiency of Methane and Acetylene in Forming Diamond by Microwave Plasma Assisted Chemical Vapor Deposition	J. Mater. Res. **7**, pp. 1427-1431, 1992
	Electrochemical Studies of the Factors Influencing the Cycle Stability of Prussian Blue Films	J. Appl. Electrochem. **22**(4), pp. 325-331, 1992
	Electrostatic Probe Measurements for Microwave Plasma Assisted Chemical Vapor Deposition of Diamond	Appl. Phys. Lett. **59**, pp. 3387-3389, 1991
	Emission Measurements and Crystal-Field Calculations for $^4G_{5/2}$ to $^6H_{7/2}$ Transistions in Sm^{3+}:YAG	J. Appl. Phys. **70**, pp. 948-953, 1991
	Energy Levels and Correlation Crystal-Field Effects in Er^{3+}-Doped Garnets	Physical Review B**48**, pp. 15561-15570, 1993
	Energy Levels and Crystal Quantum States of Trivalent Holmium in Yttrium Aluminum Garnet	J. Appl. Phys. **69**(12), p. 8183-8204, June 1991
	Energy Levels and Upconversion Fluorescence in Trivalent Thulium-Doped Yttrium Scandium Aluminum Garnet	J. Appl. Phys. **73**, pp. 1929-1935, 1993
	Energy Levels of Cr^{3+} Ions in C_{3i} Sites of $Y_3Sc_2Al_3O_{12}$	Chem. Phys. **154**, pp. 437-447, 1991
	Evidence for Strong Phonon Coupling in Thermal Conductivity of $YBa_2Cu_3O_{7-d}$	Phys. Rev. B**45**(1), pp. 511-514, 1992

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		Seven- and Eight-Ind Liquid Fueled Ramjet Configuration Study for Air-to-Air Missiles
		A Simple Approach to Mode Analysis FM Parabolic Waveguides
		Slow Cookoff Test Technique
		Solid Fuel Ramjet Tests With Single Bypass
		Solid Propellant Combustion Instability Mechanisms Investigation Using Active Control
		Solid Propellant Flame Chemistry and Structure
		Some Potential Antenna Applications of High Temperature Superconductors
		Stability Testing of Full-Scale Tactical Motors
		State Space Measures of Robustness of Pole Location for Structured and Unstructured Perturbations
		Strength of Sapphire as a Function of Temperature and Crystal Orientation
		Study of Impact-Induced Detonation for Steel and Titanium Covered PBXN-107
		A Study of Impact-Induced Ignition/Combustion in Propellants Using a Planar Rocket Motor Model
		A Study of Impact-Induced Violent Reactions in Cased Propellant Using Planar Impact Model and Radiant Ignition/Burn Rate Measurements
		SU(3) Representative Matrices, Irreducible Matrix Elements, and New Uncertainty Principles
		Supersonic Submerged Heated Jets
		Suppression of Combustion-Induced Pressure Oscillations in a Liquid-Fueled Ramjet
		Suppression of Ignition Rix Rate in Solid Propellant Rocket Motors
		A Survey of Barrier Materials for Mitigating Sympathetic Detonation
		T-Burner Combustion Response of Instinctive Munition Propellants
		Target Detection Using Co-Occurrence Matrix Segmentation and Its Hardware Implementation
		Testing and Analysis of Heat Transfer in Materials Exposed to Non-Metallized HTPB Propellant
		Thermal Characterizations of Solid Propellant Formulations
		Thermal Decomposition and Drop Weight Impact Sensitivity
		Thermally Stable Silicon-Based Elastomers for Adhesives, Sealants, and Insulator Applications: The Effect of Elevated Temperature on Their Properties
		Trace Norm Bounds for the Stable Inverse Lyapunov Operator
		A Two-Subband Model of Transient Transport in a $GaAs/Al_xGa_{1-x}As$ Heterojunction
		Update of the AQM-127A Supersonic Low Altitude
		Use of Graphite/Epoxy Composites in Rapid Optical Beam Steering (ROBS) Telescope
		Wavelength and Angular Dependence of Light Scattering From Beryllium: Comparison of Theory and Experiment

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	Examination of the Chemistry Involved in Microwave Plasma Assisted Chemical Vapor Deposition of Diamond	J. Mater. Res. **6**, pp. 2134-2144, 1991
	Experimental Observations of Particle Diffusion in Concentrated Suspensions: Couette Flow	J. Rheology **35**(5), pp. 773-795, 1991
	The First Examples of ^{109}Ag CP/MAS Spectroscopy	J. Magnetic Resonance **97**, pp. 628-631, 1992
	Fluorine in Silicate Glasses: A Multinuclear NMR Study	Geochimicalt Cosmochimica **56**, pp. 701-707, 1992
	Gas Phase Chemistry in A Direct Current Plasma Jet Diamond Reactor	J. Appl. Phys. **74**, pp. 7521-7530, 1993
	Growth of Near-Free-Standing $YBa_2Cu_3O_7$-Type Crystals Using A Self-Decanting Flux Method	J. Cryst. Growth **118**, pp. 385-395, 1992
	High Temperature Sierrulate Nonlinear Optical Polymers	Organic Thin Films for Photonic Applications Technical Digest, **17**, pp. 14-17, 1993
	Identification of Hydrocarbon Precursors to Diamond in Chemical Vapor Deposition Using Carbon Monoxide Reagent	J. Mater. Res. **8**, pp. 2245-2249, 1993
	In Search of Chemical Clues: Single-Crystal Structural Studies of $PrBa_2Cu_3O_6$ and $PrBa_2Cu_3O_7$	Physica C**201**, pp. 233-248, 1992
	Infrared Characterization of Ternary Sulfide Single Crystals	Mater. Res. Bull. **28**, pp. 1345-1354, 1993
	Investigation of Interfacial Roughness of $In_xGa_{1-x}As$ Epitaxial Layers on GaAs and InP Substrates by Soft X-Ray Reflectivity	J. Appl. Phys., **69**, 1991
	Langmuir-Blodgett Multilayers of Fluorinated, Main-Chain Chromophoric, Optically Nonlinear Polymers	Amer. Chem. Soc., Polymer Preprints **32**(1), pp. 197-202, 1991
	Lattice Thermal Conductivity of $YBa_2Cu_3O_{7-d}$	Physica C**192**, pp. 435-442, 1992
	Linear and Nonlinear Photoconductivity From Charge-Producing Defects in CaF_2	J. Appl. Phys., **70**, August 1991
	Liquid- and Solid-State (CP/MAS) Multinuclear Magnetic Resonance Study of Some 2,5-dihydro-1,2,5-oxoniastannaboratoles - Carbon-Carbon Coupling Constants $^1J(^{13}C=^{13}C)$ in Organometallic Substituted Alkenes	Magnetic Resonance Chemistry **29**, pp. S3-S10, 1991
	Low Temperature Chemical Vapor Deposition of Sb Films Using $(i\text{-}Pr)_2SbH$	Chemistry of Mater. **5**, pp. 979-982, 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		Why Quantum Mechanics Cannot Be Formulated as a Markov Process
		Workshop Summary: Stop WAG-11 Meeting July 1991 Electrostatic Discharge Hazard Subgroup
Weapons, Cruise Missiles	1	Computation of the Unsteady Flowfield About a Counter-Rotating Propfan Cruise Missile
Weapons, Directed Energy	21	Atomic-Oxygen Exposure Results for Development Optics
		Bright Spot Backgrounds in the High Power Optical Train at HELSTF
		Characterization of the Absorption in Low Loss HF
		Defect-Free Fluoride Glass Development
		Fabrication and Characterization of Ion Beam Sputtered Coatings for HEL Optics
		Grating Requirements for Aperture-Sharing Elements in High Energy Laser Systems
		High Power Polarization and Phase Control Coatings for HF Lasers
		High-Power Laser Calorimetry of HF Beam-Expander Coatings
		Ion Beam Sputtered Coatings for HF Lasers
		Laser Device Development (LDD)
		Low Temperature Plasma-Enhanced Chemical Vapor Deposition (PECVD) of Low-Loss Optical Coatings for Space-Based Laser (SBL) Mirror Applications
		Mineral Quarry Results for Developmental Coatings and Optics
		Plasma-Assisted Chemical Vapor Deposition (CVD) of Refractory and Radiation-Resistant Optical Thin Film Materials and Enhanced Reflector Coatings for Spaceborne, High-Energy, Laser Mirror Application
		Preliminary EOIM-3/LDCE Results: NAWC Rome Lab Devel Optical Mater.
		Preliminary Hunters Trophy Results: NAWC Rome Lab Devel Optical Mater.
		Process Sensitivity Study of Ion-Sputtered and Magnetron-Sputtered Boron Nitride
		Pulsed Laser Damage in Coated Mirrors With a Low Density of Surface Defects
		Simulated Natural Space Radiation Testing of Multilayer Dielectric Mirrors for 2.7M Application
		Space Environmental Effects on Coated Laser Optics
		Space Shuttle Accelerated Atomic Oxygen Test Results
		Wavelength and Pulse Width Dependence of Nonlinear Threshold Values for Alkyl Sulfate and Carbon Suspension Liquid Cell Power Limiter Materials
Space Systems, Launch Vehicles	11	Fiscal Year 1993 Development Efforts of the Dual Mode Recovery System for Application to Future Emergency Escape Systems
		Results and Discussion of Qualification Tests for Service Release of the GQ Type 2000 Aeroconical Parachute Assembly in the NACES System
		Analysis of NACES Stabilizing Drogue in Supersonic Deployment Conditions
		Description and Results of the DT-1B In-Flight Ejection Tests for the Navy Aircrew Common Ejection Seat (NACES)

TABLE (contd.)

CSF	Published	Paper Titles
Space Systems, Launch Vehicles (contd.)		Results and Discussion of the Navy Aircrew Common Ejection Seat (NACES) Parachute Assembly Environmental Protection Evaluation
		Conduct and Results of the GQ Type 2000 Aeroconical Parachute Assembly Qualification Program for Service Release in the NACES System
		STRIP-DT-1A Parachute Suspension Evaluation Test Report
		Standard for Aerodynamic Decelerator and Parachute Drawings
		PCU-56 Sizing Mod, Test Report
		Data Trend Analysis Report for Navy Ejections (1976 Through 1989)
		Major Causes of Mishap-Related Fatalities and Major Injuries 1987-1993
Space Systems, Satellites	1	Free Electron Laser Power Beaming to Satellites at China Lake, California
C4I Systems, Airborne C4I	1	Development of a Target Control Console Communications Monitor Program with Bus Simulator
Electronic Devices	45	A 100 Element HBT Grid Amplifier
		A Convenient One Pot Synthesis of Tertiarybutyldimethylantimony
		Anisotropic Optical Properties of $YBa_2Cu_3O_7$
		Application of a Transient Hot Electron Transport Green's Function Approach to a Two Dimensional Model of a $GaAs/Al_xGa_{1-x}As$ Heterojunction
		Computer Aided Design of Microstrip Patch Arrays
		Cyclotron Resonance Measurements of the Sign Electron Mobility Transistor
		Decomposition Mechanisms of Antimony Source Compounds for Organometallic Vapor Phase Epitaxy
		Decomposition Mechanisms of Trivinylantimony and Reactions with Trimethylgallium
		Decomposition Studies of Triisopropylantimony and Triallylantimony
		Depletion Electric Field Induced Changes in Second-Harmonic Generation From GaAs
		Depletion-Electric Field Induced Changes in Second Harmonic Generation from GaAs

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)		Why Quantum Mechanics Cannot Be Formulated as a Markov Process
		Workshop Summary: Stop WAG-11 Meeting July 1991 Electrostatic Discharge Hazard Subgroup
Weapons, Cruise Missiles	1	Computation of the Unsteady Flowfield About a Counter-Rotating Propfan Cruise Missile
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		Analysis of NACES Stabilizing Drogue in Supersonic Deployment Conditions
		Description and Results of the DT-1B In-Flight Ejection Tests for the Navy Aircrew Common Ejection Seat (NACES)
		Results and Discussion of the Navy Aircrew Common Ejection Seat (NACES) Parachute Assembly Environmental Protection Evaluation
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Space Systems, Satellites	1	Free Electron Laser Power Beaming to Satellites at China Lake, California
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		Application of a Transient Hot Electron Transport Green's Function Approach to a Two Dimensional Model of a $GaAs/Al_xGa_{1-x}As$ Heterojunction
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		Cyclotron Resonance Measurements of the Sign Electron Mobility Transistor
		Decomposition Mechanisms of Antimony Source Compounds for Organometallic Vapor Phase Epitaxy
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		Depletion Electric Field Induced Changes in Second-Harmonic Generation From GaAs
		Depletion-Electric Field Induced Changes in Second Harmonic Generation from GaAs

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	Magnetic Properties of the New Conducting Radical Cation Salt (Trans-1,2-bis(2-naphthyl)ethene)SbF_6	Synthetic Metals **59**, pp. 71-80, 1993
	Mainchain Accordion Polymers for Nonlinear Optics	Macromolecules **25**, pp. 6075-6077, 1992
	Mainchain Syndioregic High Glass Transition Temperature Polymer for Nonlinear Optics: Synthesis and Characterization	J. Polym. Sci.: Part A: Polym. Chem. **31**, pp. 2899-2906, 1993
	Mass Spectroscopy Study of Products From Exposure of RDX Single Crystals to KrF Excimer	J. Appl. Phys. **69**, pp 3651-3691, 1990
	MOVPE Growth of InSb on GaAs Substrates	J. Crys. Growth **124**, pp. 363-370, 1992
	Mullite Formation From Non-Crystalline Precursors	J. Mater. Sci. **27**, pp. 805-812, 1992
	Mullite Precursor Phases	J. European Ceramic. Soc. **11**, pp. 87-94, 1993
	Multisite Optical Spectra and Energy Levels of Trivalent Thulium Ions in Yttrium Scandium Gallium Garnet	J. Appl. Phys. **74**, pp. 2891-2829, 1993
	Natrual-Abundance ^{13}C Dynamic Nuclear Polarization Experiments on Chemical Vapor Deposited Diamond Film	J. Mater. Res. **7**, pp. 2791-2797
	A New Radical Cation Salt: Electrocrystallization of Trans-1,2,-Bis(2-naphthyl)-ethene and X-Ray Crystallography Studies of the Resulting Radical Cation Salt	Makromolekulare Chemie **193**, p. 575, 1992
	A New n-Type Doping Precursor for MOCVD-IMP Growth of Detector Quality MCT	J. Elctron, Mater. **22**, pp. 859, 1993
	NMR Imaging of Shear-Induced Diffusion and Crystallization in Concentrated Suspensions Undergoing Couette Flow	J. Rehology **35**(1), pp. 191-201, 1991
	Nonlinear Optical Plymer With Chromophoric Mainchain	Makromolekulare Chemie, Rapid Comm. **11**(4), pp. 141-144, April 1990
	On the Crystal Structure of $KInS_2$-I	J. Solid State Chem. **92**, pp. 520-530, 1991
	Optical, Mechanical and Microstructral Properties of Yttrium Fluoride Coatings Fabricated by Conventional and Ion-Assisted Deposition	Opt. Soc. Am., October 1993
	Percolation Effects and Oxygen Inhomogeneities in $YBa_2Cu_3O_7$-d Crystals	Phys. Rev. B**45**(9), pp. 4916-4922, 1992

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TABLE (contd.)

CSF	Published	Paper Titles
Electronic Devices (contd.)		Deposition of Polycrystalline GaP Films from the Monomeric Precursor $(t\text{-}Bu)_2GaP(t\text{-}Bu)$
		Diisopropylantimonyhydride (DIPSbH) for Low Temperature Epitaxial Growth of InSb
		Excition Transitons in Narrow GaAs/AlGa as Quantum Wells
		The Growth of InSb Using Triisopropylantimony or Tertiarybutyldimethylantimony and Trimethylindium
		High-Efficiency Ku-Band HBT NIMIC Power Amplifier
		Indium Doping of MOCVD Grown HgCdTe Using Triisopropylindium
		Indium Doping of MOCVD Grown HgCdTe Using Triisopropylindium and Diisopropyltellurium-Triisopropylindium Adduct
		Indium Doping of MOCVD Grown HgCdTe Using Triisopropylindium and Triisopropylindium-Diisopropyltellurium Adduct
		Logarithmic Amplification for Passive Airborne Direction Finding in the 1990s
		Low-Temperature Organometallic Vapor Phase Epitaxy of InSb Using the Novel Sb Precursor Triisopropylastrimony
		Metalorganic Molecular Beam Epitaxy Doping of II-VI Compound Semiconductors
		A New Antimony Precursor, Diisopropylantimonyhydride: Pyrolysis and OMVPE Growth
		A New n-Type Doping Precursor for MOCVD-IMP Growth of Detector Quality MCT
		New Optical Materials for the Long-Wave (8-12 mm) Region: Design Criteria for the Solid-State Chemist
		OMPVC Growth of Epitaxial InSb Thin Films Using a Novel Group V Source Compound
		Photoconductivity Study of ZnSe
		Pyrolysis of Diisopropylantimonyhydride: A New Precursor for OMVPE
		Pyrolysis Pathways for Unsymmetrical Organotellurium Compounds
		Pyrolysis Pathways of Symmetrical and Unsymmetrical Organotellurium(II) Compounds
		Pyrolysis Studies and Deposition of Sb Film Using the Novel OMVPE Source $(i\text{-}Pr)_2SbH$
		Pyrolysis Studies of Single-Source Precursors to Gallium Phosphide
		Pyrolysis Studies of Single-Source Precursors to Gallium Phosphide
		Pulsed 1 Watt Heterojunction Bipolar Transistors at 35 GHz
		A Survey of Possible Passive Antenna Applications of High Temperature Superconductors
		Synthesis and Dielectric Properties of Substituted $LaAlO_3$
		Syntheses and Mechanistic Studies of Symmetric Tetraorganyltellurium (IV) (R_4Te) and Diorganotellurium(II) (R'_2Te) Compounds (R = R' = Me, n-Bu, Me_3SiCH_2, and $CH_2{=}CH$; R' = t-Bu and Allyl)

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	A Photoemission Study of Coherently Strained $In_xGa_{1-x}As/InP(100)$	Surf. Sci. **274**, 1992
	Physical Aging in Second-Order Nonlinear Optical Polymers	Trend in Polymer Sci. **1**(5), pp. 138-143, 1993
	Plasma Diagnostics of a DC Arcjet Chemical Vapor Deposition Diamond Reactor	Thin Solid Films **236**, pp. 91-95, 1993
	Polyazapolycyclics by Condensation of Aldehydes with Amines. 2. Formation fo 2,4,6,8,10,12-Hexabenzyl-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}.0^{3,11}] dodecanes From Glyoxal and Benzylamines	J. Organic Chem. **57**(25), pp. 6756-6759, 1992
	Polydimethylsiloxane-urea-urethane Copolymers With 1,4-benezenedimethanol as Chain Extender	Macromolecules **28**, pp. 7029-7036, 1993
	Poly[(4-n-ethlene-n-ethylamino)-a-cyanocinnamate]: A Nonlinear Optical Plymer With a Chromophoric Mainchain. 1. Synthesis and Spectral Characterization	J. Polym. Sci., Part A: Polm. Chem. **29**, pp. 1623-1631, 1991
	Powder Diffraction Data for $ZnGa_2S_4$	Powder Diffraction **5**(4), pp. 223-224, December 1990
	Powder Diffraction File Contributions #41-1091, #41-1092, #41-1093, #41-1094, #41-1095	International Centre For Diffraction Data, August 1991
	Powder Diffraction File Contribution #42-1176	International Centre For Diffraction Data, August 1992
	Preparation and Characterization of Polyurethanes Based on a Series of Fluorinated Diols	Chem. Mater. **5**, pp. 1299-1306, 1993
	Preparation of Symmetric Di(1-alkynyl) Tellurides and Diynes by Reduction of $TeCl_4$ With (1-alkynyl) Lithium Reagents	Organometallics **11**(1), pp. 418-422, 1992
	Preparation, Spectroscopic, and Cyclic Voltammetric Studies of Poly(1,4-napthalene vinylene) Prepared From a Cycloalkylene Sulphonium Salt Precursor Polymer	Polymer **31**, pp. 1632-1636, September 1990
	Pressure Dependence of T_c in $Tl_2Ba_2CaCu_2O_8$ at Hydrostatic Pressures to 6 GPa	Phys. Rev B**44**(22), pp. 12632-34, 1991
	Pyrolysis of Pathways of Symmetrical and Unsymmetrical Organotellurium(II) Compounds	Organometallic **10**(10), pp. 3590-3596, 1991
	A Re-Examination of ^{19}F NMR in Selected Solids With Conductor Ag_2F and Reference Insulators for $YBa_2Cu_3O_7$-Type Superconductors	Appl. Magnetic Resonance, 1990

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TABLE (contd.)

CSF	Published	Paper Titles
Electronic Devices (contd.)		Synthesis and Structure of the Novel Acetylanic Gallium Phosphide trans-[(t-Bu)(Me3SiC=C)GaPEt2]2
		Synthesis, Characterization, and Reactivity of New Alkylgallium Acetylides
		Synthesis, Characterization, and Structure of Acetylenic Gallium Dialkylphosphides Having the Formula [(t-Bu) (Me3SiC=C) GaPR2]2 (R=Et,*i*-Pr, *t*-Bu)
		(t-Bu)2GaAs(t-Bu)2: A Volatile Monomeric Arsinogallane
		A Three-Element, Superdirective Array of Electrically Small, High Temperature Superconducting Half-Loops at 500 MHz
		Triisopropylantimony for Organometallic Vapor Phase Epitaxial Growth of GaSb and InSb
		Triisopropylindium for OMVPE Growth
		Triisopropylindium: Decomposition Studies and Use for Low Temperature Growth of InAs
		The Use of Triisopropylantimony for the Growth of InSb and GaSb
Environmental Sciences	1	Instrumentation for On-Line Detection of Airborne Metal Aerosols
Human Systems	15	A Symbolic Theory of Decision-Making Applied to Human Resource Management
		Natural Language Lexicon Design in Support of Multimedia Content Search
		Human Factors Problems for Aircrew-Aircraft Interfaces: Where Should We Focus Our Efforts?
		Integrating Machine and Human Vision: Lessons from Automated Target Recognition Systems
		Laboratory and In-Flight Experiments to Evaluate the Efficacy of 3-D Audio Display Technology
		Man-Machine Interface with Simulated Automatic Target Recognition Systems
		Natural Scene Templates As Cueing Devices
		Natural Scene Templates As Cueing Devices
		Operator Performance in Pattern Matching as a Function of Reference Material Structure
		Targeting Decisions Using Multiple Imaging Sensors: Operator Performance and Calibration
		TAV-8B Flight Test Results for the Demonstration of an Airborne 3D Audio Cuer
		Agent-Based Pilot-Vehicle Interfaces: Concept and Prototype (IEEE Transactions on Systems, Man and Cybernetics)
		Target Acquisition During Desert Storm, (Proceedings of the Military Operations Research Society Symposium)
		The Effect of Knowledge-Based System Assistance on Piloting Performance, Workload, and Satisfaction (Proceedings of IEEE National Aerospace and Electronics Conference)
		Adaptive Aiding: Crawling Before We Walk (Proceedings of IEEE Conference)
Environmetal Quality	2	Lithium Fire Extinction Program
		Compact Incineration
Advanced Materials	220	13C NMR Investigation of CVD Diamond: Correlation of NMR and Raman Spectral Linewidths

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	Real Time X-Ray Scattering Stuides During the Conversion of a Precursor Polymer to Poly(p-phenylene vinylene)	Polymer **32**-5, p. 781, 1991
	Search for Anomalous Effects Involving Excess Power and Helium During D_2O Electrolysis Using Palladium Cathodes	Frontier of Cold Fusion, pp. 189-199, 1993
	Second-Order Nonlinear Optical Properties of Poled Coumaromethacrylate Copolymers	Appl. Phys. B**53**, pp. 287, 1991
	Shear-Induced Migration in Couette and Parallel-Plate Viscometers; NMR Imaging and Stress Measurements	Phys. Fluids **6**(8), pp. 2561-2576, 1994
	Single-Crystal Infrared Characterization of Ternary Sulfides	Mater. Res. Bull. **28**(12), pp. 1345-1354, 1993
	Site-Selective Polarized Spectroscopy of Trivalent Holmium-Doped Yttrium Aluminum Garnet	Phys. Rev. B**46**, pp. 8007-8012, 1992
	Solid-State (CP/MAS) ^{29}Si, ^{119}Sn and ^{207}Pb Nuclear Magnetic Resonance Study of Bis(pentamethylcyclo-pentadienyl)silicon,-tin and -lead	Magnetic Resonance Chem. **29**, pp. 260-263, 1991
	A Solid-State ^{13}C and ^{1}H NMR Study of Anomalous Acid Salts of Dibasic Carboxylic Acids	Magnetic Resonance Chem. **30**(5), pp. 440-448, 1992
	A Solid-State ^{15}N NMR Study of the Phase Transitions in Ammonium Nitrate	J. Phys. Chem. 97, pp. 11096-11102, 1993
	Solution and Solid-State NMR Spectra of Mono- and Di-acetamide Derived From 0,0'-Biphenyldiol	Aeitschrift Naturforschung **466**, pp. 97-103, 1991
	Spectroscopic Analysis of Tm^{3+}:$NaLa(MoO_4)_2$	J. Appl. Phys. **72**, pp. 4269-4274
	Spectroscopic Analysis and Passive Q-Switch Performance of Er^{3+} in Calcium Fluorophosphate	OSA Proc. on Advanced Solid State Lasers **15**, pp. 246-250, 1993
	The Structural Role of H_2O in Sodium Silicate Glasses: Results From ^{29}Si and ^{1}H NMR Spectroscopy	J. Phys. Chem. **96**(15), pp. 6406-6410, 1992
	A Study of ^{13}C-Enriched Chemical Vapor Deposited Diamond Films by Means of ^{13}C NMR, EPR, and Dynamic Nuclear Polarization	J. Chem. Phys. 99, pp. 3363-3379, 1993
	Sub-TG Relaxation Behavior in Nonlinear Optical Polymers and Views on Physical Aging	Polmer Preprints **33**(1), p. 114, 1992
	Sub-TG Relaxation Behavior of Corona-Poled Nonlinear Optical Polymer Films, and Views on Physical Aging	Macromolecules **25**, pp. 4888-4894, 1992

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		^{13}C-MAS-NMR Spectra of Technical Calcium Carbide and Barium Carbide – Are the C_2^{2}-Ions in Ionic Carbides Surrounded Symmetrically?
		^{27}Al and ^{29}Si MAS NMR Spectroscopy of Mullite
		^{29}Si and ^{27}Al MAS NMR Spectroscopy of Glasses in the System $CaSiO_3$-$MgSiO_3$-Al_2O_3
		Accordion Polymers for Nonlinear Optics
		Accordion Polymers: Syndioregic Designs for Facile Assembly into Polar Conformations
		Adhesion in Organic Polymer Matrix Composites
		Advanced High-Temperature Polymers for Integrated Optical Waveguides
		Alternate Titanium Source Compounds for CVD of Ti/TiC Coatings
		Amphiphilic Polymers With Syndioregic Mainchains for Second-Order Nonlinear Optical Investigations
		Amphiphilic Polymers with Syndioregic Mainchain for Second-Order Nonlinear Optical Investigations
		Analysis of the Optical Spectra of Trivalent Holmium in Yttrium Scandium Gallium Garnet (Ho^{3+}:YSGG)
		Anionic and Zwitterionic Photophysical Effects in Some Pyridinium Oxazole Laser Dyes
*		Anisotropic Optical Properties of $YBa_2Cu_3O_7$
		Anomolous Reaction of Pentafluorophenacyl Bromide With Hexamethylene-Tetramine. Structure of the Product
		Antireflection/Antioxidation Coatings and Polishing Results for PECVD Diamond Optics
		Bis(pyridyl)silane Ligands. 2. Structural Characterization and Catalytic Applications of Palladium Complexes in the Stille Reaction
		Bromine Trifluoride as an Oxidizing Solvent for Lithium Batteries
		Calorimetric Principles and Problems in Pd-D_2O Electrolysis
		Characterization of CL-20 Residues by FTIR Polymorphs, Clathrates and Decomposition
		Characterization of Dinitrobenzimidazoles, Using n.O.e Difference and Hetero-Correlated NMR
		Characterization of Microwave Plasma CVD of Diamond by Mass Analysis and Optical Emission Spectroscopy
		Characterization of the Microwave Plasma in the Chemical Vapor Deposition of Diamond Films
		Chemistry and Diagnostics of a DC Arcjet Diamond CVD Reactor
		CL-20 Impurities. Purification and Analysis Studies
		CL-20: A Promising New Ingredient
		Comparative Analysis of Nd^{3+} (4 F_3) Energy Levels in Four Garnet Hosts
		Composite Propellant Development for Improved IM Response
		Construction of an Inexpensive DC Plasma Jet for Diamond Deposition Using Commercially Available Components

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	Synthesis and Characterization of Compounds With a Group 12-Arsenic Bound. The Crystal Structure of $[^tBuZnAs(^tBu)_2]_2$	J. Organometallic Chem. **463**, pp. 97-101, 1993
	Synthesis and Characterization of New Monomeric Dialkylindium Amides	J. Organometallic Chem. **456**, pp. 31-34, 1993
	Synthesis and Explosive Properties of Benzotriazoles	Australia J. Chem. **45**, pp. 513-524, 1992
	Synthesis and Explosive Properties of Dinitropicrylbenz-imidazoles, and the "Trigger Linkage" in Dinitropicrylbenzotriazoles	Australian J. Chem. **45**, pp. 525-539, 1992
	Synthesis and Mechanistic Studies of Symmetric Tetraorganyltellurium(IV) (R_4Te) and Diorganotellurium(II) (R'_2Te) Compounds (R=R'=Me, n-Bu, Me_3SiCh_2, and Ch_2-CH; R'=t-Bu and Allyl)	Organometallics **10**, pp. 286-291, January 1991
	Synthesis and Photophysical Properties of Some 5(2)-Aryl-2(5)-(4-pyridyl) Oxazoles and Related Oxadiazoles and Furans	J. Heterocyclic Chem. **29**,. p. 1245, 1992
	Synthesis, Characterization, and Reactivity of New Alkylgallium Acetylides	J. Organometallic Chem. 449, pp. 53-59, 1993
	Synthesis, Characterization, and Structure of Acetylenic Gallium Dialkylphosphides Having the Formula $[(t\text{-}Bu)(Me_3SiC{=}C)GaPR_2]_2$ (R=Et,i-Pr,t-Bu)	Organometallics **11**(8), pp. 2816-2821, 1992
	Synthesis, Characterization, and Structural Studies of Lewis Base Adducts of Half-Open Vanadocenes, $V(C_5H_5)(Pdl)(L)$	Organometallics **12**, pp. 1553-1558, 1993
	Synthesis, Characterization, Structural and Kinetic Studies of Half-Open Chromocenes and Their Ligand Adducts	J. Am. Chem. Soc. **113**(17), pp. 6509-6520, 1991
	Synthesis of Disubstituted *4H,8H*-bis[1,2,5]oxadiazolo[3,4-b:3',4'-epyrazines[1]	J. Heterocyclic Chem. **28**, pp. 1677-1681, 1991
	Triisopropylindium for OMVPE Growth	J. Crys. Growth **124**, pp. 88-92, 1992
	Triisopropylindium: Decomposition Studies and Use for Low Temperature Growth of InAs	J. Crys. Growth **126**, pp. 309-316, 1993
	The Use of Triisopropylantimony for the Growth of InSb and BaSb	J. Appl. Phys. **69**(11), pp. 7605-7611, June 1991
	Yttrium Substitution in CaS	J. Am. Ceram. Soc. **75**(7), pp. 1988-1989, July 1992

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		
*		A Convenient One Pot Synthesis of Tertiarybutyldimethylantimony
		Correction to UV/VIS Spectrum in Stenger-Smith et al., in Makromol. Chem. Rapid Commun. 11(4) 141 (1990)
		Correlation of Excess Enthalpy and Helium Production in Cold Fusion Experiments
		Correlation of Excess Power and Helium Production During D_2O H_2O Electrolysis Using Palladium Cathodes
		Cross Polarisation to Low-G Nuclei: the First ^{183}W CP MAS Spectra
		Cross Polarization From ^{19}F to ^{29}Si and ^{119}Sn
		Crosslinking Poly(ethylene oxide) and Poly[oxymethylene-oligo(oxyethylene)] With UV Radiation
		A Crystal Chemical Study of Pyrope by Temperature Dependent FTIR and ^{29}Si MAS NMR Spectroscopy
		Crystal Structure of 2,4,8,10-tetranitro-2,4,8,10-tetraazaspiro[5.5]undecane (TNSU), An Energetic Spiro-Bicycle Nitramine
		The Crystal Structure of $KInS_2$
		Crystal Structure of $ZnGa_2S_4$, A Defect Sphalerite-Derivative
		The Crystal Structures of Four Related 4,5,6,7-tetrahydro-1,2,5-oxadiazolo[3,4-b]pyrazines
		Crystalline Dimethylaminomethanediphosphonic Acid: The Existence of Anhydrous and Monohydrate Forms
*		Decomposition Mechanisms of Antimony Source Compounds for Organometallic Vapor Phase Epitaxy
*		Decomposition Mechanisms of Trivinylantimony and Reactions with Trimethylgallium
*		Decomposition Studies of Triisopropylantimony and Triallylantimony
*		Depletion Electric Field Induced Changes in Second-Harmonic Generation From GaAs
*		Depletion-Electric Field Induced Changes in Second Harmonic Generation from GaAs
*		Deposition of Polycrystalline GaP Films from the Monomeric Precursor $(t\text{-}Bu)_2GaP(t\text{-}Bu)$
		Development and Performance/Hazard Testing of Bismuth Trioxide Dense Additive Propellants
		Diamond CVD Growth Chemistry
		Diamond Growth in a Direct Current Arcjet Diamond Reactor Using Remote Methane Injection
		Diamond Growth Using Carbon Monoxide as a Carbon Source
		Diethyl(di-t-butylphosphino)borane and Related Compounds: The First Stable Monomeric Tetraalkylphosphinoborane
*		Diisopropylantimonyhydride (DIPSbH) for Low Temperature Epitaxial Growth of InSb

TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)	Synthesis and Characterization of Cellular SiO_2 Materials by Foaming Sol Gel	Mech. Prop. Porous Cell. Mater., **207**, 1991
	Sol-Gel Synthesis on Monoclinic Phase of Barium Aluminosilicate Ceramics	Mat. Res. Bull. **29**, pp. 55-62, 1994

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		Discharge and AC Impedance Studies of Lithium, Calcium, and Magnesium Anodes in Bromine Trifluoride
		Does Color Indicate a Common Origin of Superconductivity in Cuprate Superconductors?
		The Effect of Elevated Temperatures on the Properties of Thermally Stable Silicon-Based Elastomers for Adhesives, Sealants, and Insulator Applications
		The Effect of Particle Size and Experimental Parameters on the Thermal Decomposition of Ammonium Dinitramide
		Efficiency of Methane and Acetylene in Forming Diamond by Microwave Plasma Assisted Chemical Vapor Deposition
		Electrochemical Calorimetric Evidence for Cold Fusion in the Palladium-Deuterium System
		Electrochemical Calorimetric Studies of the Cold Fusion Effect
		Electrochemical Calorimetric Studies of the Electrolysis of Water and Heavy Water (D_2O)
		Electrochemical Studies of the Factors Influencing the Cycle Stability of Prussian Blue Films
		Electrochromic Films Involving Prussian Blue and Viologen Materials
		Electronic Structure and Optical Spectra of $YBa_2Cu_3O_{7-\partial}$ Thin Films in the IR and UV Regions
		Electrostatic Probe Measurements for Microwave Plasma Assisted Chemical Vapor Deposition of Diamond
		Ellipsometric Characterization of Polymer Film
		Emission Measurements and Crystal-Field Calculations for $^4G_{5/2}$ to $^6H_{7/2}$ Transisitons in Sm^{3+}:Yag
		Energy Levels and Correlation Crystal-Field Effects in Er^{3+}-Doped Garnets
		Energy Levels and Correlation Crystal-Field Effects in Trivalent Erbium-doped Garnets
		Energy Levels and Crystal Quantum States of Trivalent Holmium in Yttrium Aluminum Garnet
		Energy Levels and Crystal Quantum States of Trivalent Holmium in Yttrium Aluminum Garnet II. Analysis of the Ultraviolet Spectrum
		Energy Levels and Crystal Quantum States of Trivalent Holmium in Yttrium Aluminum Garnet. I. Analysis of the Infrared and Visible Spectra
		Energy Levels and Upconversion Fluorescence in Tm:YSAG
		Energy Levels and Upconversion Fluorescence in Trivalent Thulium-Doped Yttrium Scandium Aluminum Garnet
		Energy Levels of Cr^{3+} Ions in C_{3i} Sites of $Y_3Al_5O_{12}$
		Energy Levels of Cr^{3+} Ions in C_{3i} Sites of $Y_3Sc_2Al_3O_{12}$
		Evaluation of Glass-Forming Potential of Complex Chalcogenides for Long Wavelength Infrared (LWIR) Applications
		Evidence for Strong Phonon Coupling in Thermal Conductivity of $YBa_2Cu_3O_{7-d}$
		Examination of the Chemistry Involved in Microwave Plasma Assisted Chemical Vapor Deposition of Diamond

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CSF	Published	Paper Titles
Weapons, ICBMs/SLBMs	Pressure Oscillations in Post-Challenger SRMs	CPIA Pub. No. 557, November 1990.
	Intermetallic Thermal Sensor for Full Spectrum Cookoff Mitigation	CPIA Pub. No. May 1993
Weapons, Conventional Missiles/Rockets	Cook-off Workshop Summary: Mechanistic Understanding and Predictive Capabilities	CPIA Pub. No. 582, April 1992
	Absorption Measurements in Propellant Flames	CPIA Pub. No. 573, November 1991
	Acoustic Motor Data Reduction and Analysis	CPIA Pub. No. 593, October 1992 Proc.
	Active Control of Organized Oscillations in a Dump Combustor Shear Layer	International Symposium on Pulsating Combustion, August 1991
	ADN Combustion Studies (U)	CPIA Pub. No. 606, November 1993.
	ADN Propellant Diffusion Flame Structure	CPIA Pub. No. 593, October 1992.
	Combustion of Propellants Containing a High Density, Inert Additive	CPIA Pub. No. 606, November 1993.
	A Comparison of Radiant Ignition and Ballistic Impact Chamber Results	CPIA Publ. No. 582, April 1992.
	Diagnostic Measurements of 2 by 2 Motor Plumes (U)	CPIA Pub. No. 595, February 1993
	Distributed Combustion Response Mechanisms	CPIA Pub. No. 550, October 1990
	The Effect of Impact Damage on Solid Propellant Sensitivity to Electrostatic Discharge	CPIA Pub. No. 582, April 1992
	Factors Influencing Mechanical Properties of Propellants	Proceedings of International Symposium Compatibility of Plastics and Other Materials with Explosives, Propellants and Pyrotechnics, April 1991
	Flame Response in Oscillatory Solid Propellant Combustion	CPIA Pub. No. 593, October 1992
	Fluid Dynamic/Combustion Interaction as Driving Mechanism of Pressure Oscillations in a Regenerative Liquid Propellant Gun	CPIA Pub. No. 550, October 1990
	High Burning Rate High Pressure Non-Aluminized Solid Propellant Combustion	CPIA Pub. No. 606, November 1993.
	High Pressure Pulsed Motor Firing Combustion Instability Investigation	CPIA Pub. No. 606, November 1993.

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		
*		Excition Transitons in Narrow GaAs/AlGa as Quantum Wells
		Experimental Observations of Particle Diffusion in Concentrated Suspensions: Couette Flow
		Experimental Observations of Particle Migration in Concentrated Suspensions: Couette Flow
		Factors Controlling the Sensitivity of HTPB/AP/Al Propellant
		The First ^{89}Y CP/MAS Spectra
		The First Examples of ^{109}Ag CP/MAS Spectroscopy
		Fluorinated, Mainchain Chromophoric Polymer: Langmuir Layer and Fourier Transform Infrared Spectroscopic Studies
		Fluorine in Silicate Glasses: A Multinuclear NMR Study
		Gas Phase Chemistry in A Direct Current Plasma Jet Diamond Reactor
		Gas Phase Chemistry in a DC Plasma Jet Diamond Reactor
*		The Growth of InSb Using Triisopropylantimony or Tertiarybutyldimethylantimony and Trimethylindium
		Growth of Near-Free-Standing $YBa_2Cu_3O_7$-Type Crystals Using A Self-Decanting Flux Method
		Heat and Helium Production in Cold Fusion Experiments
		Helium Production During the Electrolysis of D_2O in Cold Fusion Experiments
		Helium Production During the Electrolysis of Deuterium Oxide in Cold Fusion Experiments
		High Elongation Elastomers
		High Temperature Sterrulate Nonlinear Optical Polymers
		Identification of Hydrocarbon Precursors to Diamond in Chemical Vapor Deposition Using Carbon Monoxide Reagent
		In Search of Chemical Clues: Single-Crystal Structural Studies of $PrBa_2Cu_3O_6$ and $PrBa_2Cu_3O_7$
		In Situ Pulsed Laser Deposition of $Nd_{1.85}Ce_{0.15}CuO_{4-Y}$
*		Indium Doping of MOCVD Grown HgCdTe Using Triisopropylindium
*		Indium Doping of MOCVD Grown HgCdTe Using Triisopropylindium and Diisopropyltellurium-Triisopropylindium Adduct
*		Indium Doping of MOCVD Grown HgCdTe Using Triisopropylindium and Triisopropylindium-Diisopropyltellurium Adduct
		Infrared Characterization of Ternary Sulfide Single Crystals
		Insensitive and High Energy CL-20 Minimum-Smoke Propellant
		Investigation of Interfacial Roughness of $In_xGa_{1-x}As$ Epitaxial Layers on GaAs and InP Substrates by Soft X-Ray Reflectivity
		JCPDS Powder Diffraction File Contributions W16830, W16831, W16833, W16834
		Langmuir-Blodgett Multilayers of Fluorinated, Main-Chain Chromophoric, Optically Nonlinear Polymers
		Lauryl Methacrylate Propellants

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Aerogrid Fuel Injector Demonstration in A Liquid Fueled RAMJET	CPIA Pub. No. 580, February 1992
	Combustion Stability of Side-Dump RAMJET Combustors	CPIA Pub. No., November 1993
	Degradable and Hydrolyzable Binder Explosives	International Symposium on Energetic Materials Technology, October 1992
	Development and Testing of Insensitive Energetic Reduced-Smoke (IERS) Propellants	CPIA Pub. No. 602, November 1993
	Phoenix Propulsion Improvement Investigations	CPIA Pub. No. 602, November 1993
	Plastic Rocket Motor Case	CPIA Pub. No. 602, November 1993
	Plume Energy Change for Airbreathing Engines Using a Low Cost Fuel Additive	CPIA Pub. 602, November 1993
	Seven- and Eight-Inch Liquid Fueled RAMJET Configuration Study for AIR-TO-AIR MISSILES	CPIA Pub. 602, November 1993
	Prediction and Application of Small-Scale Techniques to Cook-Off of Full-Scale Motors	CPIA Pub., April, 1990
	Reliable Determinations for Thermal Stability of Explosives	CPIA Pub., April 1993
	Requirements for Future Airbreathing Propulsion Systems and Components	CPIA Pub. 602, November 1993
	Solid Fuel RAMJET Tests with Single Bypass	CPIA Pub. 602, November 1993
	Suppression of Combustion-Induced Pressure Oscillations in a Liquid-Fueled RAMJET	CPIA Pub., October 1992
	Suppression of Ignition Rise Rate in Solid Propellant Rocket Motor	CPIA Pub. 602, November 1993
	A Survey of Barrier Materials for Mitigating Sympathetic Detonation	CPIA Pub., May 1993
	Testing and Analysis of Heat Transfer in Materials Exposed to Non-Metalized HTPB Propellant	CPIA Pub., December 1992
	Update on the AQM-127A Supersonic Low Altitude Target (SLAT) Program	CPIA Pub. 602, November 1993
	High-Performance, Reduced-Smoke Propellant	CPIA Pub. No. 550, October 1990
	High-Rate Flywheel Tensile Tester for Viscoelastic Materials	CPIA Pub. 582, April 1992
	Ignition Modeling Program	CPIA Pub. No. 593, October 1992
	Impact-Induced Delayed Reactions in Rocket Motors: Further Studies With a Planar Model	CPIA Pub, 582, April 1992
	Insensitive Minimum-Signature Propellants (IMAD-301 Propellants)	CPIA Pub. No. 550, October 1990
	Laser Recoil Combustion Response of HMX/GAP, and CL-20/GAP Propellants at Atmospheric Pressure	CPIA Pub. No. 606, November 1993.

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CSF	Published	Paper Titles
Advanced Materials (contd.)		Linear and Nonlinear Photoconductivity From Charge-Producing Defects in CaF_2
		Linear and Nonlinear Photoconductivity of CaF_2
		Liquid- and Solid-State (CMPAS) ^{13}C- and ^{207}Pb Nuclear Magnetic Resonance Study of Two Triorganolead Methoxides and a Stabilized Triorganolead Cation
		Liquid- and Solid-State (CP/MAS) Multinuclear Magnetic Resonance Study of Some 2,5-dihydro-1,2,5-oxoniastannaboratoles – Carbon-Carbon Coupling Constants $^1J(^{13}C=^{13}C)$ IN ORGanometallic Substituted Alkenes
		Low Temperature Chemical Vapor Deposition of Sb Films Using $(i\text{-}Pr)_2SbH$
*		Low-Temperature Organometallic Vapor Phase Epitaxy of InSb Using the Novel Sb Precursor Triisopropylastrimony
		Macromer Thermoplastic Elastomers as Binders for Explosives Propellants
		Magnetic Properties of the New Conducting Radical Cation Salt (*Trans*-1,2-bis(2-naphthyl)ethene)SbF_6
		Mainchain Accordion Polymers for Nonlinear Optics
		Mainchain Nonlinear Optical Polymers: Efforts towards Higher T_g and Higher $x^{(2)}$
		Mainchain Syndioregic High Glass Transition Temperature Polymer for Nonlinear Optics: Synthesis and Characterization
		Mass Spectrometry Studies of Diamond Deposition
		Mass Spectroscopy Study of Products From Exposure of RDX Single Crystals to KrF Excimer
		Material and Spectroscopic Properties of Cr in Different Oxidation States in Calcium Fluorapatite
		Measurement of the Sommerfeld Constant in $YBa_2Cu_3O_{7-d}$
*		Metalorganic Molecular Beam Epitaxy Doping of II-VI Compound Semiconductors
		Minor Components of CL-20
		Modification of Ion-Beam Sputtered Dielectric Thin Films by Low Energy Ion Bombardment
		Modification of Properties of Ion-Beam-Sputtered Yttrium-Oxide Thin Films by Low-Energy Ion Bombardment
		Molecular Dynamics of Polybenzimidazole and Contributions From Chaos
		Molecular Vapor Synthesis: The Use of Titanium Monoxide and Vanadium Monoxide Vapors as Reagents
		MOVPE Growth of InSb on GaAs Substrates
		Mullite Formation From Non-Crystalline Precursors
		Mullite Precursor Phases
		Multisite Optical Spectra and Energy Levels of Trivalent Thulium Ions in Yttrium Scandium Gallium Garnet
		Natural-Abundance ^{13}C Dynamic Nuclear Polarization Experiments On Chemical Vapor Deposited Diamond Film
*		A New Antimony Precursor, Diisopropylantimonyhydride: Pyrolysis and OMVPE Growth

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Measurement of Propellant Combustion Response to Sinusoidal Radiant Hear Flux	CPIA Pub. No. 557, November 1990
	Non-Linear Characteristics of Solid Propellant Combustion Instability	CPIA Pub. No. 593, October 1992
	Nonlinear Instability Test Results of Full Scale Rocket Motors	CPIA Pub. No. 550, October 1990
	Non-Linear Stability Testing and Pulsing of Full-Scale Tactical Motors	CPIA Pub. No. 568, May 1991
	Plume Signature Predictions and Their Comparison With Data for Tactical Rocket Motors (U)	CPIA Pub. No. 595, February 1993
	A Porous Bed (DDT) Evaluation of UTP19,360B Propellant	CPIA Pub., May 1993
	Radiant Heat Flux Combustion Response of Oxidizers ADN, HMX, and RDX at One Atmosphere	CPIA Pub. No. 593, October 1992
	The Relationship Between Ballistic Impact Damage and Violent Reaction in Cased Propellant	CPIA Pub. No. 562, March 1991
	Solid Propellant Combustion Instability Mechanisms Investigation Using Active Control	CPIA Pub. No. 593, October 1992
	Lauryl Methacrylate Propellants	CPIA Pub. No. 606, November 1993.
	The Effect of Ballistic Impact Damage on Violent Reaction in Cased Propellant	Proc. 12th International Symposium on Ballistics, Vol. III, 1990
	Plate Curvature Effects on Ballistic Limit and Fragmentation	Proc. 12th International Symposium on Ballistics, Vol. III, 1990
	Performance Characteristics of Shrouded Supersonic Rectangular and Tapered Elliptic Jets	CPIA Pub. No. 550, October 1990
	Aging Properties of Propellants Containing GAP and AN	CPIA Pub. No. 550, October 1990
	Distributed Combustion Response Mechanisms	CPIA Pub. No. 557, November 1990
	Combustion Enhancement Through Axial Vorticity	CPIA Pub. No. 557, November 1990
	The Thermal Decomposition of Beta CL-20	CPIA Pub. No. 557, November 1990
	Microexplosion of Highly Loaded Slurries	CPIA Pub. No. 557, November 1990
	Microexplosion of Highly Loaded Slurries	CPIA Pub. No. 557, November 1990
	CL-20 and CL-20/Energetic Binder Combustion Chemistry (U),	CPIA Pub. No. 557, November 1990
	CBRED II A Versatile Tool for the Characterization of Damaged Propellants	CPIA Pub. 562, March 1991
	Recent Utilization of the Porous Bed (DDT) Code at the Naval Weapons Center	CPIA Pub. 562, March 1991
	Comparison of Damage-Created Voids With Other Void Types in Energetic Materials	CPIA Pub. 562, March 1991
	Modeling Sympathetic Detonation	CPIA Pub. 562, March 1991

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		A New Class of Mainchain Chromophoric Nonlinear Optical Polymers
*		A New n-Type Doping Precursor for MOCVD-IMP Growth of Detector Quality MCT
*		New Optical Materials for the Long-Wave (8-12 mm) Region: Design Criteria for the Solid-State Chemist
		A New Radical Cation Salt: Electrocrystallization of Trans-1,2-Bis(2-naphthyl)-ethene and X-Ray Crystallography Studies of the Resulting Radical Cation Salt
		New Syndioregic Mainchain, Nonlinear Optical Polymers and Their Ellipsometric Characterization
		New Syndioregic Mainchain, Nonlinear Optical Polymers with High Chromophoric Content
		Next Generation Syndioregic Nonlinear Optical Polymers
		NMR Imaging of Shear-Induced Diffusion and Crystallization in Concentrated Suspensions Undergoing Couette Flow
		A Non-Linear Optical Polymer with a Chromophoric Mainchain Part 1: Synthesis and Spectral Characterization
		Nonlinear Optical Polymer With Chromophoric Main Chain
*		OMPVC Growth of Epitaxial InSb Thin Films Using a Novel Group V Source Compound
		On the Crystal Structure of $KInS_2$-I
		Optical Properties of InGaAs Lattice-Matched to InP
		Optical Spectra and Energy Levels of Trivalent Thulium Ions in Yttrium Scandium Aluminum Garnet
		Optical Spectra, Energy Levels, and Emission Intensity Calculations of Trivalent Thulium Ions in Gadolinium Scandium Gallium Garnet
		Optical, Mechanical and Microstructural Properties of Yttrium Fluoride Coatings Fabricated by Conventional and Ion-Assisted Deposition
		Organic Polymeric Materials for Nonlinear Optics: Oligopeptide-Bound Chromophores in ß-Sheets
		An Organomettalic Polymine Copolymer Prepared From $\{h^6$-1,4-bis(CHO)$C_6H_4\}Cr(CO)_3$ and 1,3-phenylenediamine
		Overview: High Speed Dynamics and Modeling as it Applies to Energetic Solids
		Parametric Effects of Plasma Emission Produced During Excimer Laser Ablation of $YBa_2Cu_3O_{7-x}$
		Parametric Effects on Plasma Emission Produced During ArF and KrF Excimer Laser Ablation of $YBa_2Cu_3O_{7-x}$
		Percolation Effects and Oxygen Inhomogeneities in $YBa_2Cu_3O_{7-d}$ Crystals
		Perspectives On the Recrystallization of CL-20
*		Photoconductivity Study of ZnSe
		A Photoemission Study of Coherently Strained $In_xGa_{1-x}As$/InP(100)

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Wedge Test Results of Minimum Signature Propellants and the Effect of Formulation Parameters on Their Shock Sensitivity,	CPIA Pub. 562, March 1991
	Applying 'FRAGMAP' to Sympathetic Detonation Analyses	CPIA Pub. 562, March 1991
	A Measure of Propellant Damage Due to Fragment Impact	CPIA Pub. 562, March 1991
	Fluorine-Containing Binders	Proc. International Symposium Compatibility of Plastics and Other Materials with Explosives, Propellants and Pyrotechnics, April 1991
	An Evaluation of CL-20 Propellant Formulations (U)	CPIA Pub. 563, April 1991
	Electrostatic Discharge (ESD) Hazards Evaluation of CL-20	CPIA Pub. 563, April 1991
	Combustion Instability Measurements of CL-20 Propellants	CPIA Pub. 563, April 1991
	The Calculated Performance of CL-20 in High-Energy Gun Propellants and in Ball Powder (U)	CPIA Pub. 563, April 1991
	Energetic Compositions Containing CL-20 (U)	CPIA Pub. 563, April 1991
	The Effect of Nozzle Geometry on the IR Emission of Particle-Laden Plumes	CPIA Pub. No. 568, May 1991
	Thermal Imaging of Ramjet Plumes (U)	CPIA Pub. No. 568, May 1991
	Rocket Motor Scale Effects on IR Signature	CPIA Pub. No. 568, May 1991
	Use of Chemiluminescence and Neural Networks in Active Combustion Control	Proceedings of the 3rd International Symposium on Combustion/The Combustion Institute, pp. 1101-1106, 1991
	Effect of Gaseous Fuel Mixing on Boron Combustion in Ducted Rocket With Side Dump	Proceedings of the Second International Symposium on Special Topics in Chemical Propulsion: Combustion of Boron-Based Solid Propellants and Solid Fuels, March 1991.
	Hazards of Energetic Materials and Their Relation to Munitions Survivability	Proceedings of the 22nd International Annual Conference of ICT, July 1991
	Ignitability Measurements of Solid Propellants	Proceedings of the 22nd International Annual Conference of ICT, July 1991
	Study of Combustion Dynamics For Passive and Active Control	Proceedings of the 13th International Colloquium on Dynamics of Explosions and Reactive Systems, July-August 1991
	Wavelet Analysis of a Controlled Pulsating Flame	Proceedings of the International Symposium on Pulsating Combustion, August 1991
	Three-Dimensional Vortical Structure of a Turbulent Flame	Proceedings of the 8th Symposium Turbulent Shear Flows, September 1991.

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		Physical Aging in Second-Order Nonlinear Optical Polymers
		Plasma Diagnostics of a DC Arcjet Chemical Vapor Deposition Diamond Reactor
		Plasma Diagnostics of a DC Arcjet Diamond CVD Reactor
		Plasma Parameters in Microwave Plasma Assisted Chemical Vapor Deposition of Diamond
		Polar Order in Folded Backbone Polymers
		Polyazapolycyclics by Condensation of Aldehydes With Amines. 2. Formation of 2,4,6,8,10,12-Hexabenzyl-2,4,6,8,10,12-hexaazatetracyclo[5.5.0.0^{5,9}.0^{3,11}]dodecanes From Glyoxal and Benzylamines
		Polyazapolycyclics by Condensation of Aldehydes With Amines. 3. Formation of 2,4,6,8-tetraazabicyclo[3.3.0]octanes From Formaldehyde, Glyoxal, and Benzylamines
		Polydimethylsiloxane-urea-urethane Copolymers With 1,4-benzenedimethanol as Chain Extender
		Polymorphs and Thermal Properties of CL-20
		Polymorphs and Thermal Properties of Hexanitrohexaazaisowurtzitane
		Poly[(4-n-ethylene-n-ethylamino)-a-cyanocinnamate]: A Non-Linear Optical Polymer With A Chromophoric Mainchain. 1. Synthesis and Spectral Characterization
		Powder Diffraction Data for $ZnGa_2S_4$
		Preliminary Infrared Characterization of Ternary Sulfide Single Crystals
		Preparation and Characterization of Polyurethanes Based on a Series of Fluorinated Diols
		Preparation and Evaluation of Novel Inorganic Composites as Highly Energetic Materials
		Preparation and Optical Properties of Nd-Al Doped Glass from Gels
		Preparation and Phase Transformation of Polymorphs of HNIW
		Preparation of Symmetric Di(1-alkynyl) Tellurides and Diynes by Reduction of $TeCl_4$ With (1-alkynyl) Lithium Reagents
		Preparation, Purification, and Densification of Zinc Sulfide Powder From Organometallics
		Pressure Dependence of T_c in $Tl_2Ba_2CaCu_2O_8$ at Hydrostatic Pressures to 6 GPa
		A Property Trend Study of Polybenzimidazole Using Molecular Modeling
		Pyrolysis and Film Growth Studies of Phosphinoborane Compounds
*		Pyrolysis of Diisopropylantimonyhydride: A New Precursor for OMVPE
*		Pyrolysis Pathways for Unsymmetrical Organotellurium Compounds
*		Pyrolysis Pathways of Symmetrical and Unsymmetrical Organotellurium(II) Compounds

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Suppression of Combustion Instabilities by Active Shear-Flow/Combustion Control	Proceedings of the 10th International Symposium on Air Breathing Engines, September 1991
	Aluminum Combustion Effects on Combustion Instability of High Burn Rate Propellants	CPIA Pub. No. 573, October 1991
	The Role of External Radiation in the NWC Combustion Model	CPIA Pub. No. 573, October 1991
	The Effect of Propellant Ingredients on the Combustion of CL-20 and Its Residue (U)	CPIA Pub. No. 573, October 1991
	Temperature Sensitivity of CL-20 Deflagration (U)	CPIA Pub. No. 573, October 1991
	Propellant Development: From Idea to Motor	CPIA Pub. No. 573, October 1991
	Combined Active-Passive Control of a Dump Combustor	CPIA Pub. No. 573, October 1991
	Propellant Diffusion Flame Structure	CPIA Pub. No. 573, October 1991
	Measurement of Propellant Combustion Response To Sinusoidal Radiant Heat Flux at 150 psi: Current Experimental Status	CPIA Pub. No. 573, October 1991
	Aluminum Combustion Effects on Combustion Instability of High Burn Rate Propellants	CPIA Pub. No. 573, October 1991
	An Assessment of Cookoff Modeling and Codes	CPIA Pub. No. 586, April-May 1992
	Wavelet Representation of the Multifractal Nature of a Premixed Flame	Proceedings of the 24th International Symposium on Combustion, July 1992
	Wavelet Analysis of the Nonlinear Transition from Actively Stabilized Combustion to Limit Cycle Instability	Proceedings of the 24th International Symposium on Combustion, July 1992
	The Chemistry of Extinguishable Propellants	Proceedings of the 18th International Pyrotechnics Seminar, July 1992
	Fire Extinguishing Pyrotechnics	Proceedings of the 18th International Pyrotechnics Seminar, July 1992
	Combustion Characteristics and Passive Control of an Annular Dump Combustor	CPIA Pub. No. 593, October 1992
	Mixing Enhancement in Particle-Laden Flows	CPIA Pub. No. 593, October 1992
	Combustion Characteristics and Passive Control of an Annular Dump Combustor	CPIA Pub. No. 593, October 1992
	The Reaction of Ammonium Dinitramide Under Thermal Load	CPIA Pub. No. 593, October 1992
	Ammonium Dinitramide Combustion Studies (U)	CPIA Pub. No. 593, October 1992
	High Pressure CL-20 Combustion Studies (U)	CPIA Pub. No. 593, October 1992

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		Pyrolysis Studies and Deposition of Sb Film Using the Novel OMVPE Source $(i\text{-}Pr)_2SbH$
*		Pyrolysis Studies of Single-Source Precursors to Gallium Phosphide
*		Pyrolysis Studies of Single-Source Precursors to Gallium Phosphide
		A Re-Examination of ^{19}F NMR in Selected Solids With Conductor Ag_2F and Reference Insulators for $YBa_2Cu_3O_7$-Type Superconductors
		Real Time X-Ray Scattering Studies During the Conversion of a Precursor Polymer to Poly(p-phenylene vinylene)
		Recent Synthetic Developments in Mainchain Chromophoric Nonlinear Optical Polymers
		The Recrystallization of CL-20
		Relative Stabilities and Self-alignment Tendencies of Peptide-based NLO Materials
		A Rigorous Derivation of the Chemical Master Equation
		Room Temperature MOCVD of Sb_2Te_3 Films and Solution Precipitation of M_2Te_3 (M=Sb,Bi) Powders Via a Novel N,N-dimethylaminotrimethylsilane Elimination Reaction
		Search for Anomalous Effects Involving Excess Power and Helium During D_2O Electrolysis Using Palladium Cathodes
		Search for Anomalous Effects Involving Excess Power, Helium, and Tritium During D_2O Electrolyses Using Palladium Cathodes
		Second Harmonic Generation From New Dyes in Polymer Films
		Second-Order Nonlinear Optical Measurements in Guest-Host and Side-Chain Polymer
		Second-Order Nonlinear Optical Properties of Poled Coumaromethacrylate Copolymers
		Site-Selective Polarized Spectroscopy of Trivalent Holmium-Doped Yttrium Aluminum Garnet
		Sol-Gel Synthesis of $BaO\text{-}Al_2O_3\text{-}SiO_2$ Ceramic
		Solid and Solution State NMR Studies on Energetic Materials at the NAWCWPNS/Solid and Solution State NMR Studies on Optical & Electronic Materials at the NAWCWPNS
		Solid State Conducting Polymer Devices
		Solid State Laser Materials for Naval Applications
		Solid-State (CP/MAS) ^{29}Si, ^{119}Sn and ^{207}Pb Nuclear Magnetic Resonance Study of Bis(pentamethylcyclo-pentadienyl)silicon, -tin and -lead
		A Solid-State ^{13}C and ^{1}H NMR Study of Anomalous Acid Salts of Dibasic Carboxylic Acids
		Spectrophotometric and Electrochemical Quartz Crystal Microbalance Investigations of Viologen and Poly(viologen) Films
		Spectroscopic Analysis and Passive Q-Switch Performance of Er^{3+} in Calcium Fluorophosphate
		Spectroscopic Analysis of Er^{3+} $(4f^{11})$ in $Y_3Sc_2Al_3O_{12}$

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Materials Characterization of Ablative Insulators	CPIA Pub. No. 593, October 1992
	Lessons Learned in Combustion Instability	CPIA Pub. No. 593, October 1992
	Combustion Response of Double Base Ammonium Nitrate Propellants at 1000, 2000, and 3000 psi	CPIA Pub. No. 593, October 1992
	Radiant Heat Flux Combustion Response of Oxidizers HMX, RDX, and ADN at One Atmosphere	CPIA Pub. No. 593, October 1992
	Flame Response in Oscillating Solid Propellant Combustion	CPIA Pub. No. 593, October 1992
	Supersonic Mixing Studies Using Flow Visualization (U)	CPIA Pub. No. 595, February 1993
	Closed-Loop Control of Combustion in a Flame and a Dump Combustor	IEEE Control Systems Magazine, April 1993
	Processing Aspects of Minimum-Signature Propellants	CPIA Pub. No. 597, April 1993
	Planar Mie Scattering Visualization of Reacting and Nonreacting Supersonic Coaxial Jets	Third International Symposium on Special Topics in Chemical Propulsion: Non-Intrusive Combustion Diagnostics, May 1993 (Begell House, New York, NY)
	Factors Controlling the Sensitivity of HTPB/AP/Al Propellant	1993 JANNAF Propulsion Systems Hazards Subcommittee Meeting, CPIA Pub. May 1993
	An Inert Simulant for a High-Elongation Class 1.1 Propellant	1993 JANNAF Propulsion Systems Hazards Subcommittee Meeting, CPIA Publication, May 1993
	Thermal Characterizations of Solid Propellant Formulations	1993 JANNAF Propulsion Systems Hazards Subcommittee Meeting, CPIA Pub., May 1993
	Electrostatic Discharge (ESD) Hazards of Energetic Materials	Proceedings of the Tenth International Detonation Symposium, July 1993
	Comparison of Damage-Created Voids With Other Void Types in Energetic Materials	Proceedings of the Tenth International Detonation Symposium, July 1993.
	The Application of Ballistic Impact and Radiant Ignition Techniques for Characterization of Violent Reaction in Cased Propellant	Proceedings of the Tenth International Detonation Symposium, July 1993.
	Actively Controlled Compact Waste Incinerator	1993 JANNAF Safety and Environ. Protection, August 1993
	Enhancement of Combustion Properties by Control of Air/Fuel Mixing in Turbulent Flames	9th Symposium on Turbulent Shear Flows, Kyoto, Japan, August 16-18, 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		Spectroscopic Analysis of Tm^{3+}:$NaLa(MoO_4)_2$
		The Structural Role of H_2O in Sodium Silicate Glasses: Results From ^{29}Si and ^{1}H NMR Spectroscopy
		A Study of ^{13}C-Enriched Chemical Vapor Deposited Diamond Films by Means of ^{13}C NMR, EPR and Dynamic Nuclear Polarization
		Sub-TG Relaxation Behavior in Nonlinear Optical Polymers and Views on Physical Aging
		Sub-TG Relaxation Behavior of Corona-Poled Nonlinear Optical Polymer Films, and Views On Physical Aging
*		Syntheses and Mechanistic Studies of Symmetric Tetraorganyltellurium (IV) (R_4Te) and Diorganotellurium(II) (R'_2Te) Compounds (R = R' = Me, n-Bu, Me_3SiCH_2, and CH_2=CH; R' = t-Bu and Allyl)
		Syntheses, Characterization, and Structural Studies of Lewis Base Adducts of Half-Open Vanadocenes, $V(C_5H_5)(PdI)(L)$
		Syntheses, Characterization, Structural and Kinetic Studies of Half-Open Chromocenes and Their Ligand Adducts
		Synthesis and Characterization of a New Conjugated Polymer: Poly(2,5-(4'- Methoxy)Stilbenylene Vinylene) Prepared from a Cycloalkylene Sulfonium Salt Precursor Polymer
		Synthesis and Characterization of Alkaline-Earth Indium Sulfides
		Synthesis and Characterization of Cellular SiO_2 Materials By Foaming Sol Gels
		Synthesis and Characterization of Compounds With a Group 12-Arsenic Bond. the Crystal Structure of $[^tBuZnAs(^tBu)_2]_2$
		Synthesis and Characterization of Inorganic Cellular Materials by Foaming Sol Gels
		Synthesis and Characterization of New Monomeric Dialkylindium Amides
		Synthesis and Characterization of Organic Dye Doped Silica Glasses
*		Synthesis and Dielectric Properties of Substituted $LaAlO_3$
		Synthesis and Explosive Properties of Benzotriazoles
		Synthesis and Explosive Properties of Dinitropicrylbenzimidazoles, and the "Trigger Linkage" in Dinitropicrylbenzotriazoles
		Synthesis and Photophysical Properties of Some 5(2)-Aryl-2(5)-(4-pyridyl) Oxazoles and Related Oxadiazoles and Forans
		Synthesis and Photophysical Properties of Some 5(2)-aryl-2(5)-(4-pyridyl)oxazoles and Related Oxazoles and Furans
		Synthesis and Second-Order Nonlinear Optical Properties of New Coumaromethacrylate Copolymers

TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Effect of Exothermic Reactions on Coherent Structure Formation in Supersonic Shear Layers	14th International Colloquium on the Dynamics of Explosions and Reactive Systems, University of Coimbra, Portugal, August 1993
	Periodic Chemical Energy Release for Active Combustion Control	XI ISABE, Tokyo, Japan, September 1993
	A Study of Obliquity Effects on Perforation and Ricochet Processes in Thin Plates Impacted by Compact Fragments	14th International Symposium on Ballistics, September 1993
	Mixing Enhancement in Supersonic Free Shear Flows	Review for Annual Review of Fluid Mechanics, 1993
	Ducted-Rocket Combustion Experiments at Low Gas-Generator Combustion Temperatures	CPIA Pub. No. 606, November 1993.
	Interaction Between Fluid Dynamics and Pressure Oscillations in a Simulated Liquid Propellant Gun	CPIA Pub. No. 606, November 1993.
	ADN Diffusion Flame Structures at Elevated Pressure	CPIA Pub. No. 606, November 1993.
	RDX Flame Structure and Chemistry	CPIA Pub. No. 606, November 1993.
	Shock Sensitivity of Minimum Signature Propellants Based on CL-20	Joint JANNAF Development & Characterization of New Energetic Materials, April 1994
	Safety, Aging, and Thermocompatibility Issues of ADN and ADN Propellants	Joint JANNAF Development & Characterization of New Energetic Materials, April 1994
	Lagrangian Hydrocode Modeling of Blunt Projectile Impacts Against Thick Plates at Obliquity	Computational Aspects of Impact and Penetration, Elmepress International, pp. 292-308, 1991
	Synthesis of Nd-Al Doped Silica Xerogels	Chemical Processing of Advanced Materials, John Wiley & Sons, Inc., pp 973-979, 1992
	Actively Controlled Compact Waste Incinerator	Proceedings of The Twenty-Fifth International Symposium on Combustion, The Combustion Institute, July-August 1994.
	RDX Flame Structure	Proceedings of The Twenty-Fifth International Symposium on Combustion, The Combustion Institute, July-August 1994.
	Control of Sooty High Energy Fuel Combustion	Proceedings of The Twenty-Fifth International Symposium on Combustion, The Combustion Institute, July-August 1994.

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TABLE (contd.)

CSF	Published	Paper Titles
Weapons, Conventional Missiles/Rockets (contd.)	Laser Recoil, Emission, and Flame Height Combustion Response of Oxidizers HMX and RDX at Atmospheric Pressure	Proceedings of The Twenty-Fifth International Symposium on Combustion, The Combustion Institute, July-August 1994.
	Coating Development for High-Temperature, Lightweight, Structural Applications	Proceedings of the 9th National Aero-Space Plane Technology Symposium, Paper No. 135, November 1990
	Impact Test Methodology for the Titanium-Aluminide Sheet and Truss Core	Proceedings of the 9th National Aero-Space Plane Technology Symposium, November 1990
	Electrostatic Discharge (ESD) Hazards of Energetic Materials	Proceedings of Electrostatics '91, April 1991
	Adhesive Development for Fiber Optic Guided Weapons	Proceedings of 3rd Biennial DOD Fiber Optic Conference, pp. 248-252, March 1992
	Synthesis and Characterization of Advanced Materials for Navy Applications	NASA Pub. 3249 Vol. 1 pp. 294-306, 1993
Weapons, Directed Energy	Mineral Quarry Results for Developmental Coatings and Optics	Proc. Meeting on High Power Laser Optical Components, October 1991
	Modification of Properties of Ion-Beam-Sputtered Yttrium-Oxide Thin Films by Low-Energy Ion Bombardment	1991 Spring Meeting of the Materials Res. Soc. Proc., May 1991
	Preliminary Analysis of Atomic Oxygen-Exposed Optical Materials from EOIM-3	Proc. Meeting on High Power Laser Opt. Comp., October 1992
	Radiation Hardness of Improved Single-Crystal CaF_2 Windows	Proc. Meeting on High Power Laser Opt. Comp., October 1990
	Simulated Natural Space Radiation Testing of Multilayer Dielectric Mirrors for 2.7 M Application	Proc. Meeting on High Power Laser Opt. Comp., October 1991
	Space Environmental Effects on Coated Optics	Proc. Meeting on High Power Laser Opt. Comp., October 1991
	Space Shuttle Accelerated Atomic Oxygen Test Results	Proc. Meeting on High Power Laser Opt. Comp., September 1993
	X-Ray-Induced Deformation of Multilayer Enhanced Reflectance Mirrors	Proc. Meeting on High Power Laser Opt. Comp., October 1990
Space Systems, Launch Vehicles	Fiscal Year 1993 Development Efforts of the Dual-Mode Recovery Systems for Application to Future Emergency Escape System	NAWC TM 7515, December 1993

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TABLE (contd.)

CSF	Published	Paper Titles
Space Systems, Launch Vehicles (contd.)	Results and Discussion of Qualification Tests for Service Release for the GQ Type 2000 Aeroconical Parachute Assembly in the NACES System	NWC TP 7122, December 1990
	Results and Discussion of the Navy Aircrew Common Ejection Sear (NACES) Parachute Assembly Environmental Protection Evaluation	NAWCWPNS TP 8132, July 1993
	PCU-56 Sizing Mod. Test Report	NAWCWPNS TP 8122, July 1993
	Data Trend Analysis Report for Navy Ejections (1976 through 1989)	NAWCWPNS TP 8111, March 1993
Space Systems, Satellites	Free Electron Laser Power Beaming to Satellites at China Lake, California	Free Electron Laser Conf. Proc., August 1993
Human Systems	Human Factors Problems for Aircrew-Aircraft Interfaces: Where Should We Focus Our Efforts?	AGARD Conference Proceedings 521, *Advanced Aircraft Interfaces: The Machine Side of the Man-Machine Interface*, 1992
	Agent-Based Pilot-Vehicle Interfaces: Concept and Prototype	IEEE Transactions on Systems, Man, and Cybernetics, November/December 1992
	Laboratory and In-Flight Experiments to Evaluate the Efficacy of 3-D Audio Display Technology	*Space Operations Symposium*, 1993
	Man-Machine Interface with Simulated Automatic Target Recognition Systems	AGARD Conference Proceedings 521, *Advanced Aircraft Interfaces: The Machine Side of the Man-Machine Interface*, 1992
	Natural Scene Templates As Cueing Devices	Aviation Psychology Proceedings, 1993
	Target Acquisition During Desert Storm	Proceedings of the Military Operations Research Society Symposium, Analysis Lessons Learned from Desert Shield/Desert Storm, December 1991

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TABLE (contd.)

CSF	Published	Paper Titles
Advanced Materials (contd.)		Synthesis and Spectral Analysis of Poly(ethyl(4-10-ethyl-n-(2-hydroxyethyl)amino)-a-cycanocinnamite: A Nonlinear Optical Polymer With a Chromophoric Main Chain
*		Synthesis and Structure of the Novel Acetylanic Gallium Phosphide trans-[(t-Bu)(Me_3SiC=C)$GaPEt_2$]$_2$
		Synthesis of 1,4-Disubstituted [3,4-b], [3,4-a] Difurazanopiperazines
		Synthesis of 4,8-Disubstituted 4*H*,8*H*-bis[1,2,5]oxadiazolo[3,4-*b*:3',4'-*e*]pyrazines [1]
		Synthesis of a-$NaFeO_2$-Type $LiYS_2$ by an Ion-Exchange Reaction
		Synthesis of Tetranitrotoluenes
*		Synthesis, Characterization, and Reactivity of New Alkylgallium Acetylides
		Synthesis, Characterization, and Structural Studies of Phosphine and Carbonyl Adducts of Half-Open Vanadocenes, V(C_5H_5)(Pdl)(L)
*		Synthesis, Characterization, and Structure of Acetylenic Gallium Dialkylphosphides Having the Formula [(t-Bu) (Me_3SiC=C) $GaPR_2$]$_2$ (R=Et,*i*-Pr, *t*-Bu)
*		(t-Bu)$_2$GaAs(t-Bu)$_2$: A Volatile Monomeric Arsinogallane
		The Ternary Yttrium Sulfides, CaY_2S_4, SrY_2S_4, BaY_2S_4, Structures and Properties
		Tetranitroquinodimethane (TNQ)-Electron-Deficient Prototype for a new Series of Organic Solid State Materials
		Tetrazolo[1,5-a]pyridines and Furazano[4,5-b]pyridine-1-oxides
		Theoretical Neutron Flux Levels, Dose Rates, and Metal Foil Activation in Electrochemical Cold Fusion Experiments
		Thermal Properties of Optical Thin-Film Materials
		Thermodynamics of Nitramines
		Thermogravimetric Analysis of the Oxidation of CVD Diamond Films
		Thermophysical Properties of Sodium b¢¢-Alumina Polycrystalline Ceramic
		Time Resolved Raman Spectroscopy in Diamonds Shock Compressed Along (110) and (100) Orientations
		Tough Highly Plasticized Propellants
*		Triisopropylantimony for Organometallic Vapor Phase Epitaxial Growth of GaSb and InSb
*		Triisopropylindium for OMVPE Growth
*		Triisopropylindium: Decomposition Studies and Use for Low Temperature Growth of InAs
*		The Use of Triisopropylantimony for the Growth of InSb and GaSb
		Yttrium Substitution in CaS
Total	493	

3.3 Workload

3.3.1 FY93 Workload

3.3.1.1 Work Year and Lifecycle: *Identify the number of actual workyears executed for each applicable CSF in FY93 for each of the following: government civilian; military; on-site FFRDCs; and on-site SETAs. (BRAC Criteria I)*

The NAWCWPNS laboratory function is heavily focused on the Weapons CSF, with four out of the five major departments working largely within that CSF. These departments account for approximately 80% of the technical personnel. The remaining major department (Aircraft Weapons Integration Department, Code C21) provides life-cycle engineering support to tactical aircraft weapon systems, including aircraft weapons integration, combat and combat control systems, tactical system software upgrades, targeting/fire control systems and sensors, and survivability/lethality of aircraft and weapons. While the majority of such efforts are funded by aircraft PMAs and are implemented and delivered through Operational Flight Programs for the tactical aircraft, the underlying purpose is to improve weapon delivery. In addition, the aircraft Weapon System Support Activities work with the various weapons programs at NAWCWPNS to use the various Weapon System Support Facilities and project aircraft to design, develop, integrate, and test the individual weapons and the total weapon system (including air vehicles). C4I systems and subsystems are developed and tested in conjunction with related airborne tactical systems. In order to break out the workyears by CSF, in some cases we had to estimate.

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"LAB" AIR VEHICLES, Fixed Wing, Structure	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.3	0	0	2.8
Engineering Development	9.7	0.2	0	1.1
In-Service Engineering	10	0.3	0	8.42

"LAB" AIR VEHICLES, Fixed Wing, Propulsion	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0.25	0	0	0
Engineering Development	13.7	0	0	0
In-Service Engineering	0	0	0	0

"LAB" AIR VEHICLES, Fixed Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	25.5	0	0	6.4
Engineering Development	224.5	3.5	0	23.8
In-Service Engineering	213	7.0	0	191.7

"LAB" AIR VEHICLES, Fixed Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	63	0	0	0
In-Service Engineering	0	0	0	0

"LAB" AIR VEHICLES, Fixed Wing, Structure	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.3	0	0	2.8
Engineering Development	6.2	0.2	0	1.1
In-Service Engineering	7.1	0.3	0	8.42

"LAB" AIR VEHICLES, Fixed Wing, Propulsion	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0.25	0	0	0
Engineering Development	5	0	0	0
In-Service Engineering	0	0	0	0

"LAB" AIR VEHICLES, Fixed Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	25.5	0	0	6.4
Engineering Development	183.1	3.5	0	23.8
In-Service Engineering	175.0	7.0	0	191.7

"LAB" AIR VEHICLES, Fixed Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	63	0	0	0
In-Service Engineering	0	0	0	0

"LAB" AIR VEHICLES, Fixed Wing, Structure	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.3	0	0	2.8
Engineering Development	6.2	0.2	0	1.1
In-Service Engineering	7.1	0.3	0	8.42

"LAB" AIR VEHICLES, Fixed Wing, Propulsion	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0.25	0	0	0
Engineering Development	5	0	0	0
In-Service Engineering	0	0	0	0

"LAB" AIR VEHICLES, Fixed Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	25.5	0	0	6.4
Engineering Development	70.1	3.5	0	23.8
In-Service Engineering	162.0	7.0	0	191.7

"LAB" AIR VEHICLES, Fixed Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	63	0	0	0
In-Service Engineering	0	0	0	0

"LAB" AIR VEHICLES, Rotary Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.6	0	0	0.4
Engineering Development	7.7	0.2	0	1.3
In-Service Engineering	8.9	0.4	0	10.5

"LAB" AIR VEHICLES, Rotary Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	2	0	0	0
In-Service Engineering	0	0	0	0

"LAB" WEAPONS, ICBMs/SLBMs	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	3.9	0	0	0
Engineering Development	17.8	0	0	1.4
In-Service Engineering	19.3	0	0	11.2

"LAB" WEAPONS, Conventional Missiles/Rockets	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	117.5	0.1	0	0.2
Engineering Development	738.3	0.5	0	55.8
In-Service Engineering	822.2	0.6	0	462.4

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"LAB" AIR VEHICLES, Rotary Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.6	0	0	0.4
Engineering Development	7.7	0.2	0	1.3
In-Service Engineering	8.9	0.4	0	10.5

"LAB" AIR VEHICLES, Rotary Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	2	0	0	0
In-Service Engineering	0	0	0	0

"LAB" WEAPONS, ICBMs/SLBMs	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	3.9	0	0	0
Engineering Development	10.0	0	0	1.4
In-Service Engineering	12.5	0	0	11.2

"LAB" WEAPONS, Conventional Missiles/Rockets	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	117.5	0.1	0	0.2
Engineering Development	423.6	0.5	0	55.8
In-Service Engineering	519.3	0.6	0	462.4

"LAB" AIR VEHICLES, Rotary Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.6	0	0	0.4
Engineering Development	7.7	0.2	0	1.3
In-Service Engineering	8.9	0.4	0	10.5

"LAB" AIR VEHICLES, Rotary Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	2	0	0	0
In-Service Engineering	0	0	0	0

"LAB" WEAPONS, ICBMs/SLBMs	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	3.9	0	0	0
Engineering Development	10.0	0	0	1.4
In-Service Engineering	12.5	0	0	11.2

"LAB" WEAPONS, Conventional Missiles/Rockets	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	117.5	0.1	0	0.2
Engineering Development	408.6	0.5	0	55.8
In-Service Engineering	514.3	0.6	0	459.4

"LAB" AIR VEHICLES, Rotary Wing, Avionics	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.6	0	0	0.4
Engineering Development	7.7	0.2	0	1.3
In-Service Engineering	8.9	0.4	0	10.5

"LAB" AIR VEHICLES, Rotary Wing, Flight Subsystems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	2	0	0	0
In-Service Engineering	0	0	0	0

"LAB" WEAPONS, ICBMs/SLBMs	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	3.9	0	0	0
Engineering Development	10.0	0	0	1.4
In-Service Engineering	12.5	0	0	11.2

"LAB" WEAPONS, Conventional Missiles/Rockets	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	122.5	0.1	0	0.2
Engineering Development	408.6	0.5	0	55.8
In-Service Engineering	514.3	0.6	0	459.4

"LAB" WEAPONS, Cruise Missiles	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	17.5	0	0	0
Engineering Development	83.2	0	0	6.1
In-Service Engineering	89.3	0	0	50.4

"LAB" WEAPONS, Guided Projectiles	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	6	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

"LAB" WEAPONS, Bombs	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	11.7	0	0	0
Engineering Development	55.1	0	0	4.1
In-Service Engineering	59.2	0	0	33.6

"LAB" WEAPONS, Guns and Ammunition	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.9	0	0	0
Engineering Development	9	0	0	0.7
In-Service Engineering	10.1	0	0	5.6

"LAB" WEAPONS, Cruise Missiles	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	17.5	0	0	0
Engineering Development	44.9	0	0	6.1
In-Service Engineering	56.5	0	0	50.4

"LAB" WEAPONS, Guided Projectiles	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	6	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

"LAB" WEAPONS, Bombs	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	11.7	0	0	0
Engineering Development	29.9	0	0	4.1
In-Service Engineering	37.6	0	0	33.6

"LAB" WEAPONS, Guns and Ammunition	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	1.9	0	0	0
Engineering Development	5.0	0	0	0.7
In-Service Engineering	6.3	0	0	5.6

R

"LAB" WEAPONS, Directed Energy	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	5	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

"LAB" SPACE SYSTEMS, Launch Vehicles	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	2*	1	0	0

* These workyears are contributed by personnel from the T&E Directorate working on R&D tasks.

"LAB" SPACE SYSTEMS, Satellites	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	2	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

CSF: C4I	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	10*	0	0	0
Engineering Development	4.5*	0	0	0
In-Service Engineering	3.5	0	0	0

* Estimated

CSF: Electronic Devices	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	21	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

"LAB" SPACE SYSTEMS, Launch Vehicles	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	2*	1	0	0

* These workyears are contributed by personnel from the T&E Directorate working on R&D tasks.

"LAB" SPACE SYSTEMS, Satellites	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	2	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

CSF: C4I	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	10*	0	0	0
Engineering Development	4.5*	0	0	0
In-Service Engineering	3.5	0	0	0

* Estimated

CSF: Electronic Devices	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	21	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

CSF: Human Systems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	3.2	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

CSF: Training Systems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0.5	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

CSF: Environmental Quality	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	7.6	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

CSF: Advanced Materials	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	20*	0	0	0
Engineering Development	0	0	0	0
In-Service Engineering	0	0	0	0

*Estimated

CSF: Human Systems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	3.2	0	0	0
Engineering Development	4.0	0	0	0
In-Service Engineering	0	0	0	0

CSF: Training Systems	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	0.5	0	0	0
Engineering Development	110.5*	0	0	0
In-Service Engineering	18*	0	0	3

* Some of these workyears are contributed by personnel from the T&E Directorate engaged in R&D tasks.

CSF: Environmental Quality	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	7.6	0	0	0
Engineering Development	3.5	0	0	0
In-Service Engineering	0	0	0	0

CSF: Advanced Materials	Fiscal Year 1993 Actual			
	Civilian	Military	FFRDC	SETA
Science & Technology	20*	0	0	0
Engineering Development	10*	0	0	0
In-Service Engineering	0	0	0	0

* Estimated

3.3.1.2 Engineering Development By ACAT: *For each Common Support Function (e.g. airborne C4I) at each activity engaged in engineering development, provide:*

- For each ACAT IC, ID, and II program (as defined in DODI 5000.2):
- The name of the program
- A brief program description

- For each ACAT III and IV programs:
- The number of such programs
- A list of program names

- For each program not an ACAT I, II, III, IV:
- The number of such programs
- A list of program names

- For the purpose of this question, any program between Milestone I and IV and containing demonstration and validation (Dem/Val 6.4)/Engineering and Manufacturing Development (EMD 6.5) funds in the FY95 PBS is considered to be engaged in engineering development (BRAC Criteria I).

NAWCWPNS China Lake typically plays one of four different roles in Engineering Development programs:

1. Following development of requirements and specifications, in-house design of the system, with contractor participation for packaging, preparing technical documentation, and preparing for competitive production by industry.
2. Following development of requirements and specifications, cooperative development of the system with a major system contractor, along with contractor participation for packaging, preparing technical documentation, and preparing for competitive production by industry.
3. Development of requirements and specifications, analysis, design evaluation, and testing of a contractor design.
4. Monitoring of a contractor design program.

Most recent activities have focused on roles 2 and 3.

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	5	26.8	3,434.4	See list below

List of Non-ACAT Projects:
V-22: A/C Survivability Analysis/Test/Evaluation Studies
Joint Live Fire (JLF): A/C Survivability Analysis/Test/Evaluation Studies

CSF: AIR VEHICLES, FIXED WING, STRUCTURE

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	5	26.8	3,434.4	See list below

List of Non-ACAT Projects:
NSAP
A/C Survivability
A/C Survivability/V-22
A/C Survivability/JLF
A/C Survivability

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	0	0	0	See list below

This CSF has no ACAT programs.

CSF: AIR VEHICLES, FIXED WING, PROPULSION

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	0	0	0	See list below

List of ACAT Projects:
ACAT I - SLAT
ACAT III/IV - SSST
FCT
(Russian M-31 missile)

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT ID	F/A-18 Variant	69.3	45,985	F/A-18 E/F
ACAT II	A-6E Wpns Integration	35.3	7,585	A-6E Weapons and System Integration
ACAT III/IV	1	0.9	220	See list below
Other	8	4.0	794.5	See list below

List of ACAT III/IV Projects:
F/A-18 Advanced TACAIR (JSIPS): Validation and verification of ground-based processor for reconnaissance systems

List of Non-ACAT Projects:
Aircrew Sys Prec Strike: Development of helmet-mounted display
AX: Trade studies of evolving technologies; avionics, sensor/weapons integration for tactical and air-to-air warfare
Common Avionics: Avionics, sensor/weapons integration for tactical and air-to-air warfare
F/A-18 UAV: Avionics, sensor/weapons integration for tactical and air-to-air warfare
AV-8B: Avionics, sensor/weapons integration for tactical and air-to-air warfare
F/A-18: Human Engineering integration; JSOW and JDAM; GPWS; and Digital AIM-9X
F-14D: Human Engineering evaluation of F-14D SOW
A-6E: Human Engineering inputs for display design of Block 1A upgrade; radar upgrade; E260 flight manual; night-vision goggles
JSOW: Human Engineering guidance for overall design effort
Mission Planning: Human Engineering of TAMPS man-machine interface (MMI); TAMPS module MMIs standard; MMIs software tool; NSWC-Fallon target acquisition
JMEM: Target acquisition probability models and computer program

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT ID	F/A-18 Variant	69.3	45,985	F/A-18 E/F
ACAT II	A-6E Wpns Integration	35.3	7,585	A-6E Weapons and System Integration
ACAT III/IV	1	0.9	220	See list below
Other	8	4.0	794.5	See list below

List of ACAT III/IV Projects:
F/A-18 Advanced TACAIR (JSIRS)

List of Non-ACAT Projects:
Aircrew Sys Prec Strike
AX
Common Avionics
F/A-18 UAV
AV-8B
F-14
Mission Planning
Special Project
JMEM
A-6

CSF: AIR VEHICLES, FIXED WING, AVIONICS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT ID	F/A-18 Variant	69.3	45,985	F/A-18 E/F
ACAT II	A-6E Wpns Integration	35.3	7,585	A-6E Weapons and System Integration
ACAT III/IV	1	0.9	220	See list below

List of ACAT III/IV Projects:
F/A-18 Advanced TACAIR (JSIPS)

List of Non-ACAT Projects:
Aircrew Sys Prec Strike
AX
Common Avionics
F/A-18 UAV
AV-8B

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	2	3.7	572	See list below
Other	5	84.0	10,875	See list below

List of Non-ACAT III/IV Projects:
Naval Air Combat Survivability (NAESP): A/C Survivability Analysis/Test/Evaluation Studies
V-22: A/C Survivability Analysis/Test/Evaluation Studies
JLF: A/C Survivability Analysis/Test/Evaluation Studies
Joint Technical Coordinating Group on A/C Survivability: A/C Survivability Analysis/Test/Evaluation Studies

CSF: AIR VEHICLES, FIXED WING, FLIGHT SUBSYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	2	3.7	572	See list below
Other	5	84.0	10,875	See list below

List of Non-ACAT III/IV Projects:
Naval Air combat Survivability (NAESP)
A/C Survivability/V-22
A/C Survivability/JLF (Joint Life Fire)
A/C Survivability (Joint Technical Coordinating Group on A/C Survivability)
A/C Survivability

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	None			
Other	None			

This CSF has no ACAT programs.

CSF: AIR VEHICLES, ROTARY WING, AVIONICS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	None			
Other	None			

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	None			
Other	None			

This CSF has no ACAT programs.

CSF: AIR VEHICLES, ROTARY WING, FLIGHT SUBSYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	None			
Other	None			

CSF: WEAPONS, ICBMs/SLBMs

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT IC	Trident II	40	4,675	Propellant Impact Study
Other	1	1.5	244	See list below

List of Non-ACAT Projects:
Sub Launched Ballistic Msl: Foreign Material Exploitation Studies

CSF: WEAPONS, ICBMs/SLBMs

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT IC	Trident II	40	4,675	Propellant Impact Study
Other	1	1.5	244	See list below

List of Non-ACAT Projects:
FME-Sub Launched Ballistic Msl

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT IC	NAVSTAR GPS Equip	21.4	4,704	A-6E Block 1A GPS Integration
		10.3	1,239	AV-8B NAVSTAR GPS
	HARM	8.9	1,533	HARM Command Launch Computer
	Std Missile Impr	15.6	4,509	MHIP
	Sidewinder AIM-9X	59.1	11,132	Sidewinder AIM-9X (63715F)
ACAT ID	F/A-18 Variant	7.4	1,279	F/A-18 FSPC E/F
	AIWS	6.6	811	F/A-18 AIWS
	JSOW	70.6	18,274	JSOW (BLU-108)
	AMRAAM	7.9	1,197	AMRAAM
ACAT II	A-6 Weapons Integration	3.8	843	A-6E Weapons and Sys Integration
	Abn Def ECM	20.9	3,596	ADAP/AAED
	EW Counter Response	16.9	4,206	ALR-67/ASPJ
		8.8	1,775	ASR Software/Adv Abn Decoy
ACAT III/IV	2	17.6	2,841	See list below
Other	44	160.1	18,397.3	See list below
Other (Training)	6	1.5	210	See list below (Training)

CSF: WEAPONS, CONVENTIONAL MISSILES/ROCKETS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT IC	NAVSTAR GPS Equip	21.4	4,704	A-6E Block 1A GPS Integration
		10.3	1,239	AV-8B NAVSTAR GPS
	HARM	8.9	1,533	HARM Command Launch Computer
	Std Missile Impr	15.6	4,509	MHIP
	Sidewinder AIM-9X	59.1	11,132	Sidewinder AIM-9X (63715F)
ACAT ID	F/A-18 Variant	7.4	1,279	F/A-18 FSPC E/F
	AIWS	6.6	811	F/A-18 AIWS
	JSOW	70.6	18,274	JSOW (BLU-108)
	AMRAAM	7.9	1,197	AMRAAM
ACAT II	A-6 Weapons Integration	3.8	843	A-6E Weapons and Sys Integration
	Abn Def ECM	20.9	3,596	ADAP/AAED
	EW Counter Response	16.9	4,206	ALR-67/ASPJ
		8.8	1,775	ASR Software/Adv Abn Decoy
ACAT III/IV	2	17.6	2,841	See list below
Other	44	160.1	18,397.3	See list below

List of ACAT III/IV Projects:
AH-1/ARS: Weapons integration
ARS: Development

List of Non-ACAT Projects:

Foreign Material Exploitation:	Countermeasure development/tech transfer
HARM:	RDT&E and acquisition production support
JMEM/JTCG:	Weapons effectiveness studies, vulnerability analysis
F-22:	Air-to-air missile (Sidewinder) weapon system integration
Insensitive Munitions:	Munitions RDT&E (hazard reduction)
Advanced Seeker Program:	Antiradiation Missile RDT&E
(Material deleted.)	
UAV:	F/A-18 integration
Weapon Training:	TACTS development
(Material deleted.)	
(Material deleted.)	
Airborne Targets:	Airborne targets RDT&E
(Material deleted.)	

List of Training Non-ACAT Projects:

GBU-24:	Develop weapon systems training courseware and software for loading, maintenance operations, and aircrew; provide course instruction for above.
HARM:	"
JSOW:	"
JDAM:	"
PFU:	"
SAIP:	"
AMRAAM:	"
Sidewinder:	"
Sparrow:	"
Hellfire:	"
TOW:	"
Maverick:	"
SLAM:	"
Harpoon:	"
AWW 9/13:	"
HIPAAG:	"
Nitrogen Filler Units	
Special Access	

List of ACAT III/IV Projects:
AH-NARS
ARS

List of Non-ACAT Projects:

Ordnance Reclamation	TACTS Development	VUACT
Optics Technology	Joint FCIM	22-STP
Blast Hardened Thermal Intru	Special Project	HARM TM Support
SBIR	Airborne Targets	WSEP Tapes (HARM)
Scenario Development	A/C Survivability-fire suppression	JMEM/JTCG
Warfare Systems Architecture	Soft Tree Analysis (BAT)	Ballerina Program Planning
JMEM/AA	Adv Contact Fuze	Special Project
Studies & Analysis	Naval Surface Fire Support	Vulnerability Analysis
Tech Transfer	Insensitive Munitions	FME
Next Generation Computer	Adaptive Seat Propulsion	JMEM
JMEM	9in Test Tracker Booster	Special Project
JMEM-AIM-54C	Testing & Response of Liquid Prop	Special Project
F/A-18 UAV	Hard Target Unitary Warhead	Special Project
F22/Sidewinder Integration	Anti Radiation Msl Tech	Special Project
Hi Speed Buoy	Advanced Seeker Program	

List of Weapons Environmental Non-ACAT Projects:
Foreign Shipboard Incineration Evaluation
Incineration Technology
Large Rocket Motor Disposal
Environmentally Friendly Propellants
Commercialization of Demilled Materials
Pyrotechnic Fire Extinguisher
Environmentally Friendly Explosives
Solid-State Photochemistry and Aqueous Biodegradation of Energetic Nitramines
Green Energetic Material Investigations
Rocket Motor Disposal Investigation
Bioremediation of Explosive and Propellant Sludge
Fluid Energy Mills

List of Training Non-ACAT Projects:
GBU-24
HARM
JSOW
JDAM
PFU
SAIP

List of ACAT III/IV Projects:
AH-1/ARS
ARS

List of Non-ACAT Projects:

Ordnance Reclamation	TACTS Development	VUACT
Optics Technology	Joint FCIM	22-STP
Blast Hardened Thermal Intru	Special Project	HARM TM Support
SBIR	Airborne Targets	WSEP Tapes (HARM)
Scenario Development	A/C Survivability-fire suppression	JMEM/JTCG
Warfare Systems Architecture	Soft Tree Analysis (BAT)	Ballerina Program Planning
JMEM/AA	Adv Contact Fuze	Special Project
Studies & Analysis	Naval Surface Fire Support	Vulnerability Analysis
Tech Transfer	Insensitive Munitions	FME
Next Generation Computer	Adaptive Seat Propulsion	JMEM
JMEM	9in Test Tracker Booster	Special Project
JMEM-AIM-54C	Testing & Response of Liquid Prop	Special Project
F/A-18 UAV	Hard Target Unitary Warhead	Special Project
F22/Sidewinder Integration	Anti Radiation Msl Tech	Special Project
Hi Speed Buoy	Advanced Seeker Program	

CSF: WEAPONS, CRUISE MISSILES

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT IC	Tomahawk	13.3	2,257	ESV/Block IV

CSF: WEAPONS, GUIDED PROJECTILES

This CSF has no category 6.4 or 6.5 funds.

CSF: WEAPONS, BOMBS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT ID	JDAM	0.7	450	F/A-18 JDAM

CSF: WEAPONS, GUNS AND AMMUNITION

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	1	1.3	183	See list below
Other	3	4.7	646.2	See list below

List of ACAT III/IV Projects:
Gun Sys Adv Tech: Advanced A/C gun development

List of Non-ACAT Projects:
JMEM/AA: A/C gun system effectiveness analysis
25mm Adv Multipurpose Ammo: Improved ammunition RDT&E

CSF: WEAPONS, GUNS AND AMMUNITION

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
ACAT III/IV	1	1.3	183	See list below
Other	3	4.7	646.2	See list below

List of ACAT III/IV Projects:
Gun Sys Adv Tech

List of Non-ACAT Projects:
JMEM/AA
25mm Adv Multipurpose Ammo
25mm Adv Multipurpose Ammo

CSF: WEAPONS, DIRECTED ENERGY

This CSF has no 6.4 funds and is not an ACAT program.

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

This CSF has no ACAT programs.

CSF: SPACE SYSTEMS, SATELLITES

This CSF has no category 6.4 or 6.5 funds.

CSF: C4I, AIRBORNE

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	6	46.2	13,807	See list below

List of Non-ACAT Projects:
Bosen: Sensor development

CSF: C4I

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	6	46.2	13,807	See list below

List of Non-ACAT Projects:
Bosen

CSF: ELECTRONIC DEVICES

This CSF has no ACAT programs.

CSF: HUMAN SYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
N/A				

This CSF has no ACAT programs.

CSF: HUMAN SYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
N/A				

(Material deleted.)

CSF: HUMAN SYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	8	4.0	794.5	See list below

List of Non-ACAT Projects:
JSOW
A-6
F-18
F-14
AX
Mission Planning
JMEM
Special Project

CSF: TRAINING SYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
N/A				

This CSF has no ACAT programs.

CSF: TRAINING SYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
N/A				

(Material deleted.)

CSF: TRAINING SYSTEMS

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other	6	1.5	210	See list below

List of Non-ACAT Projects:
GBU-24
HARM
JSOW
JDAM
PFU
SAIP

CSF: ENVIRONMENTAL QUALITY

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
N/A				

This CSF has no ACAT programs.

CSF: ENVIRONMENTAL QUALITY

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
N/A				

(Material deleted.)

CSF: ENVIRONMENTAL QUALITY

Engineering Development	Name or Number	Workyears (FY93 Actual) (Incl Mil/Contr)	FY93 Funds Received ($K) (Obligation Authority)	Narrative
Other				See list below

List of Non-ACAT Projects:
Foreign Shipboard Incineration Evaluation
Incineration Technology
Large Rocket Motor Disposal
Environmentally Friendly Propellants
Commercialization of Demilled Materials
Pyrotechnic Fire Extinguisher
Environmentally Friendly Explosives
Solid State Photochemistry and Aqueous Biodegradation of Energetic Nitramines
Green Energetic Material Investigations
Rocket Motor Disposal Investigation
Bioremediation of Explosive and Propellant Sludge
Fluid Energy Mills

CSF: ADVANCED MATERIALS

This CSF has no ACAT programs.

3.3.1.3 In-Service Engineering: *For each Common Support Function at each activity engaged in in-service engineering, list the in-service engineering efforts, the FY93 funds (from all sources) obligated for these efforts, the FY93 workyears for these efforts, and the weapon system(s) supported by these efforts. In-service engineering consists of all engineering support of fielded and/or out of production systems and includes efforts to improve cost, throughput, and schedule to support customer requirements as well as mods and upgrades for reliability, maintainability, and performance enhancements. (BRAC Criteria I)*

"In-Service Engineering," as used in this context, encompasses all aspects of support to a weapon system after production approval. It therefore includes Production Support, which is engineering support to resolve production problems and ensure quality, and engineering support to systems in the Fleet, whether still in production or not (the usual definition of in-service engineering). It also includes Product Improvement Programs, designed to improve performance, maintainability, or reliability of fielded systems. Tasking typically includes Basic Design Engineering in the appropriate field(s); engineering disciplines (product assurance, configuration management); and certain test engineering. For the NAWCWPNS laboratory functions, it is funded by WPN, APN, or OMN appropriations.

Common Support Functions	In-Service Engineering Efforts (List)	FY93 Actual		Weapon System(s) Supported
		Funds Received ($K) (Obligation Authority)	Workyears	
Air Vehicles, Fixed Wing, Avionics	Software Upgrade	13,039	66.3	A6-E Enhancements
	Software Upgrade	22,299	51.7	F/A-18 Enhancements
	Software Upgrade	2,844	19.2	AH-1 Enhancements
	Software Upgrade	12,029	59.3	AV-8B Enhancements
	Software Support	3,268	15.1	A-6E/Software Support
	Software Support	774	2.9	AV-8B Maint. Support
	Software Support	6,182	24.9	F/A-18 Software Support
	Software Upgrade	1,100	9.5	TACTS Enhancements
	Software Support	200	1.5	AEWTR Software Support
	Software Support	250	2.0	REWS Software Support
Subtotal		61,985	252.4	
Air Vehicles, Rotary Wing, Avionics	Software Support	750	4.9	AH-1 Software Support
Weapons, ICBMs/SLBMs	Production Support	1,840	14.0	Trident

3.3.1.3 In-Service Engineering: *For each Common Support Function at each activity engaged in in-service engineering, list the in-service engineering efforts, the FY93 funds (from all sources) obligated for these efforts, the FY93 workyears for these efforts, and the weapon system(s) supported by these efforts. In-service engineering consists of all engineering support of fielded and/or out of production systems and includes efforts to improve cost, throughput, and schedule to support customer requirements as well as mods and upgrades for reliability, maintainability, and performance enhancements. (BRAC Criteria I)*

"In-Service Engineering," as used in this context, encompasses all aspects of support to a weapon system after production approval. It therefore includes Production Support, which is engineering support to resolve production problems and ensure quality, and engineering support to systems in the Fleet, whether still in production or not (the usual definition of in-service engineering). It also includes Product Improvement Programs, designed to improve performance, maintainability, or reliability of fielded systems. Tasking typically includes Basic Design Engineering in the appropriate field(s); engineering disciplines (product assurance, configuration management); and certain test engineering. For the NAWCWPNS laboratory functions, it is funded by WPN, APN, or OMN appropriations.

Common Support Functions	In-Service Engineering Efforts (List)	FY93 Actual		Weapon System(s) Supported
		Funds Received ($K) (Obligation Authority)	Workyears	
Air Vehicles, Fixed Wing, Avionics	Software Upgrade	13,039	66.3	A6-E Enhancements
	Software Upgrade	22,299	51.7	F/A-18 Enhancements
	Software Upgrade	2,844	19.2	AH-1 Enhancements
	Software Upgrade	12,029	59.3	AV-8B Enhancements
	Software Support	3,268	15.1	A-6E/Software Support
	Software Support	774	2.9	AV-8B Maint. Support
	Software Support	6,182	24.9	F/A-18 Software Support
Subtotal		60,435	239.4	
Air Vehicles, Rotary Wing, Avionics	Software Support	750	4.9	AH-1 Software Support
Weapons, ICBMs/SLBMs	Production Support	1,840	14.0	Trident

TABLE (contd.)

Common Support Functions	In-Service Engineering Efforts (List)	FY93 Actual		Weapon System(s) Supported
		Funds Received ($K) (Obligation Authority)	Workyears	
Weapons, Conventional Missiles/Rockets	Production Support	1,028	16.7	ALR-67 Production Support
	Production Support	6,268	23.9	Phoenix Production Support
	Production Support	8,075	50.4	SLAM/Harpoon Prod Support
	Production Support	1,298	5.9	TACTS Production Support
	Production Support	909	7.6	Fleet Support-Weapons
	Production Support	157	1.1	FMU-140 Production Support
	Production Support	658	2.5	Gator Production Support
	Production Support	50,655	175.8	HARM Production Support
	Production Support	463	2.4	LAV Production Support
	Production Support	897	12.4	Maverick Production Support
	Production Support	67	0.4	Skipper Production Support
	Production Support	60	0.3	Standard Missile Prod Support
	Production Support	1,272	4.5	Hellfire Production Support
	Production Support	6,360	33.8	Maverick Production Support
	Production Support	6,530	36.8	AMRAAM Prod Support
	Production Support	2,480	16.8	RAM Production Support
	Production Support	4,586	28.6	Sidewinder Production Support
	Production Support	430	13.8	Sparrow Production Support
	Production Support	7,125	48.3	Standard Missile Prod Support
	Engineering Support	170	1.2	Out of Prod Eng Support
	Engineering Support	14,085	104.7	Misc Engineering Support
	Special Projects	3,079	15.2	Special Projects
	Training	912	8.0	Phoenix Training
	Training	52	0.2	HARM Training
	Training	69	0.2	Maverick Training
	Production Support	253	0.9	TOW (BGM-7) Prod Support
	Enhancement	454	2.3	A/C Survivability (Enhance)
	Production Support	125	0.7	Airborne Targets Prod Support
	Production Support	273	1.0	Air Vehicles Prod Support
Subtotal		118,795	616.4	
Weapons, Cruise Missiles	Safety Support	218	1.5	A/L Nuclear Wpns/Nuc Safety
	Software Support	1,701	9.5	Tomahawk Software Support
Weapons, Guided Projectiles	There was no inservice engineering in 1993.			
Weapons, Bombs	Production Support	170	1.1	GP Bomb Production Support
Weapons, Guns and Ammunition	Production Support	1,801	10.5	Gun Systems Prod Support
Space Systems, Launch Vehicles	Maintenance Support	300	3	Shuttle Crew Escape Equipment
C4I, Airborne	In-Service Support	424	3.5	Bosen In-Service Support

TABLE (contd.)

Common Support Functions	In-Service Engineering Efforts (List)	FY93 Actual		Weapon System(s) Supported
		Funds Received ($K) (Obligation Authority)	Workyears	
Weapons, Conventional Missiles/Rockets	Production Support	1,028	16.7	ALR-67 Production Support
	Production Support	6,268	23.9	Phoenix Production Support
	Production Support	8,075	50.4	SLAM/Harpoon Prod Support
	Production Support	1,298	5.9	TACTS Production Support
	Production Support	909	7.6	Fleet Support-Weapons
	Production Support	157	1.1	FMU-140 Production Support
	Production Support	658	2.5	Gator Production Support
	Production Support	50,655	175.8	HARM Production Support
	Production Support	463	2.4	LAV Production Support
	Production Support	897	12.4	Maverick Production Support
	Production Support	67	0.4	Skipper Production Support
	Production Support	60	0.3	Standard Missile Prod Support
	Production Support	1,272	4.5	Hellfire Production Support
	Production Support	6,360	33.8	Maverick Production Support
	Production Support	6,530	36.8	AMRAAM Prod Support
	Production Support	2,480	16.8	RAM Production Support
	Production Support	4,586	28.6	Sidewinder Production Support
	Production Support	430	13.8	Sparrow Production Support
	Production Support	7,125	48.3	Standard Missile Prod Support
	Engineering Support	170	1.2	Out of Prod Eng Support
	Engineering Support	14,085	104.7	Misc Engineering Support
	Special Projects	3,079	15.2	Special Projects
	Training	912	8.0	Phoenix Training
	Training	52	0.2	HARM Training
	Training	69	0.2	Maverick Training
	Production Support	253	0.9	TOW (BGM-7) Prod Support
	Enhancement	454	2.3	A/C Survivability (Enhance)
	Production Support	125	0.7	Airborne Targets Prod Support
	Production Support	273	1.0	Air Vehicles Prod Support
	-Training Curriculum and Courseware	1,200	5	HARM, Harpoon, Sidewinder, Sparrow, AMRAAM, Phoenix, SLAM
	-HARM PIT Software Development			
	Training	39	0.28	Phoenix
		246	1.75	Harpoon/SLAM
		95	0.7	Penguin
		307	2.2	Sidewinder
		365	2.6	Sparrow
		42	0.3	HARM (FMS)
		197	1.3	Air-to-air weapons support
		234	1.6	HARM Training Support
		50	0.4	A6E - Part Task Trainer
		49	0.4	IR Maverick
		69	0.6	Maverick
Subtotal		121,688	633.53	
Weapons, Cruise Missiles	Safety Support	218	1.5	A/L Nuclear Wpns/Nuc Safety
	Software Support	1,701	9.5	Tomahawk Software Support

TABLE (contd.)

		FY93 Actual		
Common Support Functions	In-Service Engineering Efforts (List)	Funds Received ($K) (Obligation Authority)	Workyears	Weapon System(s) Supported
Weapons, Guided Projectiles	There was no in-service engineering in 1993.			
Weapons, Bombs	Production Support	170	1.1	GP Bomb Production Support
Weapons, Guns and Ammunition	Production Support	1,801	10.5	Gun Systems Prod Support
Space Systems, Launch Vehicles	Maintenance Support	300	3	Shuttle Crew Escape Equipment
C4I, Airborne	In-Service Support	424	3.5	Bosen In-Service Support

TABLE (contd.)

		FY93 Actual		
Common Support Functions	In-Service Engineering Efforts (List)	Funds Received ($K) (Obligation Authority)	Workyears	Weapon System(s) Supported
Training Systems	-Training Curriculum and Courseware	1,200	5	HARM, Harpoon, Sidewinder, Sparrow, AMRAAM, Phoenix, SLAM
	-HARM PIT Software Development			
	Training	39	0.28	Phoenix
		246	1.75	Harpoon/SLAM
		95	0.7	Penguin
		307	2.2	Sidewinder
		365	2.6	Sparrow
		42	0.3	HARM (FMS)
		197	1.3	Air-to-air weapons support
		234	1.6	HARM Training Support
		50	0.4	A6E - Part Task Trainer
		49	0.4	IR Maverick
		69	0.6	Maverick
	Software Upgrade	1,100	9.5	TACTS Enhancements
	Software Support	200	1.5	AEWTR Software Support
	Software Support	250	2.0	REWS Software Support
Environmental Quality		N/A	N/A	N/A

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Bombs (contd.)					
(3%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(2%)	Sled Tracks	No	No	No	64,000
(15%)	Strike Simulation and Modeling	Yes	Yes	Yes	6,211
(5%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(3%)	TDD DDT&E Complex	Yes	Yes	Yes	1,100
(3%)	TDD Exploratory Development Facility	No	No	No	2,810
(2%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(35%)	Warhead/Bomb Assembly/Integration Facilities	No	No	No	13,900
(3%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
Weapons, Guns and Ammunition					
(100%)	Advanced Gun System Complex	Yes	Yes	Yes	630
(15%)	Air / Ground Range	Yes	Yes	Yes	231,000
(5%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(35%)	Cactus Flats Ordnance Test Area	No	No	No	1,169
(5%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	Electronic Combat Range (ECR)	Yes	Yes	Yes	863,000
(5%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(5%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(2%)	Engineering Prototype Facility	No	No	No	30,400
(8%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(16%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(10%)	Materials Engineering / Failure Analysis Fac	No	No	No	4,860
(100%)	Medium-Caliber Gun and Ammo Ballistics Test Lab	Yes	Yes	Yes	4,555
(5%)	Metrology Facility	No	No	No	6,142
(5%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(5%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(25%)	Ordnance Assembly Facility	No	No	No	464
(10%)	Ordnance Breakdown Facility	No	No	No	4,257
(20%)	Ordnance Packaging Facility	No	No	No	558
(34%)	Ordnance Stowage Facilities	No	No	No	35,829
(3%)	Ordnance Test Complex	Yes	Yes	No	5588
(5%)	Propellants and Explosive Formulation Labs	No	No	No	17,484
(1%)	Sled Tracks	No	No	No	64,000
(10%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(15%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(1%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
Weapons, Directed Energy					
(90%)	High Energy Laser Experimental Test System (HELETS)	Yes	Yes	Yes	195,000
(12%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(4%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(1%)	RF Seeker/Guidance/Control DDT&E Complex	Yes	Yes	Yes	29,800
(5%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(2%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Bombs (contd.)					
(3%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(2%)	Sled Tracks	No	No	No	64,000
(15%)	Strike Simulation and Modeling	Yes	Yes	Yes	6,211
(5%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(3%)	TDD DDT&E Complex	Yes	Yes	Yes	1,100
(3%)	TDD Exploratory Development Facility	No	No	No	2,810
(2%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(35%)	Warhead/Bomb Assembly/Integration Facilities	No	No	No	13,900
(3%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
Weapons, Guns and Ammunition					
(100%)	Advanced Gun System Complex	Yes	Yes	Yes	630
(15%)	Air / Ground Range	Yes	Yes	Yes	231,000
(5%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(35%)	Cactus Flats Ordnance Test Area	No	No	No	1,169
(5%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	Electronic Combat Range (ECR)	Yes	Yes	Yes	863,000
(5%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(5%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(2%)	Engineering Prototype Facility	No	No	No	30,400
(8%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(16%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(10%)	Materials Engineering / Failure Analysis Fac	No	No	No	4,860
(100%)	Medium-Caliber Gun and Ammo Ballistics Test Lab	Yes	Yes	Yes	4,555
(5%)	Metrology Facility	No	No	No	6,142
(5%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(5%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(25%)	Ordnance Assembly Facility	No	No	No	464
(10%)	Ordnance Breakdown Facility	No	No	No	4,257
(20%)	Ordnance Packaging Facility	No	No	No	558
(34%)	Ordnance Stowage Facilities	No	No	No	35,829
(3%)	Ordnance Test Complex	Yes	Yes	No	5588
(5%)	Propellants and Explosive Formulation Labs	No	No	No	17,484
(1%)	Sled Tracks	No	No	No	64,000
(10%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(15%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(1%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
Space Systems, Satellites					
(100%)	High Energy Laser Experimental Test System (HELETS)	Yes	Yes	Yes	195,000
(5%)	Metrology Facility	No	No	No	6,142
(15%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(4%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(2%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Space Systems, Satellites					
(10%)	High Energy Laser Experimental Test System (HELETS)	Yes	Yes	Yes	195,000
(5%)	Metrology Facility	No	No	No	6,142
(3%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
Space Systems, Launch Vehicles					
(1%)	Air / Ground Range	Yes	Yes	Yes	231,000
(5%)	Metrology Facility	No	No	No	6,142
(2%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(20%)	Recovery Systems Complex	No	No	No	1,400
(100%)	Research Rockets Launch Complex	No	No	No	10,000
(100%)	TMD Launch Complex	No	No	No	10,000
C4I Systems, Airborne C4I					
(2%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(10%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(5%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(5%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
Electronic Devices					
(2%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(25%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(10%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
Human Systems					
(100%)	Human Systems Facility	No	No	No	1,239
Training Systems					
Environmental Quality					
(10%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(15%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(85%)	High Hazard Propulsion Test Facility	Yes	Yes	Yes	3,269
Advanced Materials					
(30%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(3%)	Composites Development Lab	Yes	No	No	6,000
(35%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(25%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(5%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
Actuator & Pwr Sys Lab	0	0	0	0	0	0	0	62	33	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	100
Adv Gun Sys Complex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Aeroheat Test Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Air Breathing Propulsion Lab	0	12	0	0	0	0	0	48	12	0	0	0	0	0	0	0	0	0	0	8	0	0	20	0	0	100
Air/Ground Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	98	2	0	100
Air-to-Surface Tgt Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Antiradiation Msl Seeker Test Complex	0	0	21	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	100
Antiradiation Msl Tgts	0	0	14	0	2	0	0	56	8	0	0	0	0	0	0	0	0	0	0	0	0	0	15	5	0	100
Antiradiation Msl Integration Complex	0	0	3	0	0	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	10	0	100
Armament/Wpns Design, Proto-type Integration Facility	0	0	18	0	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	0	100
Explosive & Ordnance Modeling	0	0	0	0	0	0	0	20	13	0	15	2	0	0	0	0	0	0	0	0	0	0	30	0	20	100
Air Wpn Digital Modeling & Sim	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	100
Cactus Flats Ordnance Test Area	0	0	0	0	0	0	0	1	0	0	5	4	0	0	0	0	0	0	0	0	0	0	90	0	0	100
Chemical Analysis Research Facility	0	0	0	0	0	0	8	23	0	0	8	4	0	0	0	0	2	0	0	12	24	0	18	0	1	100

Notes:
All numbers are given in percent.
S&T is Science and Technology; D&E is Development and Engineering; IE is In-Service Engineering.

TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
China Lake Ord & Propulsion Pilot Plant	0	6	0	0	0	0	0	70	12	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Composites Development Lab	0	0	9	0	0	0	0	68	10	0	0	0	0	0	0	0	0	0	0	0	2	1[a]	10	0	0	100
Data Link Development Lab	0	0	32	0	0	0	0	0	48	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	100
Detonation Physics Lab	0	0	0	0	0	0	0	24	4	0	12	0	0	0	0	0	0	0	0	0	0	0	60	0	0	100
Development Projects Lab	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Dynamic Properties Measurements Complex	0	0	14	0	1	0	0	45	11	0	4	0	0	0	0	0	0	0	0	0	0	0	25	0	0	100
Electronic Combat Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	13	27	100
Elec Warfare Integration Lab	0	0	81	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	100
Energetic Mtls Properties Analysis Lab	0	0	0	0	0	0	0	54	9	0	23	4	0	0	0	0	0	0	0	0	0		10	0	0	100
Energetic Mtls Synthesis & Scale-Up Lab	0	0	0	0	0	0	0	75	10	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Eng Prototype Facility	0	0	1	0	7	0	0	79	2	0	8	2	0	0	0	0	0	0	0	0	0	1[b]	0	0	0	100
Environ Test Complex	0	0	2	0	2	0	0	20	8	0	4	3	0	0	0	1	0	0	0	0	0	0	60	0	0	100
Foreign Mtl Exploitation & Balloon Test Complex	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	100
Fuze Development Lab	0	0	0	0	0	0	0	65	10	0	17	0	0	0	0	0	0	0	0	0	0	0	8	0	0	100

[a] Fabrication of parts for agencies such as the USMC base at Yuma and NRaD, San Diego.

[b] Manufacturing and reverse engineering of hardware for various DOD agencies such as the USMC Logistics Base, Barstow, and Phillips Lab at Edwards AFB.

TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
Guidance Components T&A Complex	0	0	3	0	0	0	0	52	2	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	100
High Energy Laser Exp Test Sys (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
High Hazard Propulsion Test Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Human Systems Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	100
IR Seeker, GCS DDT&E Complex	0	0	0	0	0	0	0	71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	100
Junction Ranch RCS Range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Large Rocket Motor Disposal Facility	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Laser Seeker Integration & Test Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Mtls & Processes Research Facility	0	0	0	0	0	0	0	50	0	0	0	0	0	0	0	0	15	0	0	0	35	0	0	0	0	100
Mtls Eng/ Failure Analysis Facility	0	0	4	0	0	0	0	4	4	0	4	4	0	0	0	0	10	0	0	0	10	0	60	0	0	100
Med-Caliber Gun & Ammo Ballistic Test Lab	0	0	0	0	0	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	0	0	45	0	0	100
Metrology Facility	0	0	4	0	1	0	0	22	12	0	2	2	0	2	2	0	0	0	0	0	0	3[a]	50	0	0	100
Msl Engagement Simulation Arena	0	0	20	0	0	0	0	40	20	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	100
Msl/Rocket Motor Assy Facility	0	0	0	0	0	0	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	100

[a] Used to calibrate test equipment for various products such as ground vehicles, submarines, etc.

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TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
MK 45 TDD Eng Dev HITL/Test Lab	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	100
Non Destructive Ord Test Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Optics & Laser Research Facility	0	0	5	0	0	0	0	68	0	0	0	5	11	0	3	0	0	0	0	0	0	0	8	0	0	100
Ordnance Assy Facility	0	0	0	0	0	0	0	16	0	0	18	11	0	0	0	0	0	0	0	0	0	0	55	0	0	100
Ordnance Break-down Facility	0	0	0	0	0	0	0	90	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Ordnance Pack-aging Facility	0	0	0	0	0	0	0	30	0	0	10	10	0	0	0	0	0	0	0	0	0	0	50	0	0	100
Ordnance & Pro-pulsion FME Lab	0	0	1	0	1	0	0	12	3	0	0	0	1	0	0	2	0	0	0	0	0	0	5	0	75	100
Ordnance & Pro-pulsion Plant Support Shops	0	0	0	0	0	0	0	10	76	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Ordnance Stowage Facility	0	0	0	0	0	0	0	16	0	0	16	17	0	0	0	0	0	0	0	0	0	0	51	0	0	100
Ordnance Test Complex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Propellants & Explosive Formulation Labs	0	0	0	0	0	0	0	75	10	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Propulsion & Energy Conver-sion Research Facility	0	0	0	0	0	0	50	30	10	0	3	0	0	2	0	0	0	0	0	0	5	0	0	0	0	100
Recovery Systems Complex	0	0	0	20	0	0	0	10	10	0	0	0	0	10	0	0	0	0	0	0	0	0	50	0	0	100
Research Rockets Launch Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100

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TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
MK 45 TDD Eng Dev HITL/Test Lab	0	0	0	0	0	0	0	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	100
Non Destructive Ord Test Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Optics & Laser Research Facility	0	0	5	0	0	0	0	68	0	0	0	5	11	0	3	0	0	0	0	0	0	0	8	0	0	100
Ordnance Assy Facility	0	0	0	0	0	0	0	16	0	0	18	11	0	0	0	0	0	0	0	0	0	0	55	0	0	100
Ordnance Break-down Facility	0	0	0	0	0	0	0	90	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Ordnance Pack-aging Facility	0	0	0	0	0	0	0	30	0	0	10	10	0	0	0	0	0	0	0	0	0	0	50	0	0	100
Ordnance & Pro-pulsion FME Lab	0	0	1	0	1	0	0	12	3	0	0	0	1	0	0	2	0	0	0	0	0	0	5	0	75	100
Ordnance & Pro-pulsion Plant Support Shops	0	0	0	0	0	0	0	10	76	12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Ordnance Stowage Facility	0	0	0	0	0	0	0	16	0	0	16	17	0	0	0	0	0	0	0	0	0	0	51	0	0	100
Ordnance Test Complex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Propellants & Explosive Formulation Labs	0	0	0	0	0	0	0	75	10	0	10	5	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Propulsion & Energy Conver-sion Research Facility	0	0	0	0	0	0	50	30	10	0	3	0	0	2	0	0	0	0	0	0	0	5	0	0	0	100
Recovery Systems Complex	0	0	0	20	0	0	0	10	10	0	0	0	0	10	0	0	0	0	0	0	0	0	50	0	0	100
Research Rockets Launch Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100

TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
RF Seeker/ Guidance/Control DDT&E Complex	0	0	1	0	0	0	0	81	0	0	0	0	1	0	0	0	0	0	0	0	0	0	16	1	0	100
Sensor & Target-ing Technology Facility	0	0	17	0	0	0	0	21	25	13	0	0	0	0	0	0	8	0	0	0	0	0	13	3	0	100
Ship Self Defense Test Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Signature Measurement & Evaluation	0	0	10	0	5	0	0	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Simulation Lab-Msl HITL	0	0	0	0	0	0	0	72	8	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	100
Sled Tracks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Std Msl/VLS Test Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Strategic Propulsion Test Complex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
Strike Simulation & Modeling	0	0	0	0	0	0	0	32	22	0	10	0	0	0	0	0	0	0	0	0	0	0	33	3	0	100
Strike Software Simulation Facility	0	0	0	0	0	0	0	42	42	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	100
Sys Modeling & Signal Processing Facility	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	100
Tactical Propul-sion Test Facility	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
TARIF/Combat Environment	0	0	70	0	5	0	0	10	0	0	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	100
TDD DDT&E Complex	0	0	0	0	0	0	0	97	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100

TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
TDD Exploratory Devel Facility (IR)	0	0	0	0	0	0	0	97	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
TDD Perform Eval Lab	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Telemetry Devel Lab	0	0	15	0	0	0	0	43	4	0	2	12	0	0	0	0	0	0	0	0	0	0	20	0	0	100
TMD Launch Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
TSSAM Hardware in the Loop	0	0	5	0	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	100
TSSAM Mission Planning Facility	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	100
VHF Anechoic Chamber	0	0	13	0	0	0	0	64	0	0	0	0	4	0	0	4	0	0	0	0	0	0	15	0	0	100
Warhead/Bomb Assy/Integration Facilities	0	0	0	0	0	0	0	20	13	0	17	0	0	0	0	0	0	0	0	0	0	0	50	0	0	100
Weapon System Support Facility Complex	0	0	42	0	3	0	0	3	0	0	2	1	0	0	0	0	0	0	0	0	0	0	38	0	11	100
Weapons Guidance/ Control/Seeker Integration Lab	0	0	2	0	2	0	0	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	100
Weapons Signal Processing Design Complex	0	0	14	0	0	0	0	70	0	0	0	0	2	0	0	4	0	0	0	0	0	0	10	0	0	100
Weapons Survivability Lab	0	0	8	40	2	14	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	100
Weapons & Tactics Analysis Center	5	0	7	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	2	25	25	0	100

TABLE (contd.)

Facility/ Equipment	CSFs (R&D Only, i.e., S&T, D&E, IE)																					Other R&D Non CSF	T&E	T&D	Other	Total
	Air Vehicles						Weapons							Space Systems		C4I	Pervasive Functions									
	Fixed Wing				Rotary Wing																					
	Structure	Propulsion	Avionics	Flt Subsys	Avionics	Flt Subsys	ICBMs/SLBMs	Conv. Msl/Rkt	Cruise Msl	Guided Proj.	Bombs	Guns & Ammo	Directed Energy	Launch Veh.	Satellites	Airborne	Elec Devices	Human Sys	Training Sys	Env. Qual	Adv. Mtls		Test & Evaluation	Training & Doctrine		
TDD Exploratory Devel Facility (IR)	0	0	0	0	0	0	0	97	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
TDD Perform Eval Lab	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
Telemetry Devel Lab	0	0	15	0	0	0	0	43	4	0	2	12	0	0	0	0	0	0	0	0	0	0	20	0	0	100
TMD Launch Complex (White Sands)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	100
TSSAM Hardware in the Loop	0	0	5	0	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	0	100
TSSAM Mission Planning Facility	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	100
VHF Anechoic Chamber	0	0	13	0	0	0	0	0	64	0	0	0	4	0	0	4	0	0	0	0	0	0	15	0	0	100
Warhead/Bomb Assy/Integration Facilities	0	0	0	0	0	0	0	0	20	12	17	0	0	0	0	0	0	0	0	0	0	0	50	0	0	100
Weapon System Support Facility Complex	0	0	42	0	3	0	0	3	0	0	2	1	0	0	0	0	0	0	0	0	0	0	38	0	11	100
Weapons Guidance/ Control/Seeker Integration Lab	0	0	2	0	2	0	0	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	100
Weapons Signal Processing Design Complex	0	0	14	0	0	0	0	70	0	0	0	0	2	0	0	4	0	0	0	0	0	0	10	0	0	100
Weapons Survivability Lab	0	0	8	40	2	14	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	100
Weapons & Tactics Analysis Center	5	0	7	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	0	0	0	2	25	25	0	100

Note: The data contained in the Table on pages 145-151 cannot be compared to the data contained in the Table on pages 151a to 151f with respect to the percentage of use of the facility for each "common support function", and in many cases are not the identical for the same facility.

The data in the Table on pages 145-151 is broken out by the percentage of use of the facility by "Common Support Function" for all life cycle phases such as R&D, T&E, T&D (Training & Doctrine), etc. The numbers in this table add up to 100% for only those CSF's defined in Data Call #12.

The data in the Table on pages 151a - 151f is broken out by phases of Life Cycle first, and then subsequently subdivided by "Common Support Function" for the R&D phases of the life cycle only (i.e. S&T, Engineering & Development, and In-Service Engineering). The numbers in this table add up to 100% for all the life cycles.

For example, the Anti Radiation Missile (ARM) Seeker Test Complex is used 35% for Air Vehicles, Fixed Wing, Avionics & 65% for Weapons, Conventional Missiles and Rockets for a total of 100% of the CSF's defined in the data call, and also 100% of the life cycles as shown in the table on pages 145 and 146. However, since this facility is used 40% for T&E, and 60% for R&D (5% S&T and 55% D&E) we multiply the 60% times each CSF to get the % of time the facility is used for R&D CSF's only in the table on page 151a (i.e. 0.6 X 35% = 21% use for Air Vehicles, Fixed Wing, Avionics R&D)

TABLE (contd.)

Common Support Function (%use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Space Systems, Satellites					
(10%)	High Energy Laser Experimental Test System (HELETS)	Yes	Yes	Yes	195,000
(5%)	Metrology Facility	No	No	No	6,142
(3%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
Space Systems, Launch Vehicles					
(1%)	Air / Ground Range	Yes	Yes	Yes	231,000
(5%)	Metrology Facility	No	No	No	6,142
(2%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(20%)	Recovery Systems Complex	No	No	No	1,400
(100%)	Research Rockets Launch Complex	No	No	No	10,000
(100%)	TMD Launch Complex	No	No	No	10,000
C4I Systems, Airborne C4I					
(2%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(10%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(5%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(5%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
Electronic Devices					
(2%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(25%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(10%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
Human Systems					
(100%)	Human Systems Facility	No	No	No	1,239
Training Systems					
(70%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
Environmental Quality					
(10%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(15%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(85%)	High Hazard Propulsion Test Facility	Yes	Yes	Yes	3,269
Advanced Materials					
(30%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(3%)	Composites Development Lab	Yes	No	No	6,000
(35%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(25%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(5%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020

The following material is amplifying information on the NAWCWPNS China Lake facilities, which was summarized in the table above.

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Space Systems, Satellites (contd.)					
(1%)	RF Seeker/Guidance/Control DDT&E Complex	Yes	Yes	Yes	29,800
(5%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(2%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
Space Systems, Launch Vehicles					
(5%)	Metrology Facility	No	No	No	6,142
(20%)	Recovery Systems Complex	No	No	No	1,400
(100%)	Research Rockets Launch Complex	No	No	No	10,000
(100%)	TMD Launch Complex	No	No	No	10,000
C4I Systems, Airborne C4I					
(2%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(10%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(5%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(5%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
Electronic Devices					
(2%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(25%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(10%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
Human Systems					
(100%)	Human Systems Facility	No	No	No	1,239
Training Systems					
(70%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
Environmental Quality					
(10%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(15%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(85%)	High Hazard Propulsion Test Facility	Yes	Yes	Yes	3,269
Advanced Materials					
(30%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(3%)	Composites Development Lab	Yes	No	No	6,000
(35%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(25%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(5%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020

The following material is amplifying information on the NAWCWPNS China Lake facilities, which was summarized in the table above.

R

Actuator and Power Systems Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Actuator and Power Systems Lab	Yes	Yes	Yes	$6,676K = Total $5,964K = Buildings

Facility Description (contd.). The Actuator and Power Systems Laboratories are a group of buildings in the China Lake Propulsion Laboratory (CLPL) area of NAWCWPNS that has the capacity to conduct developmental evaluation and test of actuation and power system components of missiles and related equipment, and the capacity to pressure-test and hydroburst-test motor cases, igniter housings, and other pressure vessels. The full range of actuation systems including electromechanical, hydraulic and pneumatic, and energy storage systems can be evaluated either at the component level or as part of a larger control assembly. The laboratory can conduct load testing, performance characterization, and acceptance testing of missile and air-vehicle flight-control actuators, separately or as an integral part of the missile flight control autopilot.

This equipment is unique because when the planned improvement in FY95 is completed, it will be the only known facility capable of simulating full dynamic loads on actuators and thrust vector control units.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	65
Weapons, Cruise Missiles	35

Life-Cycle Functions	Percentage
T&E	5
S&T	20
D&E	60
IE	15
T&D	0
Other	0

Actuator and Power Systems Laboratory

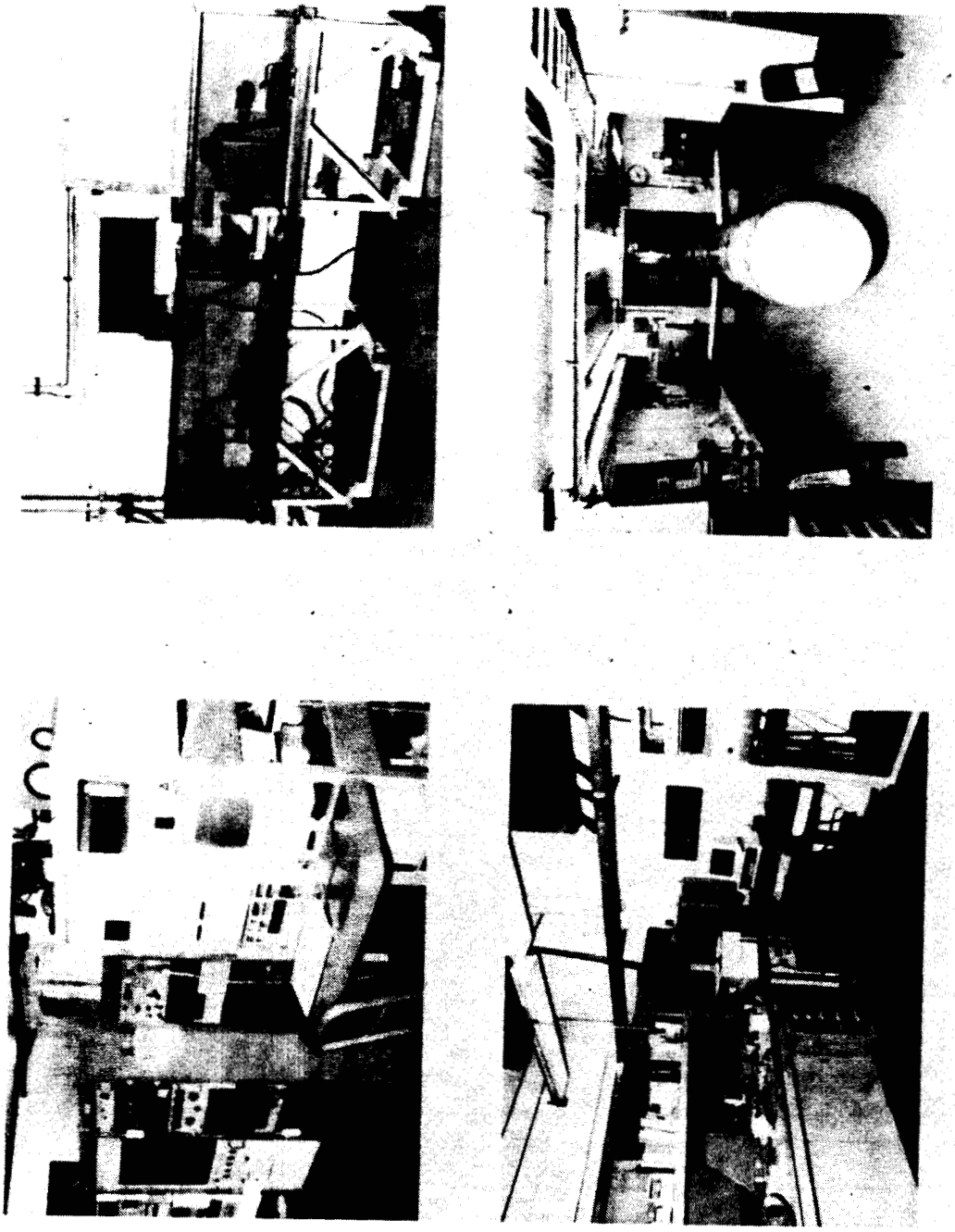
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Actuator and Power Systems Lab	Yes	Yes	Yes	$6,676K = Total $5,964K = Buildings

Facility Description (contd.). The Actuator and Power Systems Laboratories are a group of buildings in the China Lake Propulsion Laboratory (CLPL) area of NAWCWPNS that has the capacity to conduct developmental evaluation and test of actuation and power system components of missiles and related equipment, and the capacity to pressure-test and hydroburst-test motor cases, igniter housings, and other pressure vessels. The full range of actuation systems including electromechanical, hydraulic and pneumatic, and energy storage systems can be evaluated either at the component level or as part of a larger control assembly. The laboratory can conduct load testing, performance characterization, and acceptance testing of missile and air-vehicle flight-control actuators, separately or as an integral part of the missile flight control autopilot.

This equipment is unique because when the planned improvement in FY95 is completed, it will be the only known facility capable of simulating full dynamic loads on actuators and thrust vector control units.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	65
Weapons, Cruise Missiles	35

Actuator and Power Systems Laboratory



Actuator and Power Systems Laboratory

R

Advanced Gun System Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Guns and Ammunition	Advanced Gun System Complex	Yes	Yes	Yes	$630K

Facility Description (contd.). The mission of this facility is to test advanced gun weapon systems to include barrels, propellants, projectiles, and submunitions to increase the range, accuracy, and lethality of Navy Gun Weapon Systems. This test complex sited at WSMR includes a Mk 39 Gun Mount at WSMR Launch Complex (LC)-35, an FY95 MILCON (Project P008) at LC-37, a Range Extension Near Term (RENT) Program site, and numerous inert and live munitions impact areas.

This equipment is unique because this facility will provide long-range gunnery (up to 100 miles) that cannot be provided anywhere else in the U.S.

Common Support Functions	Percentage
Weapons, Guns and Ammunition	100

This facility is almost exclusively used for T&E.

Advanced Gun System Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Guns and Ammunition	Advanced Gun System Complex	Yes	Yes	Yes	$630K

Facility Description (contd.). The mission of this facility is to test advanced gun weapon systems to include barrels, propellants, projectiles, and submunitions to increase the range, accuracy, and lethality of Navy Gun Weapon Systems. This test complex sited at WSMR includes a Mk 39 Gun Mount at WSMR Launch Complex (LC)-35, an FY95 MILCON (Project P008) at LC-37, a Range Extension Near Term (RENT) Program site, and numerous inert and live munitions impact areas.

This equipment is unique because this facility will provide long-range gunnery (up to 100 miles) that cannot be provided anywhere else in the U.S.

Common Support Functions	Percentage
Weapons, Guns and Ammunition	100

Advanced Gun System Complex

Aeroheat Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs	Aeroheat Test Facility	Yes	Yes	Yes	$2,165K = Total $ 467K = Buildings

Facility Description (contd.). The aeroheat facility at NAWCWPNS China Lake is used to simulate supersonic flight conditions for materials survivability and to test ramjet propulsion systems and is capable of testing a variety of tactical-sized missiles, both all-up rounds and components. Test stand capabilities include air velocities to Mach 2.9, temperature elevation of blowdown gasses to 2200°F, a maximum mass flow of 150 lb/sec, and a range of surface heat flux from 0 to 300 BTU/ft^2/sec. The workload currently experienced and envisioned into the near future is directed at supporting both China Lake and other government and contractor programs. This test support currently is made to all phases of acquisition development—RDT&E on new or emerging products through production follow-on tests supporting product improvements. Approximately 55% of tasking effort is China Lake programs, 15% is other government programs, and 30% is done for contractors that have active government weapons-development contracts. The T-Range facility already supports nearly the full Navy integrated RDT&E process for all aeroheat tasks generated within the Navy T&E community for small tactical missile material testing. The facility is also part of China Lake's core competency level regarding missile RDT&E. The facility is sited for 200 pounds Class 1.1, 1.3, and 1.4 materials. The Facility consists of Buildings/Test Pad 16178, 12143, 16020, 16059, 16060, 16061, and 16101.

This equipment is unique because the facility provides a range of heat flux and mass flows that is unique. This facility was included in the recent BOD studies and was not found to be duplicative of any other facility.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	85
Weapons, Bombs	15

Life-Cycle Functions	Percentage
T&E	100*

* However, many tests support an R&D project.

Aeroheat Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs	Aeroheat Test Facility	Yes	Yes	Yes	$2,165K = Total $ 467K = Buildings

Facility Description (contd.). The aeroheat facility at NAWCWPNS China Lake is used to simulate supersonic flight conditions for materials survivability and to test ramjet propulsion systems and is capable of testing a variety of tactical-sized missiles, both all-up rounds and components. Test stand capabilities include air velocities to Mach 2.9, temperature elevation of blowdown gasses to 2200°F, a maximum mass flow of 150 lb/sec, and a range of surface heat flux from 0 to 300 BTU/ft^2/sec. The workload currently experienced and envisioned into the near future is directed at supporting both China Lake and other government and contractor programs. This test support currently is made to all phases of acquisition development—RDT&E on new or emerging products through production follow-on tests supporting product improvements. Approximately 55% of tasking effort is China Lake programs, 15% is other government programs, and 30% is done for contractors that have active government weapons-development contracts. The T-Range facility already supports nearly the full Navy integrated RDT&E process for all aeroheat tasks generated within the Navy T&E community for small tactical missile material testing. The facility is also part of China Lake's core competency level regarding missile RDT&E. The facility is sited for 200 pounds Class 1.1, 1.3, and 1.4 materials. The Facility consists of Buildings/Test Pad 16178, 12143, 16020, 16059, 16060, 16061, and 16101.

This equipment is unique because the facility provides a range of heat flux and mass flows that is unique. This facility was included in the recent BOD studies and was not found to be duplicative of any other facility.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	85
Weapons, Bombs	15

Aeroheat Test Facility

Air-Breathing Propulsion Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Propulsion Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Environmental Quality	Air-Breathing Propulsion Lab	Yes	Yes	Yes	$12,564K = Total $ 8,367K = Buildings

Facility Description (contd.). This facility is an open-air facility to static-fire and test air-breathing engines and engine components including fuels, inlets, insulators, combustors, and fuel management systems. This facility can also static-fire instrumented rocket motors and pyrotechnic devices up to 20 pounds Class 1.3 or 100 mg Class 1.1. The facility can simulate flight conditions up to Mach 5 from sea level to 80,000 feet altitude in operational environments of -65 to 200°F with engine sizes less than 8 inches diameter direct-connected to the air supply. The facility has test bays for cold flow and hot firing of liquid and solid fuel ramjets and for expendable turbine engine testing. A liquid fuels formulation and development and evaluation laboratory also exists within the facility.

A new program has started on shipboard waste treatment by incineration using the expertise, facilities, and instrumentation associated with this Laboratory. In FY95 a full-scale ship incinerator will be installed in close proximity to the Laboratory.

This equipment is unique because the remote location, coupled with the equipment, provides safety and security measures not matched by any other DOD facility with a high population surrounding it.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Propulsion	15
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	15
Environmental Quality	10

Life-Cycle Functions	Percentage
T&E	20
S&T	70
D&E	10
IE	0
T&D	0
Other	0

Air-Breathing Propulsion Laboratory

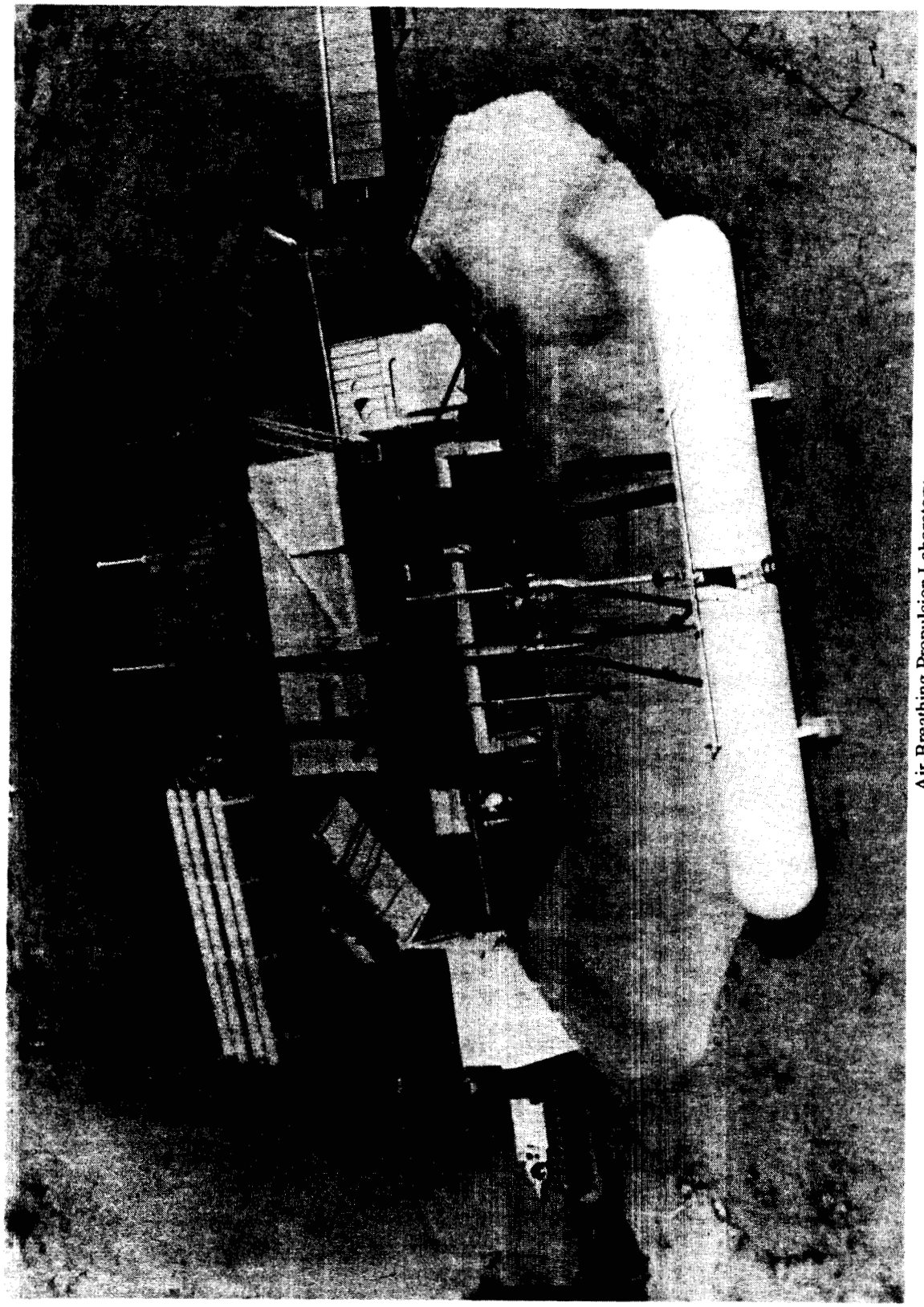
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Environmental Quality	Air-Breathing Propulsion Lab	Yes	Yes	Yes	$12,564K = Total $ 8,367K = Buildings

Facility Description (contd.). This facility is an open-air facility to static-fire and test air-breathing engines and engine components including fuels, inlets, insulators, combustors, and fuel management systems. This facility can also static-fire instrumented rocket motors and pyrotechnic devices up to 20 pounds Class 1.3 or 100 mg Class 1.1. The facility can simulate flight conditions up to Mach 5 from sea level to 80,000 feet altitude in operational environments of -65 to 200°F with engine sizes less than 8 inches diameter direct-connected to the air supply. The facility has test bays for cold flow and hot firing of liquid and solid fuel ramjets and for expendable turbine engine testing. A liquid fuels formulation and development and evaluation laboratory also exists within the facility.

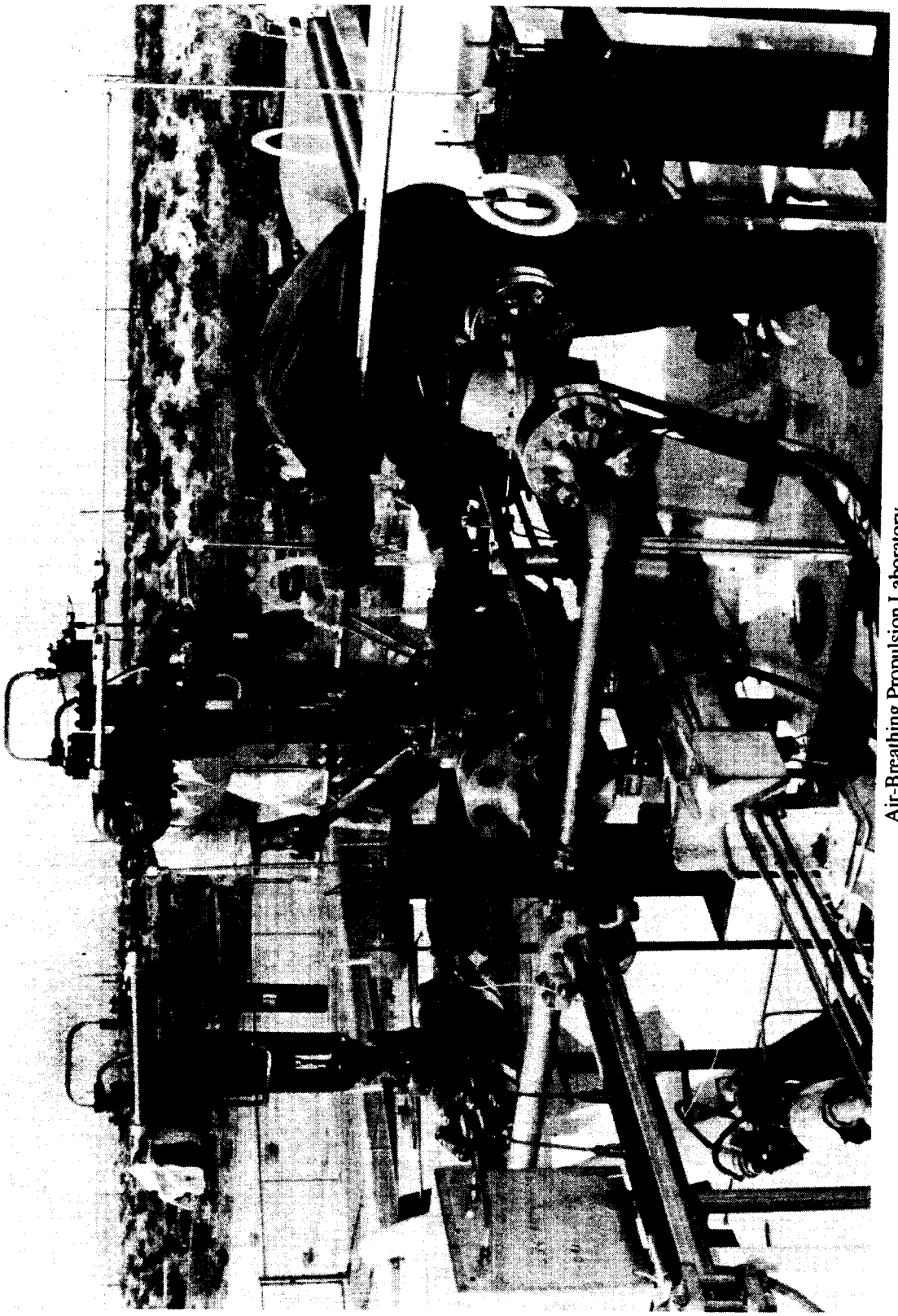
A new program has started on shipboard waste treatment by incineration using the expertise, facilities, and instrumentation associated with this Laboratory. In FY95 a full-scale ship incinerator will be installed in close proximity to the Laboratory.

This equipment is unique because the remote location, coupled with the equipment, provides safety and security measures not matched by any other DOD facility with a high population surrounding it.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	75
Weapons, Cruise Missiles	15
Environmental Quality	10



Air-Breathing Propulsion Laboratory



Air-Breathing Propulsion Laboratory

Air / Ground Range

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Fixed Wing, Flight Subsystems Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition Space Systems, Launch Vehicles	Air / Ground Range Elements • RF Target Array • G-6 Point Defense Site • Randsburg Wash Towers and Fuze Range • Cruise Impact Testing • G-4 Test Track • G Range • B/C Range • Coso Range • Airport Lake • G-2 Range • G-6 Range • Redeye Range • Randsburg Wash Gun Range • Mojave B North • Drop Zones	Yes	Yes	Yes	$231,000K = Total $ 67,600K = Buildings

Facility Description (contd.). The North Range is a fully instrumented MRTFB facility supporting T&E for both air and ground testing of conventional weapons, including cruise missiles, air-vehicle tests, training and tactics development, and parachute systems.

The Range includes over 1.1 million acres of land and over 20,000 square miles of restricted airspace. The primary Range can be subdivided into smaller ranges that are used independently or collectively depending on test scenarios.

The climate and geography of these lands are typical of the arid regions of the U.S. Southwest. The weather is usually clear, with very little precipitation and practically unlimited visibility throughout most of the year. The land is barren, consisting mainly of flat dry lake beds, large dry washes, alluvial fans, and rugged mountains. Nearly all the land is used exclusively for test and evaluation or as a buffer between sensitive/hazardous tests and the surrounding civilian lands.

Outside NAWCWPNS boundaries the land is sparsely populated; equally as diverse in topography and ground cover; and, within a radius of 50 miles, mainly in the public domain. The airspace over the test ranges is restricted from surface to infinity; the surrounding lands are overlain by the R-2508 complex of restricted airspaces (20,000 feet above sea level to infinity), which center on NAWCWPNS and cover an area larger than the state of Maryland. These restricted airspaces combine with the surrounding desert to provide safe and secure air and ground range operational areas.

This equipment is unique because the Range contains several facilities and features that are "one-of-a-kind," including

1. The RF Target Array - A large array, 60+, of shootable RF targets. These targets are constructed and geographically positioned to simulate real-world threat scenarios. Additionally, many of the targets are capable of replicating multiple threats.
2. G6 Point Defense Site - A hardened test site approximately 700 feet above the valley floor allowing for launch/testing of weapons, at co-altitude with test site, where there is a significant risk of either launch item or target impacting the test site. The site is designed to safely sustain impact from a full-scale aerial target.
3. Randsburg Wash Towers and Fuze Range - Two wooden towers capable of suspending full-scale targets 250 feet above the ground, allowing gun fuze testing to be performed in a realistic environment.
4. Cruise Impact Testing - The only range that allows impact test of U/RGM-109 D and C (surface and subsurface launch of Tomahawk) after having flown an operationally realistic track from launch at sea to impact (IR-200 route).
5. G-4 Track - Allows test item to be launched off the end of a track, which looks out over a valley floor several hundred feet below. The facility allows cost-effective, free-flight testing of weapons and retardation devices prior to aircraft flight testing.
6. Colocation with one of DOD's primary weapons RDT&E laboratories. This provides for a convenient and effective interchange between T&E and R&D, including
   - Test conduct without travel time and expense
   - The ability to test experimental ordnance without off-site shipping expense and coordination
   - Quick turnaround of data, data analyses, and re-test
7. Electronic link between China Lake, Edwards AFB, Vandenburg AFB, and Point Mugu. Allows for interchange of data and interrange testing of systems requiring capabilities beyond those of one range—for example, cruise missile testing.
8. Good weather and visibility (>260 clear days per year) providing excellent photo-optical data coverage and test conditions.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	55
Air Vehicles, Fixed Wing, Flight Subsystems	2
Weapons, Conventional Missiles/Rockets	20
Weapons, Cruise Missiles	1
Weapons, Bombs	6
Weapons, Guns and Ammunition	15
Space Systems, Launch Vehicles	1

Life-Cycle Functions	Percentage
T&E	98*
S&T	0
D&E	0
IE	0
T&D	2
Other	0

* Much of this supports R&D programs.

This equipment is unique because the Range contains several facilities and features that are "one-of-a-kind," including

1. The RF Target Array - A large array, 60+, of shootable RF targets. These targets are constructed and geographically positioned to simulate real-world threat scenarios. Additionally, many of the targets are capable of replicating multiple threats.
2. G6 Point Defense Site - A hardened test site approximately 700 feet above the valley floor allowing for launch/testing of weapons, at co-altitude with test site, where there is a significant risk of either launch item or target impacting the test site. The site is designed to safely sustain impact from a full-scale aerial target.
3. Randsburg Wash Towers and Fuze Range - Two wooden towers capable of suspending full-scale targets 250 feet above the ground, allowing gun fuze testing to be performed in a realistic environment.
4. Cruise Impact Testing - The only range that allows impact test of U/RGM-109 D and C (surface and subsurface launch of Tomahawk) after having flown an operationally realistic track from launch at sea to impact (IR-200 route).
5. G-4 Track - Allows test item to be launched off the end of a track, which looks out over a valley floor several hundred feet below. The facility allows cost-effective, free-flight testing of weapons and retardation devices prior to aircraft flight testing.
6. Colocation with one of DOD's primary weapons RDT&E laboratories. This provides for a convenient and effective interchange between T&E and R&D, including
   - Test conduct without travel time and expense
   - The ability to test experimental ordnance without off-site shipping expense and coordination
   - Quick turnaround of data, data analyses, and re-test
7. Electronic link between China Lake, Edwards AFB, Vandenburg AFB, and Point Mugu - Allows for interchange of data and interrange testing of systems requiring capabilities beyond those of one range—for example, cruise missile testing.
8. Good weather and visibility (>260 clear days per year) providing excellent photo-optical data coverage and test conditions.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	55
Air Vehicles, Fixed Wing, Flight Subsystems	2
Weapons, Conventional Missiles/Rockets	20
Weapons, Cruise Missiles	1
Weapons, Bombs	6
Weapons, Guns and Ammunition	15
Space Systems	1

3.3.2 Projected Funding

3.3.2.1 Direct Funding: *For each applicable CSF, identify direct mission funding by appropriation from FY94 to FY97. Use FY95 PBS for FY95-FY97. (BRAC Criteria I)*

The laboratory function (R&D Pillar) at NAWCWPNS is a DBOF activity and does not receive any direct mission funding.

The SELENE main site is in the planning stage and does not yet have an established funding source. Both the House and Senate Armed Services subcommittees have included a budget line item for fiscal year 1995 funding to support a feasibility study, but an agreed-to appropriations level has not yet been established.

3.3.2.2 Other Obligation Authority: *For each applicable CSF, identify reimbursable and direct-cite funding (other obligation authority expected) from FY94 to FY97. Funding allocation must be traceable to FY95 PBS. (BRAC Criteria I)*

CSF	FY94 ($K)	FY95 ($K)	FY96 ($K)	FY97 ($K)
Air Vehicles, Fixed Wing, Structure	9,928	9,704	9,308	9,056
Air Vehicles, Fixed Wing, Propulsion	200*	400*	600*	400*
Air Vehicles, Fixed Wing, Avionics	210,162	204,910	195,845	190,093
Air Vehicles, Fixed Wing, Flight Subsystems	11,000*	11,000*	11,000*	11,000*
Air Vehicles, Rotary Wing, Avionics	12,410	12,130	11,635	11,320
Air Vehicles, Rotary Wing, Flight Subsystems	200*	200*	200*	200*
Weapons, ICBMs/SLBMs	7,930	7,834	7,498	7,304
Weapons, Conventional Missiles/Rockets	319,378	314,945	298,299	292,988
Weapons, Cruise Missiles	35,685	35,253	33,741	32,868
Weapons, Guided Projectiles	200	800	1,000	1,500
Weapons, Bombs	23,790	23,502	22,494	21,912
Weapons, Guns and Ammunition	3,965	3,917	3,749	3,652
Weapons, Directed Energy	75	300	300	300
Space Systems, Launch Vehicles	420	525	300	300
Space Systems, Satellites	100**	1,000**	3,000**	50,000**
C4I, Airborne	1,820	1,856	1,912	1,931
Electronic Devices	2,542	2,774	2,909	2,789
Human Systems	1,340	1,400	1,400	1,400
Training Systems*	60	65	70	75
Environmental Quality*	875	880	890	895
Advanced Materials*	2,230	2,230	2,350	2,408

*Estimates only.
**Estimated NASA funding for China Lake to install NAOMI optics and construct the SELENE Laser (from Nunn-Lugar amendment). Not part of current President's budget for NAWCWPNS.

3.3.2.2 Other Obligation Authority: *For each applicable CSF, identify reimbursable and direct-cite funding (other obligation authority expected) from FY94 to FY97. Funding allocation must be traceable to FY95 PBS. (BRAC Criteria I)*

CSF	FY94 ($K)	FY95 ($K)	FY96 ($K)	FY97 ($K)
Air Vehicles, Fixed Wing, Structure	9,928	9,704	9,308	9,056
Air Vehicles, Fixed Wing, Propulsion	200*	400*	600*	400*
Air Vehicles, Fixed Wing, Avionics	180,046	175,474	167,610	162,622
Air Vehicles, Fixed Wing, Flight Subsystems	11,000*	11,000*	11,000*	11,000*
Air Vehicles, Rotary Wing, Avionics	12,410	12,130	11,635	11,320
Air Vehicles, Rotary Wing, Flight Subsystems	200*	200*	200*	200*
Weapons, ICBMs/SLBMs	7,930	7,834	7,498	7,304
Weapons, Conventional Missiles/Rockets	315,379	309,075	288,455	288,941
Weapons, Cruise Missiles	35,685	35,253	33,741	32,868
Weapons, Guided Projectiles	200	800	1,000	1,500
Weapons, Bombs	23,790	23,502	22,494	21,912
Weapons, Guns and Ammunition	3,965	3,917	3,749	3,652
Weapons, Directed Energy	75	300	300	300
Space Systems, Launch Vehicles	420	525	300	300
Space Systems, Satellites	100**	1,000**	3,000**	50,000**
C4I, Airborne	1,820	1,856	1,912	1,931
Electronic Devices	2,542	2,774	2,909	2,789
Human Systems	1,340	1,400	1,400	1,400
Training Sys***	31,672	31,086	29,890	29,221
Environmental Quality	2,268	4,055	7,926	2,063
Advanced Materials	3,340	3,340	3,473	3,612
Total	644,310	635,625	608,400	642,391

*Estimates only.
**Estimated NASA funding for China Lake to install NAOMI optics and construct the SELENE Laser (from Nunn-Lugar amendment). Not part of current President's budget for NAWCWPNS.
***TARIF/combat environment.

3.3.2.2 Other Obligation Authority: *For each applicable CSF, identify reimbursable and direct-cite funding (other obligation authority expected) from FY94 to FY97. Funding allocation must be traceable to FY95 PBS. (BRAC Criteria I)*

CSF	FY94 ($K)	FY95 ($K)	FY96 ($K)	FY97 ($K)
Air Vehicles, Fixed Wing, Structure	9,928	9,704	9,308	9,056
Air Vehicles, Fixed Wing, Propulsion	200*	400*	600*	400*
Air Vehicles, Fixed Wing, Avionics	180,046	175,474	167,610	162,622
Air Vehicles, Fixed Wing, Flight Subsystems	11,000*	11,000	11,000	11,000
Air Vehicles, Rotary Wing, Avionics	12,410	12,130	11,635	11,320
Air Vehicles, Rotary Wing, Flight Subsystems	200*	200*	200*	200*
Weapons, ICBMs/SLBMs	7,930	7,834	7,498	7,304
Weapons, Conventional Missiles/Rockets	315,454	309,375	291,455	289,241
Weapons, Cruise Missiles	35,685	35,253	33,741	32,868
Weapons, Guided Projectiles	200	800	1,000	1,500
Weapons, Bombs	23,790	23,502	22,494	21,912
Weapons, Guns and Ammunition	3,965	3,917	3,749	3,652
Space Systems, Launch Vehicles	420	525	300	300
Space Systems, Satellites	100**	1,000**	3,000**	50,000**
C4I, Airborne	1,820	1,856	1,912	1,931
Electronic Devices	2,542	2,774	2,909	2,789
Human Systems	1,340	1,400	1,400	1,400
Training Systems***	31,672	31,086	29,890	29,221
Environmental Quality	2,268	4,055	7,926	2,063
Advanced Materials	3,340	3,340	3,473	3,612
Total	644,700	634,300	607,600	591,600

*Estimates only.
**Estimated NASA funding for China Lake to install NAOMI optics and construct the SELENE Laser (from Nunn-Lugar amendment). Not part
***TARIF/combat environment.

3.4 Facilities and Equipment

3.4.1 Major Equipment and Facilities: *Describe major facilities and equipment necessary to support each Common Support Function (include SCIFs). If the facilities and equipment are shared with other functions, identify those functions and the percentage of total time used by each of the functions. Provide labeled photographs that picture the breadth and scope of the equipment and facilities described. If it is unique to DOD, to the Federal Government, or to the US, describe why it is unique. Insert the replacement cost. For this exercise, Replacement cost = (Initial cost + capital investment) multiplied by the inflation factor for the original year of construction. (BRAC Criteria II)*

The major equipment/facilities investment at the NAWCWPNS China Lake lab is focused in approximately 80 special laboratories and test facilities, with a replacement value of approximately $2.6 billion. They are employed in Science and Technology (S&T), support to Engineering Development programs, and In-Service Engineering. The facilities include basic and applied research laboratories, measurement facilities, engineering laboratories, digital modeling and simulation laboratories, hardware-in-the-loop (HWIL) laboratories, missile and weapon system integration facilities, facilities for test and checkout of systems as installed in platforms, and access to the NAWCWPNS colocated T&E ranges. The design laboratories are equipped with Computer-Aided Engineering systems, which interface with an extensive in-house Prototype Fabrication facility. The technical functions addressed by the various facilities encompass missile guidance and control, proximity fuzing, warheads and ordnance components, missile propulsion systems, missile airframes and actuators, missile embedded software, advanced computing, and missile/platform integration.

Computer internetting is used extensively, both within the China Lake lab and with other sites. Within China Lake, the Weapon System Support Facilities for various aircraft types are netted with missile hardware-in-the-loop labs and with the Electronic Combat Range. This permits thorough test and analysis of problems during weapon/aircraft integration, under repeatable conditions. It also facilitates assessment of weapon and avionic system performance under realistic conditions. Figure 5 shows intersite connectivity, which extends the capability to other sites.

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The major equipment/facilities investment at the NAWCWPNS China Lake lab is focused in approximately 80 special laboratories and test facilities, with a replacement value of approximately $4 billion. They are employed in Science and Technology (S&T), support to Engineering Development programs, and In-Service Engineering. The facilities include basic and applied research laboratories, measurement facilities, engineering laboratories, digital modeling and simulation laboratories, hardware-in-the-loop (HWIL) laboratories, missile and weapon system integration facilities, facilities for test and checkout of systems as installed in platforms, and access to the NAWCWPNS colocated T&E ranges. The design laboratories are equipped with Computer-Aided Engineering systems, which interface with an extensive in-house Prototype Fabrication facility. The technical functions addressed by the various facilities encompass missile guidance and control, proximity fuzing, warheads and ordnance components, missile propulsion systems, missile airframes and actuators, missile embedded software, advanced computing, and missile/platform integration.

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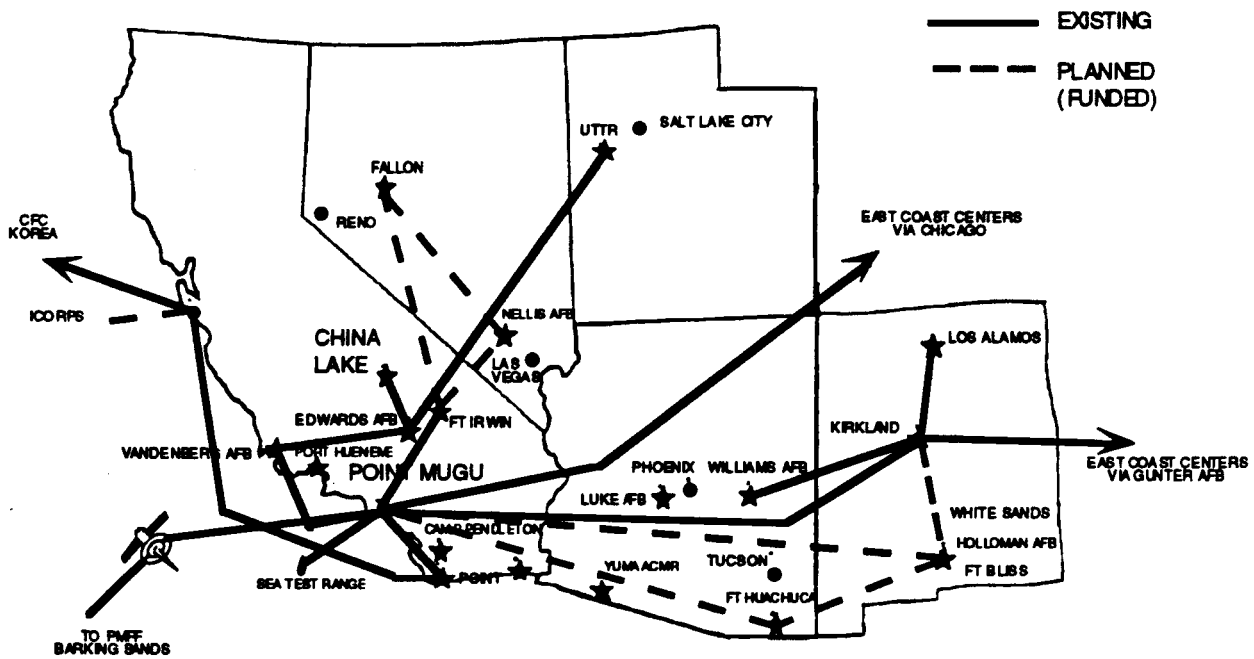

FIGURE 5. Interconnectivity With Other Installations.

Another example of internetting, not associated with weapon development or performance assessment, is the net that NAWCWPNS China Lake has with the Marine Corps facility at Barstow. This net is used for passing engineering data back and forth between the facilities. The data are used for reverse engineering out-of-production parts for Marine Corps vehicles, which are then manufactured in small lots in the Prototype Facility at China Lake.

A major portion of the lab facilities are housed in the Michelson Laboratory complex, shown in the aerial view in Figure 6. Major laboratories in this complex are the Michelson Laboratory itself (Figure 7), the Lauritsen Laboratory (Figure 8), and the Engineering Laboratory (Figure 9).

Other laboratory facilities are remotely located within the China Lake site. Figure 10 shows the airfield and its associated laboratory complex, and Figure 11 shows the layout of the China Lake Propulsion Plant at Salt Wells in relationship to the main site. Figure 12 shows the layout of the Thompson Lab complex, which houses the TARIF Training System.

Due to the location of China Lake and the large amount of land and airspace available (as evident from Figures 6 through 11), extensive facilities for research, development, scale-up, and pilot production of energetic materials (explosives and propellants) are located here.

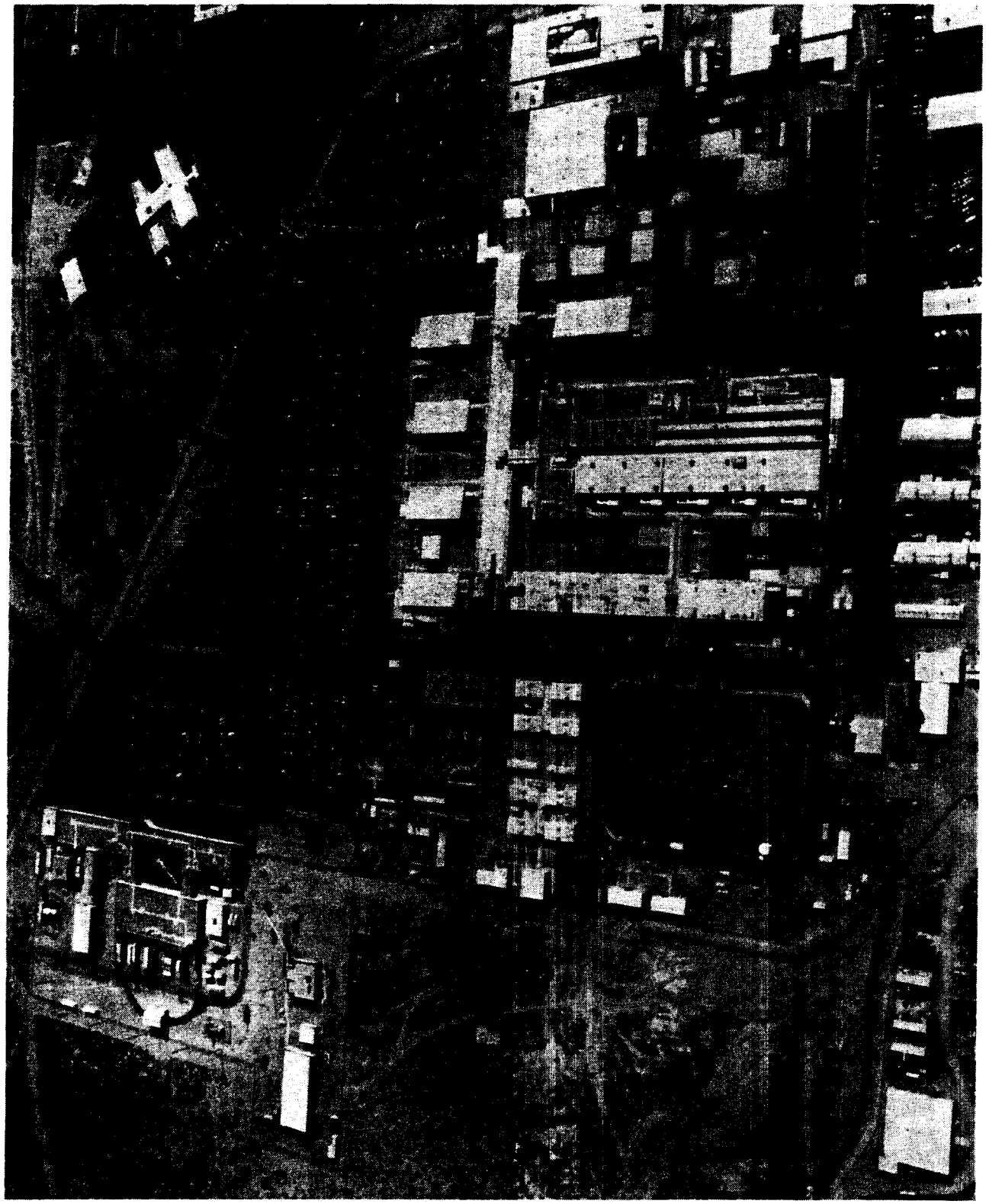

FIGURE 6. Aerial View of Michelson Laboratory Complex.

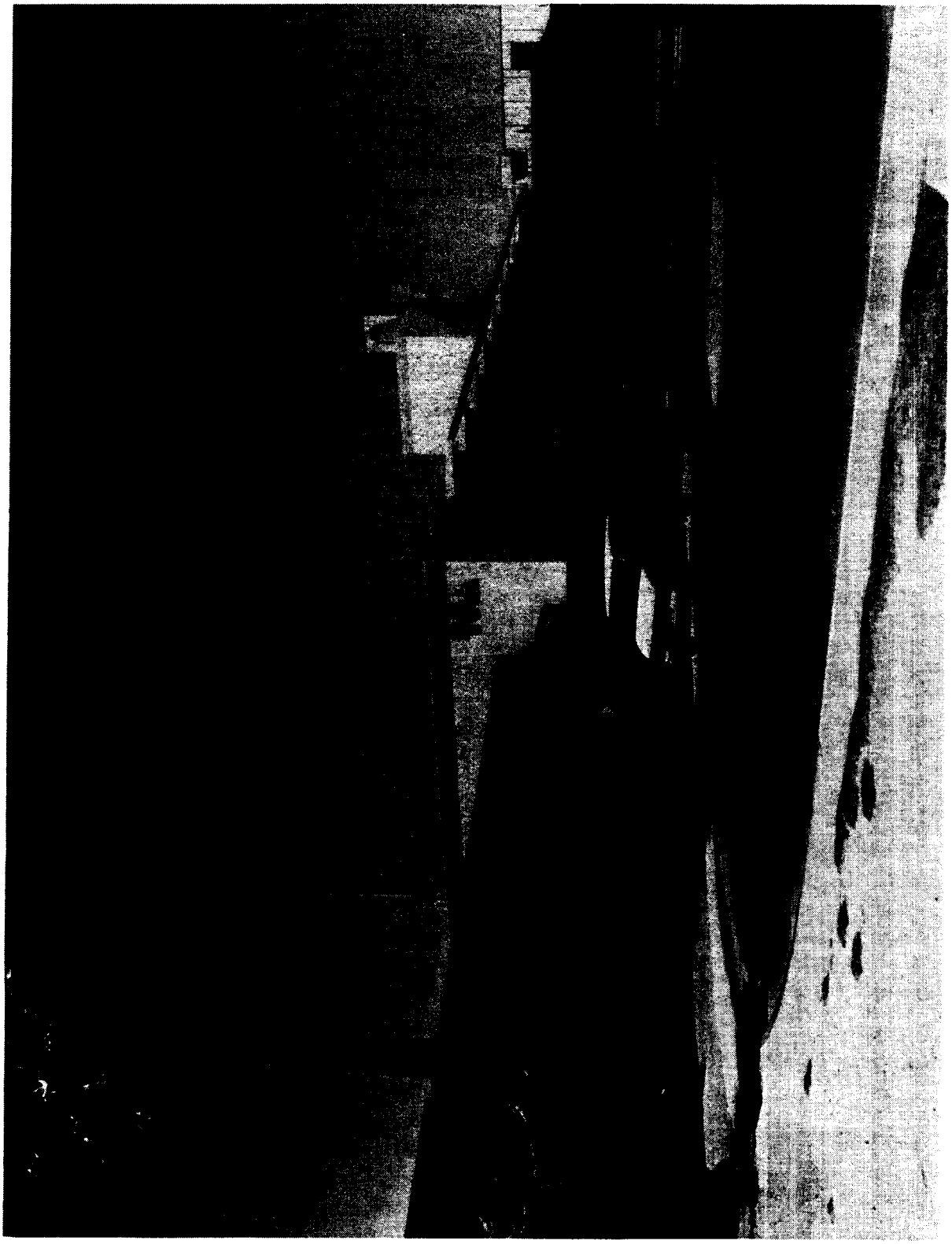

FIGURE 7. Michelson Laboratory.

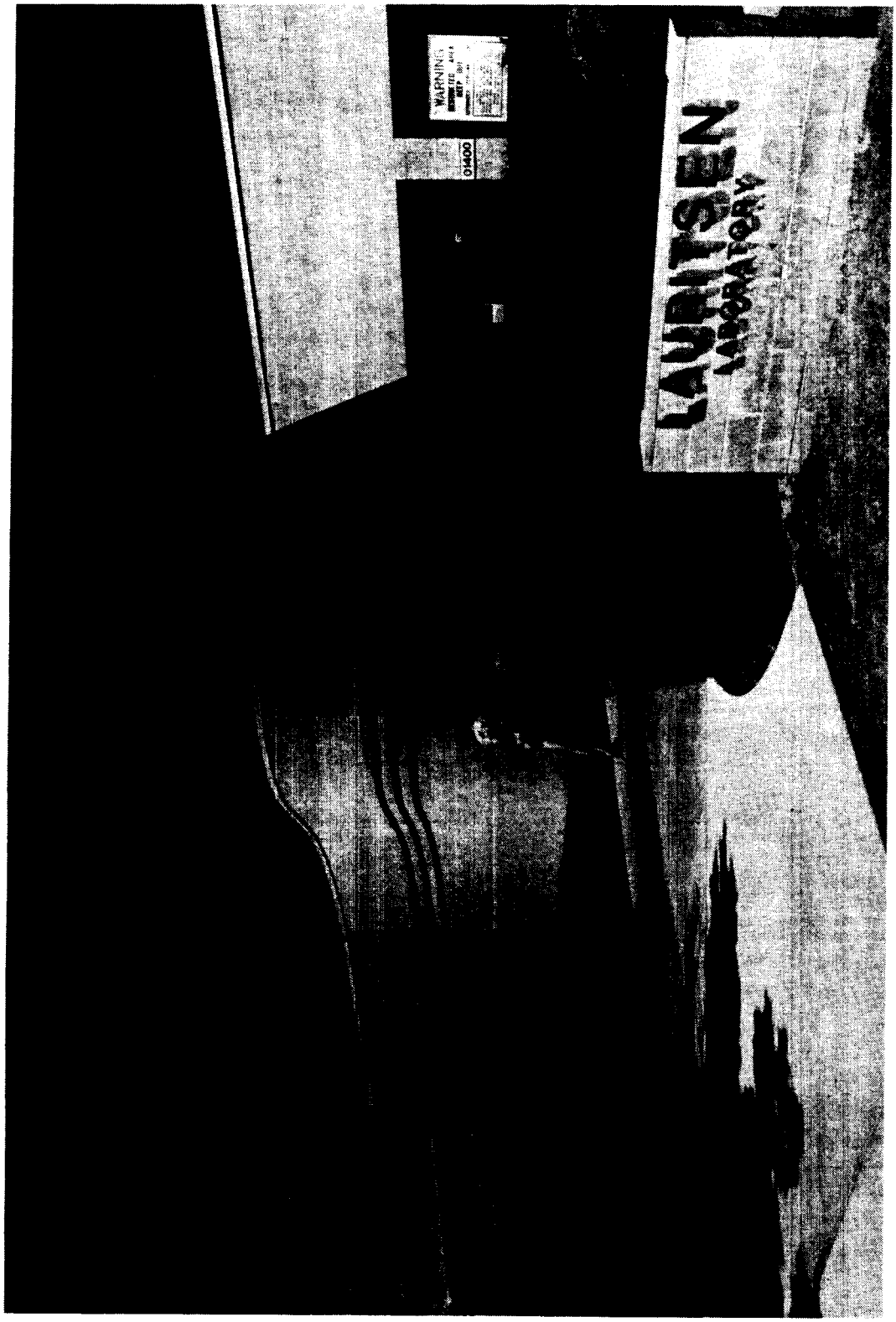

FIGURE 8. Lauritsen Laboratory.

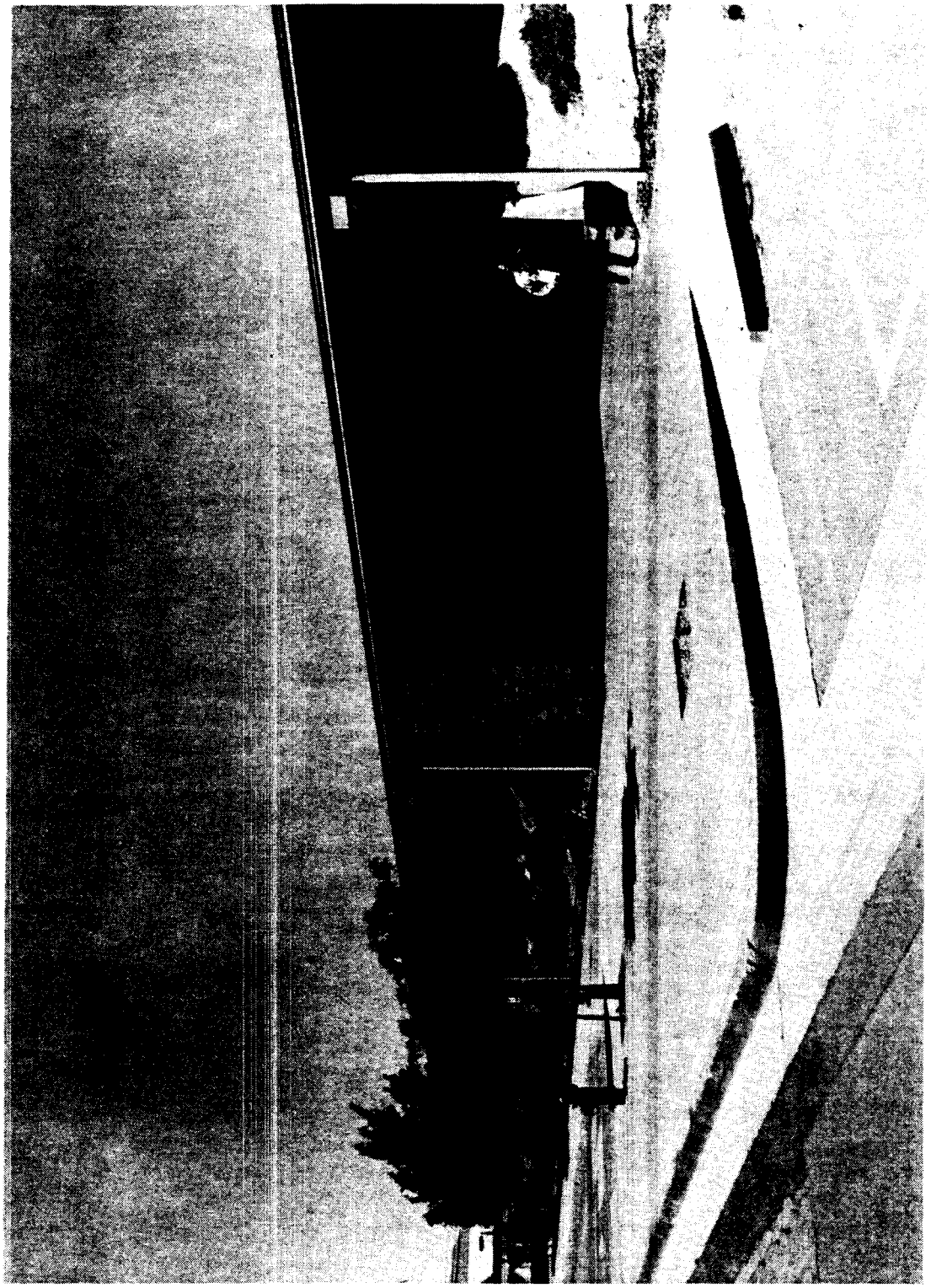

FIGURE 9. Engineering Laboratory.

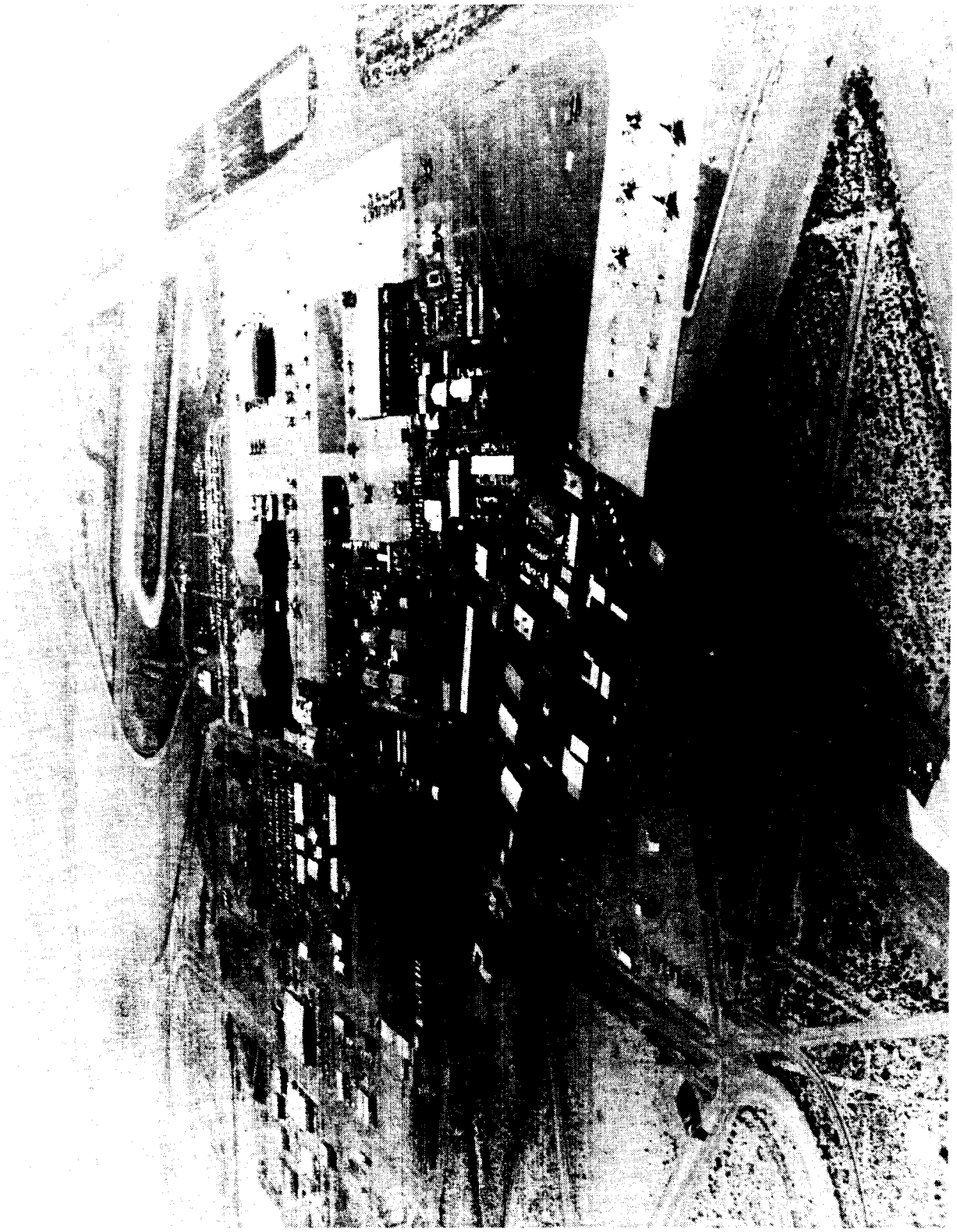

FIGURE 10. Airfield and Associated Laboratory Complex.

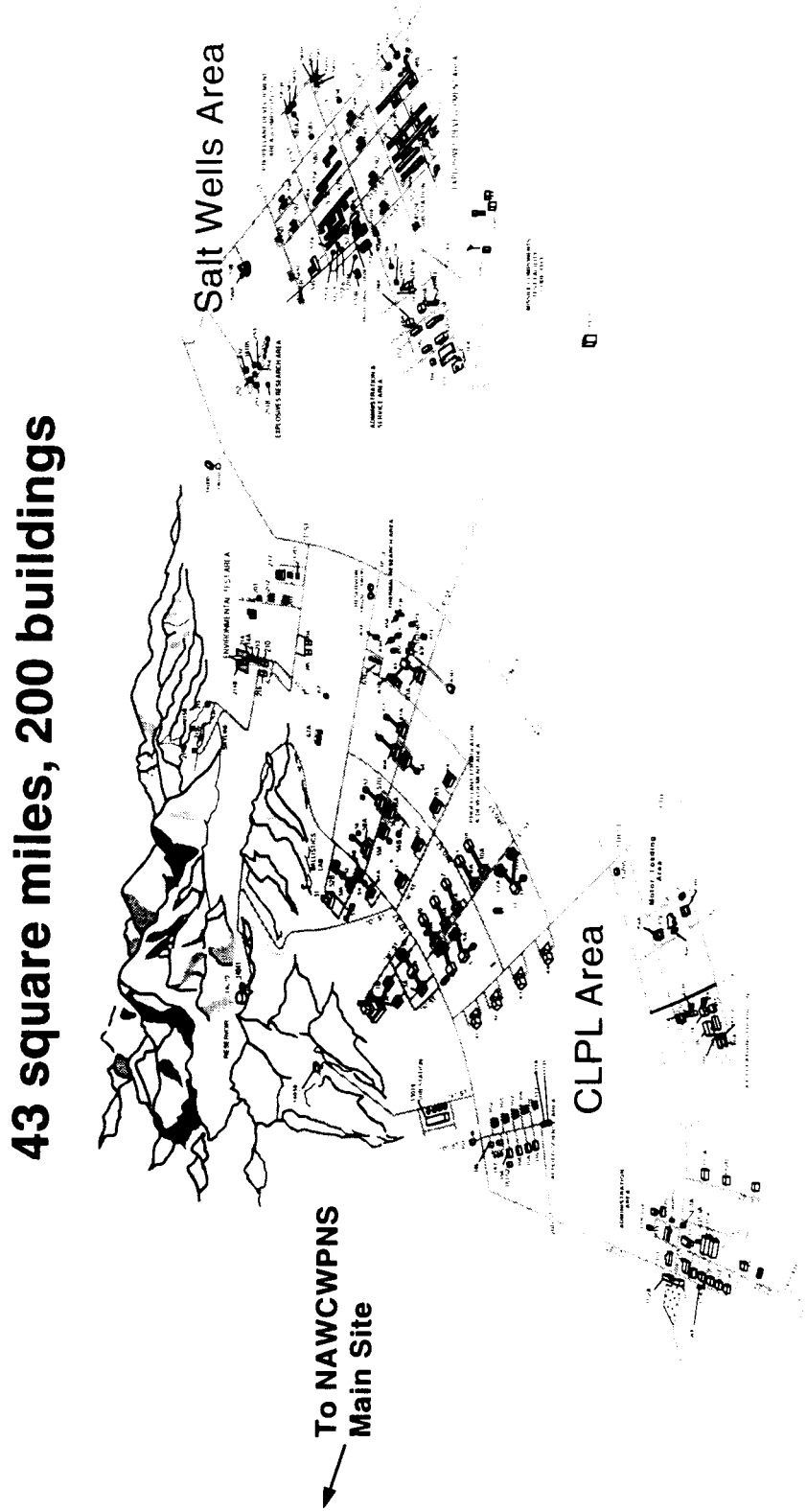

FIGURE 11. China Lake Propulsion Plant.

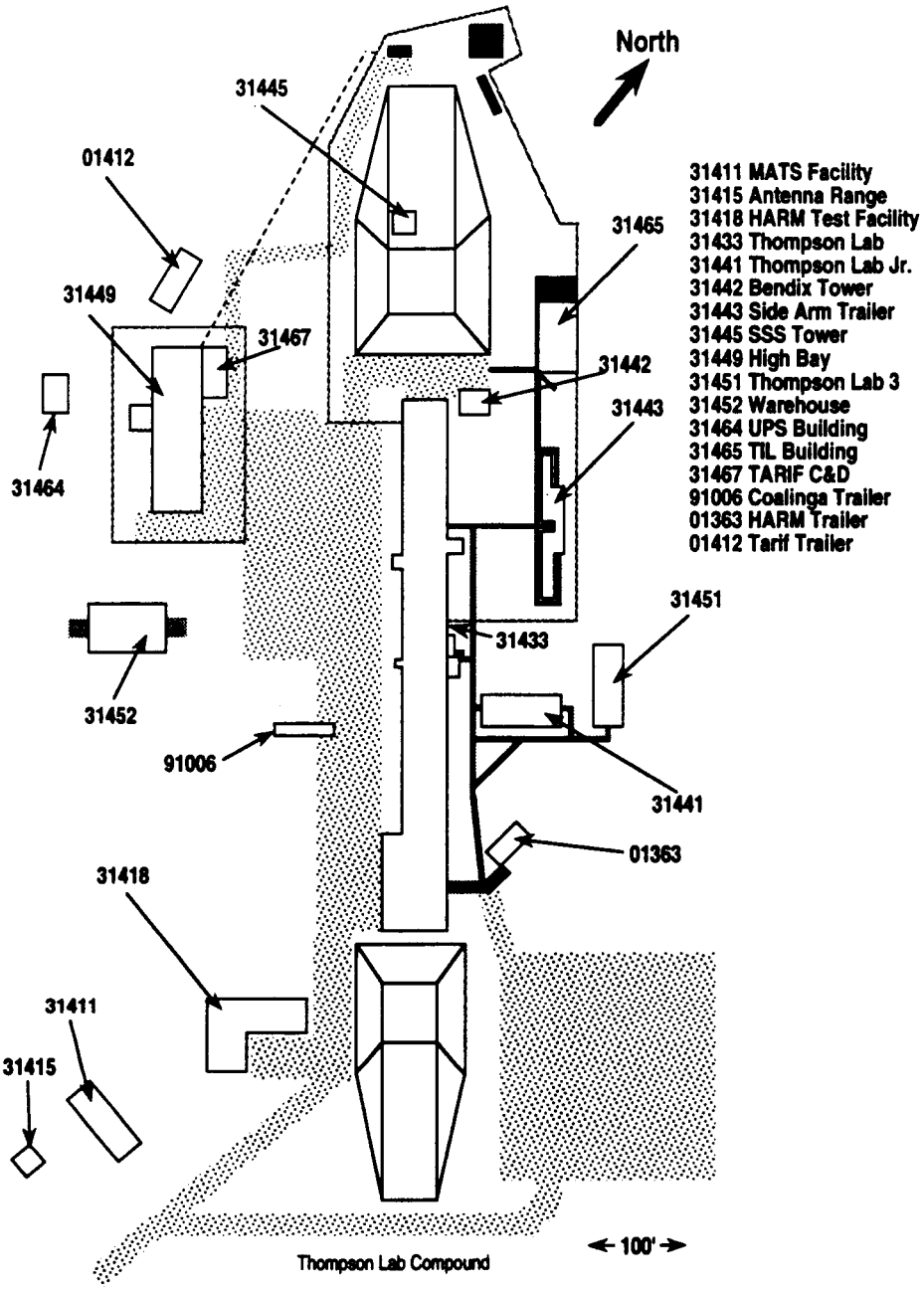

FIGURE 12. Thompson Laboratory Complex.

SCIF Discussion. Over 40 Special Compartmented Information Facilities (SCIFs), amounting to over 155,000 square feet, are currently used at China Lake to support extensive involvement in these critical advanced technology programs. These facilities were designed to meet DIAM 50-3 security requirements. These include engineering laboratories, classified storage facilities, ordnance assembly buildings, secure hangars, secure data reduction and analysis facilities, and computer facilities. Some of these facilities are specially designed and constructed to meet strict TEMPEST requirements. Radar cross-section laboratories and chambers are utilized for these special projects. In addition, non-dedicated secure working areas have been established, including test control rooms, telemetry processing and display areas, and data reduction and analysis facilities.

To support classified special projects data reduction and analysis, several VAX computers and their workstations that are specially configured to process highly classified data in accordance with all relevant regulations have been provided. These stand-alone computer systems are completely dedicated to special projects. In addition, unique telemetry processing equipment, computers, and facilities are approved on a non-dedicated basis for special projects use. Missile testing laboratories are equipped with special missile test equipment that is utilized by special projects.

Previous discussions of the synergy between R&D and T&E are particularly relevant in this area. Many of the programs are joint-service efforts that independently selected the China Lake site for program execution for the reasons discussed in Section 3.1.1 above.

This very large volume of highly classified work, which, by its nature, cannot be discussed in any detail, is inextricably woven into the RDT&E process leading to the production and integration of weapons, aircraft, and EW systems.

These programs are a significant portion of the RDT&E work at the NAWCWPNS China Lake lab. Although factors related to capacity, facilities details, cost or feasibility of relocation, criticality and uniqueness, funding levels and sources, and numbers and types of personnel assigned by program cannot be listed here, they must be a major factor in decisions based on these facilities data.

It is strongly recommended that an analysis of the volume and nature of these programs be conducted as part of the BRAC process.

The following table is a summary of the major facilities at the China Lake site (in the data call format). Following this table is a table listing all facilities and their usage by each CSF and by non-CSF functions or non-R&D functions. Following that table the reader will find amplifying information on each of the facilities and photographs of each.

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It is strongly recommended that an analysis of the volume and nature of these programs be conducted as part of the BRAC process.

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Structure					
(10%)	Weps and Tactics Analy Ctr (WEPTAC)	Yes	Yes	Yes	8,000
Air Vehicles, Fixed Wing, Propulsion					
(15%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(6%)	China Lake Ordnance Propulsion Pilot Plant	Yes	Yes	Yes	106,875
Air Vehicles, Fixed Wing, Avionics					
(55%)	Air / Ground Range	Yes	Yes	Yes	231,000
(35%)	Anti-Radiation Missile (ARM) Seeker Test Complex	Yes	Yes	Yes	15,570
(18%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(10%)	Anti-Radiation Missile Integration Complex	Yes	Yes	Yes	10,600
(20%)	Armament/Weapons Design, Prototyping, and Integration Facility	Yes	Yes	No	20,000
(10%)	Composites Development Lab	Yes	No	No	6,000
(40%)	Data Link Development Lab	Yes	Yes	Yes	3,379
(19%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(66%)	Electronic Combat Range (ECR)	Yes	Yes	Yes	863,000
(90%)	Electronic Warfare Integration Lab (EWIL)	Yes	Yes	Yes	3,195
(1%)	Engineering Prototype Facility	No	No	No	30,400
(5%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(5%)	Guidance Components T&A Complex	Yes	Yes	No	13,084
(10%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(8%)	Metrology Facility	No	No	No	6,142
(25%)	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	28,000
(5%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(5%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(1%)	RF Seeker/Guidance/Control DDT&E Complex	Yes	Yes	Yes	29,800
(20%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
(10%)	Signature Measurements and Evaluation	Yes	Yes	Yes	10,000
(6%)	Sled Tracks	No	No	No	64,000
(70%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(19%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(10%)	TSSAM Hardware-in-the-Loop	Yes	Yes	Yes	10,250
(15%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(85%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
(3%)	Weapons Guidance/Control/Seeker IL	Yes	Yes	Yes	15,234
(15%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
(10%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,771
(15%)	Weps and Tactics Analy Ctr (WEPTAC)	Yes	Yes	Yes	8,000

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
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Air Vehicles, Fixed Wing, Propulsion					
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Air Vehicles, Fixed Wing, Avionics					
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(19%)	Dynamic Properties Measurements Complex	No	No	No	2,230
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(5%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(19%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
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(15%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
(10%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
(15%)	Weps and Tactics Analy Ctr (WEPTAC)	Yes	Yes	Yes	8,000

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Flight Subsystems					
(3%)	Air / Ground Range	Yes	Yes	Yes	231,000
(40%)	Recovery Systems Complex	No	No	No	1,400
(8%)	Sled Tracks	No	No	No	64,000
(50%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,771
Air Vehicles, Rotary Wing, Avionics					
(2%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(1%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(7%)	Engineering Prototype Facility	No	No	No	30,400
(5%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(2%)	Metrology Facility	No	No	No	6,142
(5%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(5%)	Signature Measurements and Evaluation	Yes	Yes	Yes	10,000
(5%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(5%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
(2%)	Weapons Guidance/Control/Seeker IL	Yes	Yes	Yes	15,234
(3%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,771
Air Vehicles, Rotary Wing, Flight Subsystems					
(17%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,771
Weapons, ICBMs/SLBMs					
(10%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	High Hazard Propulsion Test Facility	Yes	Yes	Yes	3,269
(28%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(100%)	Large Rocket Motor Disposal Facility	Yes	Yes	Yes	5,500
(40%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(5%)	Ordnance Test Complex	Yes	Yes	No	5588
(50%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(37%)	Sled Tracks	No	No	No	64,000
(90%)	Strategic Propulsion Test Complex	Yes	Yes	Yes	24,311
Weapons, Conventional Missiles/Rockets					
(65%)	Actuator and Power Systems Lab	Yes	Yes	Yes	6,676
(85%)	Aeroheat Test Facility	Yes	Yes	Yes	2,165
(20%)	Air / Ground Range	Yes	Yes	Yes	231,000
(60%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(100%)	Air-to-Surface Target Complex	Yes	Yes	Yes	N/A
(65%)	Anti-Radiation Missile (ARM) Seeker Test Complex	Yes	Yes	Yes	15,570
(70%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(90%)	Anti-Radiation Missile Integration Complex	Yes	Yes	Yes	10,600

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Flight Subsystems					
(3%)	Air / Ground Range	Yes	Yes	Yes	231,000
(40%)	Recovery Systems Complex	No	No	No	1,400
(8%)	Sled Tracks	No	No	No	64,000
(50%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Air Vehicles, Rotary Wing, Avionics					
(2%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(1%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(7%)	Engineering Prototype Facility	No	No	No	30,400
(5%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(2%)	Metrology Facility	No	No	No	6,142
(5%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(5%)	Signature Measurements and Evaluation	Yes	Yes	Yes	10,000
(5%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(5%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
(2%)	Weapons Guidance/Control/Seeker IL	Yes	Yes	Yes	15,234
(3%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Air Vehicles, Rotary Wing, Flight Subsystems					
(17%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Weapons, ICBMs/SLBMs					
(10%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	High Hazard Propulsion Test Facility	Yes	Yes	Yes	3,269
(28%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(100%)	Large Rocket Motor Disposal Facility	Yes	Yes	Yes	5,500
(40%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(5%)	Ordnance Test Complex	Yes	Yes	No	5588
(50%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(37%)	Sled Tracks	No	No	No	64,000
(90%)	Strategic Propulsion Test Complex	Yes	Yes	Yes	24,311
Weapons, Conventional Missiles/Rockets					
(65%)	Actuator and Power Systems Lab	Yes	Yes	Yes	6,676
(85%)	Aeroheat Test Facility	Yes	Yes	Yes	2,165
(20%)	Air / Ground Range	Yes	Yes	Yes	231,000
(60%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(100%)	Air-to-Surface Target Complex	Yes	Yes	Yes	N/A
(65%)	Anti-Radiation Missile (ARM) Seeker Test Complex	Yes	Yes	Yes	15,570
(70%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(90%)	Anti-Radiation Missile Integration Complex	Yes	Yes	Yes	10,600

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Flight Subsystems					
(3%)	Air / Ground Range	Yes	Yes	Yes	231,000
(40%)	Recovery Systems Complex	No	No	No	1,400
(8%)	Sled Tracks	No	No	No	64,000
(50%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Air Vehicles, Rotary Wing, Avionics					
(2%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(1%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(7%)	Engineering Prototype Facility	No	No	No	30,400
(5%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(2%)	Metrology Facility	No	No	No	6,142
(5%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(5%)	Signature Measurements and Evaluation	Yes	Yes	Yes	10,000
(5%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(5%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
(2%)	Weapons Guidance/Control/Seeker IL	Yes	Yes	Yes	15,234
(3%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Air Vehicles, Rotary Wing, Flight Subsystems					
(17%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Weapons, ICBMs/SLBMs					
(10%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(15%)	High Hazard Propulsion Test Facility	Yes	Yes	Yes	3,269
(28%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(100%)	Large Rocket Motor Disposal Facility	Yes	Yes	Yes	5,500
(40%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(5%)	Ordnance Test Complex	Yes	Yes	No	5588
(50%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(37%)	Sled Tracks	No	No	No	64,000
(90%)	Strategic Propulsion Test Complex	Yes	Yes	Yes	24,311
Weapons, Conventional Missiles/Rockets					
(65%)	Actuator and Power Systems Lab	Yes	Yes	Yes	6,676
(85%)	Aeroheat Test Facility	Yes	Yes	Yes	2,165
(20%)	Air / Ground Range	Yes	Yes	Yes	231,000
(75%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(100%)	Air-to-Surface Target Complex	Yes	Yes	Yes	N/A
(65%)	Anti-Radiation Missile (ARM) Seeker Test Complex	Yes	Yes	Yes	15,570
(70%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(90%)	Anti-Radiation Missile Integration Complex	Yes	Yes	Yes	10,600

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets (contd.)					
(80%)	Armament/Weapons Design, Prototyping, and Integration Facility	Yes	Yes	No	20,000
(40%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(100%)	C29 Air Weapon Digital Modeling and Sim	Yes	Yes	Yes	2,670
(15%)	Cactus Flats Ordnance Test Area	No	No	No	1,169
(28%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(70%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(76%)	Composites Development Lab	Yes	No	No	6,000
(60%)	Detonation Physics Lab	No	No	No	4,820
(100%)	Development Projects Lab	No	No	No	3,440
(60%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(19%)	Electronic Combat Range (ECR)	Yes	Yes	Yes	863,000
(10%)	Electronic Warfare Integration Lab (EWIL)	Yes	Yes	Yes	3,195
(60%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(75%)	Energetic Materials Synthesis & Scaleup Lab	No	No	No	2,335
(80%)	Engineering Prototype Facility	No	No	No	30,400
(50%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(100%)	Foreign Material Exploitn (FME) and Balloon Test Complex	Yes	Yes	Yes	3,250
(70%)	Fuze Development Lab	Yes	Yes	Yes	14,800
(92%)	Guidance Components T&A Complex	Yes	Yes	No	13,084
(100%)	IR Seeker, GCS DDT&E Complex	Yes	Yes	Yes	19,900
(18%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(100%)	Laser Seeker Integration and Test Facility	Yes	Yes	Yes	1,900
(50%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(10%)	Materials Engineering / Failure Analysis Fac	No	No	No	4,860
(45%)	Metrology Facility	No	No	No	6,142
(50%)	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	28,000
(100%)	Missile/Rocket Motor Assembly Facility	Yes	Yes	Yes	5,960
(100%)	Mk 45 TDD Engineering Development HITL/Test Laboratory	Yes	Yes	Yes	13,484
(40%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(75%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(60%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(10%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(35%)	Ordnance Assembly Facility	No	No	No	464
(90%)	Ordnance Breakdown Facility	No	No	No	4,257
(60%)	Ordnance Packaging Facility	No	No	No	558
(33%)	Ordnance Stowage Facilities	No	No	No	35,829
(68%)	Ordnance Test Complex	Yes	Yes	No	5,588
(75%)	Propellants and Explosive Formulation Labs	No	No	No	17,484
(30%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(20%)	Recovery Systems Complex	No	No	No	1,400
(98%)	RF Seeker/Guidance/Control DDT&E Complex	Yes	Yes	Yes	29,800

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets (contd.)					
(80%)	Armament/Weapons Design, Prototyping, and Integration Facility	Yes	Yes	No	20,000
(40%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(100%)	C29 Air Weapon Digital Modeling and Sim	Yes	Yes	Yes	2,670
(15%)	Cactus Flats Ordnance Test Area	No	No	No	1,169
(28%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(70%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(76%)	Composites Development Lab	Yes	No	No	6,000
(60%)	Detonation Physics Lab	No	No	No	4,820
(100%)	Development Projects Lab	No	No	No	3,440
(60%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(19%)	Electronic Combat Range (ECR)	Yes	Yes	Yes	863,000
(60%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(75%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(80%)	Engineering Prototype Facility	No	No	No	30,400
(50%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(100%)	Foreign Material Exploitn (FME) and Balloon Test Complex	Yes	Yes	Yes	3,250
(70%)	Fuze Development Lab	Yes	Yes	Yes	14,800
(92%)	Guidance Components T&A Complex	Yes	Yes	No	13,084
(100%)	IR Seeker, GCS DDT&E Complex	Yes	Yes	Yes	19,900
(18%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(100%)	Laser Seeker Integration and Test Facility	Yes	Yes	Yes	1,900
(50%)	Materials and Processes Research Facility	Yes	Yes	Yes	32,700
(10%)	Materials Engineering / Failure Analysis Fac	No	No	No	4,860
(45%)	Metrology Facility	No	No	No	6,142
(50%)	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	28,000
(100%)	Missile/Rocket Motor Assembly Facility	Yes	Yes	Yes	5,960
(100%)	Mk 45 TDD Engineering Development HITL/Test Laboratory	Yes	Yes	Yes	13,484
(40%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(75%)	Optics and Laser Research Facility	Yes	Yes	Yes	17,600
(60%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(10%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(35%)	Ordnance Assembly Facility	No	No	No	464
(90%)	Ordnance Breakdown Facility	No	No	No	4,257
(60%)	Ordnance Packaging Facility	No	No	No	558
(33%)	Ordnance Stowage Facilities	No	No	No	35,829
(68%)	Ordnance Test Complex	Yes	Yes	No	5,588
(75%)	Propellants and Explosive Formulation Labs	No	No	No	17,484
(30%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(20%)	Recovery Systems Complex	No	No	No	1,400
(98%)	RF Seeker/Guidance/Control DDT&E Complex	Yes	Yes	Yes	29,800

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets (contd.)					
(25%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
(100%)	Ship Self Defense Test Complex	Yes	Yes	Yes	6,000
(85%)	Signature Measurements and Evaluation	Yes	Yes	Yes	10,000
(90%)	Simulation Laboratory - Missile HITL	Yes	Yes	Yes	50,400
(36%)	Sled Tracks	No	No	No	64,000
(100%)	Standard Missile/VLS Test Complex	Yes	Yes	Yes	30,000
(10%)	Strategic Propulsion Test Complex	Yes	Yes	Yes	24,311
(50%)	Strike Simulation and Modeling	Yes	Yes	Yes	6,211
(50%)	Strike Software/Simulation Facility	Yes	Yes	Yes	1,550
(100%)	System Modeling and Signal Processing Facility	No	No	No	420
(100%)	Tactical Propulsion Test Facility	No	No	No	4,650
(10%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(97%)	TDD DDT&E Complex	Yes	Yes	Yes	1,100
(97%)	TDD Exploratory Development Facility	No	No	No	2,810
(100%)	TDD Performance Evaluation Laboratory	Yes	Yes	No	5,609
(54%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(90%)	TSSAM Hardware-in-the-Loop	Yes	Yes	Yes	10,250
(75%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(40%)	Warhead/Bomb Assembly/Integration Facs	No	No	No	13,900
(6%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
(95%)	Weapons Guidance/Control/Seeker IL	Yes	Yes	Yes	15,234
(78%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
(10%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,771
(75%)	Weps and Tactics Analy Ctr (WEPTAC)	Yes	Yes	Yes	8,000
Weapons, Cruise Missiles					
(35%)	Actuator and Power Systems Lab	Yes	Yes	Yes	6,676
(1%)	Air / Ground Range	Yes	Yes	Yes	231,000
(15%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(10%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(25%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(12%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(11%)	Composites Development Lab	Yes	No	No	6,000
(60%)	Data Link Development Lab	Yes	Yes	Yes	3,379
(10%)	Detonation Physics Lab	No	No	No	4,820
(15%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(10%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(10%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(2%)	Engineering Prototype Facility	No	No	No	30,400
(20%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(11%)	Fuze Development Lab	Yes	Yes	Yes	14,800
(3%)	Guidance Components T&A Complex	Yes	Yes	No	13,084
(38%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(10%)	Materials Engineering / Failure Analysis Fac.	No	No	No	4,860
(25%)	Metrology Facility	No	No	No	6,142
(25%)	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	28,000

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets (contd.)					
(25%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
(100%)	Ship Self Defense Test Complex	Yes	Yes	Yes	6,000
(85%)	Signature Measurements and Evaluation	Yes	Yes	Yes	10,000
(90%)	Simulation Laboratory - Missile HITL	Yes	Yes	Yes	50,400
(36%)	Sled Tracks	No	No	No	64,000
(100%)	Standard Missile/VLS Test Complex	Yes	Yes	Yes	30,000
(10%)	Strategic Propulsion Test Complex	Yes	Yes	Yes	24,311
(50%)	Strike Simulation and Modeling	Yes	Yes	Yes	6,211
(50%)	Strike Software/Simulation Facility	Yes	Yes	Yes	1,550
(100%)	System Modeling and Signal Processing Facility	No	No	No	420
(100%)	Tactical Propulsion Test Facility	No	No	No	4,650
(10%)	TARIF/Combat Environment	Yes	Yes	Yes	14,359
(97%)	TDD DDT&E Complex	Yes	Yes	Yes	1,100
(97%)	TDD Exploratory Development Facility	No	No	No	2,810
(100%)	TDD Performance Evaluation Laboratory	Yes	Yes	No	5,609
(54%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(90%)	TSSAM Hardware-in-the-Loop	Yes	Yes	Yes	10,250
(75%)	VHF Anechoic Chamber	Yes	Yes	Yes	22,500
(40%)	Warhead/Bomb Assembly/Integration Facs	No	No	No	13,900
(6%)	Weapon System Support Facility Complex	Yes	Yes	Yes	159,886
(95%)	Weapons Guidance/Control/Seeker IL	Yes	Yes	Yes	15,234
(78%)	Weapons Signal Processing Design Complex	Yes	Yes	Yes	6,550
(10%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
(75%)	Weps and Tactics Analy Ctr (WEPTAC)	Yes	Yes	Yes	8,000
Weapons, Cruise Missiles					
(35%)	Actuator and Power Systems Lab	Yes	Yes	Yes	6,676
(1%)	Air / Ground Range	Yes	Yes	Yes	231,000
(15%)	Air-Breathing Propulsion Lab	Yes	Yes	Yes	12,564
(10%)	Anti-Radiation Missile (ARM) Targets	Yes	Yes	Yes	22,900
(25%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(12%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(11%)	Composites Development Lab	Yes	No	No	6,000
(60%)	Data Link Development Lab	Yes	Yes	Yes	3,379
(10%)	Detonation Physics Lab	No	No	No	4,820
(15%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(10%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(10%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(2%)	Engineering Prototype Facility	No	No	No	30,400
(20%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(11%)	Fuze Development Lab	Yes	Yes	Yes	14,800
(3%)	Guidance Components T&A Complex	Yes	Yes	No	13,084
(38%)	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	34,930
(10%)	Materials Engineering / Failure Analysis Fac.	No	No	No	4,860
(25%)	Metrology Facility	No	No	No	6,142
(25%)	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	28,000

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Cruise Missiles (contd.)					
(5%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(16%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(76%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(10%)	Propellants and Explosive Formulation Labs	No	No	No	17,484
(10%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(20%)	Recovery Systems Complex	No	No	No	1,400
(30%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
(10%)	Simulation Laboratory - Missile HITL	Yes	Yes	Yes	50,400
(10%)	Sled Tracks	No	No	No	64,000
(35%)	Strike Simulation and Modeling	Yes	Yes	Yes	6,211
(50%)	Strike Software/Simulation Facility	Yes	Yes	Yes	1,550
(5%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(100%)	TSSAM Mission Planning Facility	No	No	No	400
(25%)	Warhead/Bomb Assembly/Integration Facs	No	No	No	13,900
(10%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,771
Weapons, Guided Projectiles					
(2%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(12%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(15%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
Weapons, Bombs					
(15%)	Aeroheat Test Facility	Yes	Yes	Yes	2,165
(6%)	Air / Ground Range	Yes	Yes	Yes	231,000
(30%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(50%)	Cactus Flats Ordnance Test Area	No	No	No	1,169
(10%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(10%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(30%)	Detonation Physics Lab	No	No	No	4,820
(5%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(25%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(10%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(8%)	Engineering Prototype Facility	No	No	No	30,400
(10%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(19%)	Fuze Development Lab	Yes	Yes	Yes	14,800
(10%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(5%)	Metrology Facility	No	No	No	6,142
(10%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(2%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(40%)	Ordnance Assembly Facility	No	No	No	464
(20%)	Ordnance Packaging Facility	No	No	No	558
(33%)	Ordnance Stowage Facilities	No	No	No	35,829
(24%)	Ordnance Test Complex	Yes	Yes	No	5588
(10%)	Propellants and Explosive Formulation Labs	No	No	No	17,484

TABLE (contd.)

Common Support Function (% use)	Major Facility or Equipment Description	Unique To			Replacement Cost $(K)
		DOD	Federal Gov't	U.S.	
Weapons, Cruise Missiles (contd.)					
(5%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(16%)	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	11,359
(76%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(10%)	Propellants and Explosive Formulation Labs	No	No	No	17,484
(10%)	Propulsion and Energy Conversion Research Facility	Yes	Yes	Yes	43,020
(20%)	Recovery Systems Complex	No	No	No	1,400
(30%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
(10%)	Simulation Laboratory - Missile HITL	Yes	Yes	Yes	50,400
(10%)	Sled Tracks	No	No	No	64,000
(35%)	Strike Simulation and Modeling	Yes	Yes	Yes	6,211
(50%)	Strike Software/Simulation Facility	Yes	Yes	Yes	1,550
(5%)	Telemetry Development Lab	Yes	Yes	Yes	9,106
(100%)	TSSAM Mission Planning Facility	No	No	No	400
(25%)	Warhead/Bomb Assembly/Integration Facs	No	No	No	13,900
(10%)	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	70,271
Weapons, Guided Projectiles					
(2%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(12%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(15%)	Sensor and Targeting Technology Facility	No	No	Yes	13,520
Weapons, Bombs					
(15%)	Aeroheat Test Facility	Yes	Yes	Yes	2,165
(6%)	Air / Ground Range	Yes	Yes	Yes	231,000
(30%)	C27 Explosive and Ordnance Modeling	No	No	No	600
(50%)	Cactus Flats Ordnance Test Area	No	No	No	1,169
(10%)	Chemical Analysis Research Facility	Yes	Yes	Yes	7,300
(10%)	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	106,875
(30%)	Detonation Physics Lab	No	No	No	4,820
(5%)	Dynamic Properties Measurements Complex	No	No	No	2,230
(25%)	Energetic Materials Properties Analysis Lab	No	No	No	9,168
(10%)	Energetic Materials Synthesis and Scaleup Lab	No	No	No	2,335
(8%)	Engineering Prototype Facility	No	No	No	30,400
(10%)	Environmental Test Complex	Yes	Yes	Yes	25,240
(19%)	Fuze Development Lab	Yes	Yes	Yes	14,800
(10%)	Materials Engineering / Failure Analysis Facility	No	No	No	4,860
(5%)	Metrology Facility	No	No	No	6,142
(10%)	Non-Destructive Ordnance Test Facility	No	No	No	27,300
(2%)	Ordnance and Propulsion Plant Support Shops	No	No	No	5,532
(40%)	Ordnance Assembly Facility	No	No	No	464
(20%)	Ordnance Packaging Facility	No	No	No	558
(33%)	Ordnance Stowage Facilities	No	No	No	35,829
(24%)	Ordnance Test Complex	Yes	Yes	No	5588
(10%)	Propellants and Explosive Formulation Labs	No	No	No	17,484

Air/Ground Range

Air-to-Surface Target Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Air-to-Surface Target Complex	Yes	Yes	Yes	N/A

Facility Description (contd.). The mission of this complex is to support air-to-surface missile development and operational firing tests. Extensive ground impact areas are available throughout WSMR supporting a variety of air-to-surface scenarios. Target elements are transported to and setup in the impact area for single or multiple missions and are removed from the impact area at completion of the test series. Live-fire tests of submunition configured warheads can be accomplished at some impact sites. The operational environment includes airspace from surface to unlimited, subsonic/supersonic, day or night, and a variety of overland terrain. Maximum live firing range is 100 miles. Standoff Land Attack Missile (SLAM) is currently the only Navy-sponsored air-to-surface program at WSMR. Planning is in process for the Joint Standoff Weapon System (JSOW) to include live submunitions testing. Reference Fig. WS14, WS15, WS17

This equipment is unique because this facility is unique in terms of land area (40 by 100 miles) supporting long-range overland flight, land usage supporting live submunitions tests and recovery of test articles/debris, and owned/restricted air space.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	100*

* However, many tests are in support of R&D projects.

Air-to-Surface Target Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Air-to-Surface Target Complex	Yes	Yes	Yes	N/A

Facility Description (contd.). The mission of this complex is to support air-to-surface missile development and operational firing tests. Extensive ground impact areas are available throughout WSMR supporting a variety of air-to-surface scenarios. Target elements are transported to and setup in the impact area for single or multiple missions and are removed from the impact area at completion of the test series. Live-fire tests of submunition configured warheads can be accomplished at some impact sites. The operational environment includes airspace from surface to unlimited, subsonic/supersonic, day or night, and a variety of overland terrain. Maximum live firing range is 100 miles. Standoff Land Attack Missile (SLAM) is currently the only Navy-sponsored air-to-surface program at WSMR. Planning is in process for the Joint Standoff Weapon System (JSOW) to include live submunitions testing. Reference Fig. WS14, WS15, WS17

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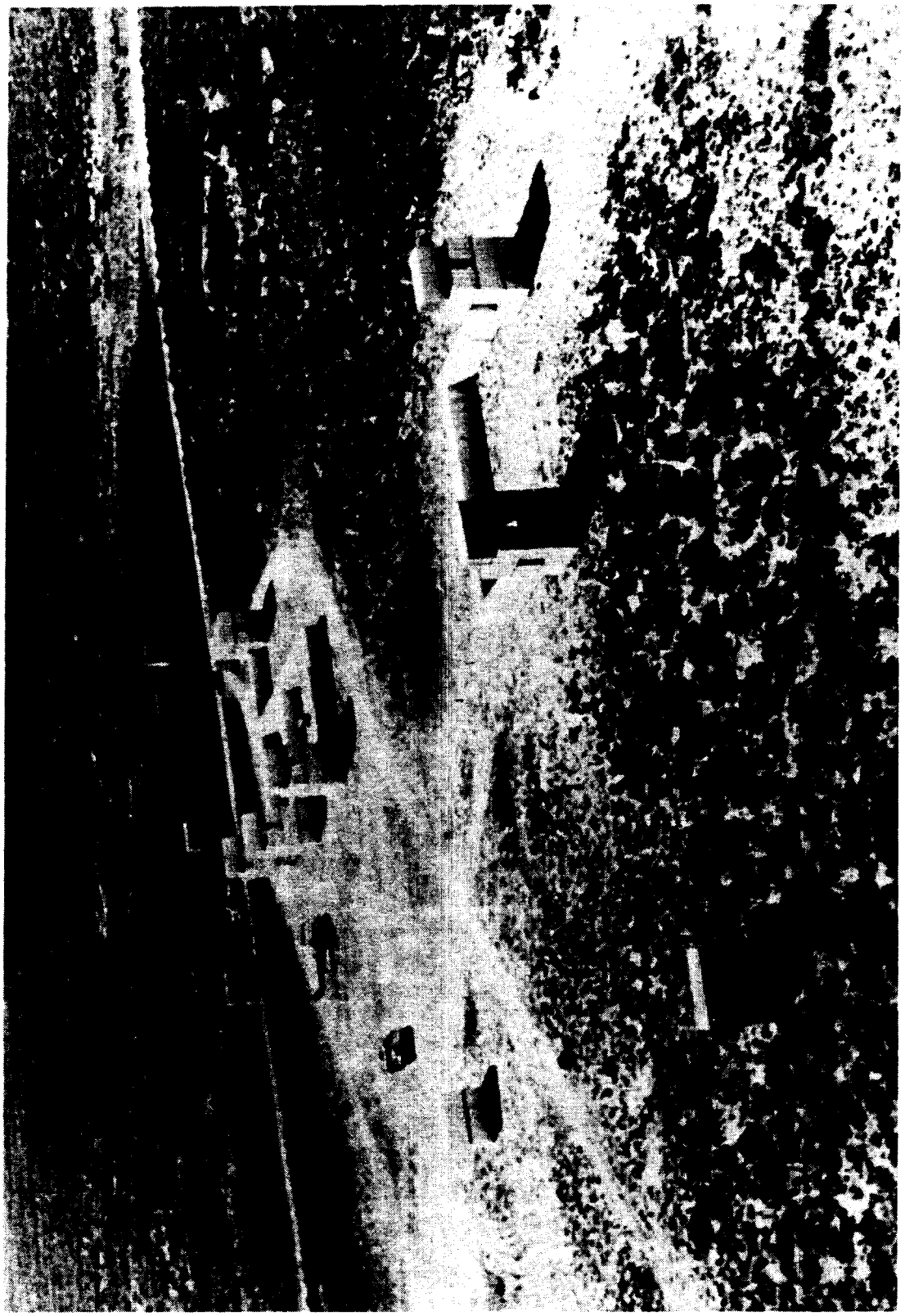
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



Air-to-Surface Target Complex

Anti-Radiation Missile (ARM) Seeker Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets	Anti-Radiation Missile (ARM) Seeker Test Complex Elements • HARM Skr Test Van • Sidearm Integ Fac • HARM Knosy FTS • Tactical A/C Instrumentation • Seeker Test Facility	Yes	Yes	Yes	$15,570K = Total $ 600K = Buildings

Facility Description (contd.). The complex consists of an anechoic chamber/rate table, a test van, a NTA-4F Knosy instrument aircraft, and instrumented A-6 and F-18A and C aircraft. The purpose of the complex is development/test and evaluation of ARM seekers in laboratory to free space environments.

The shielded RF anechoic chamber is 20 by 40 feet and contains equipment to evaluate seeker performance from 500 Mhz to 20 Ghz. The rate table, along with peripheral equipment, provides the capability to perform end-to-end testing including simulated missile launches. The test van is used to evaluate seeker performance and perform target verification. NTA-4F BuNo 152102 aircraft is dedicated to HARM Missile systems T&E and contains an ARM weapon system less missile motor, wings, and actuators. It is used to evaluate seeker performance in free space under dynamic conditions. The instrumented A-6E and F-18A and C aircraft are used to evaluate the seeker interface with on-board avionics under dynamic flight conditions.

This equipment is unique because the van is an ARM-specific asset. No other van exists to support ARM weapons in ground-based testing. The NTA-4F is the only aircraft for ARM-type weapons capable of projecting the seeker forward of the aircraft body and thus flying the terminal portion of the missile trajectory in free space and recording the seeker DF and wing commands.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	35
Weapons, Conventional Missiles/Rockets	65

Life-Cycle Functions	Percentage
T&E	40
S&T	5
D&E	55
IE	0
T&D	0
Other	0

Anti-Radiation Missile (ARM) Seeker Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets	Anti-Radiation Missile (ARM) Seeker Test Complex Elements • HARM Skr Test Van • Sidearm Integ Fac • HARM Knosy FTS • Tactical A/C Instrumentation • Seeker Test Facility	Yes	Yes	Yes	$15,570K = Total $ 600K = Buildings

Facility Description (contd.). The complex consists of an anechoic chamber/rate table, a test van, a NTA-4F Knosy instrument aircraft, and instrumented A-6 and F-18A and C aircraft. The purpose of the complex is development/test and evaluation of ARM seekers in laboratory to free space environments.

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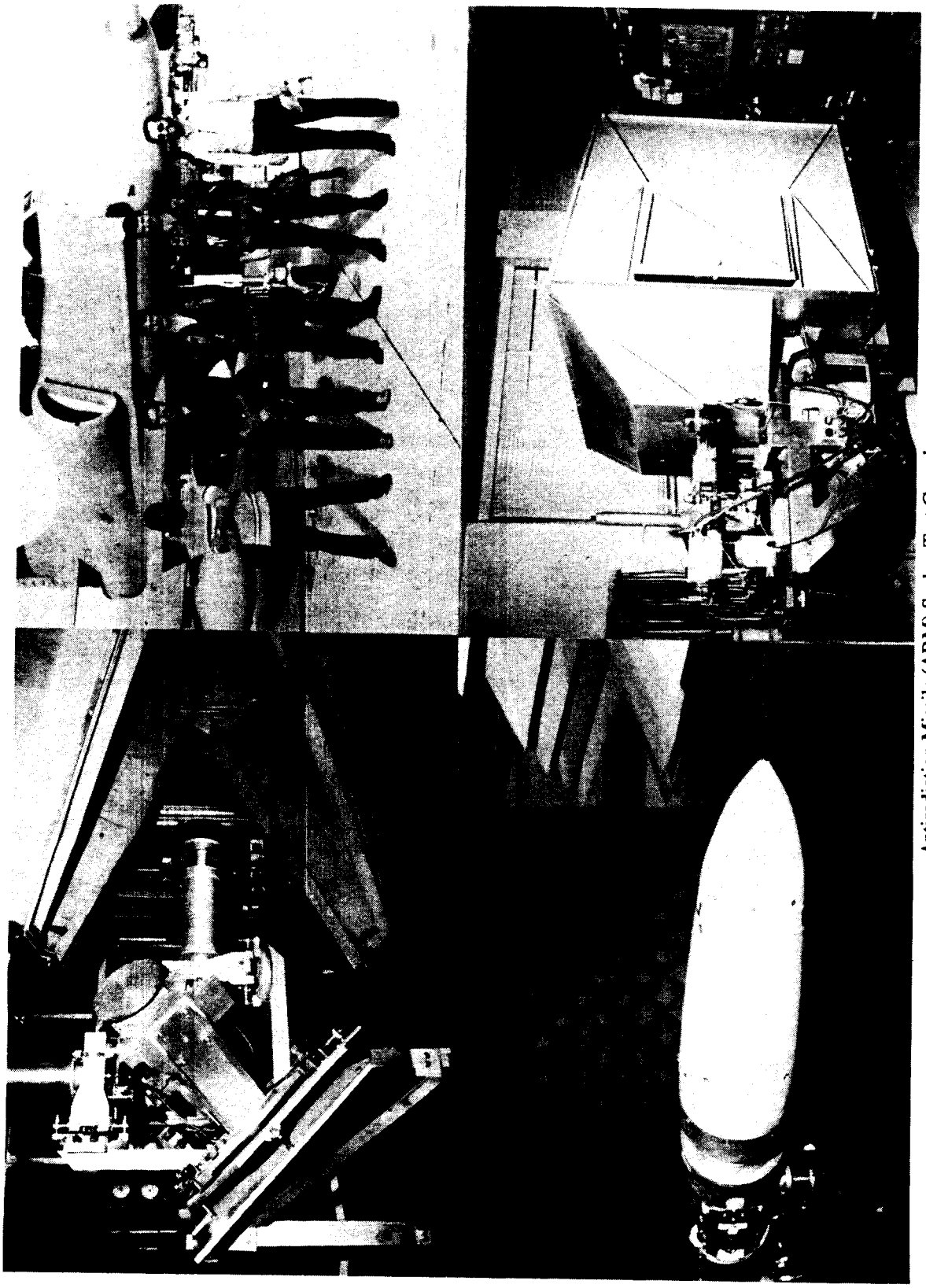
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	35
Weapons, Conventional Missiles/Rockets	65



Antiradiation Missile (ARM) Seeker Test Complex

Anti-Radiation Missile (ARM) Targets

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Anti-Radiation Missile (ARM) Targets Elements • HARM Tgt Cert Van • RF Targets	Yes	Yes	Yes	$22,900K = Total $ 750K = Buildings

Facility Description (contd.). ARM RF target assets number approximately 54 transmitters with associated antennas and components that simulate, to various degrees, 42 air defense systems. Three main target areas are in use at the China Lake North Range and are positioned to represent a slice through a Forward Edge of Battle Area (FEBA). The majority of these targets are located in fixed sites and are not transportable. These ARM target test assets are used almost exclusively for the testing and training of ARM weapons and tactics. Additionally, some ELINT platforms have been supported by the target arrays.

The Cert Van is mounted on a 4 by 4 truck, is 8 by 8 by 12 feet, and houses electronic receiving and recording equipment. The van is used for pretest target setup and checkout, to monitor and record launch and impact target parameters during the test, to monitor the RF environment for possible RF interference from non-test-associated radiators, and to aid in post-test target measurements to verify overall target fidelity and operation.

This equipment is unique because the NAWCWPNS China Lake ARM target complex is the only facility where ARM weapons can be fired into a realistic, instrumented, target area.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	18
Air Vehicles, Rotary Wing, Avionics	2
Weapons, Conventional Missiles/Rockets	70
Weapons, Cruise Missiles	10

This facility is used for R&D, T&E, and Training. However, the exact percentages are not available.

Anti-Radiation Missile (ARM) Targets

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Anti-Radiation Missile (ARM) Targets Elements • HARM Tgt Cert Van • RF Targets	Yes	Yes	Yes	$22,900K = Total $ 750K = Buildings

Facility Description (contd.). ARM RF target assets number approximately 54 transmitters with associated antennas and components that simulate, to various degrees, 42 air defense systems. Three main target areas are in use at the China Lake North Range and are positioned to represent a slice through a Forward Edge of Battle Area (FEBA). The majority of these targets are located in fixed sites and are not transportable. These ARM target test assets are used almost exclusively for the testing and training of ARM weapons and tactics. Additionally, some ELINT platforms have been supported by the target arrays.

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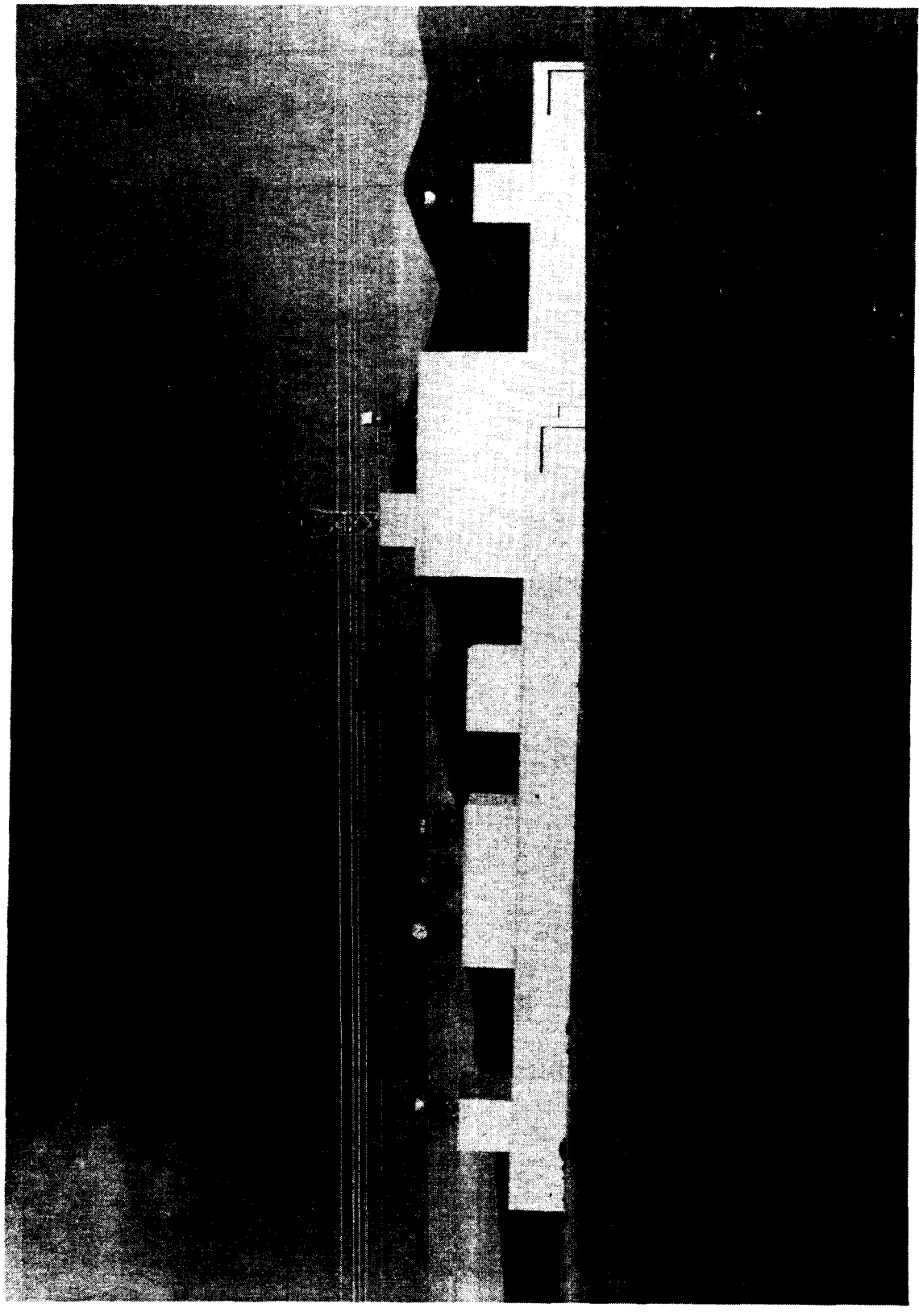
This equipment is unique because the NAWCWPNS China Lake ARM target complex is the only facility where ARM weapons can be fired into a realistic, instrumented, target area.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	18
Air Vehicles, Rotary Wing, Avionics	2
Weapons, Conventional Missiles/Rockets	70
Weapons, Cruise Missiles	10



Antiradiation Missile Targets

Anti-Radiation Missile Integration Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional, Missiles/Rockets	Anti-Radiation Missile Integration Complex Elements • HARM Data Reduction Fac • HARM Mission Planning Module • Harm Test Fac • HARM HEA Integ Fac • HARM Missile Buildup Fac • HARM Wpn Sys Integ Console Fac • Adv HARM Work Station • Wpn Sys Verification Console	Yes	Yes	Yes	$10,600K = Total $ 621K = Buildings

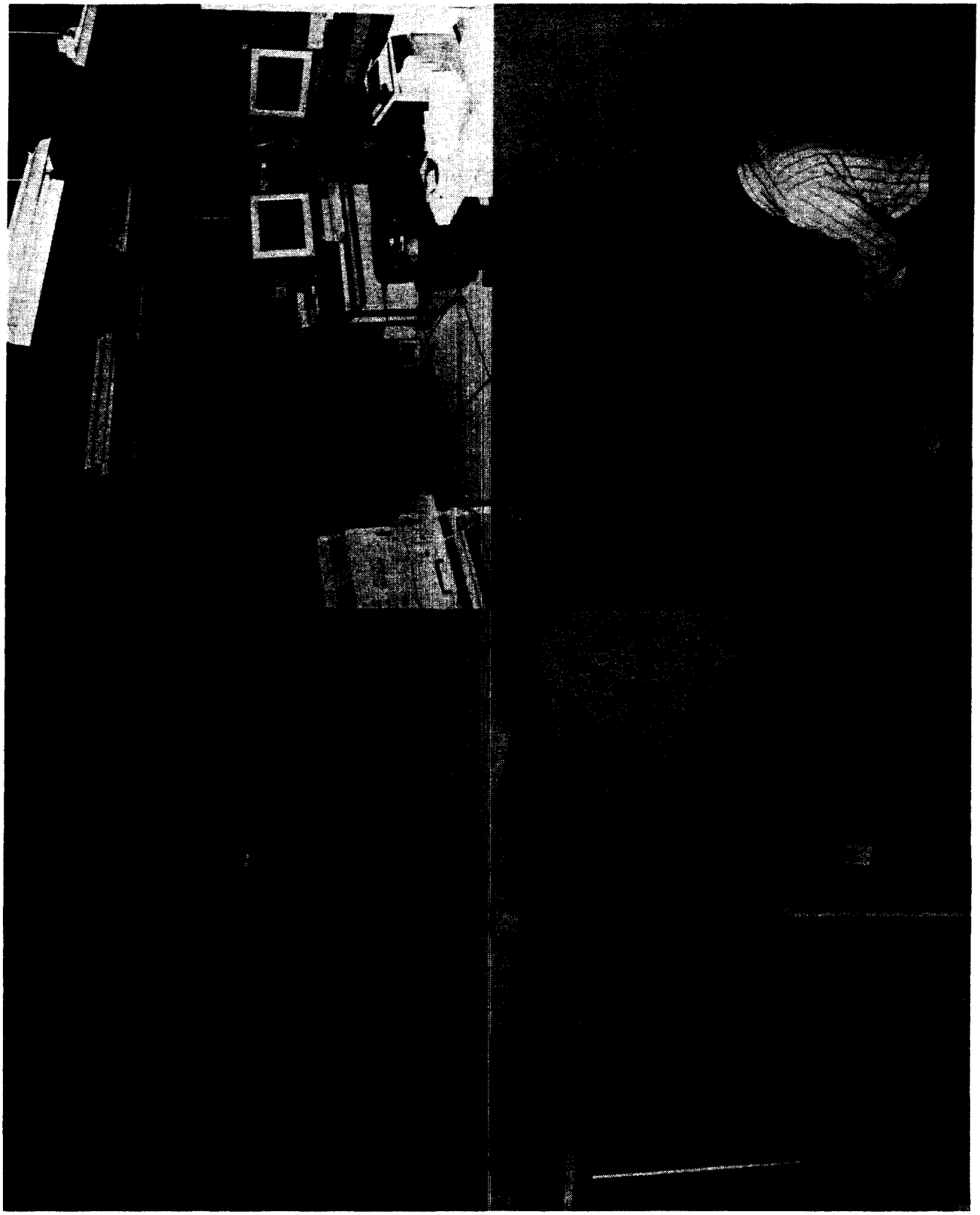
Facility Description (contd.). This capability is a multisite organization including a 6-degree of freedom (DOF) analysis computer laboratory, mission planning module development, data reduction facility, advanced HARM workstation, weapon system integration facility, and weapon system verification facility. The purpose of the complex is to do laboratory-based research, development, and development testing (DT) of static and dynamic hardware; ELINT test and verification; electronic warfare suite integration; production hardware verification, assembly and electrical test of anti-radiation missiles (ARMs) for the multiple services/foreign governments, electrical test and repair of ARM avionics, ARM integration with navy aircraft (OFPs), dynamic missile computer simulation, mission-planning software development (TAMPS), test and debugging of ARM ground-support equipment, and ARM software debugging for live-fire mission scenario testing.

This equipment is unique because this is the only facility in the world that provides unique full-cycle testing of ARM weapons capability, from laboratory-based research, DT, and operational testing (OT) to Fleet test and evaluation. This includes fundamental laboratory-based hardware and software development, instrumented aircraft flight/missile firing, and actual measurement of missile impact in relationship to the required impact target (land or sea base) to access probability of kill (Pk) using complex models of warhead pattern on each target.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Weapons, Conventional, Missiles/Rockets	90

Life-Cycle Functions	Percentage
T&E	60
S&T	0
D&E	20
IE	10
T&D	10
Other	0

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Weapons, Conventional, Missiles/Rockets	90



Antiradiation Missile Integration Complex

Armament/Weapons Design, Prototyping, and Integration Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional, Missiles/Rockets	Armament/Weapons Design, Prototyping, and Integration Facility Elements • System Dev Laboratory • Electro-Mech Fab Fac • Air Vehicle Integ Fac • Mk 54 TDD Software Integ Test Stand • CADCAM Lab	Yes	Yes	No	$20,000K = Total $ 6,000K = Buildings

Facility Description (contd.). The facility consists of six major areas for the purpose of providing electronic/mechanical design, fabrication, test, and evaluation of prototype proof-of-concept hardware. The facility also provides a multidisciplined modeling (CAD/CAE), simulation, analysis, and engineering capability to conduct concept development and demonstration of advanced seekers/fuzes (RF, IR, EO, laser), signal processors, advanced trackers, and stabilized platforms/control systems for armament/weapons. The facility also provides for all-up weapon system integration and demonstration through laboratory and flight testing. Other capabilities include providing consulting services on materials, components, and design/fabrication processes.

The specific facility capabilities include a CAD/CAE facility, electronic/mechanical assembly areas, electronic test areas, environmental laboratories, plastics/materials laboratory, mechanical fabrication facilities, anechoic chamber, carpentry shop, bonded storage areas, and classified vaults.

This equipment is unique because it provides hangar deck/laboratory space for full-scale air-vehicle/weapon integration and testing.

Fiber optic payout rail gun track facility.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	20
Weapons, Conventional, Missiles/Rockets	80

Life-Cycle Functions	Percentage
T&E	8
S&T	19
D&E	70
IE	2
T&D	1
Other	0

Armament/Weapons Design, Prototyping, and Integration Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional, Missiles/Rockets	Armament/Weapons Design, Prototyping, and Integration Facility Elements • System Dev Laboratory • Electro-Mech Fab Fac • Air Vehicle Integ Fac • Mk 54 TDD Software Integ Test Stand • CADCAM Lab	Yes	Yes	No	$20,000K = Total $ 6,000K = Buildings

Facility Description (contd.). The facility consists of six major areas for the purpose of providing electronic/mechanical design, fabrication, test, and evaluation of prototype proof-of-concept hardware. The facility also provides a multidisciplined modeling (CAD/CAE), simulation, analysis, and engineering capability to conduct concept development and demonstration of advanced seekers/fuzes (RF, IR, EO, laser), signal processors, advanced trackers, and stabilized platforms/control systems for armament/weapons. The facility also provides for all-up weapon system integration and demonstration through laboratory and flight testing. Other capabilities include providing consulting services on materials, components, and design/fabrication processes.

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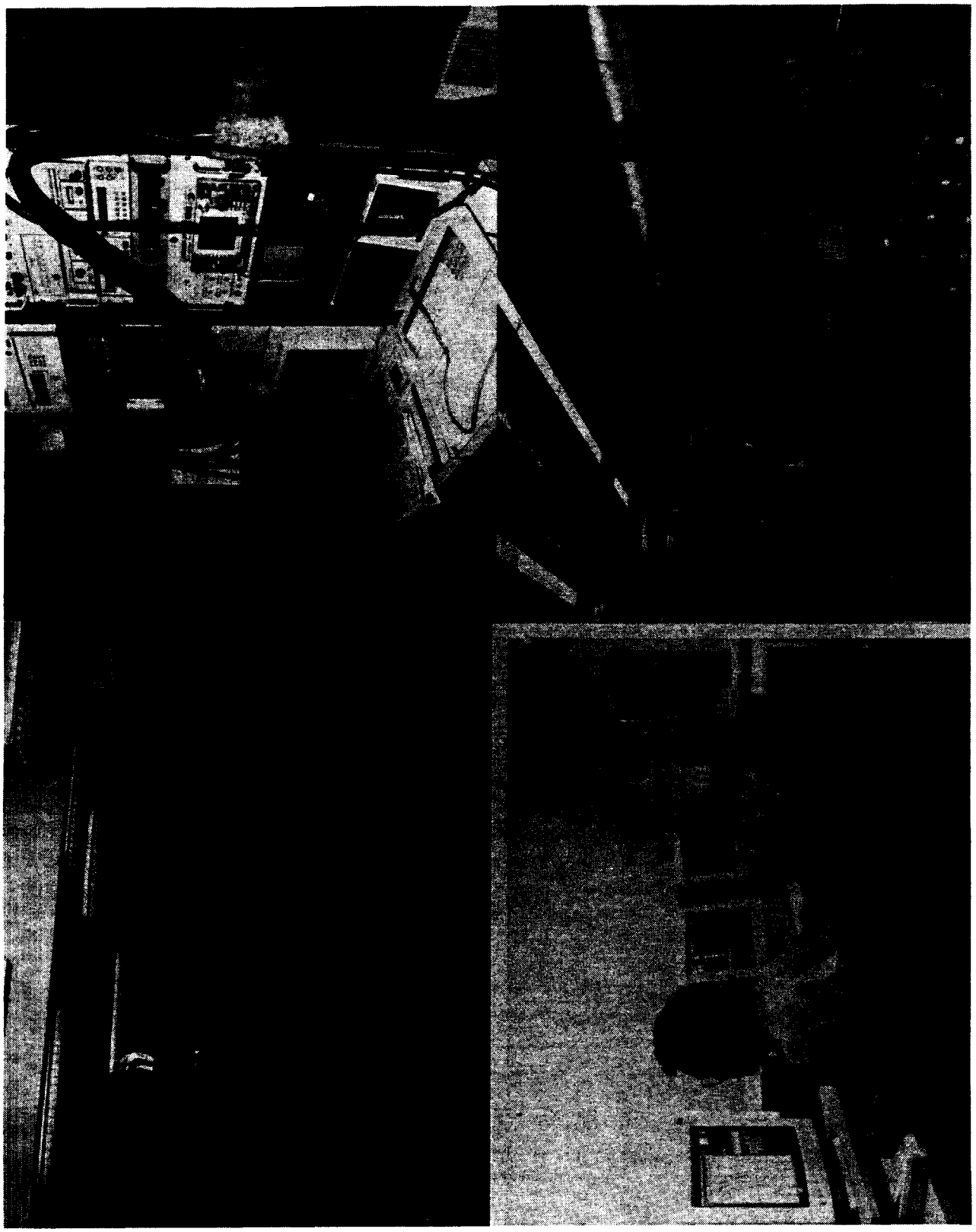
This equipment is unique because it provides hangar deck/laboratory space for full-scale air-vehicle/weapon integration and testing.

Fiber optic payout rail gun track facility.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	20
Weapons, Conventional, Missiles/Rockets	80



Armament/Weapons Design, Prototyping, and Integration Facility

C27 Explosive and Ordnance Modeling

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	C27 Explosive and Ordnance Modeling	No	No	No	$600K = Total $ 30K = Buildings

Facility Description (contd.). C27 uses a networked system of personal computers and workstations to model various ordnance performance characteristics. These characteristics include ordnance and propulsion sections' responses to shock waves (sympathetic detonation), hard target penetration of warheads, and solid modeling for design studies.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	40
Weapons, Cruise Missiles	25
Weapons, Bombs	30
Weapons, Guns and Ammunition	5

Life-Cycle Functions	Percentage
T&E	30
S&T	20
D&E	25
IE	5
T&D	0
Other	20

C27 Explosive and Ordnance Modeling

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	C27 Explosive and Ordnance Modeling	No	No	No	$600K = Total $ 30K = Buildings

Facility Description (contd.). C27 uses a networked system of personal computers and workstations to model various ordnance performance characteristics. These characteristics include ordnance and propulsion sections' responses to shock waves (sympathetic detonation), hard target penetration of warheads, and solid modeling for design studies.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	40
Weapons, Cruise Missiles	25
Weapons, Bombs	30
Weapons, Guns and Ammunition	5

C27 Explosive and Ordnance Modeling

C29 Air Weapon Digital Modeling and Simulation

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	C29 Air Weapon Digital Modeling and Sim	Yes	Yes	Yes	$2,670K = Total $ 560K = Buildings

Facility Description (contd.). C291 has an extensive array of computing assets, digital simulations, and simulation and modeling tools to support design, development, testing, and evaluation of air- and surface-launched weapons. Simulations developed, used, or maintained by C291 include Sidewinder 9L, 9M, 9M-8/9, 9R, and 9X; Sidewinder kinematic reference simulation; 9M and 9M 8/9 detailed seeker; RAM; RAM IRMU 6-DOF and detailed seeker; BOA; MMPT (Multi-mission Propulsion Technology); GIF (Guidance Integrated Fuzing); Sparrow; AIM/RIM-7M/P/R; MHIP detailed seeker; ESSM (Evolved Seasparrow Missile); JSEM (Joint Service Endgame Model); and Standard and AMRAAM TDD (Target Detection Device). Signal-/image-processing work includes IR/EO image synthesis and analysis and wavelet-based tracking and detection algorithm development and simulation for IR and RF systems.

This equipment is unique because simulations, and the products of the simulations, on Sidewinder, Sidewinder variants, and RAM are not duplicated elsewhere.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	20
S&T	40
D&E	40
IE	0
T&D	0
Other	0

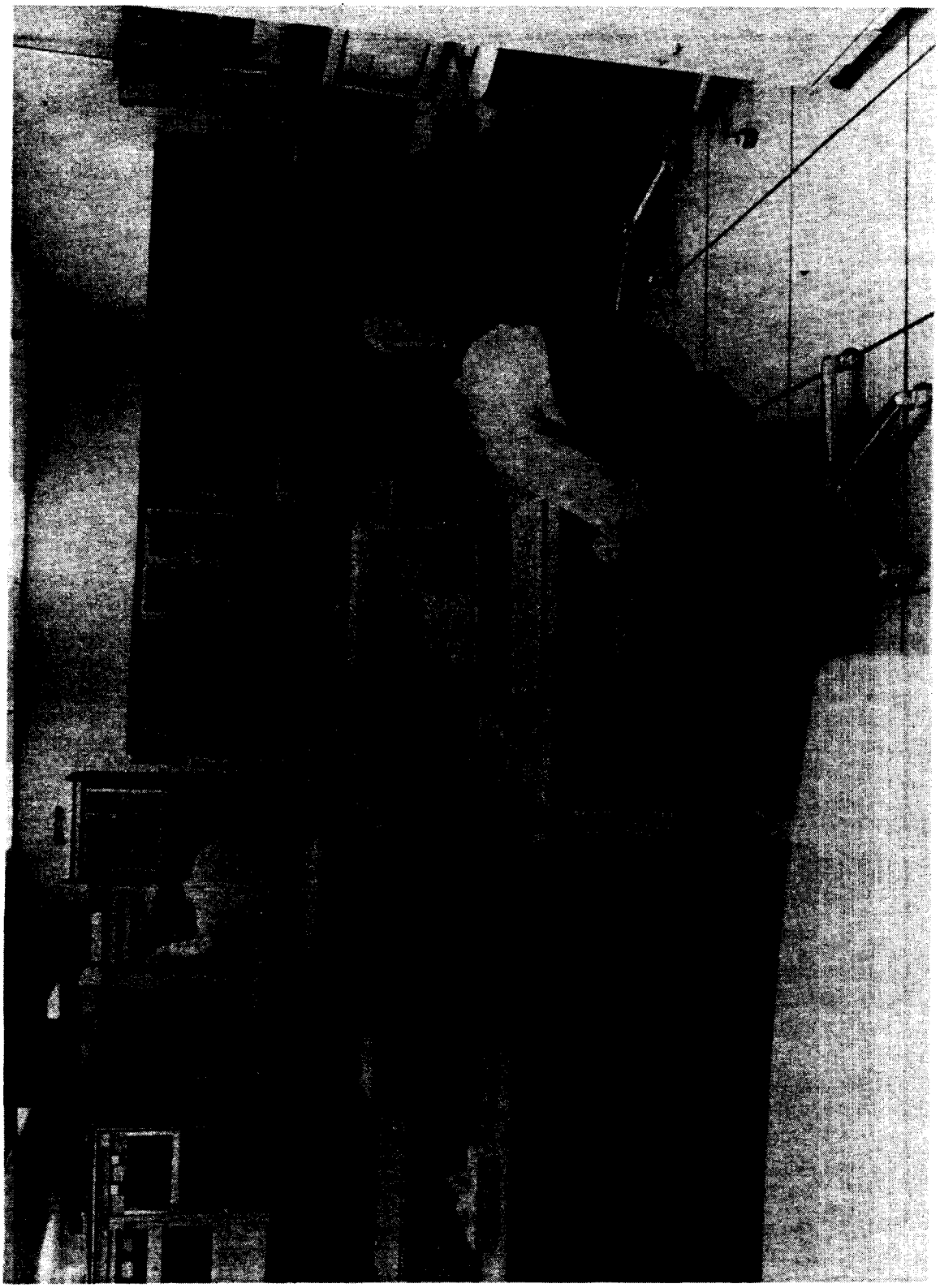
C29 Air Weapon Digital Modeling and Simulation

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	C29 Air Weapon Digital Modeling and Sim	Yes	Yes	Yes	$2,670K = Total $ 560K = Buildings

Facility Description (contd.). C291 has an extensive array of computing assets, digital simulations, and simulation and modeling tools to support design, development, testing, and evaluation of air- and surface-launched weapons. Simulations developed, used, or maintained by C291 include Sidewinder 9L, 9M, 9M-8/9, 9R, and 9X; Sidewinder kinematic reference simulation; 9M and 9M 8/9 detailed seeker; RAM; RAM IRMU 6-DOF and detailed seeker; BOA; MMPT (Multi-mission Propulsion Technology); GIF (Guidance Integrated Fuzing); Sparrow; AIM/RIM-7M/P/R; MHIP detailed seeker; ESSM (Evolved Seasparrow Missile); JSEM (Joint Service Endgame Model); and Standard and AMRAAM TDD (Target Detection Device). Signal-/image-processing work includes IR/EO image synthesis and analysis and wavelet-based tracking and detection algorithm development and simulation for IR and RF systems.

This equipment is unique because simulations, and the products of the simulations, on Sidewinder, Sidewinder variants, and RAM are not duplicated elsewhere.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



C291 Air Weapon Digital Modeling and Simulation

Cactus Flats Ordnance Test Area

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Cactus Flats Ordnance Test Area	No	No	No	$1,169K = Total $ 321K = Buildings

Facility Description (contd.). This facility is a 15-square-mile test arena for conducting large- and small-scale high-explosive tests, as well as gun testing. The test site can handle tests up to 200,000 pounds net explosive weight. Tests supported include survivability of improved magazine designs, quantity-distance/hazard zone safety tests, sympathetic detonation tests, gun testing (up to 120 mm), and testing of underground explosive storage facilities. Capabilities include high-speed photography, video, pressure measurements, and debris mapping. Mission statement: Engineering and development of ordnance programs to determine safety, performance, and storage properties.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	15
Weapons, Bombs	50
Weapons, Guns and Ammunition	35

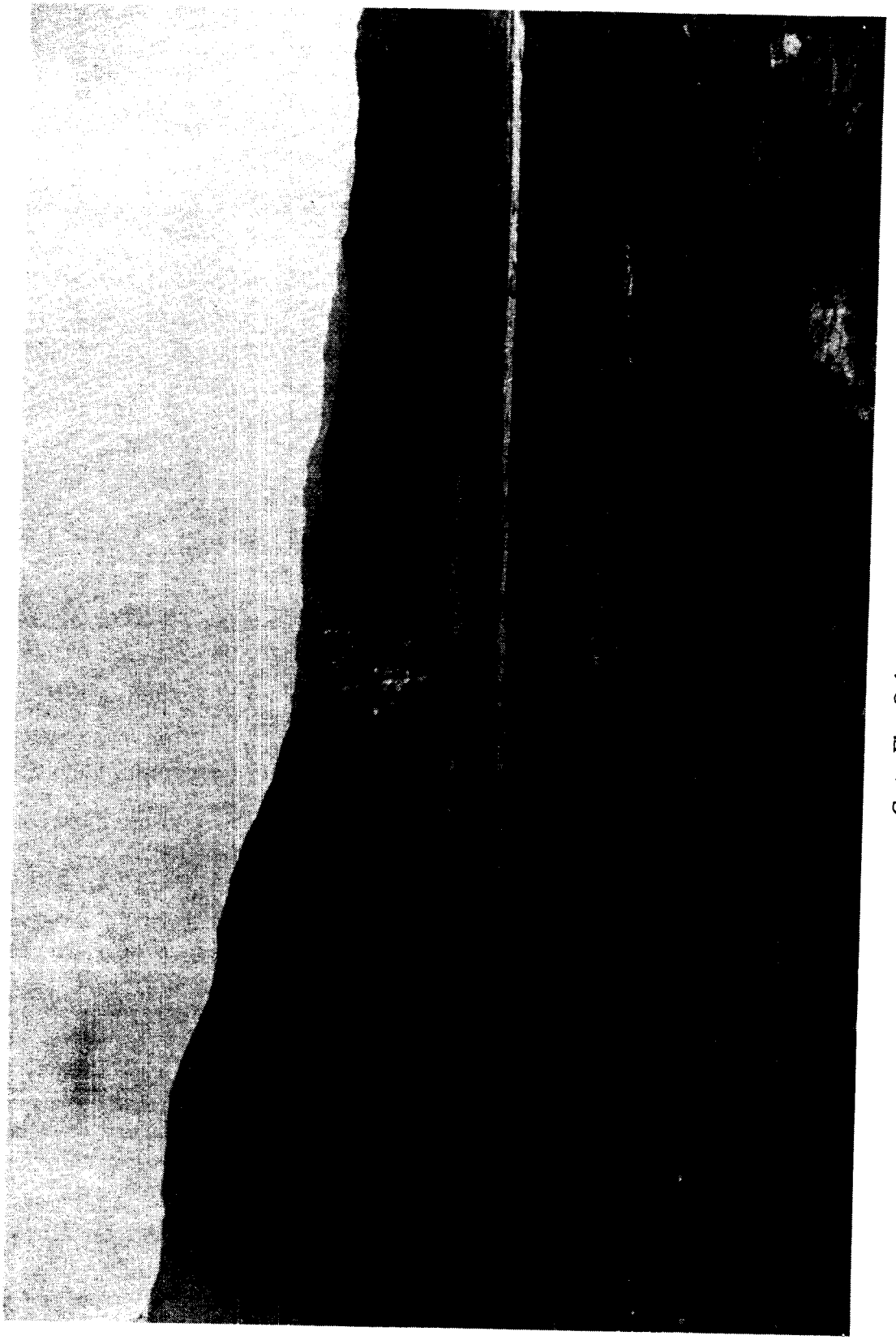
Life-Cycle Functions	Percentage
T&E	90
S&T	10
D&E	0
IE	0
T&D	0
Other	0

Cactus Flats Ordnance Test Area

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Cactus Flats Ordnance Test Area	No	No	No	$1,169K = Total $ 321K = Buildings

Facility Description (contd.). This facility is a 15-square-mile test arena for conducting large- and small-scale high-explosive tests, as well as gun testing. The test site can handle tests up to 200,000 pounds net explosive weight. Tests supported include survivability of improved magazine designs, quantity-distance/hazard zone safety tests, sympathetic detonation tests, gun testing (up to 120 mm), and testing of underground explosive storage facilities. Capabilities include high-speed photography, video, pressure measurements, and debris mapping. Mission statement: Engineering and development of ordnance programs to determine safety, performance, and storage properties.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	15
Weapons, Bombs	50
Weapons, Guns and Ammunition	35



Cactus Flats Ordnance Test Area

Chemical Analysis Research Facility

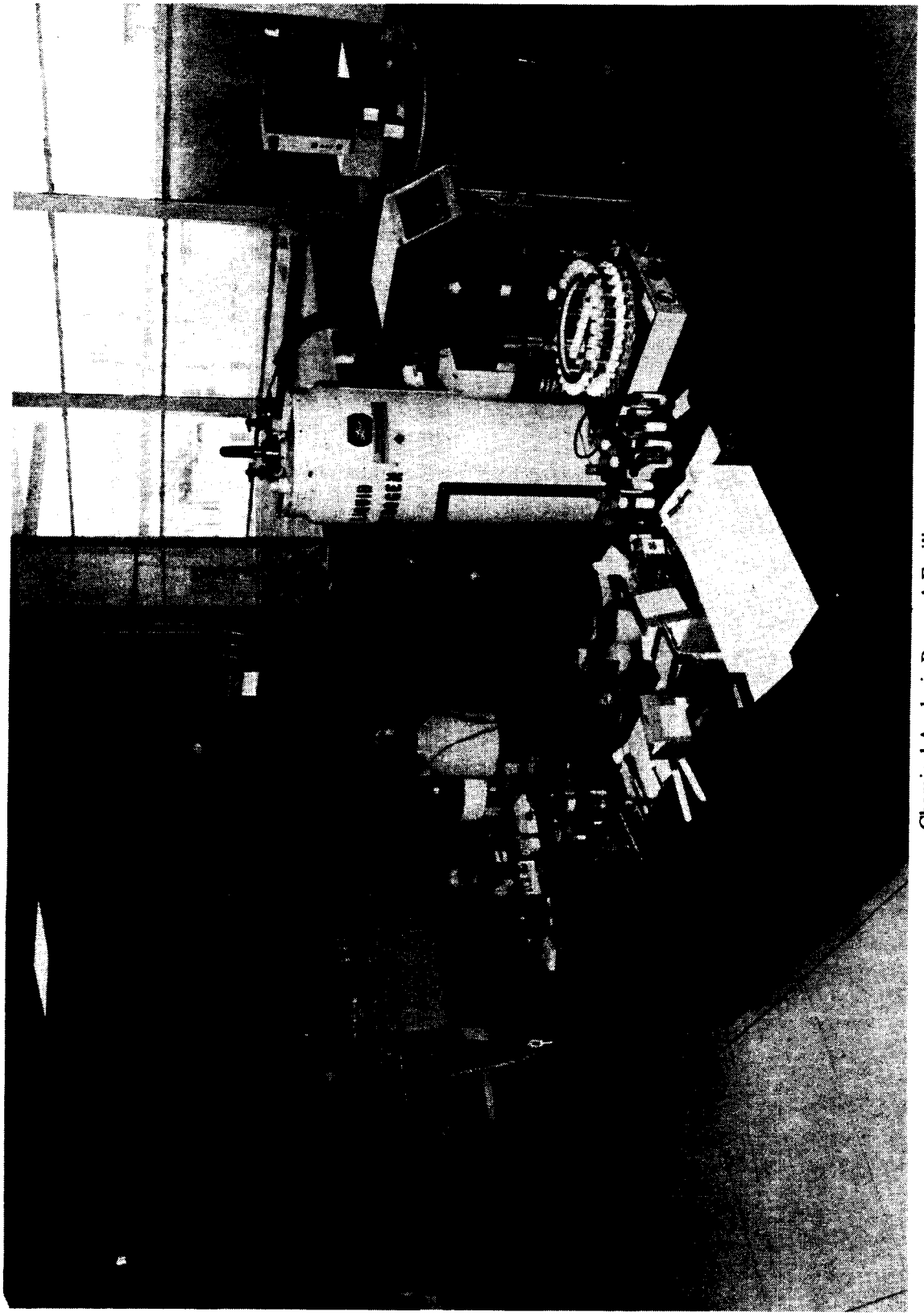
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition Electronic Devices Environmental Quality Advanced Materials	Chemical Analysis Research Facility Elements • Nuclear Magnetic Resonance Fac • FT-IR/Raman Fac • Chem Analysis Lab • Polymer Characterization Fac • Auger/SEM Fac • Materials Engineering • X-ray Crystallography • Synthesis Laboratory	Yes	Yes	Yes	$7,300K = Total $1,100K = Buildings

Facility Description (contd.). This facility provides synthesis, characterization, and engineering of advanced materials for a wide variety of Navy weapon programs requirements. State-of-the-art analytical equipment allows characterization to a large number of in-house and external activities including SSPO (Trident) and research programs in the areas of energetic materials, polymer precursors, foreign materials characterization, failure analysis, and general unknown determinations. Analytical environmental and hazardous waste samples analyses are critical to the operations of the Environmental Project Office. Support is also provided to programs engaged in seeking substitutes for ozone-depleting substances. Facilities and capabilities include mass spectrometry, NMR laboratory, IR laboratory, polymer synthesis and characterization, Auger/SEM spectroscopy, environmental analysis, synthesis laboratory, and X-ray diffraction.

This equipment is unique because it supports a broad range of activities from basic research to advanced development. It is not only state-of-the-art in instrumentation but also is accredited to do EPA-certified analyses and is certified to do analyses and testing of energetic materials.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	10
Weapons, Conventional Missiles/Rockets	28
Weapons, Bombs	10
Weapons, Guns and Ammunition	5
Electronic Devices	2
Environmental Quality	15
Advanced Materials	30

Life-Cycle Functions	Percentage
T&E	18
S&T	69
D&E	10
IE	2
T&D	0
Other	1



Chemical Analysis Research Facility

China Lake Ordnance and Propulsion Pilot Plant

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Propulsion Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Guided Projectiles Weapons, Bombs	China Lake Ordnance and Propulsion Pilot Plant	Yes	Yes	Yes	$106,875K = Total $ 79,575K = Buildings

Facility Description (contd.). The mission of the China Lake Ordnance and Propulsion Pilot Plant is to advance ordnance-related technology (i.e., energetic materials, propulsion, warheads, bombs, and fuzing), and to design and develop weapons and weapon components that contain energetic materials. As part of its mission, the Pilot Plant is responsible for the design and development of warheads and propulsion systems, and for the development and application of Insensitive Munitions technology. Its uniqueness is in having the capability to go from hand-mixes and synthesis of new energetic materials and new formulations through large-scale processing of both propellants and explosives. Processing equipment includes high-shear mixers from 1 gallon to 150 gallon in size for mixing propellants and explosives; up to 40-gallon slurry kettles for mixing melt cast and other explosives; pellet presses; 20-, 50-, and 300-ton explosive presses; complete raw material preparation in hammer mill; Sweco grinders and fluid energy mills; injection loaders for explosives; casting facilities; ovens for curing explosives and propellants; and complete machining capability for rocket motors, warheads, bombs, explosives, and propellants. Availability of on-site disposal for all explosive and propellant scrap and other excess ordnance components is invaluable. This facility is composed of 56 buildings designed exclusively for proper handling of energetic materials. These buildings are positioned according to quantity distance tables to handle propellants and explosives up to several thousand pounds, with no current or anticipated encroachment from residential, commercial, or recreational development that could compromise the S&T mission. Construction is of reinforced concrete or designed with earth-filled barricades. Safety measures in place include conductive floors and static grounding systems to prevent ignition of energetics through electric discharge. An atmospheric warning system is installed and encompasses the area. Personnel barricades to prevent unauthorized intrusion to process equipment during remote operations are equipped with electrical interlocks. Explosion-proof electrical fixtures and equipment prevent ignition of flammable dusts or vapors, and water-deluge fire-suppression systems are installed to protect the facilities investment. A regulatory approved hazardous waste treatment system that allows for effluent collection, treatment, and disposal of explosive hazardous waste is installed.

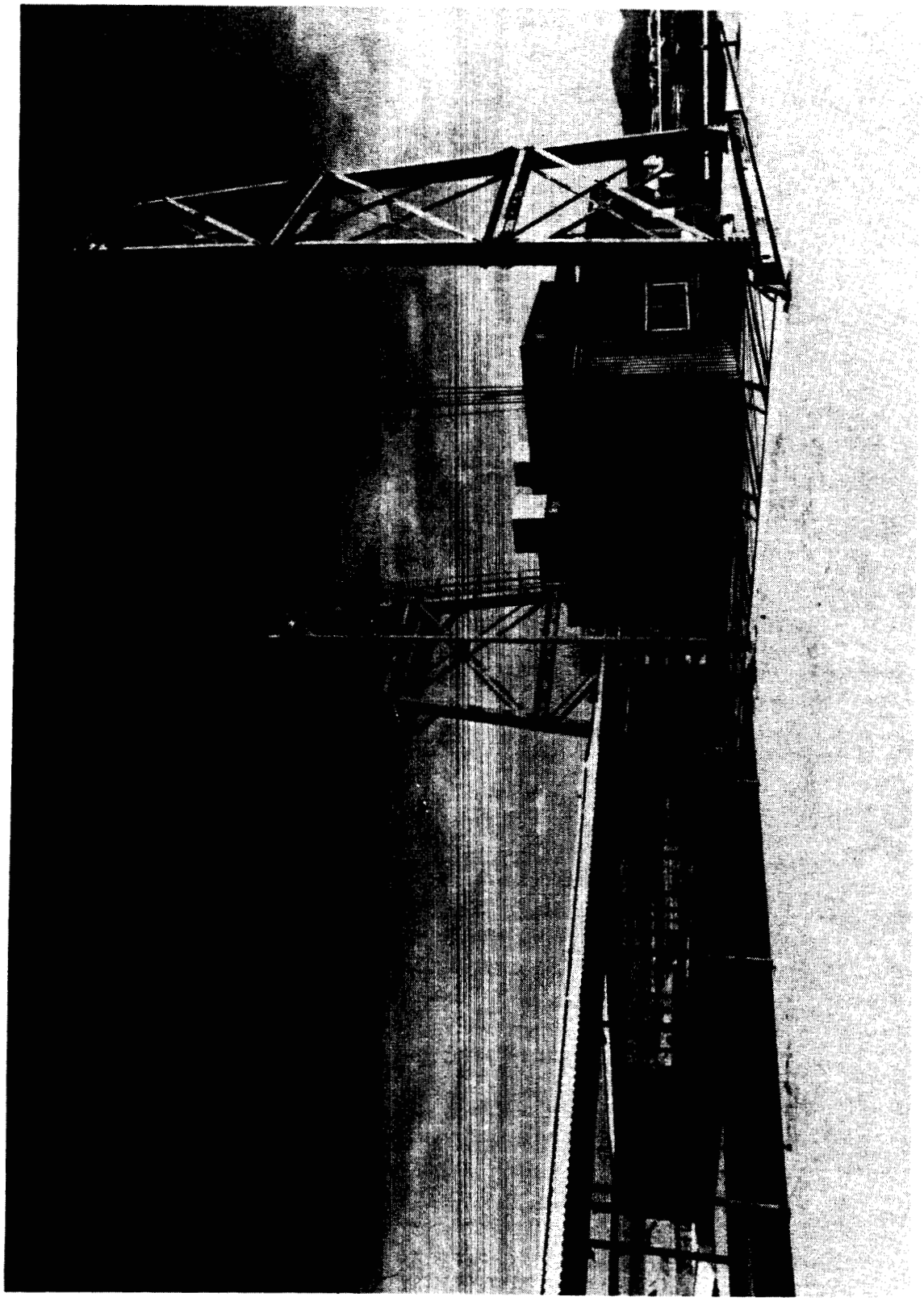
This equipment is unique because this is a one-of-a-kind facility within the DOD, DOE, and the U.S. Its uniqueness is in having the capability to go from hand-mixes and synthesis of new energetic materials and new formulations through large-scale processing of both propellants and explosives. Availability of on-site disposal for all explosive and propellant scrap and other excess ordnance components is invaluable. There are no encroachment problems and no possibility of encroachment in the future. There is virtually unlimited room for expansion.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Propulsion	6
Weapons, Conventional Missiles/Rockets	70
Weapons, Cruise Missiles	12
Weapons, Guided Projectiles	2
Weapons, Bombs	10

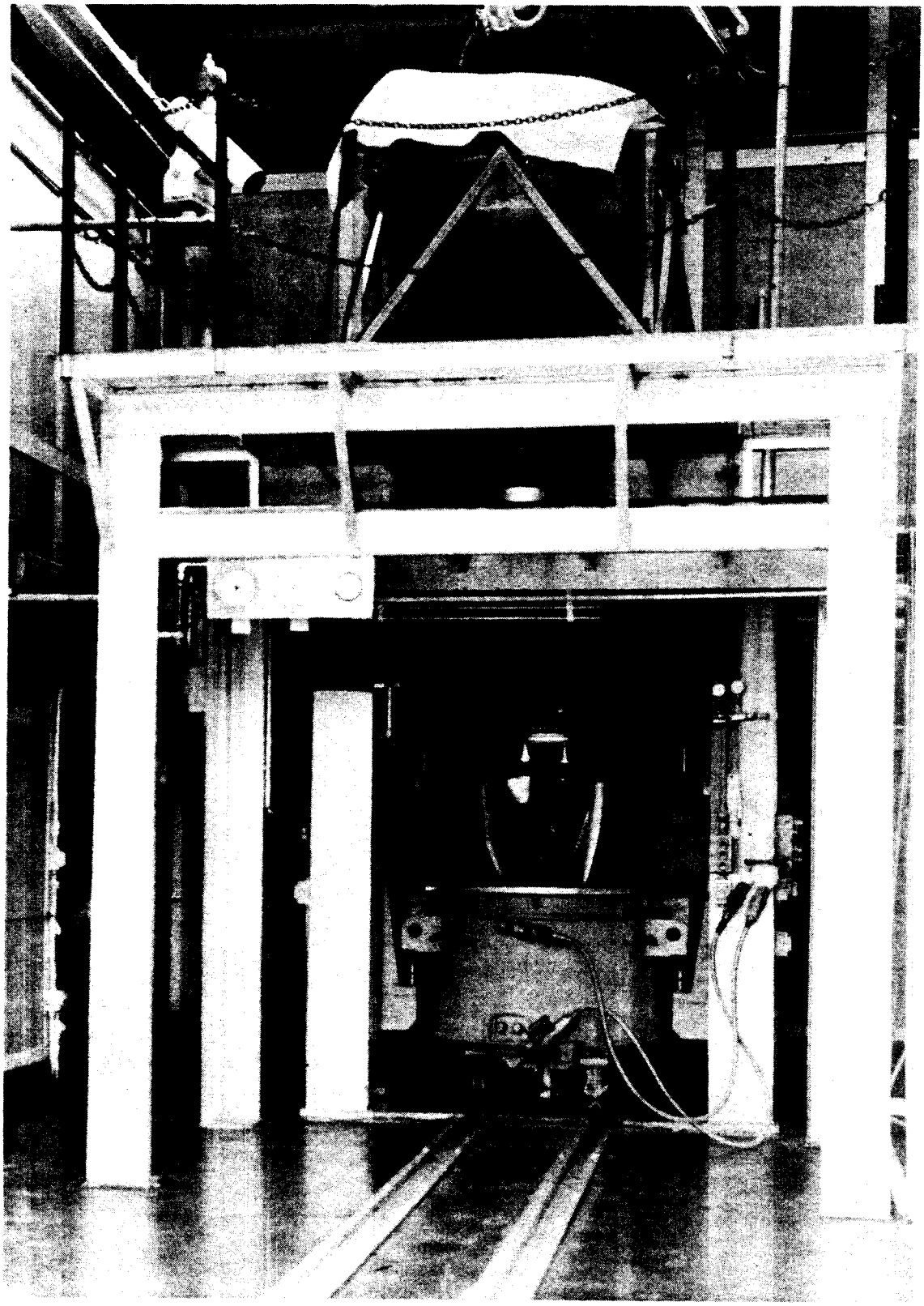
This facility is largely used for R&D; however, it has occasionally been used for T&E.

This equipment is unique because this is a one-of-a-kind facility within the DOD, DOE, and the U.S. Its uniqueness is in having the capability to go from hand-mixes and synthesis of new energetic materials and new formulations through large-scale processing of both propellants and explosives. Availability of on-site disposal for all explosive and propellant scrap and other excess ordnance components is invaluable. There are no encroachment problems and no possibility of encroachment in the future. There is virtually unlimited room for expansion.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Propulsion	6
Weapons, Conventional Missiles/Rockets	70
Weapons, Cruise Missiles	12
Weapons, Guided Projectiles	2
Weapons, Bombs	10



China Lake Ordnance and Propulsion Pilot Plant



China Lake Ordnance and Propulsion Pilot Plant

Composites Development Laboratory

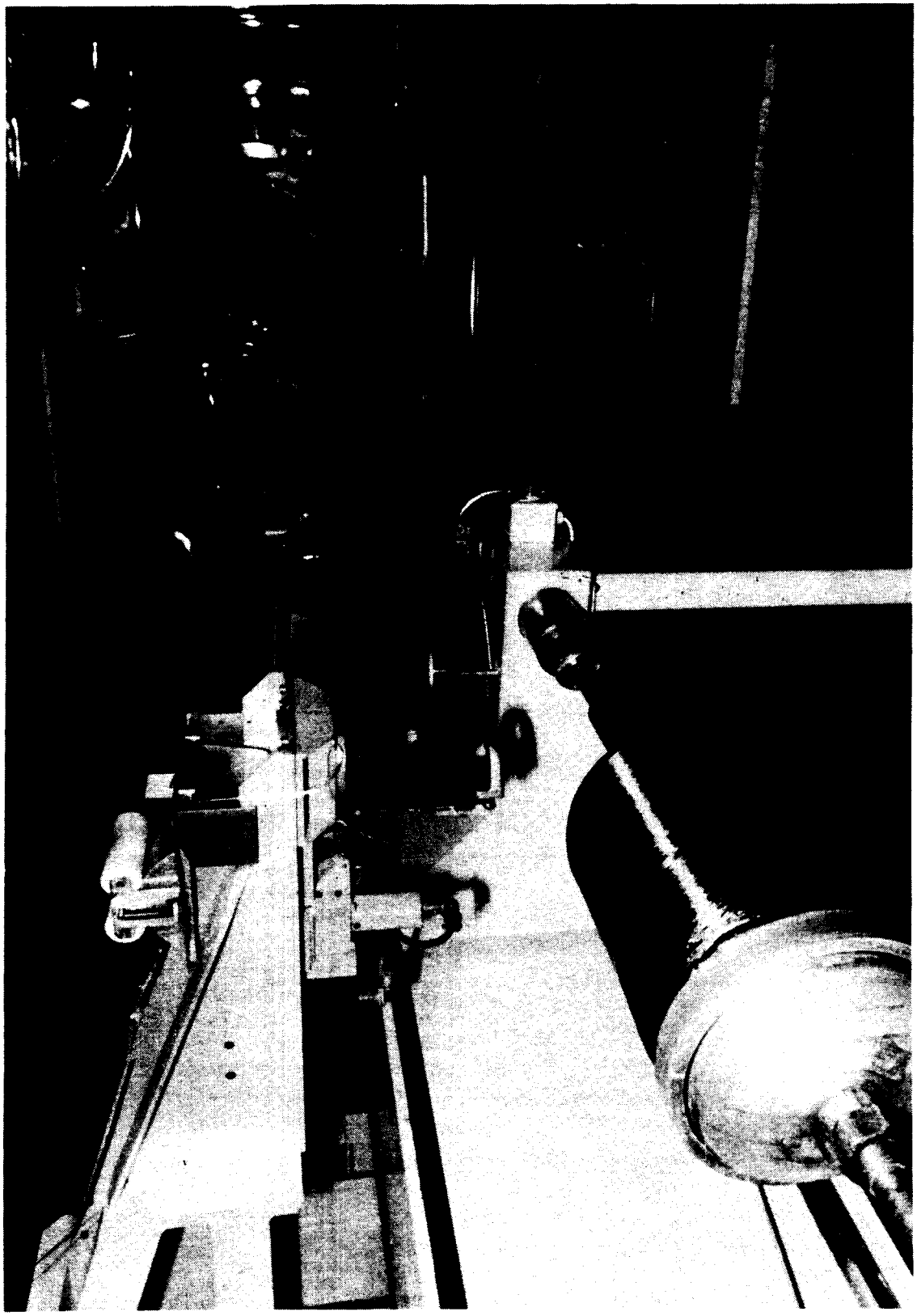
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Advanced Materials	Composites Development Lab Elements • Composites and Plastics Lab • Composites Dev Lab	Yes	No	No	$6,000K = Total $2,500K = Buildings

Facility Description (contd.). The primary purpose of this S&T laboratory is to provide advanced composite development from design/analysis methodology, materials development and characterization, and fabrication methods through testing for tactical missile airframes and propulsion systems. This laboratory function is located at three primary sites. Plastic and composite parts are developed from bulkheads to complete airframes and nozzles, liners/insulators to rocket motor cases. The laboratory includes unique design, fabrication, and test equipment that are integrated together. The laboratory provides quick-turnaround and special one-of-a-kind solutions to science and technology projects. Layup tables, presses up to 720 tons, autoclaves, and curing ovens afford a self-contained capability to meet all manner of non-metallic parts fabrication requirements. The composite winding equipment can fabricate solid rocket motor cases and complete airframes for any size tactical missile. Design and analysis tools are integrated into the fabrication and test facility to form a full-spectrum composite development laboratory.

This equipment is unique because within DOD, no other facility possesses the capability to support the entire developmental process, from design of new methodologies and processes all the way through fabrication. No other site has the amount or breadth of equipment and resident capability in the composites design, analysis, fabrication, and testing areas. This is the only facility capable of molding large and complex rocket nozzles and manifolds.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing Avionics	10
Weapons, Conventional Missiles/Rockets	76
Weapons, Cruise Missiles	11
Advanced Materials	3

Life-Cycle Functions	Percentage
T&E	10
S&T	65
D&E	15
IE	10
T&D	0
Other	0



Composites Development Laboratory

Data Link Development Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing Avionics Weapons, Cruise Missile	Data Link Development Lab	Yes	Yes	Yes	$3,379K = Total $ 439K = Buildings

Facility Description (contd.). The mission is to design, develop, test, and evaluate two-way RF weapon data links for Man-In-The-Loop (MITL) control of air-to-ground weapons, Battle Damage Assessment (BDA), and Bomb Impact Assessment Systems (BIAS). This facility is a laboratory for the design, development, and testing of two-way RF weapon data links.

The facility consists of an R&D laboratory, prototype fabrication facility, flight-test support equipment with communications gear and antennas, and office spaces.

This equipment is unique because this is the only weapon data link development facility where actual hardware development is performed and that is located at the edge of a controlled flight-test range to enable development flight testing.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing Avionics	40
Weapons, Cruise Missile	60

Life-Cycle Functions	Percentage
T&E	20
S&T	0
D&E	80
IE	0
T&D	0
Other	0

Data Link Development Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing Avionics Weapons, Cruise Missile	Data Link Development Lab	Yes	Yes	Yes	$3,379K = Total $ 439K = Buildings

Facility Description (contd.). The mission is to design, develop, test, and evaluate two-way RF weapon data links for Man-In-The-Loop (MITL) control of air-to-ground weapons, Battle Damage Assessment (BDA), and Bomb Impact Assessment Systems (BIAS). This facility is a laboratory for the design, development, and testing of two-way RF weapon data links.

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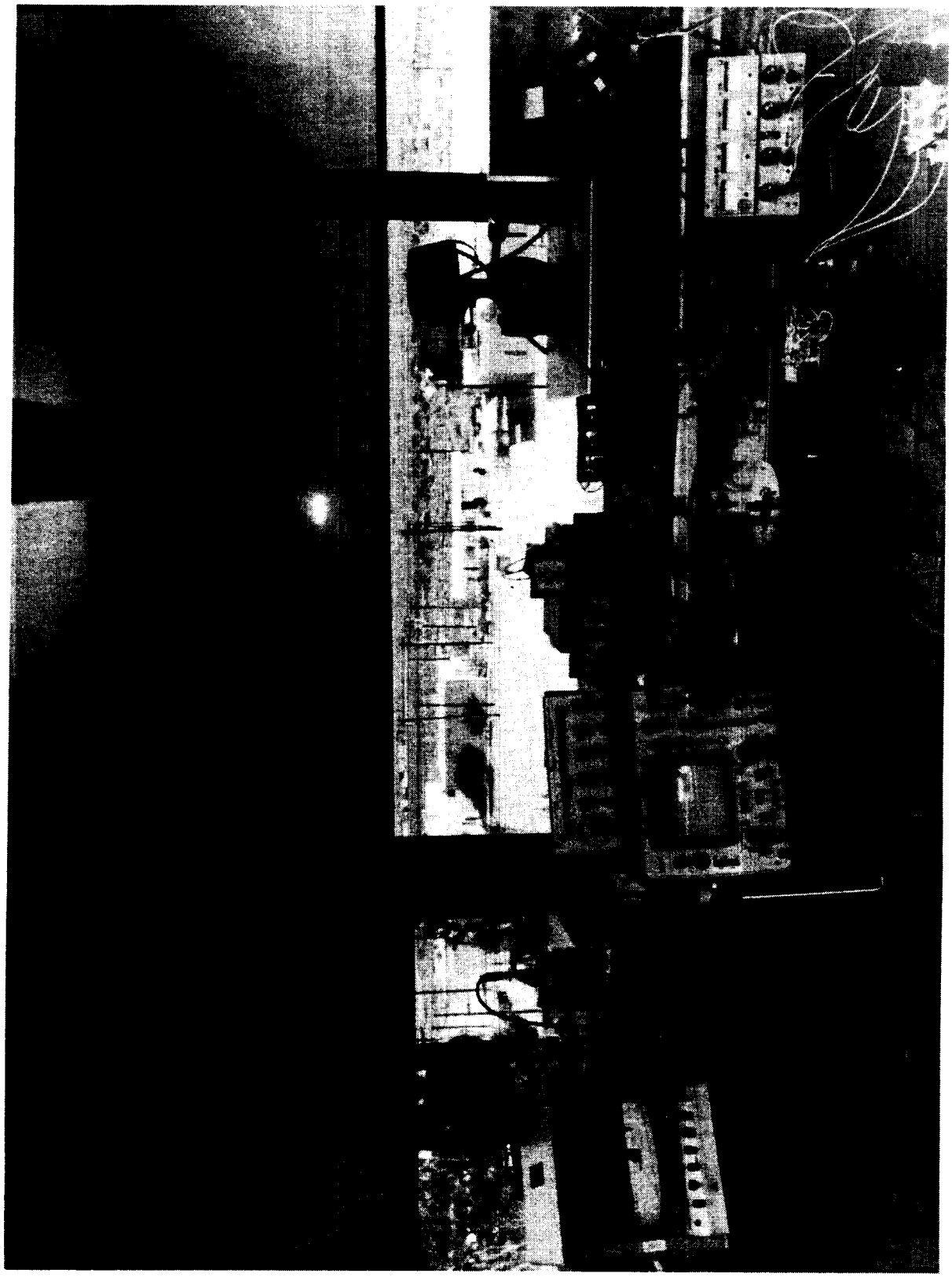
This equipment is unique because this is the only weapon data link development facility where actual hardware development is performed and that is located at the edge of a controlled flight-test range to enable development flight testing.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing Avionics	40
Weapons, Cruise Missile	60



Data Link Development Laboratory

Detonation Physics Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Detonation Physics Lab	No	No	No	$4,820K = Total $3,220K = Buildings

Facility Description (contd.). This facility consists of three test bays: an enclosed test chamber with separate control room, an indoor firing bay, and an outdoor firing bay with a common control room. All three bays are instrumented, and the ultra-high-speed framing and streak cameras may be used for the indoor and outdoor bays. Precise timing and pressure measurements can also be made. All bays are heavily constructed for work with energetic materials, and control rooms are heated/air conditioned for instrumentation. Support for test facilities includes office space, machine shop, wood working shop, electronics laboratory, chemical laboratory with fume hoods, and photo laboratory. The facility has the capability to be totally self-sufficient: make test fixtures, build stands, instrumentation, test, gather data, evaluate data, report results, and develop film. Test supported are detonation velocity, detonation pressure, fragment velocity, penetration performance, cap sensitivity, shock sensitivity, sympathetic detonation, critical diameter, shock sensitivity, failure thickness, and fuel-air-explosive characterization.

Mission statement: To determine the quality, safety, and operational characteristics of energetic materials through detonation physics testing.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	10
Weapons, Bombs	30

Life-Cycle Functions	Percentage
T&E	60
S&T	40
D&E	0
IE	0
T&D	0
Other	0

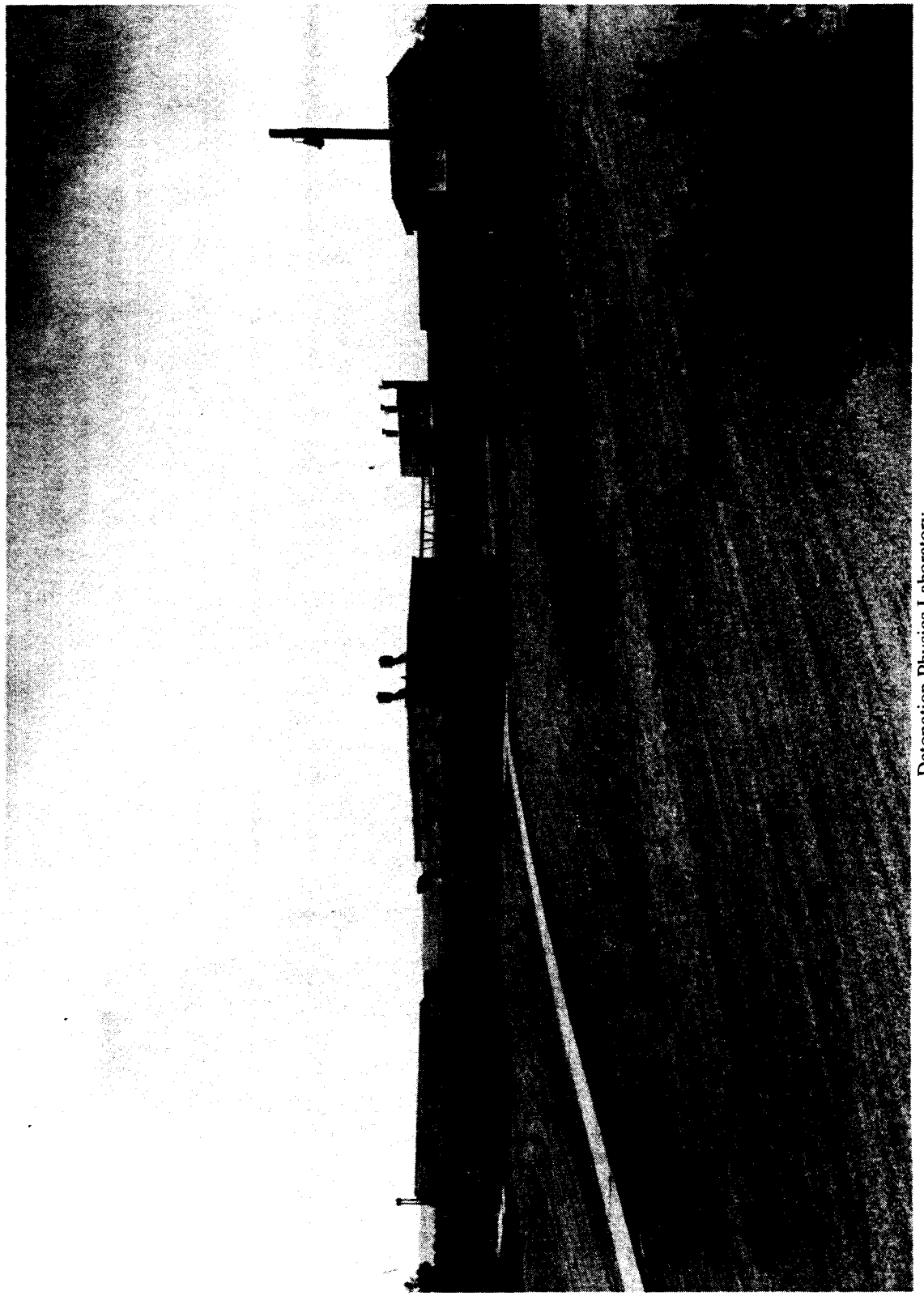
Detonation Physics Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Detonation Physics Lab	No	No	No	$4,820K = Total $3,220K = Buildings

Facility Description (contd.). This facility consists of three test bays: an enclosed test chamber with separate control room, an indoor firing bay, and an outdoor firing bay with a common control room. All three bays are instrumented, and the ultra-high-speed framing and streak cameras may be used for the indoor and outdoor bays. Precise timing and pressure measurements can also be made. All bays are heavily constructed for work with energetic materials, and control rooms are heated/air conditioned for instrumentation. Support for test facilities includes office space, machine shop, wood working shop, electronics laboratory, chemical laboratory with fume hoods, and photo laboratory. The facility has the capability to be totally self-sufficient: make test fixtures, build stands, instrumentation, test, gather data, evaluate data, report results, and develop film. Test supported are detonation velocity, detonation pressure, fragment velocity, penetration performance, cap sensitivity, shock sensitivity, sympathetic detonation, critical diameter, shock sensitivity, failure thickness, and fuel-air-explosive characterization.

Mission statement: To determine the quality, safety, and operational characteristics of energetic materials through detonation physics testing.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	10
Weapons, Bombs	30



Detonation Physics Laboratory

Development Projects Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Development Projects Lab	No	No	No	$3,440K = Total $2,840K = Buildings

Facility Description (contd.). The facility includes office space, laboratory, and hardware storage/assembly areas.

The facility mission is to provide work space for developmental projects at NAWCWPNS China Lake, including design, analysis, data reduction, and hardware storage and assembly activities. The facility provides a unique capability because of its ability to handle information and hardware, and because of its proximity to hardware fabrication, assembly, and test areas.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

This facility is currently used for R&D (including S&T, D&E, and IE).

Development Projects Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Development Projects Lab	No	No	No	$3,440K = Total $2,840K = Buildings

Facility Description (contd.). The facility includes office space, laboratory, and hardware storage/assembly areas.

The facility mission is to provide work space for developmental projects at NAWCWPNS China Lake, including design, analysis, data reduction, and hardware storage and assembly activities. The facility provides a unique capability because of its ability to handle information and hardware, and because of its proximity to hardware fabrication, assembly, and test areas.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Development Projects Laboratory

R

Dynamic Properties Measurements Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Dynamic Properties Measurements Complex Elements • Mass Properties and Modal Analysis • Structural Dynamics Lab	No	No	No	$2,230K = Total $1,480K = Buildings

Facility Description (contd.). The Mass Properties Facility measures weight, center of gravity, moment of inertia, and product of inertia of items from 2 to 5,500 pounds. Mission statement: To provide readily available mass properties measurements for any item at a minimum of cost and a maximum of accuracy.

The structural dynamics laboratory is a highly specialized structural analysis resource. The laboratory can perform modal testing and dynamic analysis of structures on both the component and system levels. Analyses are generally performed in the test facility. However, the equipment is fully portable, allowing testing and analyses to be performed on or off site. The data are used to validate Computer Aided Engineering(CAE) structural dynamics analytical models. The laboratory hardware/software is fully integrated into the overall CAE capability.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	19
Air Vehicles, Rotary Wing, Avionics	1
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	15
Weapons, Bombs	5

Life-Cycle Functions	Percentage
T&E	25
S&T	20
D&E	55
IE	0
T&D	0
Other	0

Dynamic Properties Measurements Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Dynamic Properties Measurements Complex Elements • Mass Properties and Modal Analysis • Structural Dynamics Lab	No	No	No	$2,230K = Total $1,480K = Buildings

Facility Description (contd.). The Mass Properties Facility measures weight, center of gravity, moment of inertia, and product of inertia of items from 2 to 5,500 pounds. Mission statement: To provide readily available mass properties measurements for any item at a minimum of cost and a maximum of accuracy.

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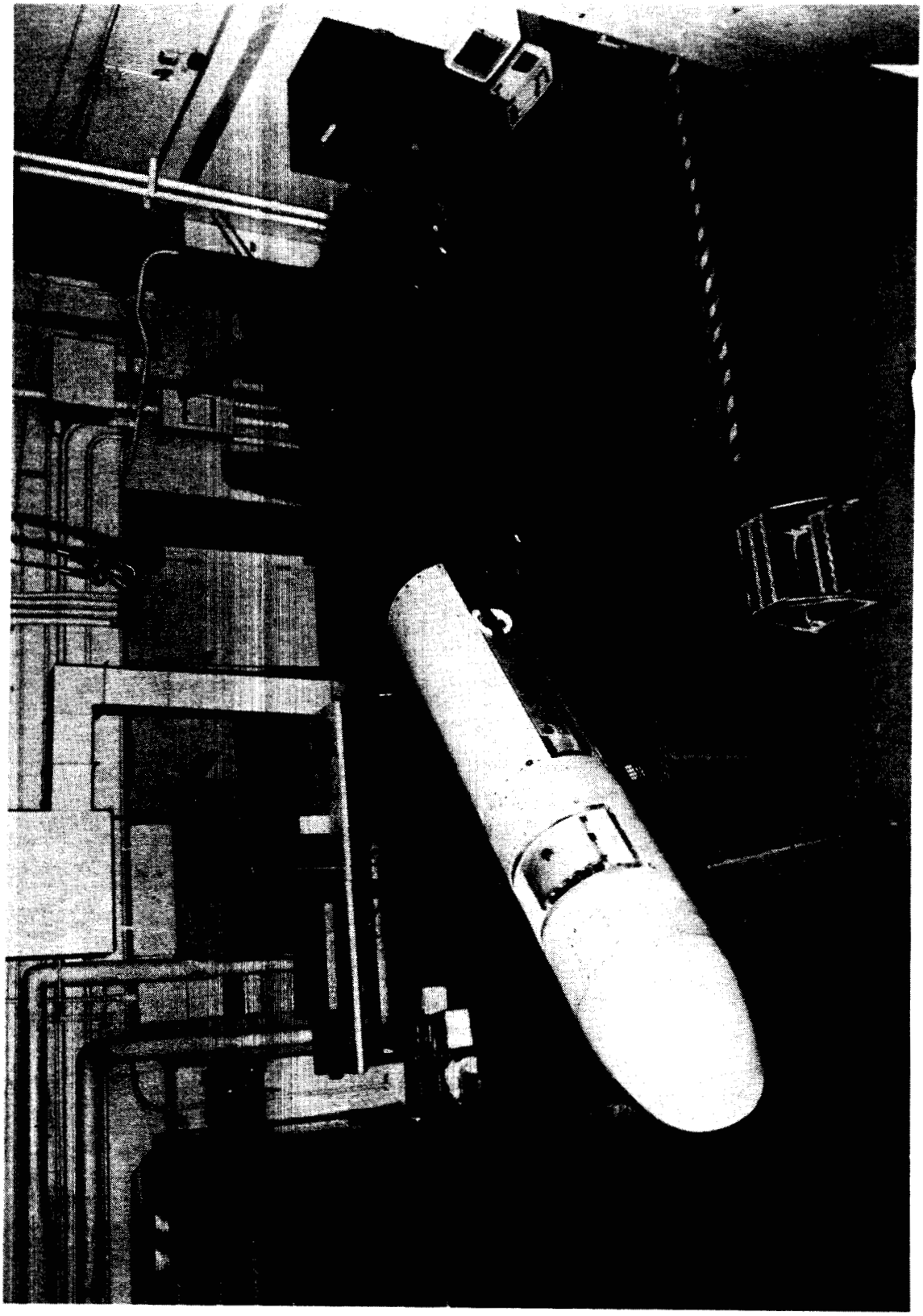
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	19
Air Vehicles, Rotary Wing, Avionics	1
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	15
Weapons, Bombs	5



Dynamic Properties Measurements Complex

Electronic Combat Range (ECR)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Guns and Ammunition	Electronic Combat Range (ECR)	Yes	Yes	Yes	$863,000K = Total $ 32,200K = Buildings

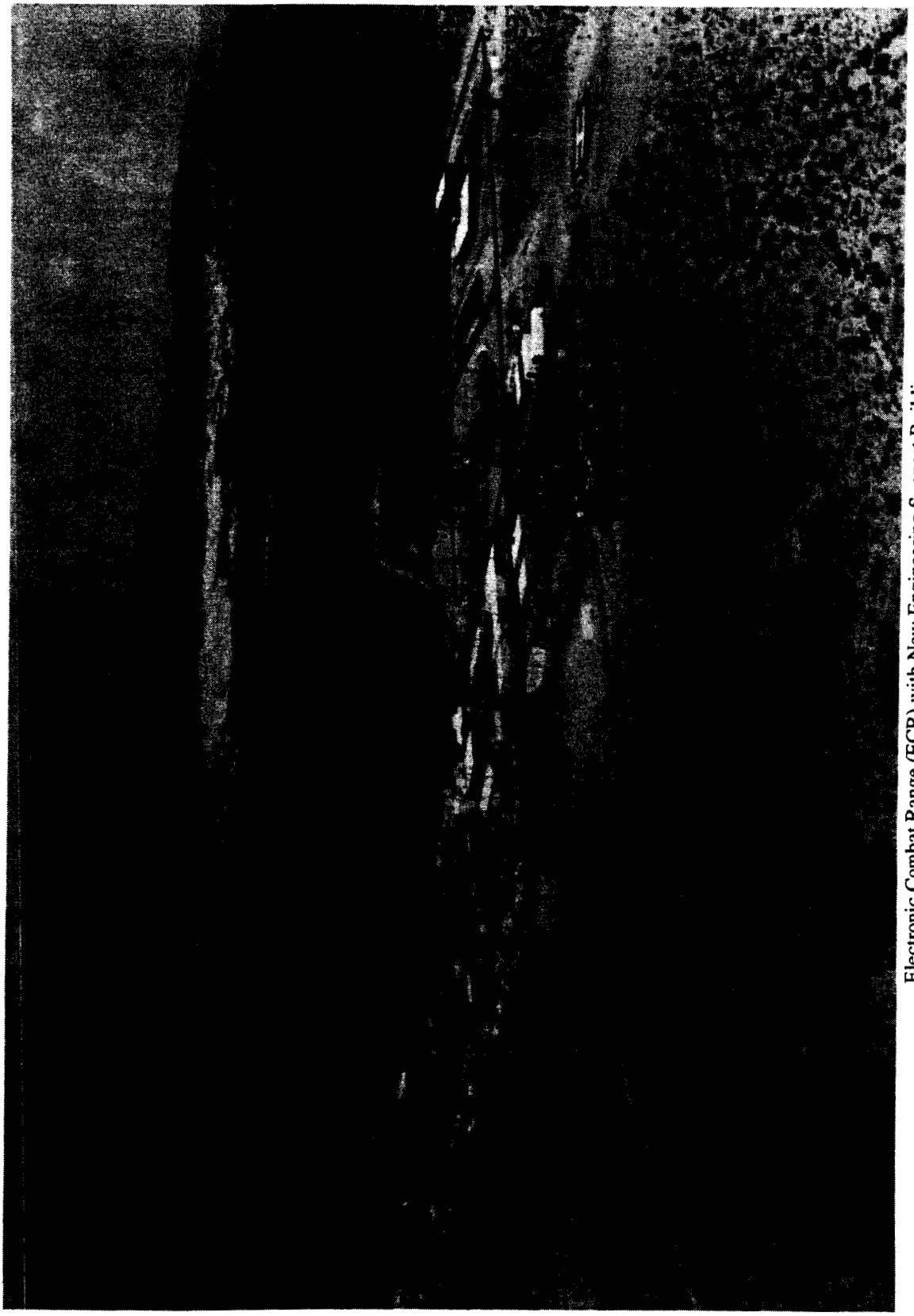
Facility Description (contd.). The Electronic Combat Range (ECR) is one of the land ranges supporting the test and evaluation mission of NAWCWPNS. ECR specifically provides the open-air range (free-space) resources (people, land, airspace, facilities, air defense threat systems, instrumentation, and data reduction) required to support customers who need to test airborne systems designed to collect signals from, counter, or penetrate air defenses. The technical activity of ECR includes the acquisition and/or development of threat air defense systems, acquisition or development of communication and instrumentation systems and facilities, and the operation and maintenance of the range. This includes research and implementation of threat intelligence data and operating doctrine. Unique threat systems at ECR include Russian Naval Systems, shipboard C2 system, same land-based systems, and some blue/gray systems. ECR is the only EW OAR that has any Russian Naval Systems or associated shipboard C2 simulations.

This equipment is unique because the ECR has unique capability not duplicated elsewhere. The ECR is the only Navy free-space (open-air) test range for aircraft/airborne systems and techniques designed to sense, counter, or penetrate threat air defense systems. It is the only DOD EC range with the ability to test against naval air defense systems and combinations of land and naval systems (Lattoral Threat) either individually or as part of an integrated air defense system (IADS). It is the only DOD EC range with the capability to simulate the advanced unique Russian double-digit threats SA-10 (SA-N-6) and SA-12. ECR clearly provides synergy to the NAWCWPNS R&D functions in EW development, ARM weapon development, and aircraft integration (WSSA). ECR is a dedicated EC test range. It operates on 1,150 square miles of withdrawn land, under 1,200-square-mile unlimited-altitude restricted airspace and does not compete for assets with other test facilities. ECR is located in a region selected for its remoteness and relative absence of population and offers high security with minimum electromagnetic interference either with test operations or with other military or civilian communities. ECR provides for unlimited use of expendables and decoys.

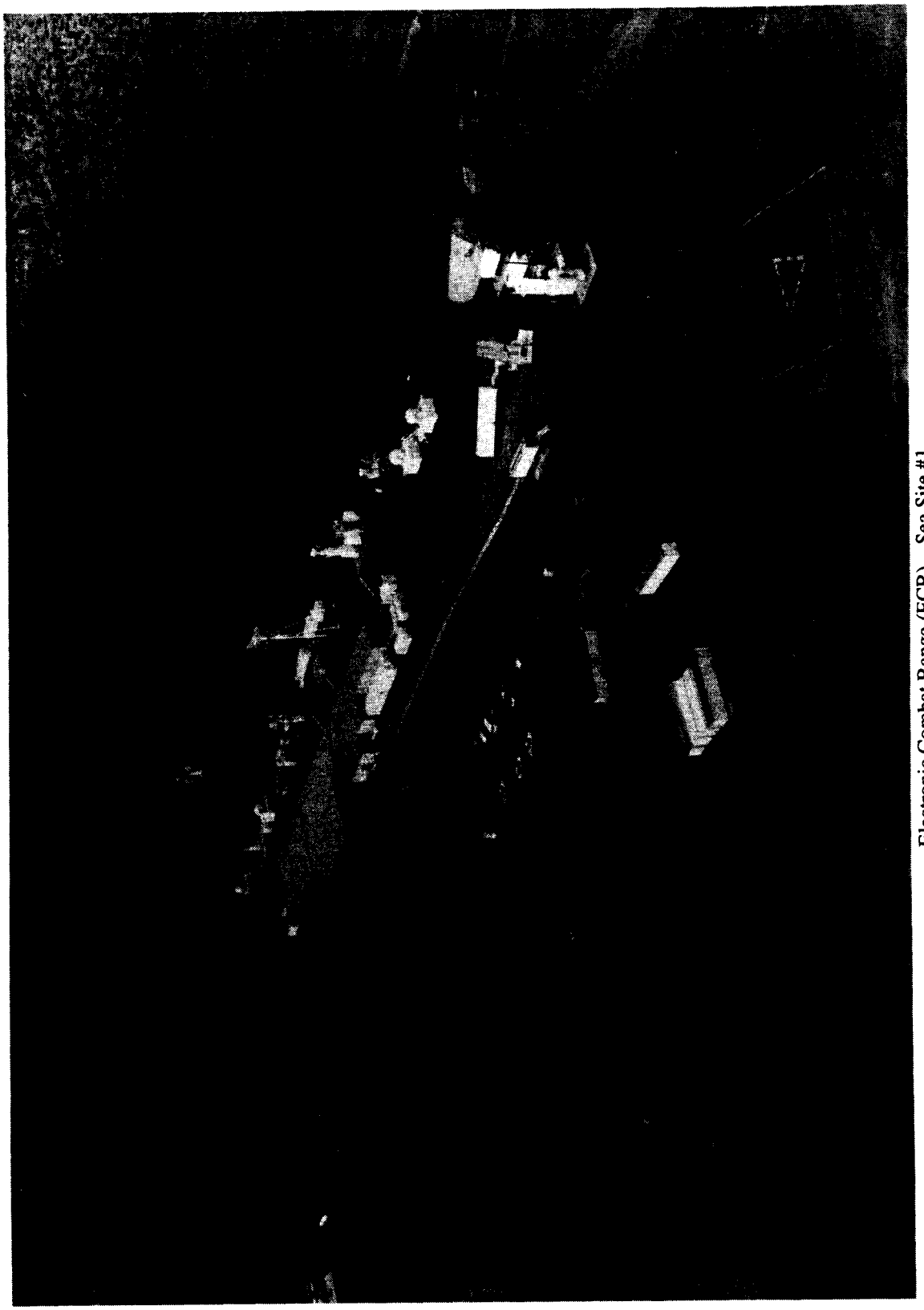
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	66
Weapons, Conventional Missiles/Rockets	19
Weapons, Guns and Ammunition	15

Life-Cycle Functions	Percentage
T&E	60*
S&T	0
D&E	0
IE	0
T&D	13
Other	27

* Much of this is in support of R&D programs.



Electronic Combat Range (ECR) with New Engineering Support Building



Electronic Combat Range (ECR)—Sea Site #1

Electronic Warfare Integration Laboratory (EWIL)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets	Electronic Warfare Integration Lab (EWIL) (Bldg 31462)	Yes	Yes	Yes	$3,195K = Total $3,000K = Equipment

Facility Description (contd.). The EW Integration Lab with its Multiple Agile Radar Threat Simulator (MARTS) workstation is actually several EW laboratories integrated together in one building with an equipment replacement value of $2 million. These laboratories are

1. Multi-target radio frequency (RF) environment (up to 112 simultaneous emitters, 14 pulse Dopplers, 600 MHz to 18 GHz, capable of dynamic control as in a scenario). Emitters are available in an anechoic chamber at RF.
2. EW suite integration laboratory: Powered spread-benches for radar warning receivers (RWRs) (AN/ALR-67 (V)2 (V)3&4, AN/ALR-45F, etc.); self-protect jammers (ALQ-126B, ALQ-165 (ASPJ), ALQ-162, ALQ-164, etc.); anti-radiation missile (ARM) seekers and associated command-launch computer; and emulated aircraft mission computers on MIL-STD 1553 data buses.
3. Anti-radiation seeker development laboratory, utilizing the multitarget RF environment and ARM system development environment.
4. Radar warning receiver development laboratory, utilizing the multitarget RF environment and RWR system development environment.

This equipment is unique because it is the only laboratory with complete end-to-end test/integration for avionics/weapons/EW suites aboard Navy tactical aircraft.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	90
Weapons, Conventional Missiles/Rockets	10

Life-Cycle Functions	Percentage
T&E	10
S&T	0
D&E	90
IE	0
T&D	0
Other	0

Electronic Warfare Integration Laboratory (EWIL)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics	Electronic Warfare Integration Lab (EWIL) (Bldg 31462)	Yes	Yes	Yes	$3,195K = Total $3,000K = Equipment

Facility Description (contd.). The EW Integration Lab with its Multiple Agile Radar Threat Simulator (MARTS) workstation is actually several EW laboratories integrated together in one building with an equipment replacement value of $2 million. These laboratories are

1. Multi-target radio frequency (RF) environment (up to 112 simultaneous emitters, 14 pulse Dopplers, 600 MHz to 18 GHz, capable of dynamic control as in a scenario). Emitters are available in an anechoic chamber at RF.
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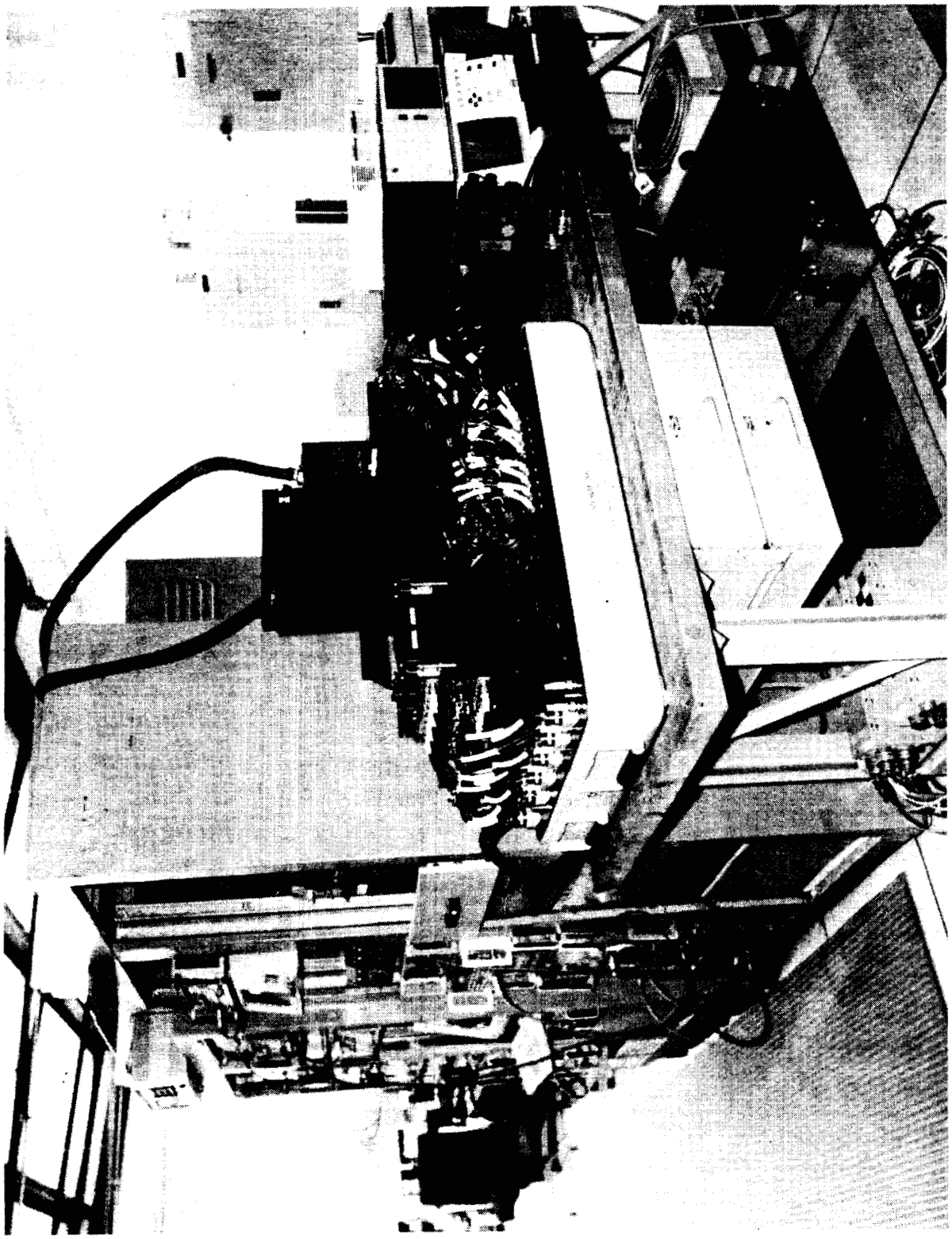
3. Anti-radiation seeker development laboratory, utilizing the multitarget RF environment and ARM system development environment.
4. Radar warning receiver development laboratory, utilizing the multitarget RF environment and RWR system development environment.

This equipment is unique because it is the only laboratory with complete end-to-end test/integration for avionics/weapons/EW suites aboard Navy tactical aircraft.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	100



Electronic Warfare Integration Laboratory

Energetic Materials Properties Analysis Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Energetic Materials Properties Analysis Lab	No	No	No	$9,168K = Total $6,990K = Buildings

Facility Description (contd.). These facilities are a combination of laboratories and field test sites. The total square footage of the laboratory spaces is 12,345 square feet. They are configured in a typical laboratory setup for wet and dry chemical analyses and physical properties analysis. This includes proper fume hoods; electrical out lets; uninterrupted power supplies; non-conductive surfaces; inert gas plumbing throughout; and chemical, energetic material, and hazardous waste storage. All laboratory facilities are heavily constructed for the explosive environment and are air condition/heated for the instrumentation. Instrumentation includes particle size analysis, differential scanning calorimetry, vacuum thermal stability, HPLC, gas chromatograph-mass/spectroscope, reaction rate calorimeter, combustion bomb, thermal gravimetric analysis, IR spectrophotometer, differential thermal analysis, friction sensitivity, electrostatic sensitivity, impact sensitivity, propellant strand burning rate, tensile testing, and cure shrinkage measurement. The combined field test sites buildings square footage is 679. They are converted battleship gun turrets and are configured into control rooms and enclosed firing bays. The field test sites are instrumented for the thermal characterization of fast cookoff (open-air flame), small-scale cookoff bomb (1 pound), and large-scale cookoff bomb (25 pounds) of energetic materials. Steady- and non-steady-state thermal cookoff tests as well as open-flame fast cookoff tests are conducted.

Mission statement: To determine the quality, safe handling, and operational characteristics of energetic materials through state-of-the-art thermal, chemical, and physical analysis.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	10
Weapons, Bombs	25
Weapons, Guns and Ammunition	5

Life-Cycle Functions	Percentage
T&E	10
S&T	90
D&E	0
IE	0
T&D	0
Other	0

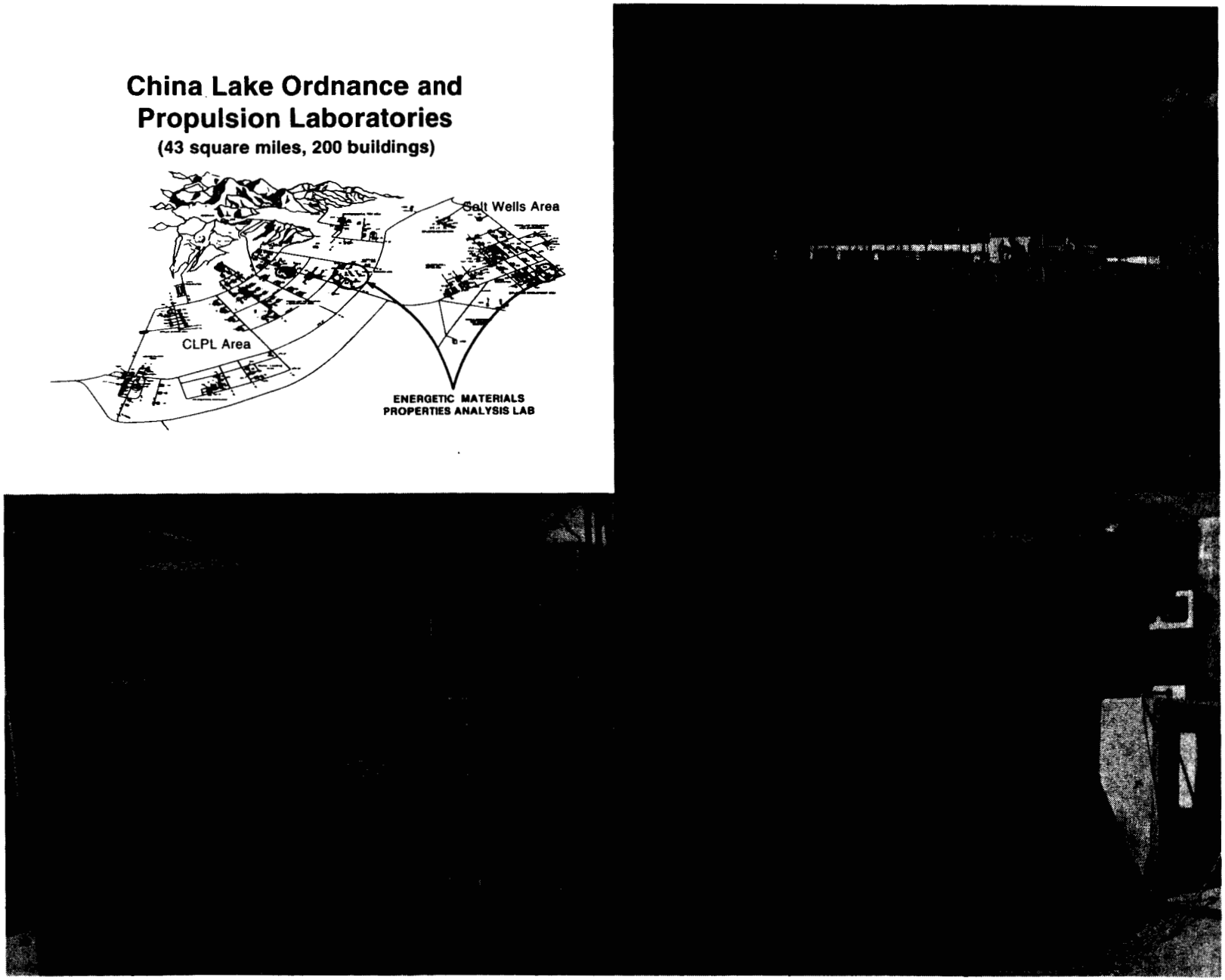
Energetic Materials Properties Analysis Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Energetic Materials Properties Analysis Lab	No	No	No	$9,168K = Total $6,990K = Buildings

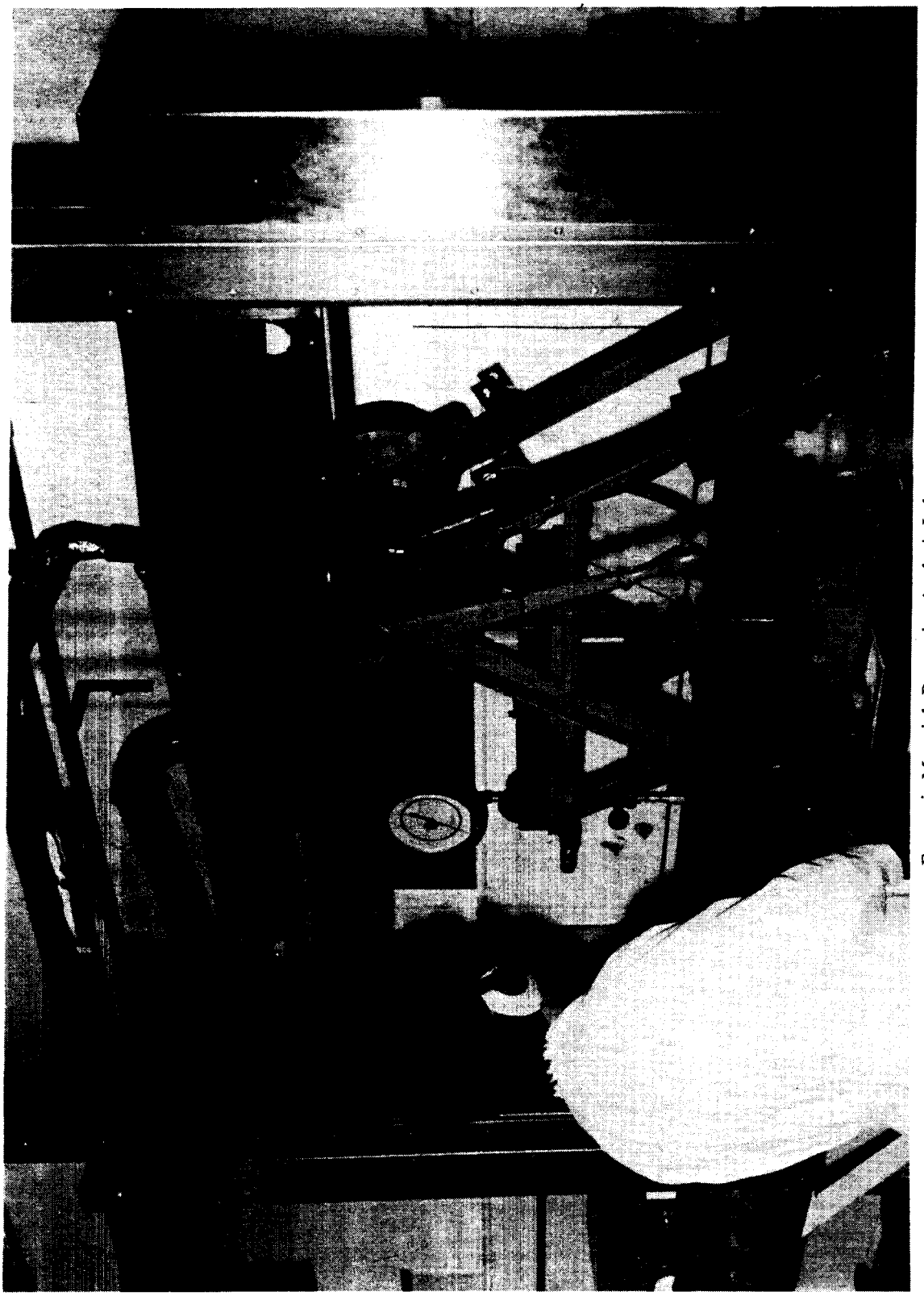
Facility Description (contd.). These facilities are a combination of laboratories and field test sites. The total square footage of the laboratory spaces is 12,345 square feet. They are configured in a typical laboratory setup for wet and dry chemical analyses and physical properties analysis. This includes proper fume hoods; electrical outlets; uninterrupted power supplies; non-conductive surfaces; inert gas plumbing throughout; and chemical, energetic material, and hazardous waste storage. All laboratory facilities are heavily constructed for the explosive environment and are air condition/heated for the instrumentation. Instrumentation includes particle size analysis, differential scanning calorimetry, vacuum thermal stability, HPLC, gas chromatograph-mass/spectroscope, reaction rate calorimeter, combustion bomb, thermal gravimetric analysis, IR spectrophotometer, differential thermal analysis, friction sensitivity, electrostatic sensitivity, impact sensitivity, propellant strand burning rate, tensile testing, and cure shrinkage measurement. The combined field test sites buildings square footage is 679. They are converted battleship gun turrets and are configured into control rooms and enclosed firing bays. The field test sites are instrumented for the thermal characterization of fast cookoff (open-air flame), small-scale cookoff bomb (1 pound), and large-scale cookoff bomb (25 pounds) of energetic materials. Steady- and non-steady-state thermal cookoff tests as well as open-flame fast cookoff tests are conducted.

Mission statement: To determine the quality, safe handling, and operational characteristics of energetic materials through state-of-the-art thermal, chemical, and physical analysis.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	10
Weapons, Bombs	25
Weapons, Guns and Ammunition	5



Energetic Materials Properties Analysis Laboratory



Energetic Materials Properties Analysis Laboratory

Energetic Materials Synthesis and Scale-Up Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Energetic Materials Synthesis and Scale-Up Lab	No	No	No	$2,335K = Total $1,677K = Buildings

Facility Description (contd.). The mission is to develop scale-up procedures for the chemical synthesis of new explosive materials.

This facility consists of an energetic materials synthesis laboratory (Bldg. 15700) and a scale-up facility (Bldg. 15702). The facility is devoted to explosives synthesis and ingredient preparation. Solid explosive materials are ingredients for both propellant and explosive formulations. Bldg. 15702 is devoted to the intermediate scale-up of explosives synthesis and ingredient preparation; this facility is capable of scaling up new ingredients to the 10- to 20-pound-per-batch level, enough new material to support exploratory development efforts. The facility consists of a control room and two remote operations laboratories behind a barricade. Remote operations include several chemical reactors, up to 150 liter capacity, and pilot-plant scale materials handling equipment. Operations in Bldg. 15700 also include formulation (weighing, mixing, casting, curing), and one 1-pint Baker Perkins mixer with control room is located there. The building also contains three energetic materials laboratories, three steam ovens, and a field office.

This equipment is unique because this is an all glass system that enables the handling of strong acids without contamination caused by leaching ions from metal systems.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	75
Weapons, Cruise Missiles	10
Weapons, Bombs	10
Weapons, Guns and Ammunition	5

This facility is currently used for R&D (including S&T, D&E, and IE).

Energetic Materials Synthesis and Scale-Up Laboratory

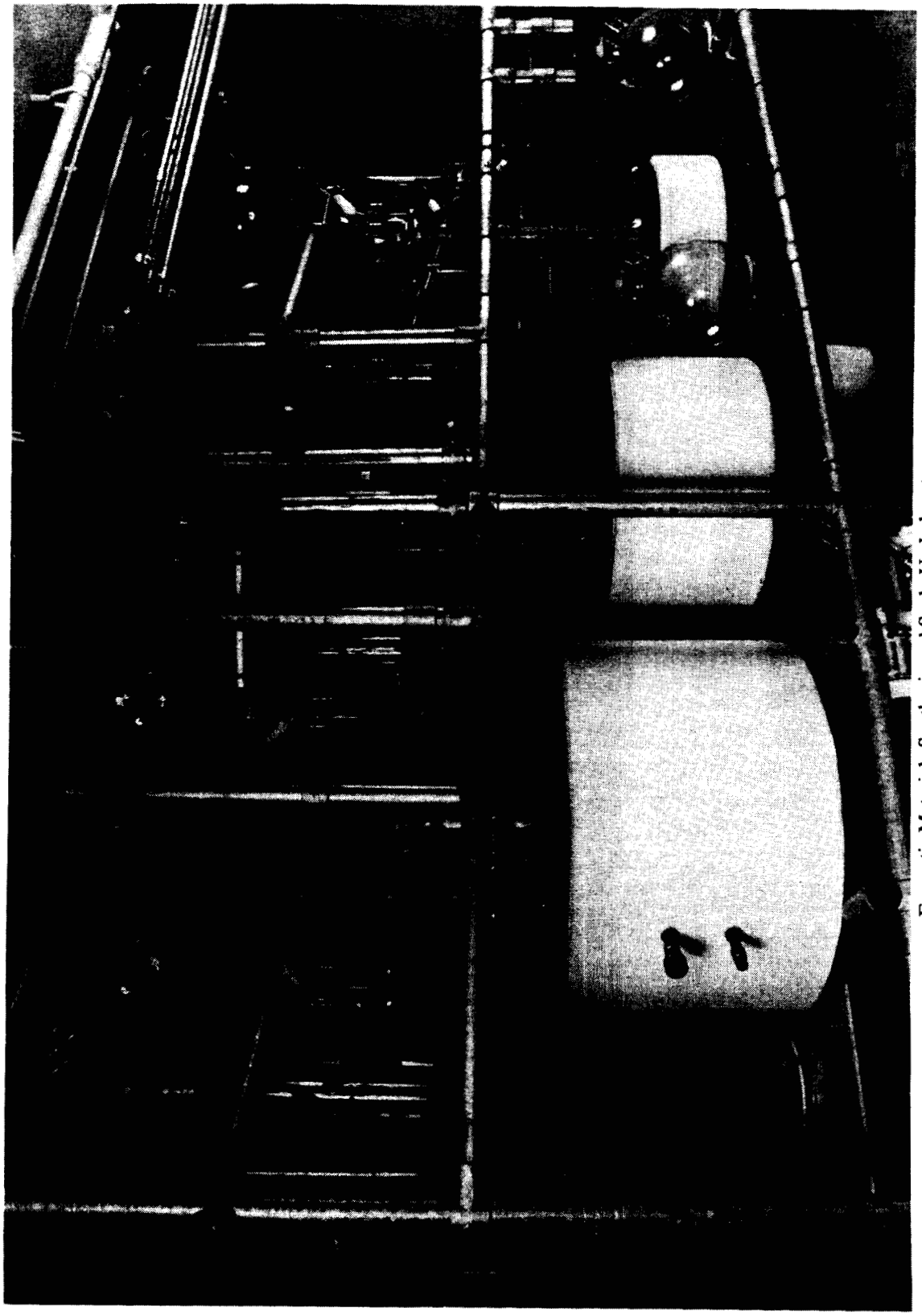
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Energetic Materials Synthesis and Scale-Up Lab	No	No	No	$2,335K = Total $1,677K = Buildings

Facility Description (contd.). The mission is to develop scale-up procedures for the chemical synthesis of new explosive materials.

This facility consists of an energetic materials synthesis laboratory (Bldg. 15700) and a scale-up facility (Bldg. 15702). The facility is devoted to explosives synthesis and ingredient preparation. Solid explosive materials are ingredients for both propellant and explosive formulations. Bldg. 15702 is devoted to the intermediate scale-up of explosives synthesis and ingredient preparation; this facility is capable of scaling up new ingredients to the 10- to 20-pound-per-batch level, enough new material to support exploratory development efforts. The facility consists of a control room and two remote operations laboratories behind a barricade. Remote operations include several chemical reactors, up to 150 liter capacity, and pilot-plant scale materials handling equipment. Operations in Bldg. 15700 also include formulation (weighing, mixing, casting, curing), and one 1-pint Baker Perkins mixer with control room is located there. The building also contains three energetic materials laboratories, three steam ovens, and a field office.

This equipment is unique because this is an all glass system that enables the handling of strong acids without contamination caused by leaching ions from metal systems.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	75
Weapons, Cruise Missiles	10
Weapons, Bombs	10
Weapons, Guns and Ammunition	5



Energetic Materials Synthesis and Scale-Up Laboratory

Engineering Prototype Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Engineering Prototype Facility	No	No	No	$30,400K = Total $19,700K = Buildings

Facility Description (contd.). This facility is an engineering prototype facility that provides quality technical and industrial manufacturing support to science and technology, development, and test and evaluation projects through continuous improvements using comprehensive prototyping/manufacturing technologies that satisfy customer requirements. This is accomplished using concurrent engineering and manufacturing best practices principles.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	1
Air Vehicles, Rotary Wing, Avionics	7
Weapons, Conventional Missiles/Rockets	80
Weapons, Cruise Missiles	2
Weapons, Bombs	8
Weapons, Guns and Ammunition	2

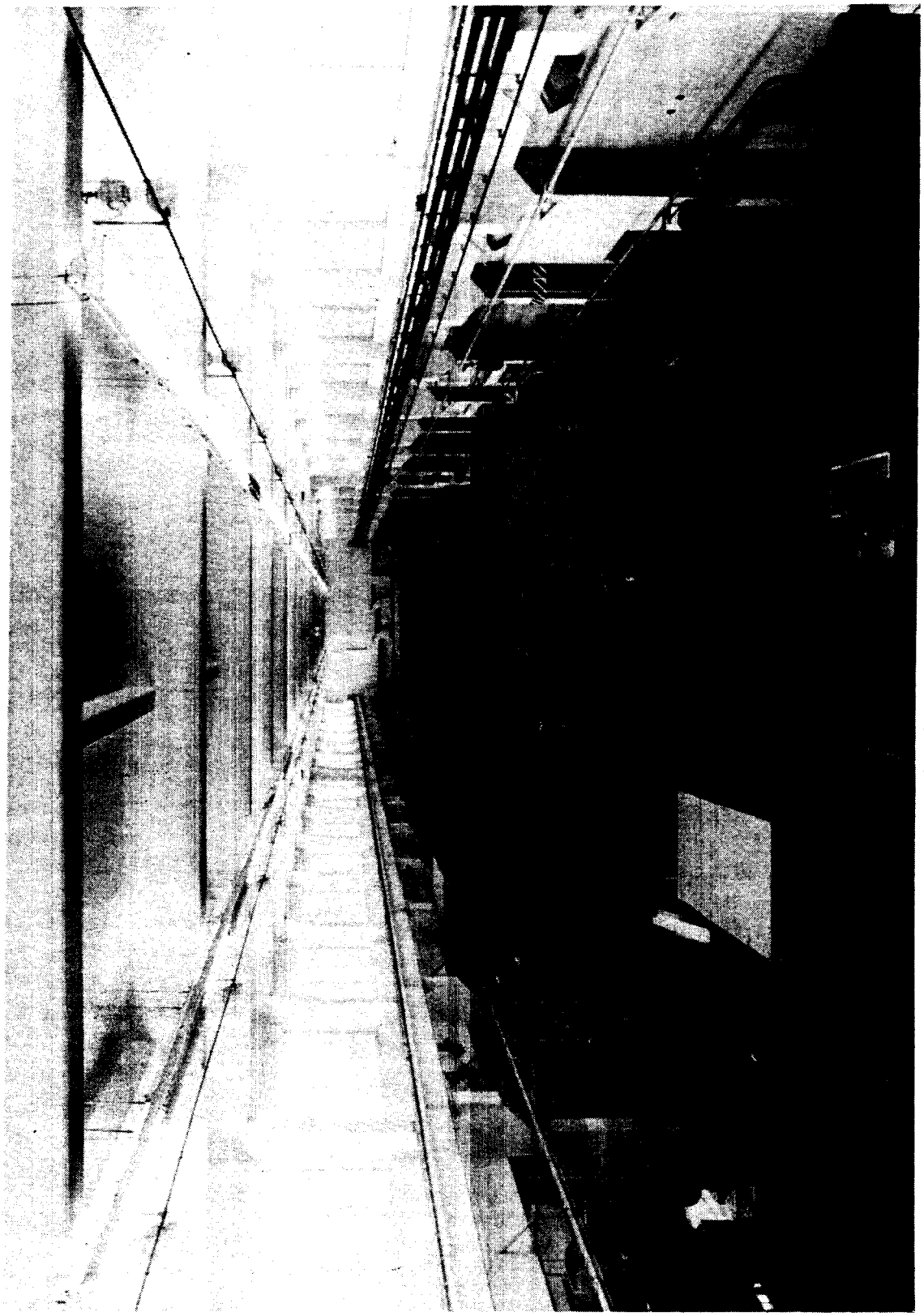
This facility is currently used mostly for R&D, and some work is done in support of T&E and Training. However, the exact percentage is not available.

Engineering Prototype Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Engineering Prototype Facility	No	No	No	$30,400K = Total $19,700K = Buildings

Facility Description (contd.). This facility is an engineering prototype facility that provides quality technical and industrial manufacturing support to science and technology, development, and test and evaluation projects through continuous improvements using comprehensive prototyping/manufacturing technologies that satisfy customer requirements. This is accomplished using concurrent engineering and manufacturing best practices principles.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	1
Air Vehicles, Rotary Wing, Avionics	7
Weapons, Conventional Missiles/Rockets	80
Weapons, Cruise Missiles	2
Weapons, Bombs	8
Weapons, Guns and Ammunition	2



Engineering Prototype Facility

Environmental Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition C4I Systems, Airborne C4I	Environmental Test Complex Elements • Envir Test Lab • Envir Test/Climatic Fac • Envir Test Vibration Fac • Electromagnetic Environment	Yes	Yes	Yes	$25,240K = Total $11,840K = Buildings

Facility Description (contd.). The Environmental Test Complex consists of 36,000 square feet of indoor laboratory (Michelson Laboratory) for testing inert test items; four remote sites separated by the appropriate explosives quantity distances utilized for climatic and dynamic explosives testing with siting limits up to 30,000 pounds Class 1.1 and 100,000 pounds Class 1.3; a complex of three steel-shielded enclosures (two each 13- by 20- by 12-foot and one each 25- by 25- by 12-foot enclosures) NVLAP accredited for MIL-STD 461/462 testing; and a bounded wave pulse facility providing a peak field strength of 50,000 volts/meter over a test area of 125 cubic meters.

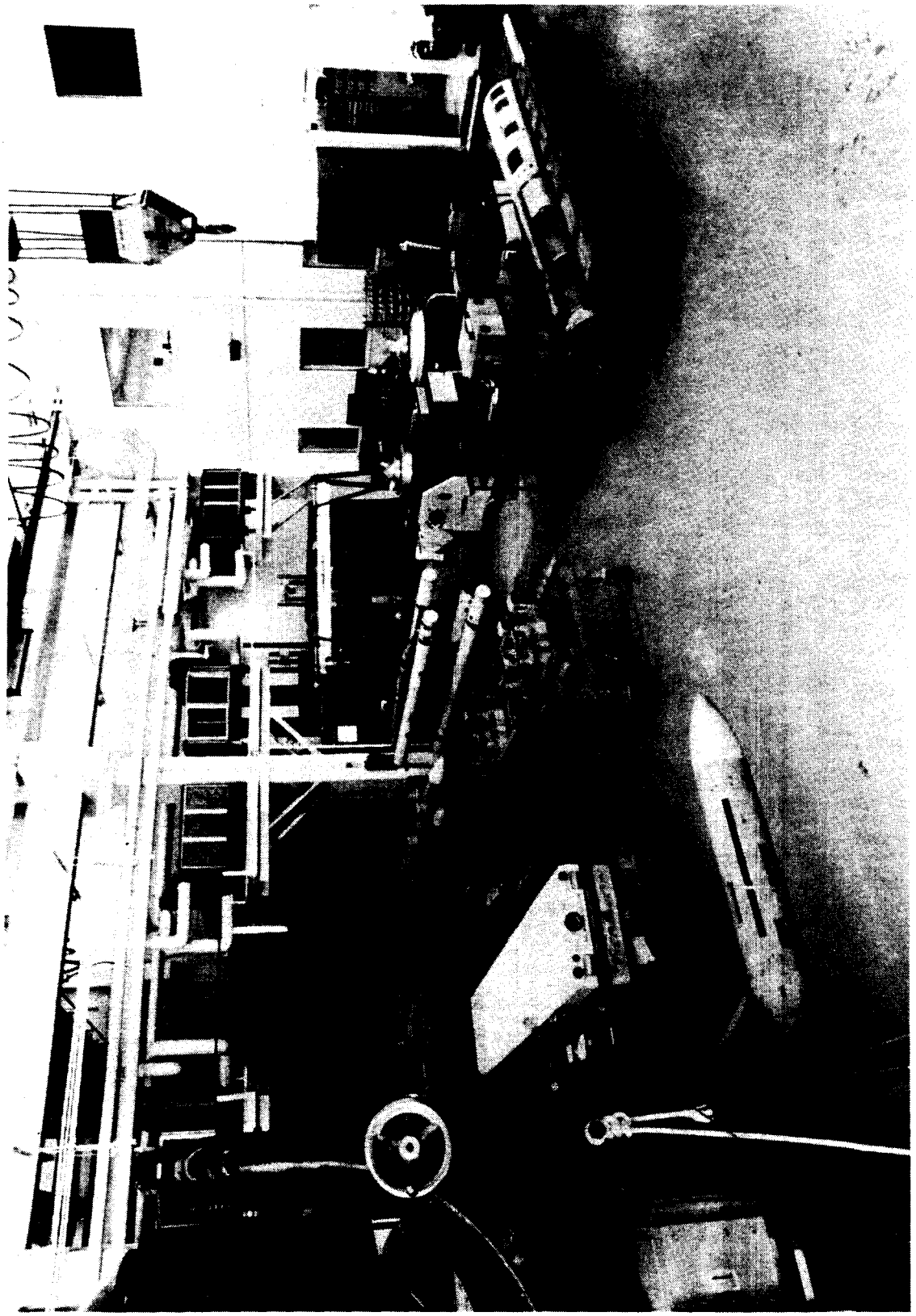
The mission of the environmental test complex is to support NAWC and other military programs in all matters, including gathering environmental data; analyzing, interpreting, and reporting environmental data; developing environmental specifications and test methods; performing environmental tests; and evaluating test procedures, methods, and equipment.

This equipment is unique because the 2-inch stroke capability of two 36,000 force lb electrodynamic shakers and slip table with capability to test 8,000 pounds Class 1.1, 5,000 pounds Class 1.2, or 100,000 pounds Class 1.3 explosives is unique.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	20
Weapons, Bombs	10
Weapons, Guns and Ammunition	8
C4I Systems, Airborne C4I	2

Life-Cycle Functions	Percentage
T&E	60
S&T	10
D&E	25
IE	5
T&D	0
Other	0

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	20
Weapons, Bombs	10
Weapons, Guns and Ammunition	8
C4I Systems, Airborne C4I	2



Environmental Test Complex

Foreign Material Exploitation (FME) and Balloon Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Foreign Material Exploitation (FME) and Balloon Test Complex Elements • FME Test Fac • Balloon Support Facilities	Yes	Yes	Yes	$3,250K = Total $1,750K = Buildings

Facility Description (contd.). The FME facilities' primary purpose is to perform exploitation on all types of foreign weapon systems. This includes all manner of testing, signals analysis, reverse engineering, and report writing, with the associated support facilities and equipment required.

The Balloon Support Facility's primary purpose is to test radar, radar attack weapons, IR weapons and sensors, and other sensors and emitters.

This equipment is unique because the FME portion of the complex is capable of performing the complete spectrum of FME work. All other facilities can perform only special tests. All aspects (fuzing, warhead, guidance, propulsion, simulation, flight testing, countermeasures) of missile exploitation can be addressed by the OSD FME Program Office in this facility. The facility has the capability to exploit and analyze (MMW, ARM, Laser) RF, IR, and EO missile systems as well as multimode systems.

The balloon portion of the complex is the only long tethered test facility using balloons (up to 12,000 AGL) in the United States.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	25
S&T	15
D&E	60
IE	0
T&D	0
Other	0

Foreign Material Exploitation (FME) and Balloon Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Foreign Material Exploitation (FME) and Balloon Test Complex Elements • FME Test Fac • Balloon Support Facilities	Yes	Yes	Yes	$3,250K = Total $1,750K = Buildings

Facility Description (contd.). The FME facilities' primary purpose is to perform exploitation on all types of foreign weapon systems. This includes all manner of testing, signals analysis, reverse engineering, and report writing, with the associated support facilities and equipment required.

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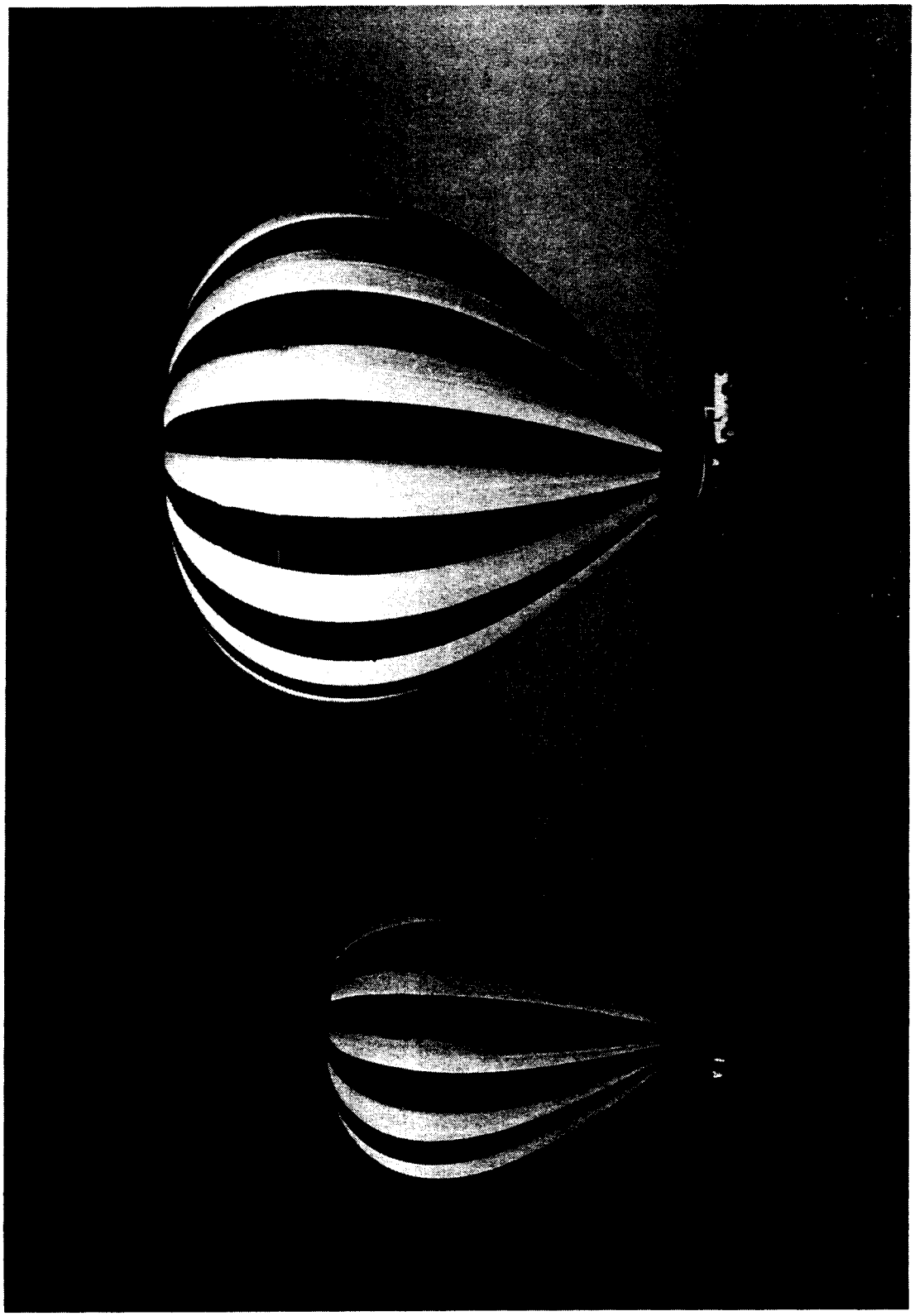
The balloon portion of the complex is the only long tethered test facility using balloons (up to 12,000 AGL) in the United States.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

FME and Balloon Test Complex



FME and Balloon Test Complex

Fuze Development Laboratory

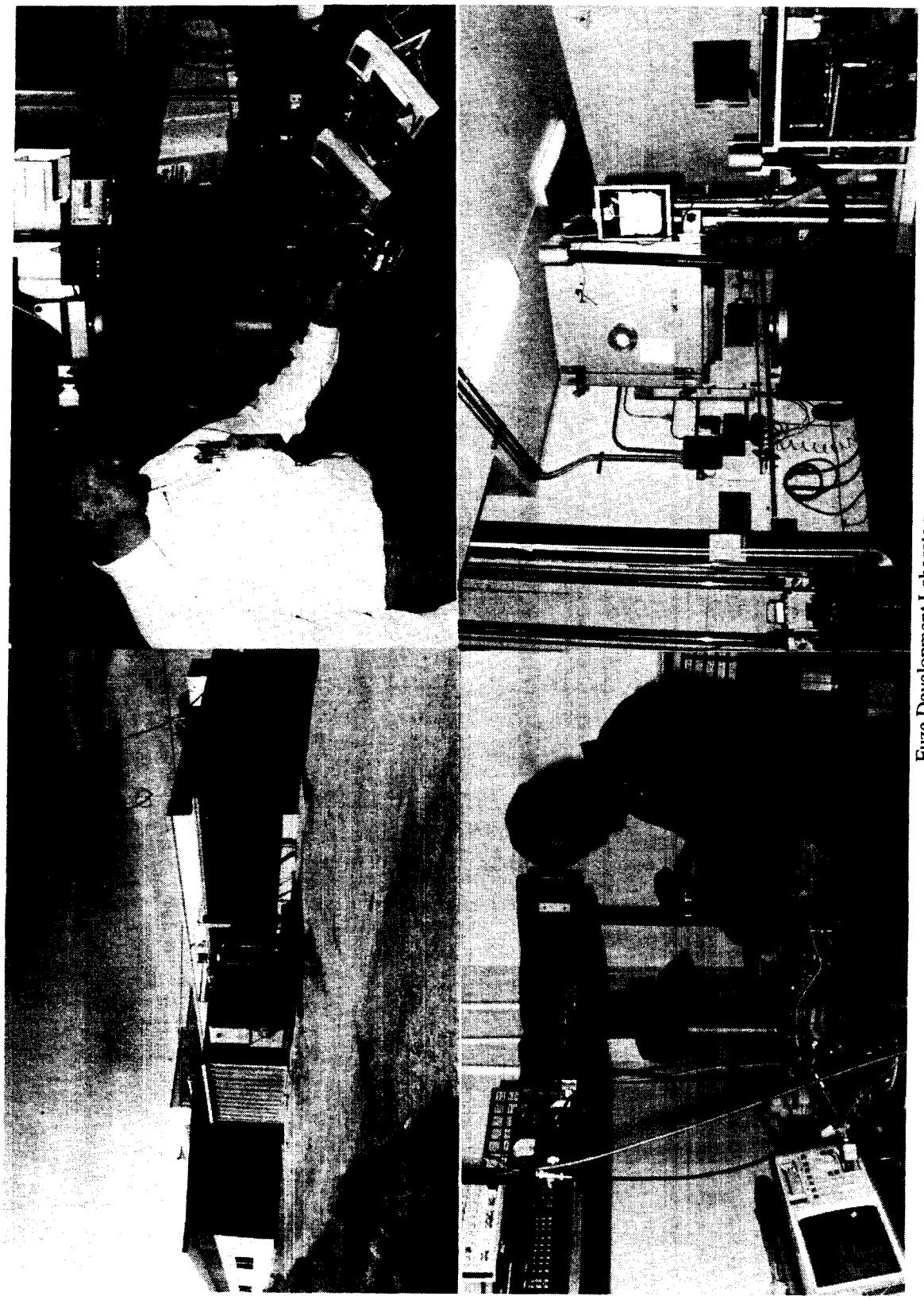
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Fuze Development Lab	Yes	Yes	Yes	$14,800K = Total $12,700K = Buildings

Facility Description (contd.). The C274 Fuze Development Laboratories are made up of six buildings, three specialty test docks, two storage areas, five explosive magazines, and four magazettes, all with limited access. Altogether the facilities provide approximately 11,500 square feet of office space and 13,800 square feet of laboratory and explosive operations space. The facility's primary mission is S&T and development engineering (DE) on safety and arming devices, contact fuzes, and explosive components used in missiles and free-fall weapons. The Fuze Development Lab's primary capabilities include the design, test, and evaluation of inert and explosively loaded arming and firing devices, safety and arming devices, and fuzes. Evaluations are performed on the devices in exploratory development, demonstration and validation, engineering, or production support phases. The facility, with the associated equipment, has the capability of subjecting test items to a range of electrical environmental stimuli including acceleration, shock, vibration, temperature and humidity. The facilities and equipment provide for design, design modeling, computer analysis, data analysis, environmental testing, explosive output and performance testing.

This equipment is unique because the C274 Fuze Development/T&E laboratories can provide connections for a full range of safety and arming device, contact fuzing devices and explosive components T&E, from S&T through integration and in-service testing. The facilities are colocated with over 80 ordnance engineers and technicians, which is unique to this site within the US. The facilities are connected to the NAWC network via a T1 link; this permits communication with the remainder of NAWCWPNS and any site in the world with Internet access capability. This integrated evaluation facility is invaluable in the development and maintenance of the technical expertise of the personnel. The impact of losing this facility would involve degradation, over time, of the personnel technical skills and ultimately lower quality fuzing devices in the Fleet.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	70
Weapons, Cruise Missiles	11
Weapons, Bombs	19

Life-Cycle Functions	Percentage
T&E	8
S&T	50
D&E	42
IE	0
T&D	0
Other	0



Fuze Development Laboratory

Guidance Components T&A Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Guidance Components T&A Complex Elements • Actuator Test and Analysis • Inertial Component Test and Analysis • Thermal Battery Test and Analysis • Electronics Assembly Test and Analysis • Inertial Test Lab	Yes	Yes	No	$13,084K = Total $ 1,784K = Buildings

Facility Description (contd.). The Guidance Components Test and Analysis (T&A) Complex includes the Actuator, Inertial Component, Thermal Battery, and Electronics Assembly T&As, and the Inertial Test Laboratory.

Descriptions:
Actuator T&A: Approximately 1,400 square feet of laboratory and test facility space equipped with multiaxis actuator test stands, power/pneumatic/hydraulic supplies, assembly/disassembly tools, and workspace dedicated to the T&E of missile control actuators and gas generators.

Inertial Component T&A: Approximately 450 square feet of laboratory test and workspace for the T&E of gyroscopes and accelerometers. Includes a computer-based testbed to control precision power supplies, signal and waveform synthesis, rate table controllers (2), waveform analysis, and power analysis. Equipment and capabilities for precision and stability tests at MIL-SPEC temperatures are also installed.

Inertial Test Lab: The Inertial Test Lab is a classified facility with capability of testing gyros, accelerometers, and Global Positioning System (GPS) receivers, both as individual components and as part of integrated Inertial Measurement Units (IMUs) and integrated IMU/GPS.

Thermal Battery T&A: Approximately 600 square feet of laboratory and test space dedicated to the T&E of thermal batteries used in tactical missiles, bombs, and aircraft. Batteries technologies currently under T&E are primarily lithium chemistry, silver-zinc, and calcium chromate technologies. Precisely controlled loads and heating elements are also used to simulate worst-case environments for safety tests of batteries.

Electronics Assembly T&A: The Electronics Assembly T&A Facility is an engineering and development test laboratory within a controlled environmental building. This facility provides a quick-turnaround test capability for testing electronic components and subsystems within various weapon systems.

Missions:
Evaluation and characterization of the design and performance of pneumatic, hydraulic, and electro-mechanical missile actuation systems. Performance evaluation of inertial components being considered for application to tactical missile guidance/seeker stabilization. Provide weapons integration support for inertial and GPS navigation systems in Navy air-launched weapons, and support of developmental engineering of new inertial and GPS sensors and to support integration of aircraft inertial and inertial/GPS navigation systems. Functional and safety testing of thermal batteries. Provide a quick-turnaround test capability for testing electronic components and subsystems.

This equipment is unique because the Actuator T&A facility is uniquely certified to conduct gas generator actuator tests.

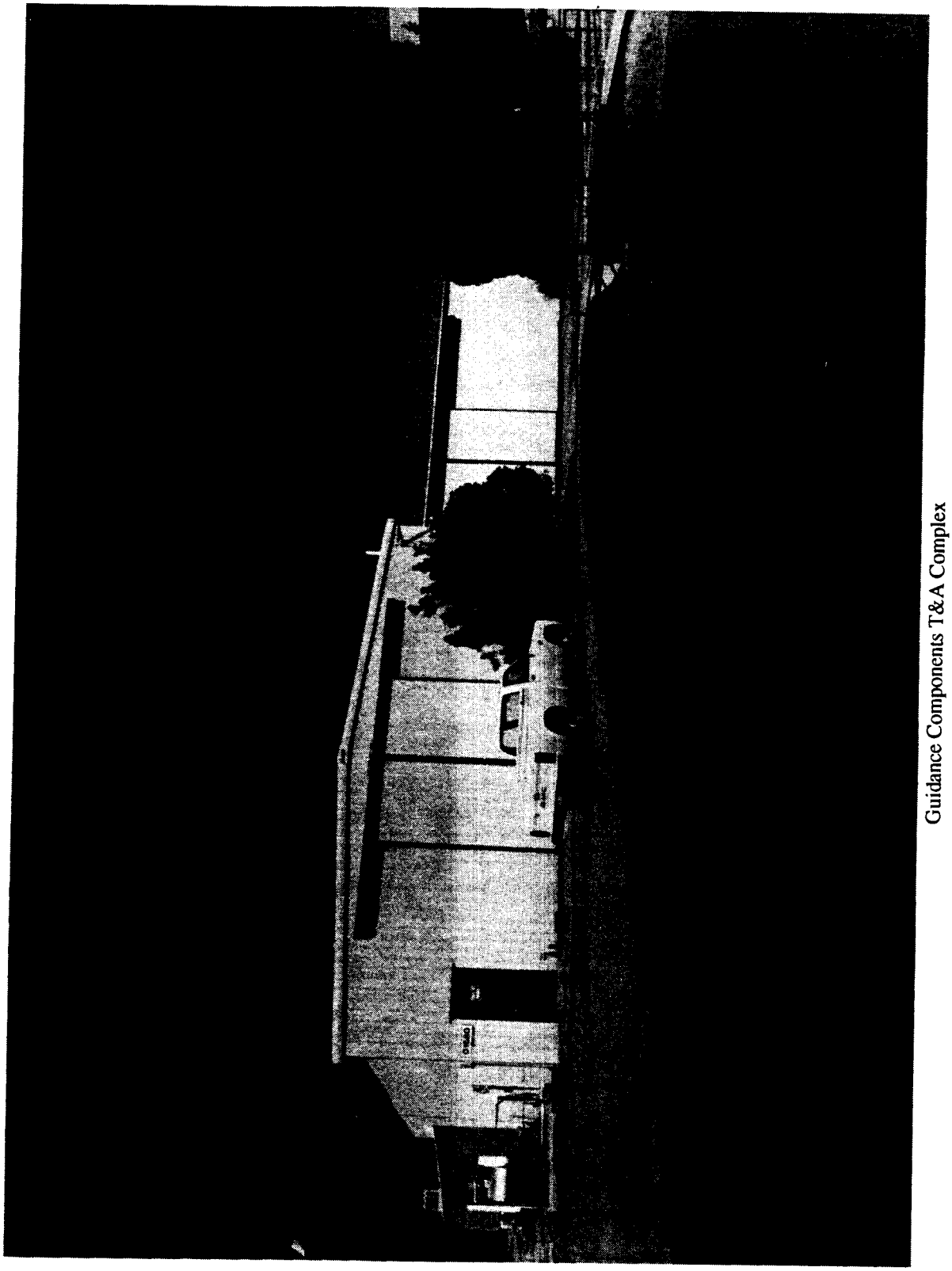
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	92
Weapons, Cruise Missiles	3

Life-Cycle Functions	Percentage
T&E	43
S&T	4
D&E	41
IE	12
T&D	0
Other	0

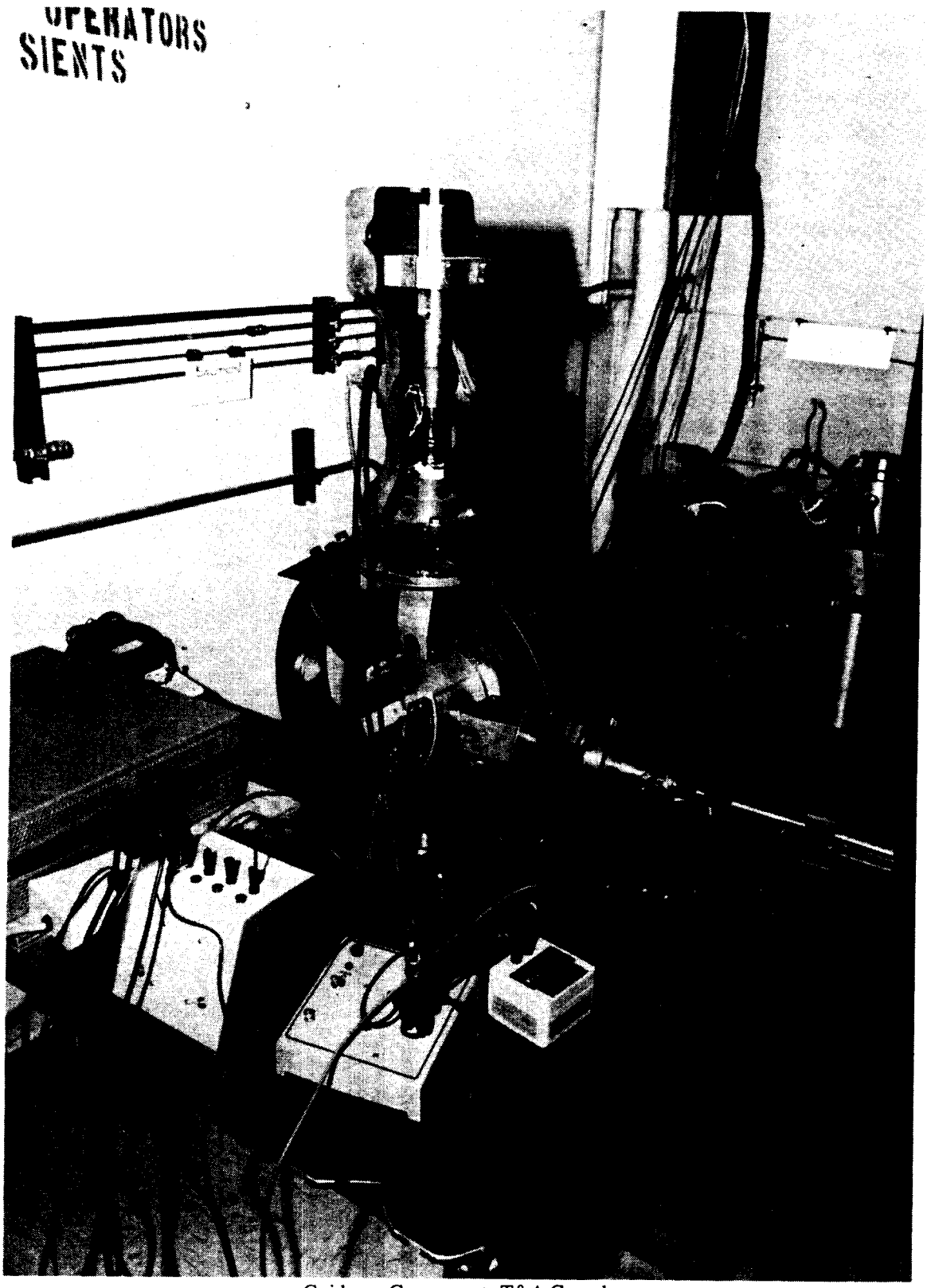
Missions:
Evaluation and characterization of the design and performance of pneumatic, hydraulic, and electro-mechanical missile actuation systems. Performance evaluation of inertial components being considered for application to tactical missile guidance/seeker stabilization. Provide weapons integration support for inertial and GPS navigation systems in Navy air-launched weapons, and support of developmental engineering of new inertial and GPS sensors and to support integration of aircraft inertial and inertial/GPS navigation systems. Functional and safety testing of thermal batteries. Provide a quick-turnaround test capability for testing electronic components and subsystems.

This equipment is unique because the Actuator T&A facility is uniquely certified to conduct gas generator actuator tests.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	92
Weapons, Cruise Missiles	3



Guidance Components T&A Complex



Guidance Components T&A Complex

High Energy Laser Experimental Test System (HELETS) (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Directed Energy Space Systems, Satellites	High Energy Laser Experimental Test System (HELETS)	Yes	Yes	Yes	$195,000K

Facility Description (contd.). HELETS mission is to provide the U.S. Army High Energy Laser System Test Facility the capability to perform DOD tri-service high-energy laser (HEL) research, development, test, and evaluation capability; materials damage and vulnerability support; and a contingency antisatellite capability.

HELETS consists of the Mid-InfraRed Advanced Chemical Laser (MIRACL) and Sea-Lite Beam Director (SLBD) and their associated fire-control systems. HELETS is installed at the High Energy Laser System Test Facility (HELSTF) at WSMR and became operational in 1983. HELETS was built for the U.S. Navy for ground-based testing and evaluation of a prototype shipboard laser weapon. The megawatt-class, deuterium-fluoride (DF) chemical laser is used to evaluate AAW laser system effectiveness against subsonic and supersonic aerial targets. The system was upgraded in 1991 to have a limited, contingency antisatellite (ASAT) operational capability. In addition to lasing tests and the ASAT capability, the Sea Lite Beam Director has been used as a passive infrared tracking and imaging system for theater ballistic missiles and surrogates launched on the Range. Parametric and radiometric imaging supports the national IR signature database.

This equipment is unique because HELETS is the nation's only megawatt-class, continuous-wave chemical laser weapon system prototype. HELETS can be used for engagement of subsonic and supersonic flying targets; lasing to indoor or outdoor laboratory setups to determine materials, system, and subsystem damage and vulnerability to high energy laser effects; potential commercial applications such as exotic material development (fullerenes, diamond-like carbon, etc.); and scientific research endeavors (high-energy plasma research).

Common Support Functions	Percentage
Weapons, Directed Energy	90
Space Systems, Satellites	10

Life-Cycle Functions	Percentage
T&E	100

High Energy Laser Experimental Test System (HELETS) (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Space Systems, Satellites	High Energy Laser Experimental Test System (HELETS)	Yes	Yes	Yes	$195,000K

Facility Description (contd.). HELETS mission is to provide the U.S. Army High Energy Laser System Test Facility the capability to perform DOD tri-service high-energy laser (HEL) research, development, test, and evaluation capability; materials damage and vulnerability support; and a contingency antisatellite capability.

HELETS consists of the Mid-InfraRed Advanced Chemical Laser (MIRACL) and Sea-Lite Beam Director (SLBD) and their associated fire-control systems. HELETS is installed at the High Energy Laser System Test Facility (HELSTF) at WSMR and became operational in 1983. HELETS was built for the U.S. Navy for ground-based testing and evaluation of a prototype shipboard laser weapon. The megawatt-class, deuterium-fluoride (DF) chemical laser is used to evaluate AAW laser system effectiveness against subsonic and supersonic aerial targets. The system was upgraded in 1991 to have a limited, contingency antisatellite (ASAT) operational capability. In addition to lasing tests and the ASAT capability, the Sea Lite Beam Director has been used as a passive infrared tracking and imaging system for theater ballistic missiles and surrogates launched on the Range. Parametric and radiometric imaging supports the national IR signature database.

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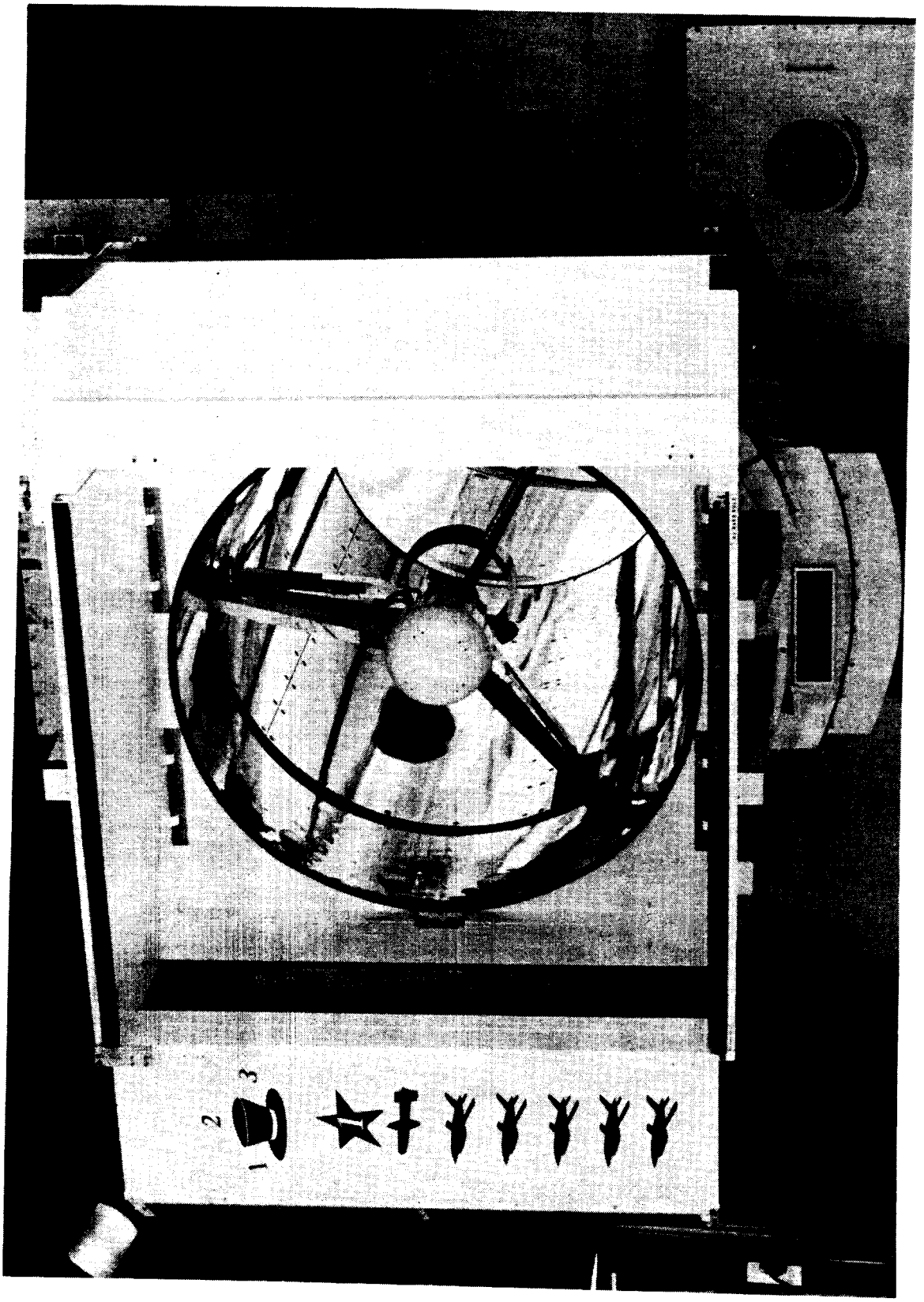
Common Support Functions	Percentage
Space Systems, Satellites	100



High Energy Laser Experimental Test System (HELETS)

High Hazard Propulsion Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Environmental Quality	High Hazard Propulsion Test Facility	Yes	Yes	Yes	$3,269K = Total $ 560K = Buildings

Facility Description (contd.). Bay III consists of nine test pads for conducting high hazard of high-energy systems. Motors can be fired in a variety of attitudes. The CBAT chamber at MS-3 is currently supporting technology development for rocket motor disposal studies. The facility is permitted through the Mojave Air Quality Control District for air emissions. No permits are necessary for use of cooling or quench water.

TMDI pads 1 through 4: nozzle-up, 300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-0: horizontal, 50,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-1: horizontal, 300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-2: Horizontal and 50o nozzle down, 300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-3: vertical, horizontal, confined burn chamber (SS & TS motors only),300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-4: motor detonation site, sited for 130, 000 lbs 1.1.

The facility numbers for this test area are 16132, 16144, 16147, 16147, 16148, 16152, 16153, 16154.

This equipment is unique because, although there is one other facility capable of conducting high-hazard motor testing, the Bay III facility is unique in its ability to fire motors at any attitude, the availability of any instrumentation requirement, the high flexibility to configuration requirements, and the explosive limits. The facility can be used for sympathetic detonations, static firings, thrust cutoff studies, command destruct, or partial burns for flight termination and internal ballistic studies.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	15
Environmental Quality	85

Life-Cycle Functions	Percentage
T&E	100

High Hazard Propulsion Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Environmental Quality	High Hazard Propulsion Test Facility	Yes	Yes	Yes	$3,269K = Total $ 560K = Buildings

Facility Description (contd.). Bay III consists of nine test pads for conducting high hazard of high-energy systems. Motors can be fired in a variety of attitudes. The CBAT chamber at MS-3 is currently supporting technology development for rocket motor disposal studies. The facility is permitted through the Mojave Air Quality Control District for air emissions. No permits are necessary for use of cooling or quench water.

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MS-0: horizontal, 50,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-1: horizontal, 300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-2: Horizontal and 50o nozzle down, 300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-3: vertical, horizontal, confined burn chamber (SS & TS motors only),300,000 lbs thrust, sited for 60,000 lbs 1.1 and 1.3.
MS-4: motor detonation site, sited for 130, 000 lbs 1.1.

The facility numbers for this test area are 16132, 16144, 16147, 16147, 16148, 16152, 16153, 16154.

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Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	15
Environmental Quality	85

High Hazard Propulsion Test Facility

Human Systems Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Human Systems	Human Systems Facility Elements • Crew Station Simulation Lab • Image Processing Lab • Night-Vision Goggle Lab	No	No	No	$1,239

Facility Description (contd.). The Crew Station Simulation Lab provides the capability for rapid prototyping and evaluation of crew station systems related to aircraft and weapon control. This functional area includes survivability and lethality aspects of mission performance for air-to-air and air-to-surface weapons.The Lab simulates multifunction displays and controls, automatically captures human performance data, provides a multitasking environment for human performance testing and thus enables the evaluation of aircraft-weapons system human interfaces.

The Image Processing Lab includes a computer, Beta and U-Matic video recorders, a videoframe synchronizer and an optical scanner, optical disk recorder and other related equipment required to support human performance research in the fields of multisensor integration, image enhancement, and image correlation. The Lab provides the capability to collect, digitize, process, store, and display imagery.

The Night Vision Goggle Lab is a light-tight room containing specialized equipment both for testing new or newly repaired night vision goggles for useability and for conducting research on human performance with night vision goggles. Goggle repair can also be done there although NAWCWPNS is not a designated NVG repair/maintenance depot.

Common Support Functions	Percentage
Human Systems	100

This facility is currently used for R&D (including S&T, D&E, and IE).

Human Systems Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Human Systems	Human Systems Facility Elements • Crew Station Simulation Lab • Image Processing Lab • Night-Vision Goggle Lab	No	No	No	$1,239

Facility Description (contd.). The Crew Station Simulation Lab provides the capability for rapid prototyping and evaluation of crew station systems related to aircraft and weapon control. This functional area includes survivability and lethality aspects of mission performance for air-to-air and air-to-surface weapons.The Lab simulates multifunction displays and controls, automatically captures human performance data, provides a multitasking environment for human performance testing and thus enables the evaluation of aircraft-weapons system human interfaces.

The Image Processing Lab includes a computer, Beta and U-Matic video recorders, a videoframe synchronizer and an optical scanner, optical disk recorder and other related equipment required to support human performance research in the fields of multisensor integration, image enhancement, and image correlation. The Lab provides the capability to collect, digitize, process, store, and display imagery.

The Night Vision Goggle Lab is a light-tight room containing specialized equipment both for testing new or newly repaired night vision goggles for useability and for conducting research on human performance with night vision goggles. Goggle repair can also be done there although NAWCWPNS is not a designated NVG repair/maintenance depot.

Common Support Functions	Percentage
Human Systems	100

IR Seeker, GCS DDT&E Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	IR Seeker, GCS DDT&E Complex Elements • Optics Lab • Detector Lab • FME Lab • Seeker Stability Lab • Cryogenics Lab • Missile Seeker Eval Lab • MHIP Common Skr Test Fac • Weapons G&C Control Lab	Yes	Yes	Yes	$19,900K = Total $ 1,626K = Buildings

Facility Description (contd.). The mission of this facility is to support the design, development, test and evaluation, and missile integration of electro-optic seekers, including the exploitation of foreign systems. Laboratories include optics, detector, cryogenics, seeker stability measurement, and generic facilities including a Class 100 clean room. There are also laboratories containing specialized and unique equipment for testing specific missile systems and for exploiting foreign systems. Typical equipment includes rate tables, optics benches, detector test sets, cooler (RDU) test sets, various Sidewinder missile test sets, and the MHIP Common Seeker test set.

This equipment is unique because of the expertise and equipment to quickly and efficiently exploit air-to-air and ground-to-air IR systems to determine system capabilities and possible missile countermeasures. No other known facility can exploit an entire weapon system. This facility also contains unique test equipment for specific missiles.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	29
S&T	28
D&E	38
IE	5
T&D	0
Other	0

IR Seeker, GCS DDT&E Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	IR Seeker, GCS DDT&E Complex Elements • Optics Lab • Detector Lab • FME Lab • Seeker Stability Lab • Cryogenics Lab • Missile Seeker Eval Lab • MHIP Common Skr Test Fac • Weapons G&C Control Lab	Yes	Yes	Yes	$19,900K = Total $ 1,626K = Buildings

Facility Description (contd.). The mission of this facility is to support the design, development, test and evaluation, and missile integration of electro-optic seekers, including the exploitation of foreign systems. Laboratories include optics, detector, cryogenics, seeker stability measurement, and generic facilities including a Class 100 clean room. There are also laboratories containing specialized and unique equipment for testing specific missile systems and for exploiting foreign systems. Typical equipment includes rate tables, optics benches, detector test sets, cooler (RDU) test sets, various Sidewinder missile test sets, and the MHIP Common Seeker test set.

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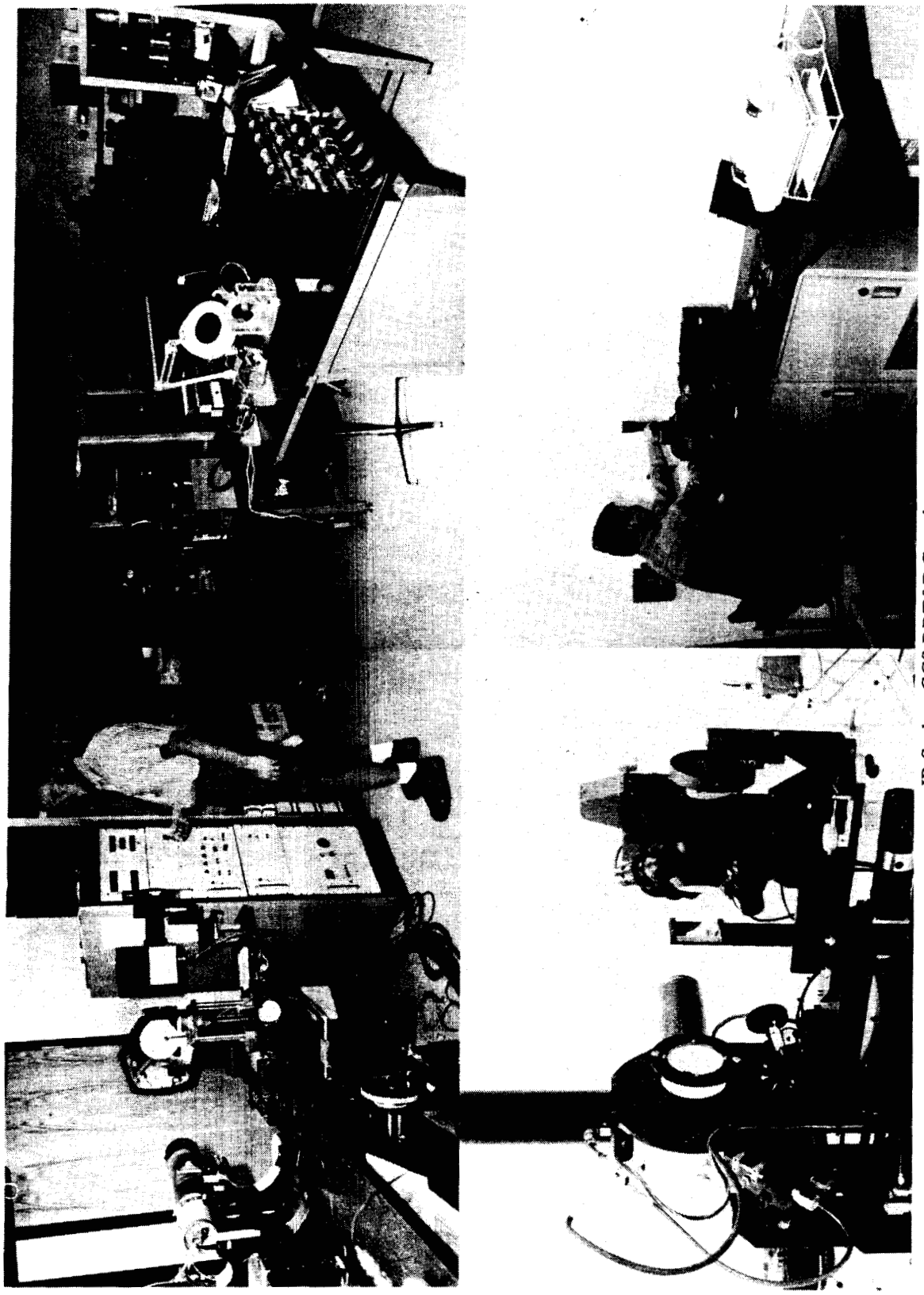
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



IR Seeker, GCS DDT&E Complex

Junction Ranch Radar Cross-Section Range

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICMBs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Guns and Ammunition	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	$34,930K = Total $ 1,640K = Buildings

Facility Description (contd.). The Junction Ranch (JR) Radar Cross-Section (RCS) measurement range is located in a remote valley of the China Lake North Range Complex and was built in the late 1970s. The facility occupies approximately 44,000 acres. The 4,000-foot Horizontal Bounce Range generates wideband, coherent monostatic and wideband, coherent bistatic, full-scatter matrix RCS data of missiles, aircraft, tanks and trucks, models, and components. Frequency coverage is 40-55 MHz, 0.15-18 GHz, and 34-36.5 GHz. The 17,000-foot Look Down Range supports wideband monostatic, full-scatter matrix testing of ship models and other test items in a simulated ocean or look down environment. Both the 78- by 110-foot salt water pond and a 78- by 132-foot tilt deck have 30-foot-diameter, 10,000-pound turntables. Almost all JR customers are local China Lake programs. Security is excellent (TS) because of restricted land and air space (R-2508). Visual access is restricted because of the surrounding mountains.

This equipment is unique because the Look Down Range is the only site in the Free World for RCS measurements of ship models in a simulated ocean environment with a slant range between the radar and the target of 17,000 feet.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	28
Weapons, Conventional Missiles/Rockets	18
Weapons, Cruise Missiles	38
Weapons, Guns and Ammunition	16

Life-Cycle Functions	Percentage
T&E	100

Junction Ranch Radar Cross-Section Range

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICMBs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Guns and Ammunition	Junction Ranch Radar Cross-Section Range	Yes	Yes	Yes	$34,930K = Total $ 1,640K = Buildings

Facility Description (contd.). The Junction Ranch (JR) Radar Cross-Section (RCS) measurement range is located in a remote valley of the China Lake North Range Complex and was built in the late 1970s. The facility occupies approximately 44,000 acres. The 4,000-foot Horizontal Bounce Range generates wideband, coherent monostatic and wideband, coherent bistatic, full-scatter matrix RCS data of missiles, aircraft, tanks and trucks, models, and components. Frequency coverage is 40-55 MHz, 0.15-18 GHz, and 34-36.5 GHz. The 17,000-foot Look Down Range supports wideband monostatic, full-scatter matrix testing of ship models and other test items in a simulated ocean or look down environment. Both the 78- by 110-foot salt water pond and a 78- by 132-foot tilt deck have 30-foot-diameter, 10,000-pound turntables. Almost all JR customers are local China Lake programs. Security is excellent (TS) because of restricted land and air space (R-2508). Visual access is restricted because of the surrounding mountains.

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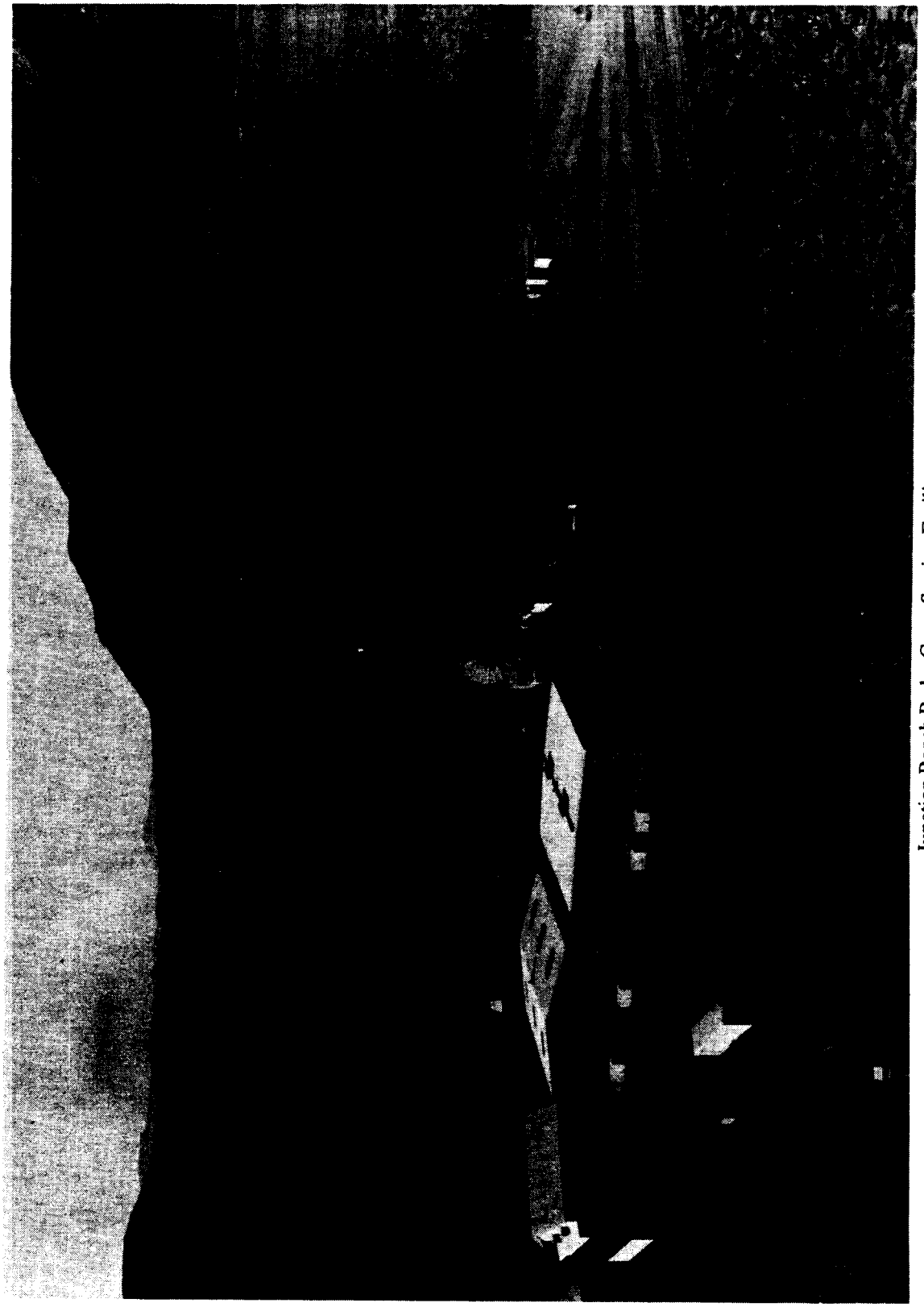
Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	28
Weapons, Conventional Missiles/Rockets	18
Weapons, Cruise Missiles	38
Weapons, Guns and Ammunition	16



Junction Ranch Radar Cross Section Facility

Large Rocket Motor Disposal Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICMBs/SLBMs	Large Rocket Motor Disposal Facility Elements • Contain Burn Assessment Test • Sub-Scale Facility for Propellant	Yes	Yes	Yes	$5,500K = Total $ 400K = Buildings

Facility Description (contd.). The mission is to conduct research on solid propellant disposal techniques on small-scale motors (ca 200 pounds of propellant) to determine low-pressure combustion mechanisms, to analyze the combustion products, and to demonstrate that these products can be treated in an environmentally correct manner; to scale-up the processes to the 40,000-pound scale; and to provide data necessary to design and operate the full scale Large Rocket Motor Disposal Facility (LRMDF) capable of disposing of outdated or surplus ballistic missile motors (up to ca 100,000 pounds of propellant/ motor) in an environmentally clean method. The LRMDF will dispose of two motors/day, 7 days/week, 45 weeks/year.

This equipment is unique because the Joint Ordnance Commanders Group (JOCG) established a subgroup (Large Rocket Motor Disposal) to coordinate Tri-Service Disposal Of Rocket Motors. This facility sanctioned and funded in part by the JOCG is the only controlled burn with subsequent scrubbing of exhaust.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	100

This facility is currently used for R&D (including S&T, D&E, and IE).

Large Rocket Motor Disposal Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICMBs/SLBMs	Large Rocket Motor Disposal Facility Elements • Contain Burn Assessment Test • Sub-Scale Facility for Propellant	Yes	Yes	Yes	$5,500K = Total $ 400K = Buildings

Facility Description (contd.). The mission is to conduct research on solid propellant disposal techniques on small-scale motors (ca 200 pounds of propellant) to determine low-pressure combustion mechanisms, to analyze the combustion products, and to demonstrate that these products can be treated in an environmentally correct manner; to scale-up the processes to the 40,000-pound scale; and to provide data necessary to design and operate the full scale Large Rocket Motor Disposal Facility (LRMDF) capable of disposing of outdated or surplus ballistic missile motors (up to ca 100,000 pounds of propellant/ motor) in an environmentally clean method. The LRMDF will dispose of two motors/day, 7 days/week, 45 weeks/year.

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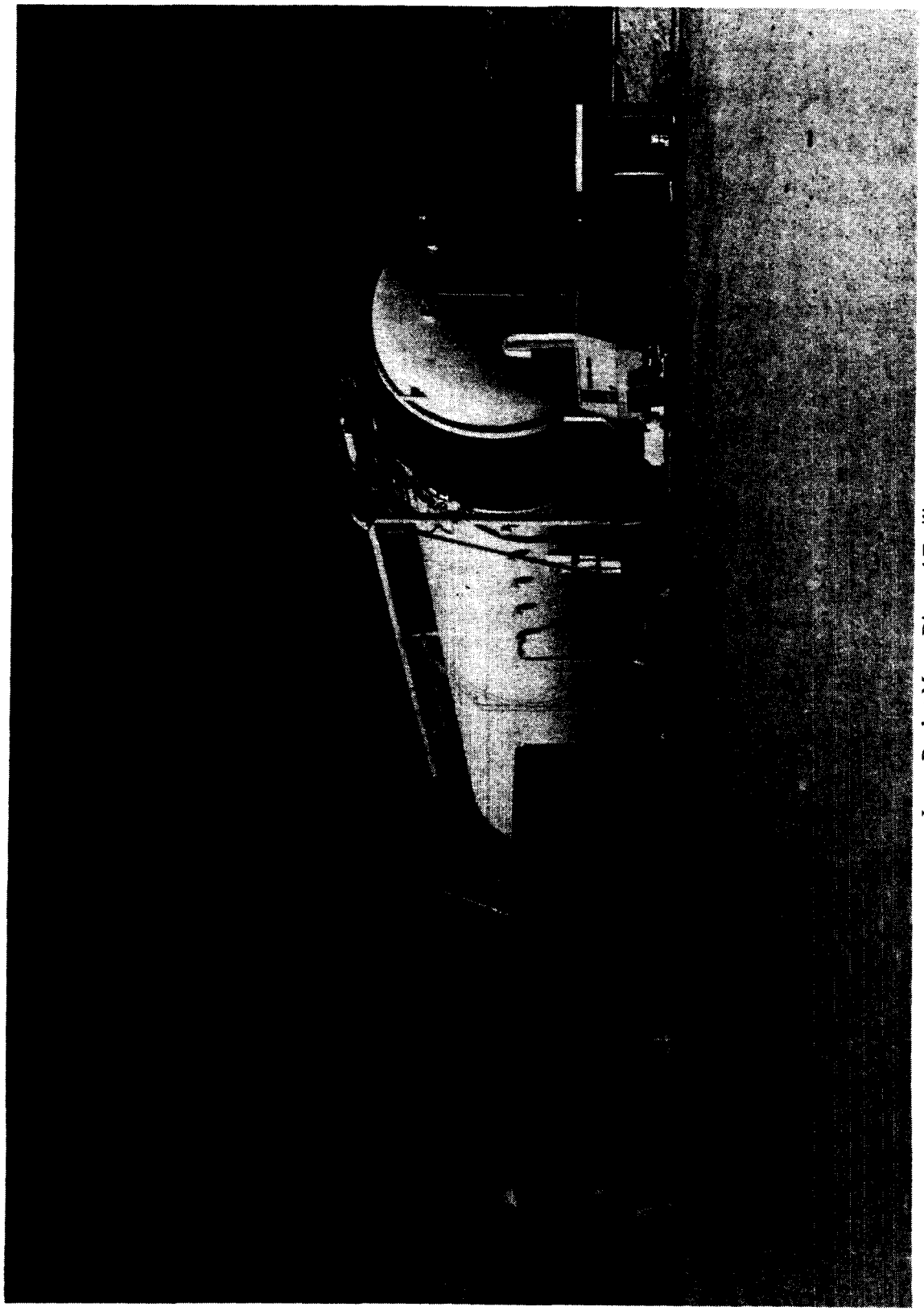
Common Support Functions	Percentage
Weapons, ICMBs/SLBMs	100



Large Rocket Motor Disposal Facility

Laser Seeker Integration and Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Laser Seeker Integration and Test Facility	Yes	Yes	Yes	$1,900K = Total $ 400K = Buildings

Facility Description (contd.). This facility occupies 2,888 square feet of laboratory space and consists of 2 pulsed YAG lasers, one helium neon laser (for aligning the system), one rate table, and the laser flight simulator source (LFSS). In addition, the system also includes the optical benches on which the laser and the LFSS mount and the optics and ducting used to route the laser energy to the rate table room.

The purpose of this facility is to test and evaluate the operation of semiactive laser-guided weapons in scenarios that mimic the actual flight of such weapons. This allows for cost-effective debugging and optimization of seekers early in their development stage, increasing the likelihood of successful flight tests at later stages.

This equipment is unique because to the best of our knowledge, this is the only facility of its type still operational.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	100

Laser Seeker Integration and Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Laser Seeker Integration and Test Facility	Yes	Yes	Yes	$1,900K = Total $ 400K = Buildings

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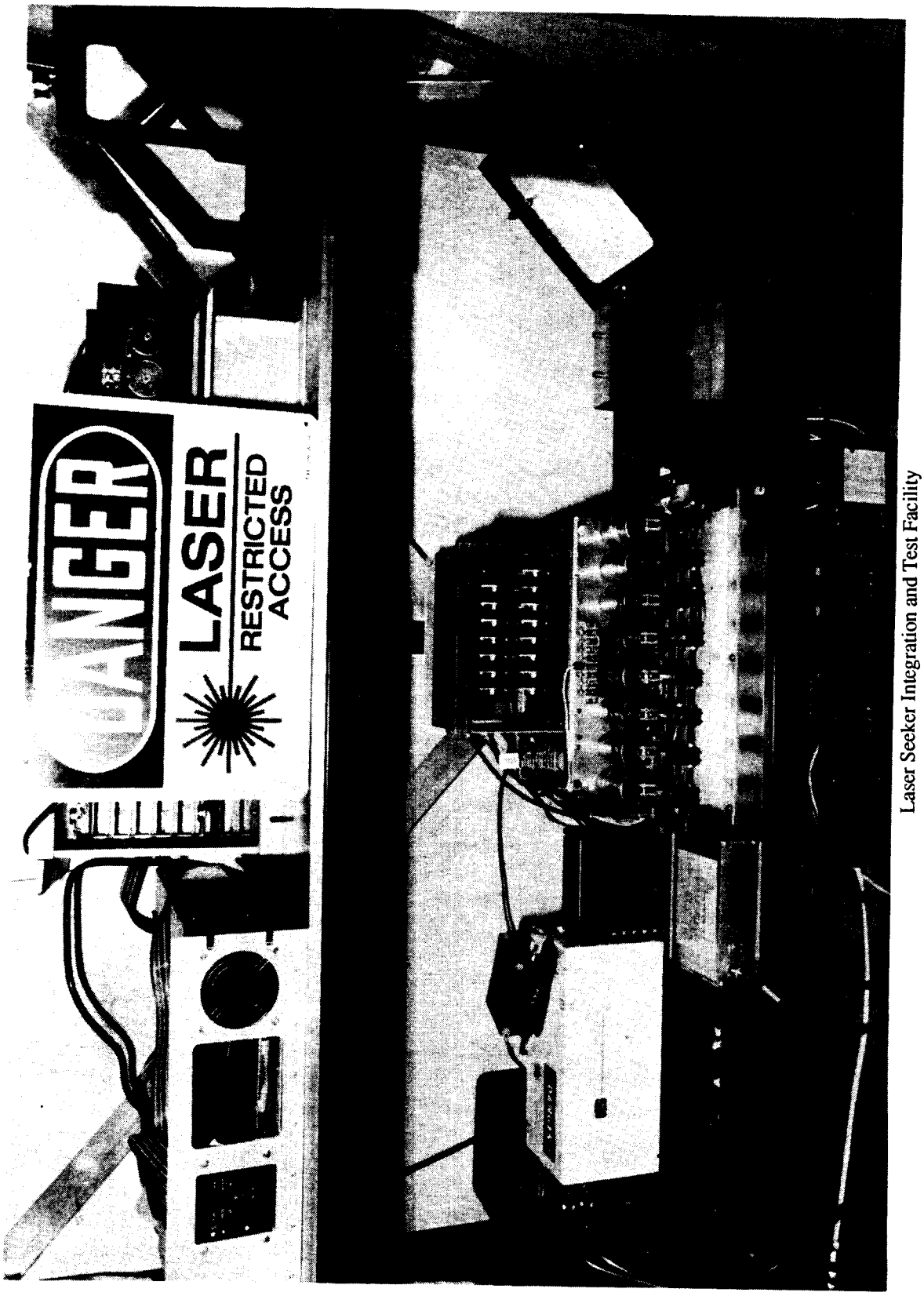
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



Laser Seeker Integration and Test Facility

Materials and Processes Research Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Electronic Devices Advanced Materials	Materials and Processes Research Facility Elements • Microelectronics Fac • Chemical Vapor Deposition Coating Fac • Molecular Beam Epitaxy Fac • Sol Gen Materials Fac	Yes	Yes	Yes	$32,700K = Total $ 3,600K = Buildings

Facility Description (contd.). This equipment is unique because the material synthesis capability for II-V/II-VI semiconductors, non-linear optical polymers, metal-organic precursors, and CVD diamond are not duplicated elsewhere.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	50
Electronic Devices	15
Advanced Materials	35

This facility is currently used for R&D (including S&T, D&E, and IE).

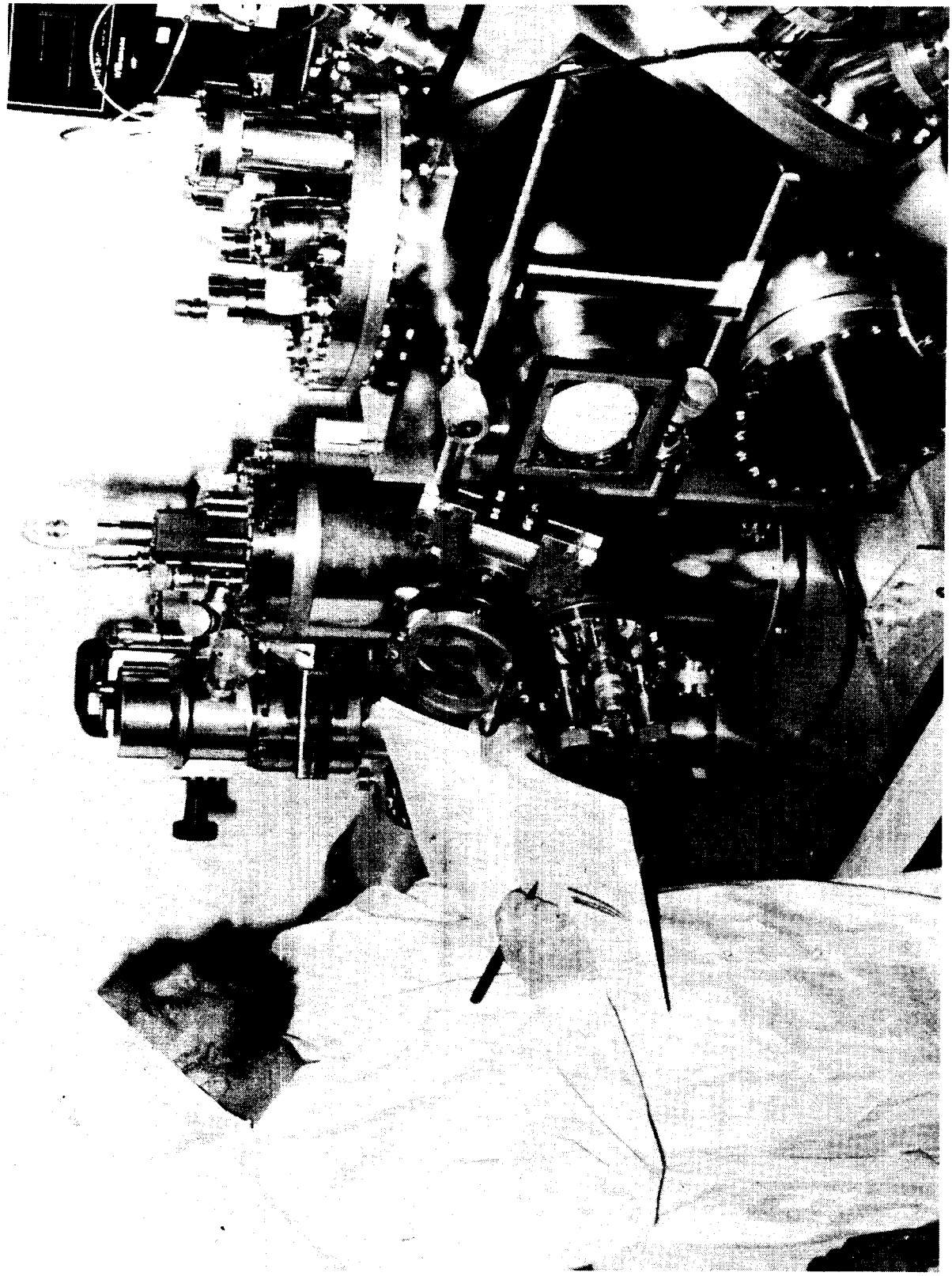
Materials and Processes Research Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Electronic Devices Advanced Materials	Materials and Processes Research Facility Elements • Microelectronics Fac • Chemical Vapor Deposition Coating Fac • Molecular Beam Epitaxy Fac • Sol Gen Materials Fac	Yes	Yes	Yes	$32,700K = Total $ 3,600K = Buildings

Facility Description (contd.).

This equipment is unique because the material synthesis capability for II-V/II-VI semiconductors, non-linear optical polymers, metal-organic precursors, and CVD diamond are not duplicated elsewhere.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	50
Electronic Devices	15
Advanced Materials	35



Materials and Processes Research Facility

Materials Engineering/Failure Analysis Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition Electronic Devices Advanced Materials	Materials Engineering / Failure Analysis Facility Elements • Metals Characterization • Composite Research • Mechanical Testing • Stress Testing • Failure Analysis Lab	No	No	No	$4,860K = Total $1,360K = Buildings

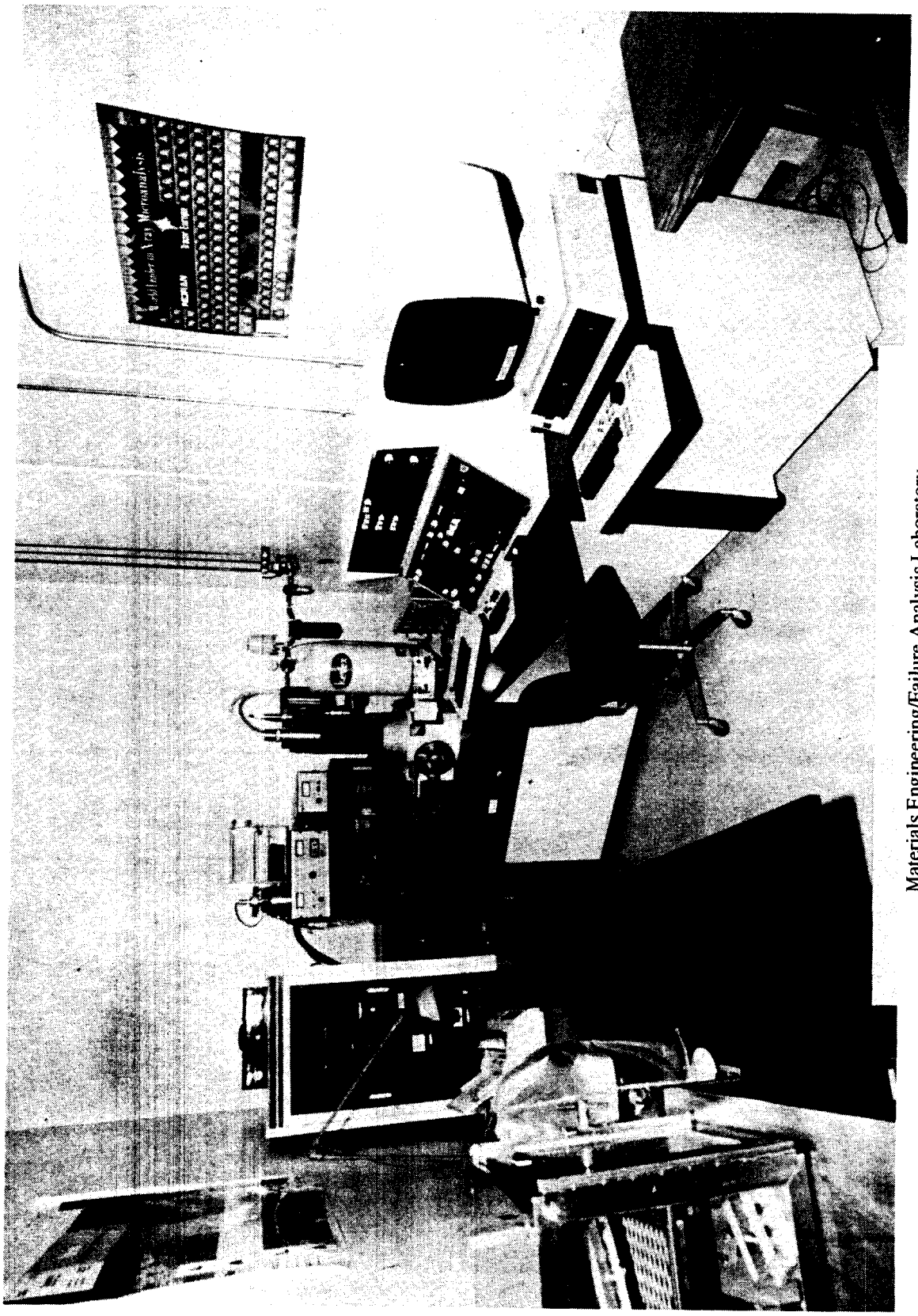
Facility Description (contd.). The primary mission is to provide materials engineering technical support and consultation; conduct applied research to develop materials and processes for systems applications; and provide materials engineering support and failure analysis in the fields of corrosion control, ceramics, composite structures, metallurgy, polymers, nondestructive and destructive testing, and plastics applications. Laboratory equipment and facilities include capabilities for analysis and characterization of materials, specifically metal and metal alloys, polymer-based composites, and semiconductor materials. Facilities are tailored to accommodate component scale units for initial failure analysis assessment and extend into molecular and subgrain regions to determine root causes. Facilities determine bulk properties, molecular structure, and interfacial boundary layer composition. Resources characterize mechanical, electrical, electro-optical and thermal properties or materials used in the fabrication of avionic and missile components.

R

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Weapons, Conventional Missiles/Rockets	10
Weapons, Cruise Missiles	10
Weapons, Bombs	10
Weapons, Guns and Ammunition	10
Electronic Devices	25
Advanced Materials	25

Life-Cycle Functions	Percentage
T&E	60
S&T	40
D&E	0
IE	0
T&D	0
Other	0

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Weapons, Conventional Missiles/Rockets	10
Weapons, Cruise Missiles	10
Weapons, Bombs	10
Weapons, Guns and Ammunition	10
Electronic Devices	25
Advanced Materials	25



Materials Engineering/Failure Analysis Laboratory

Medium-Caliber Gun and Ammo Ballistics Test Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Guns and Ammunition	Medium-Caliber Gun and Ammo Ballistics Test Lab	Yes	Yes	Yes	$4,555K = Total $3,867K = Buildings

Facility Description (contd.). The Ballistics Test Laboratory (BTL) has two 150-foot underground firing tunnels that can fire up to 20-mm caliber rounds in single shot firings. The BTL also has a 230-foot medium caliber (up to 30-mm) outdoor firing range capable of high-rate automatic gun firing using all-up aircraft gun systems. All firing stations have a broad spectrum of instrumentation. Full range shop facility for maintenance of gun systems, including intermediate level maintenance for selected systems. Capability exists for small rocket motor and combustion bomb tests.

Mission statement: Perform test and evaluation on aircraft gun systems and related ammunition for safety, performance, and reliability.

This equipment is unique because: Unique facility to perform ammunition lot acceptance testing for 25-mm ammunition purchased for the Navy.

Common Support Functions	Percentage
Weapons, Guns and Ammunition	100

Life-Cycle Functions	Percentage
T&E	45
S&T	35
D&E	0
IE	20
T&D	0
Other	0

Medium-Caliber Gun and Ammo Ballistics Test Laboratory

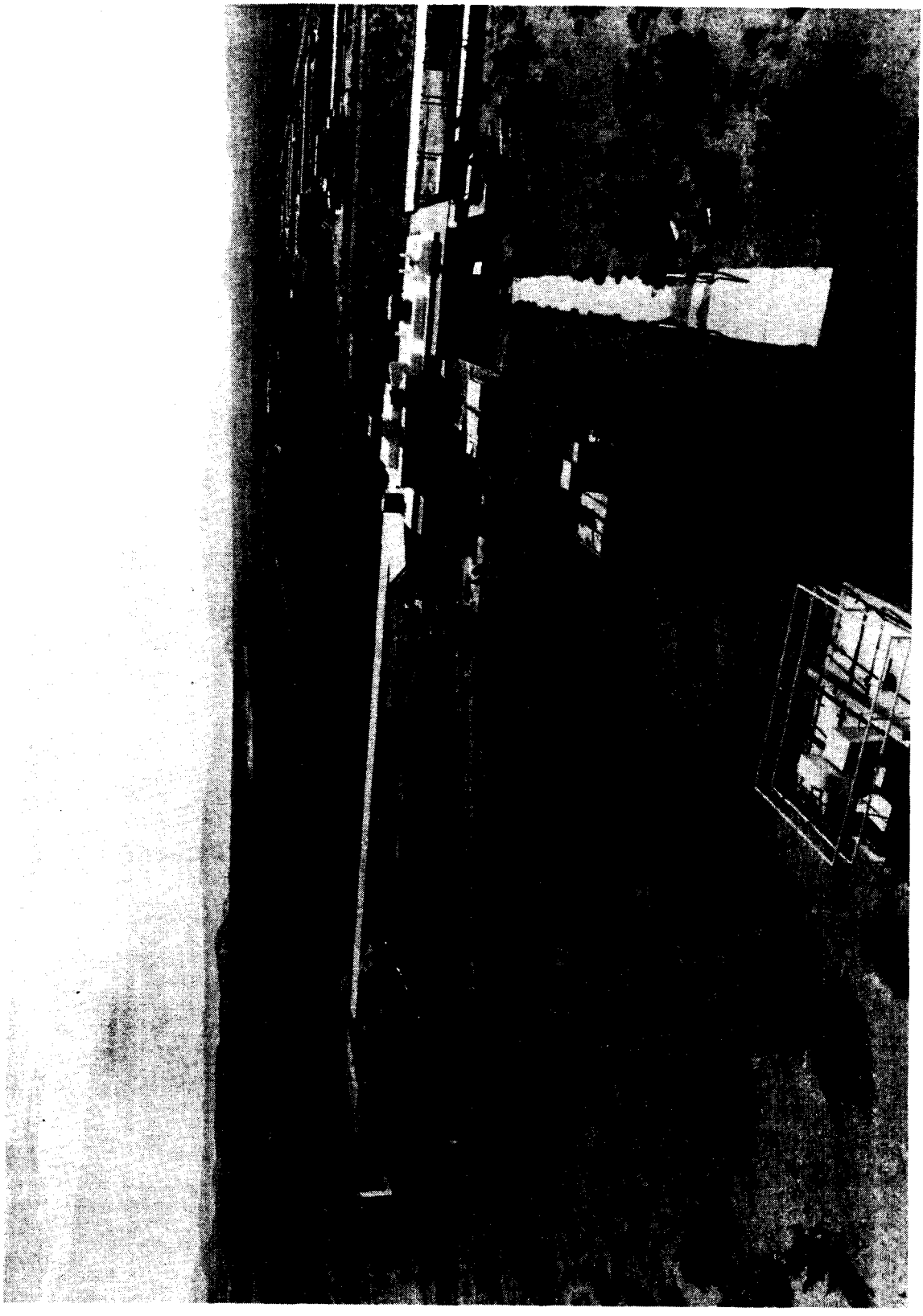
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Guns and Ammunition	Medium-Caliber Gun and Ammo Ballistics Test Lab	Yes	Yes	Yes	$4,555K = Total $3,867K = Buildings

Facility Description (contd.). The Ballistics Test Laboratory (BTL) has two 150-foot underground firing tunnels that can fire up to 20-mm caliber rounds in single shot firings. The BTL also has a 230-foot medium caliber (up to 30-mm) outdoor firing range capable of high-rate automatic gun firing using all-up aircraft gun systems. All firing stations have a broad spectrum of instrumentation. Full range shop facility for maintenance of gun systems, including intermediate level maintenance for selected systems. Capability exists for small rocket motor and combustion bomb tests.

Mission statement: Perform test and evaluation on aircraft gun systems and related ammunition for safety, performance, and reliability.

This equipment is unique because: Unique facility to perform ammunition lot acceptance testing for 25-mm ammunition purchased for the Navy.

Common Support Functions	Percentage
Weapons, Guns and Ammunition	100



Medium-Caliber Gun and Ammo Ballistics Test Laboratory

Metrology Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition Space Systems, Launch Vehicles Space Systems, Satellites	Metrology Facility	No	No	No	$6,142K = Total $1,842K = Buildings

Facility Description (contd.). The Metrology Laboratory is a Type 3 Navy Laboratory that ensures that measurement accuracies are uniform and traceable to National Institute of Standards and Technology (NIST). The Laboratory also manages the China Lake site Metrology Calibration (METCAL) Program.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	8
Air Vehicles, Rotary Wing, Avionics	2
Weapons, Conventional Missiles/Rockets	45
Weapons, Cruise Missiles	25
Weapons, Bombs	5
Weapons, Guns and Ammunition	5
Space Systems, Launch Vehicles	5
Space Systems, Satellites	5

This facility is used by both R&D and T&E functions, roughly in equal proportions, but exact percentages are not available.

Metrology Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition Space Systems, Launch Vehicles Space Systems, Satellites	Metrology Facility	No	No	No	$6,142K = Total $1,842K = Buildings

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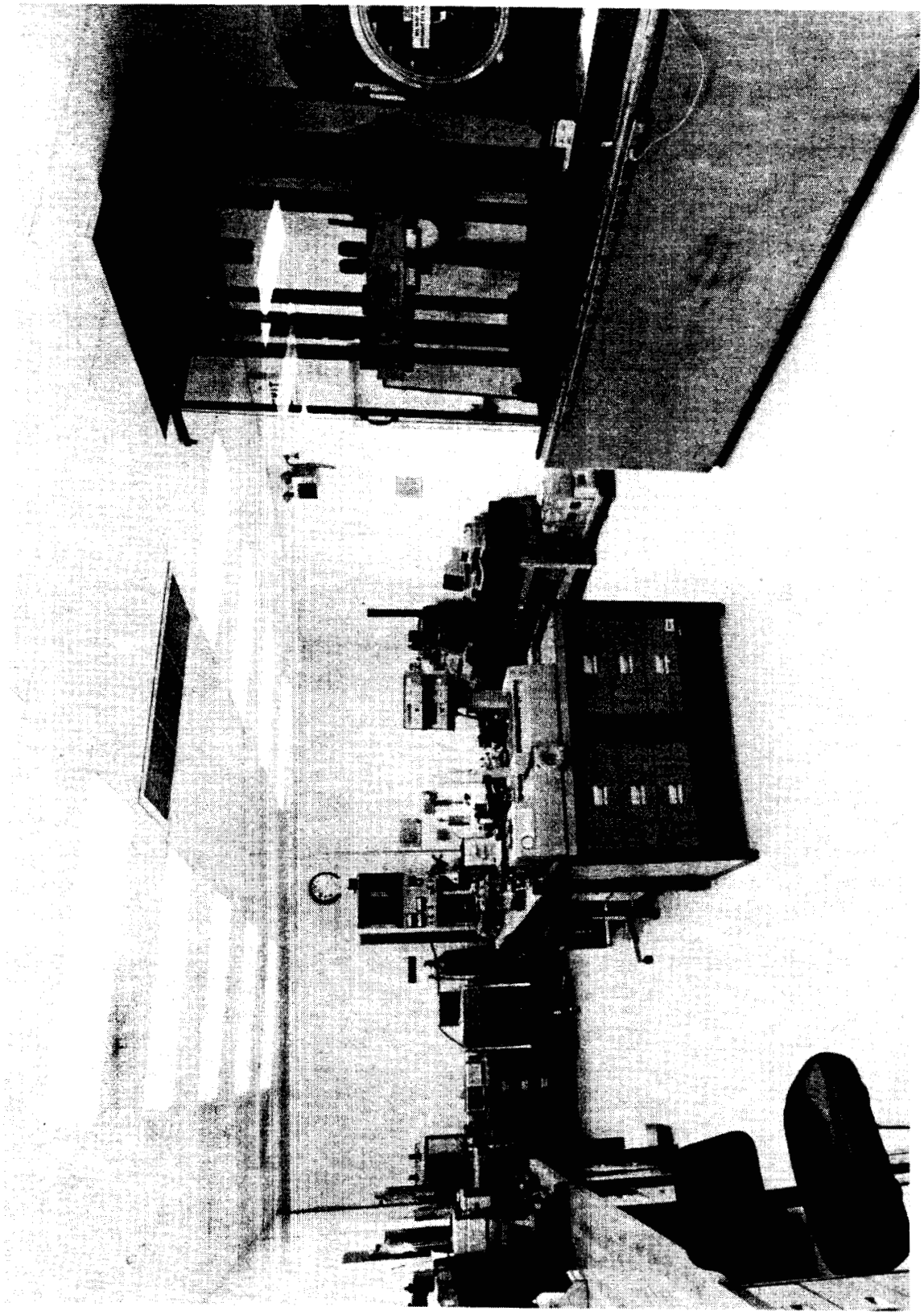
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	8
Air Vehicles, Rotary Wing, Avionics	2
Weapons, Conventional Missiles/Rockets	45
Weapons, Cruise Missiles	25
Weapons, Bombs	5
Weapons, Guns and Ammunition	5
Space Systems, Launch Vehicles	5
Space Systems, Satellites	5



Metrology Facility

Missile Engagement Simulation Arena (MESA)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	$28,000K = Total $16,850K = Buildings

Facility Description (contd.). The Missile Engagement Simulation Arena (MESA), currently under construction, will be a unique test facility used for RDT&E of Target Detection Devices (TDDs). The MESA facility will replace the Encounter Simulation Laboratory (ESL), Norco, California, in February 1995. The performance of tactical missile TDDs will be evaluated against threat systems in this facility. The facility is used to gather TDD target signature and perform post-processing of the signature to determine the warhead burst point. The results of the testing are used to assess the effectiveness of the missile and investigate upgrades to enhance the performance of the tactical systems. Additionally, the facility will be used to gather data for missile and aircraft survivability analysis.

This equipment is unique because MESA will be a unique test facility used for RDT&E of TDDs. The performance of tactical missile TDDs is evaluated against threat systems. The results of the testing are used to assess the effectiveness of the missile and investigate upgrades to enhance the performance of the tactical systems. Additionally, the facility will be used to gather data for missile and aircraft survivability analysis.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	25
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	25

Life-Cycle Functions	Percentage
T&E	20
S&T	60
D&E	20
IE	0
T&D	0
Other	0

Missile Engagement Simulation Arena (MESA)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Missile Engagement Simulation Arena (MESA)	Yes	Yes	Yes	$28,000K = Total $16,850K = Buildings

Facility Description (contd.). The Missile Engagement Simulation Arena (MESA), currently under construction, will be a unique test facility used for RDT&E of Target Detection Devices (TDDs). The MESA facility will replace the Encounter Simulation Laboratory (ESL), Norco, California, in February 1995. The performance of tactical missile TDDs will be evaluated against threat systems in this facility. The facility is used to gather TDD target signature and perform post-processing of the signature to determine the warhead burst point. The results of the testing are used to assess the effectiveness of the missile and investigate upgrades to enhance the performance of the tactical systems. Additionally, the facility will be used to gather data for missile and aircraft survivability analysis.

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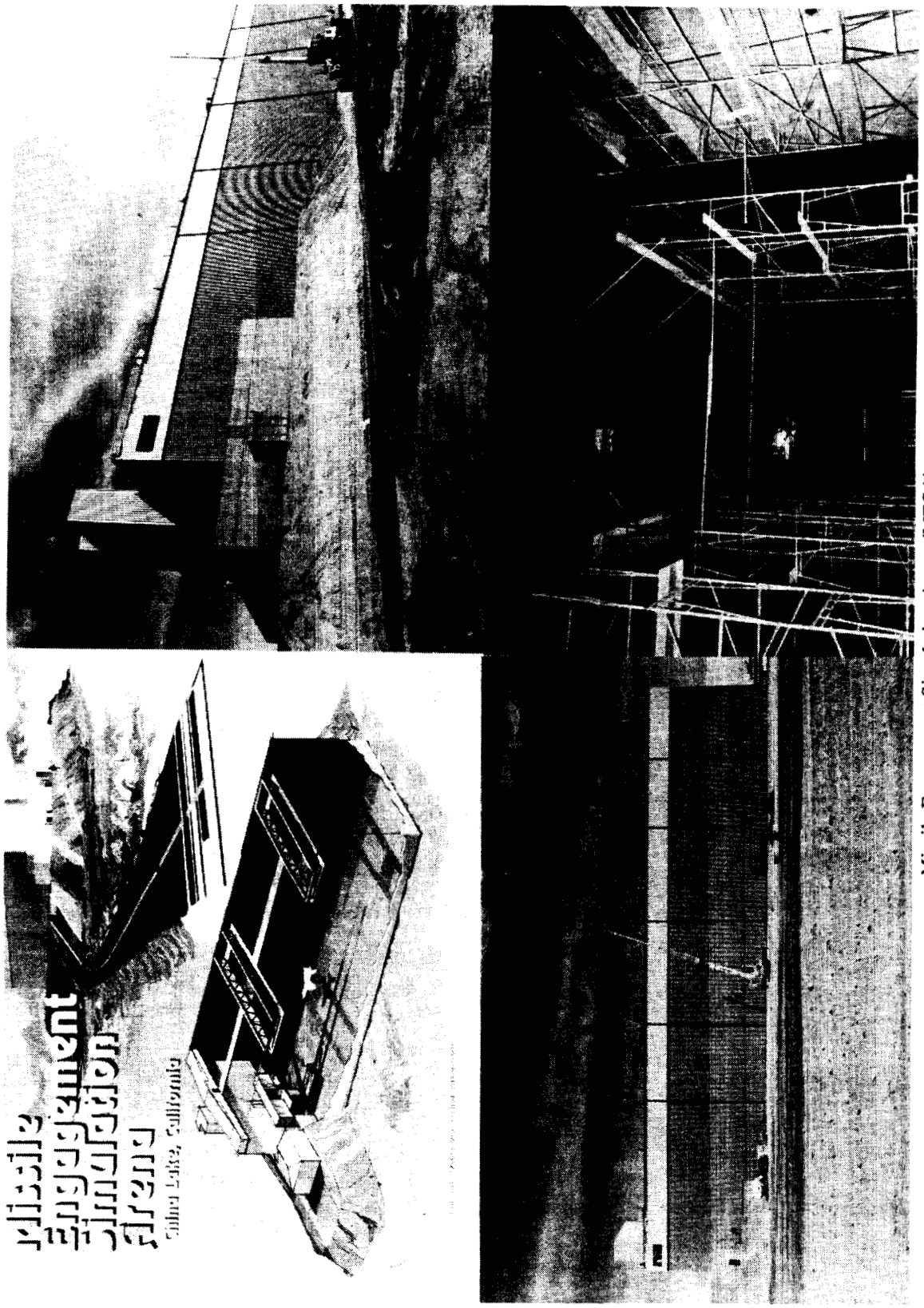
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	25
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	25



Missile Engagement Simulation Arena (MESA)

R

Missile/Rocket Motor Assembly Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Missile/Rocket Motor Assembly Facility	Yes	Yes	Yes	$5,960K = Total $5,655K = Buildings

Facility Description (contd.). A group of buildings in the CLPL area of NAWCWPNS with the capacity to handle full assembly and disassembly, inspection, mass properties measurement, and integration, checkout and fitment testing of missiles and their components including rocket motors, warheads, igniters, and safing/arming devices. Missiles and components are also instrumented here for flight testing, static firing, safety, hazard, and environmental testing. The facilities are unique in that their proximity to the test ranges and their ability to accommodate live ordnance permit pretest checkout and modifications for R&D tests to be turned around in a very quick, economical manner.

This equipment is unique because: This is the only facility capable of handling all-up-round integration and integration testing of the Joint Standoff Weapon (JSOW).

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	45
S&T	15
D&E	40
IE	0
T&D	0
Other	0

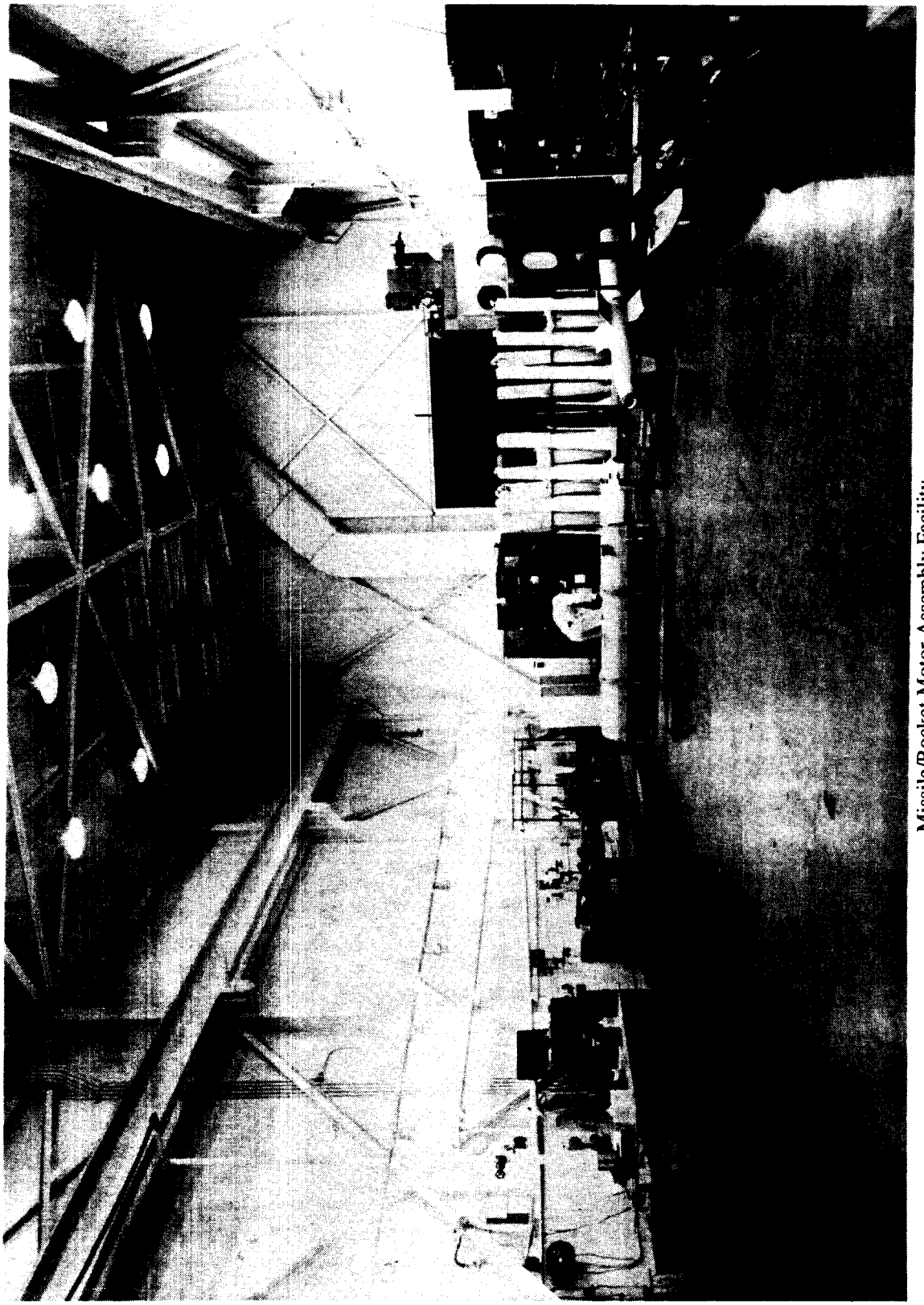
Missile/Rocket Motor Assembly Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Missile/Rocket Motor Assembly Facility	Yes	Yes	Yes	$5,960K = Total $5,655K = Buildings

Facility Description (contd.). A group of buildings in the CLPL area of NAWCWPNS with the capacity to handle full assembly and disassembly, inspection, mass properties measurement, and integration, checkout and fitment testing of missiles and their components including rocket motors, warheads, igniters, and safing/arming devices. Missiles and components are also instrumented here for flight testing, static firing, safety, hazard, and environmental testing. The facilities are unique in that their proximity to the test ranges and their ability to accommodate live ordnance permit pretest checkout and modifications for R&D tests to be turned around in a very quick, economical manner.

This equipment is unique because: This is the only facility capable of handling all-up-round integration and integration testing of the Joint Standoff Weapon (JSOW).

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



Missile/Rocket Motor Assembly Facility

R

Mk 45 TDD Engineering Development HITL/Test Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Mk 45 TDD Engineering Development HITL/Test Laboratory	Yes	Yes	Yes	$13,484K = Total $ 756K = Buildings

Facility Description (contd.). The Mk 45 laboratory consists of three test sets, which together are capable of conducting hardware-in-the-loop RF proximity fuze engineering development testing on the various mods of the Mk 45 fuze system. The test sets employ state-of-the-art computer controlled equipment for control of the simulation of the fuze encounter environment. The software control language is a high-level graphical interface language that speeds and eases development of new scenarios for performance evaluation testing. The test sets are the only ones available that use actual sea and target data to create the missile flyout environment. The mission of the laboratory is to support the host mission as Technical Development Agent for the Mk 45 fuze by simulating fuze/target encounters to evaluate fuze performance for design, development, and test analysis.

This equipment is unique because the test sets are the only ones in existence for all variants of the Mk 45 that use real sea and target data and simulation data outputs to create missile encounter simulations for the Mk 45 hardware.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	40
S&T	0
D&E	50
IE	10
T&D	0
Other	0

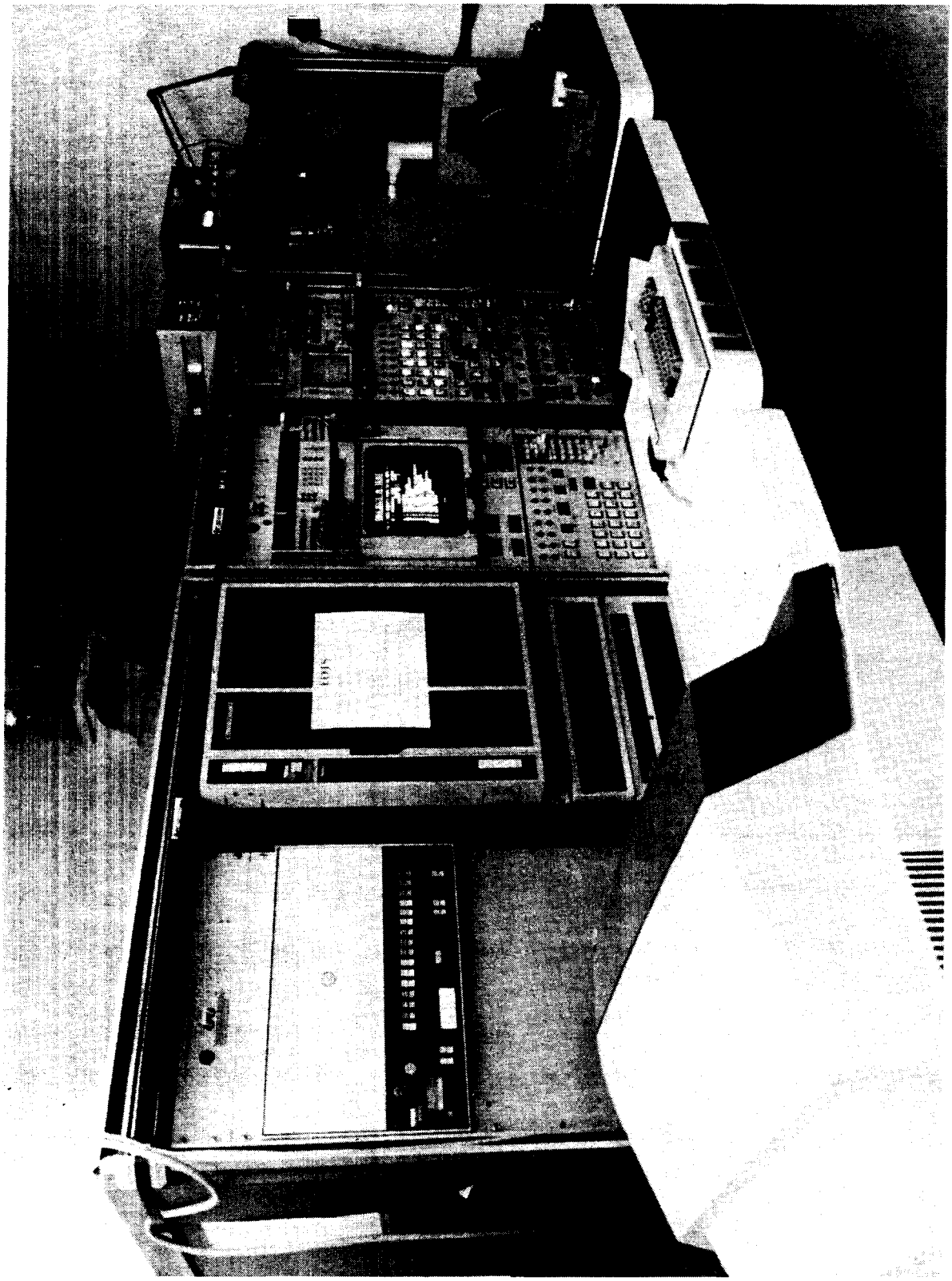
Mk 45 TDD Engineering Development HITL/Test Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Mk 45 TDD Engineering Development HITL/Test Laboratory	Yes	Yes	Yes	$13,484K = Total $ 756K = Buildings

Facility Description (contd.). The Mk 45 laboratory consists of three test sets, which together are capable of conducting hardware-in-the-loop RF proximity fuze engineering development testing on the various mods of the Mk 45 fuze system. The test sets employ state-of-the-art computer controlled equipment for control of the simulation of the fuze encounter environment. The software control language is a high-level graphical interface language that speeds and eases development of new scenarios for performance evaluation testing. The test sets are the only ones available that use actual sea and target data to create the missile flyout environment. The mission of the laboratory is to support the host mission as Technical Development Agent for the Mk 45 fuze by simulating fuze/target encounters to evaluate fuze performance for design, development, and test analysis.

This equipment is unique because the test sets are the only ones in existence for all variants of the Mk 45 that use real sea and target data and simulation data outputs to create missile encounter simulations for the Mk 45 hardware.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



Mk 45 TDD Engineering Development HITL/Test Laboratory

Non-Destructive Ordnance Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Non-Destructive Ordnance Test Facility	No	No	No	$27,300K = Total $ 4,700K = Buildings

Facility Description (contd.). Building 15988 contains a large high-energy computed tomography inspection system. This system currently can inspect items up to 86 inches in diameter and 24 feet long. The system consists of an L-6000 High RAD Output linear accelerator that provides a 13,500 rad, 16 Mev energy source, detectors, and an elevator system in a 3-foot-deep pit capable of supporting rocket motors weighing up to 130,000 pounds. In addition to providing two-dimensional digital video data, the facility is capable of producing conventional film x-rays.

Buildings 15790 and 15800 are standard film x-ray facilities equipped with various x-ray machines and associated film processing and support capabilities. The facilities can handle a wide range of items from small ordnance items and components to first-stage Polaris motors. Other non-destructive test capabilities exist at these facilities such as helium leak testing or boroscopic inspections.

Facilities are sited as follows:
Bldg 15988: 225,000 lbs 1.1, 5,000 1.2, 300,000 1.3, 225, 1.4;
Bldg 15790: 50,000 1.1, 5,000 1.2, 60,000 1.3;
Bldg 15800: 50,000 1.1, 60,000 1.3.
Other facilities that support these operations are 15794, 15804, and 15987.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	40
Weapons, Conventional Missiles/Rockets	40
Weapons, Cruise Missiles	5
Weapons, Bombs	10
Weapons, Guns and Ammunition	5

Life-Cycle Functions	Percentage
T&E	100

Non-Destructive Ordnance Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Non-Destructive Ordnance Test Facility	No	No	No	$27,300K = Total $ 4,700K = Buildings

Facility Description (contd.). Building 15988 contains a large high-energy computed tomography inspection system. This system currently can inspect items up to 86 inches in diameter and 24 feet long. The system consists of an L-6000 High RAD Output linear accelerator that provides a 13,500 rad, 16 Mev energy source, detectors, and an elevator system in a 3-foot-deep pit capable of supporting rocket motors weighing up to 130,000 pounds. In addition to providing two-dimensional digital video data, the facility is capable of producing conventional film x-rays.

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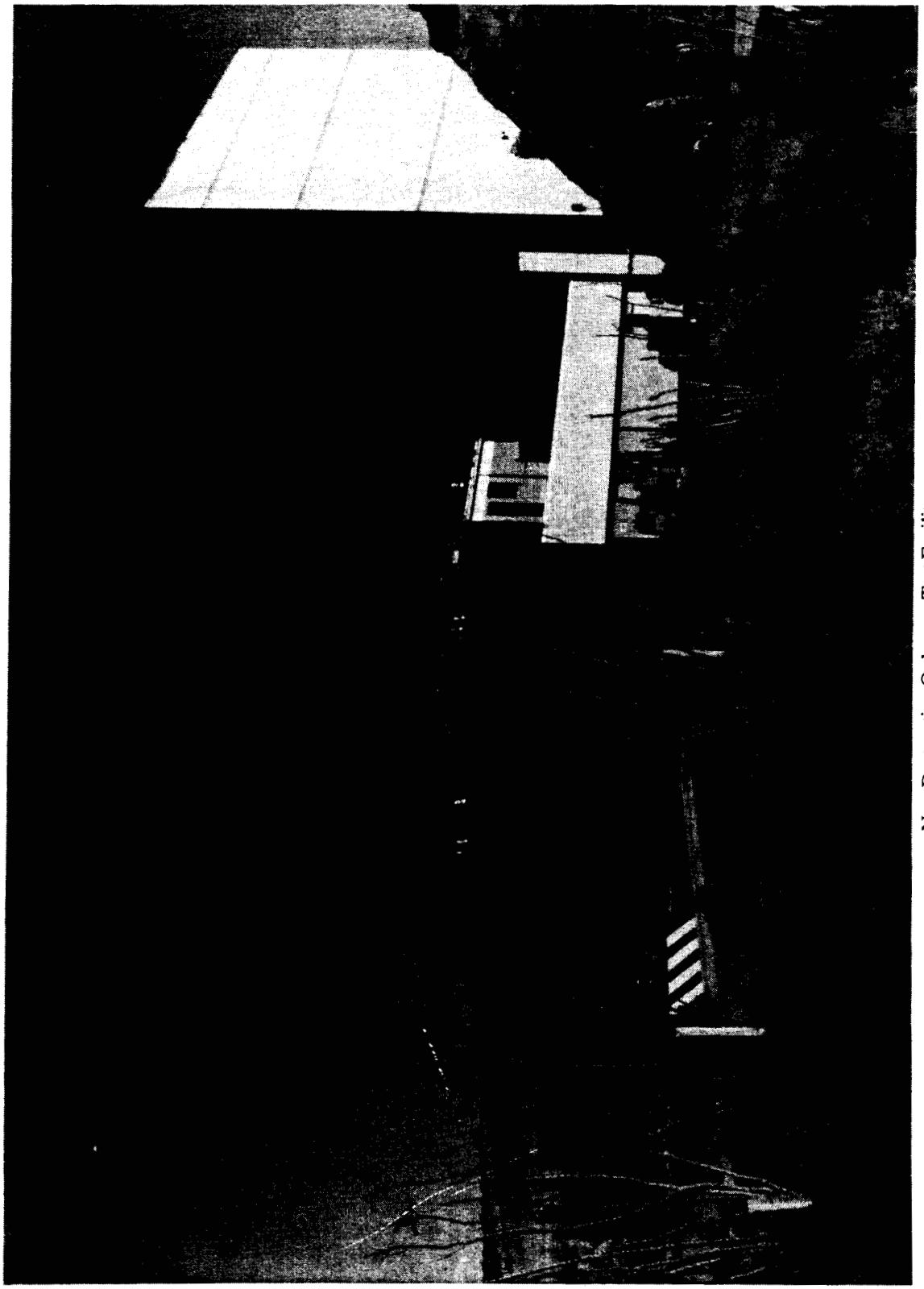
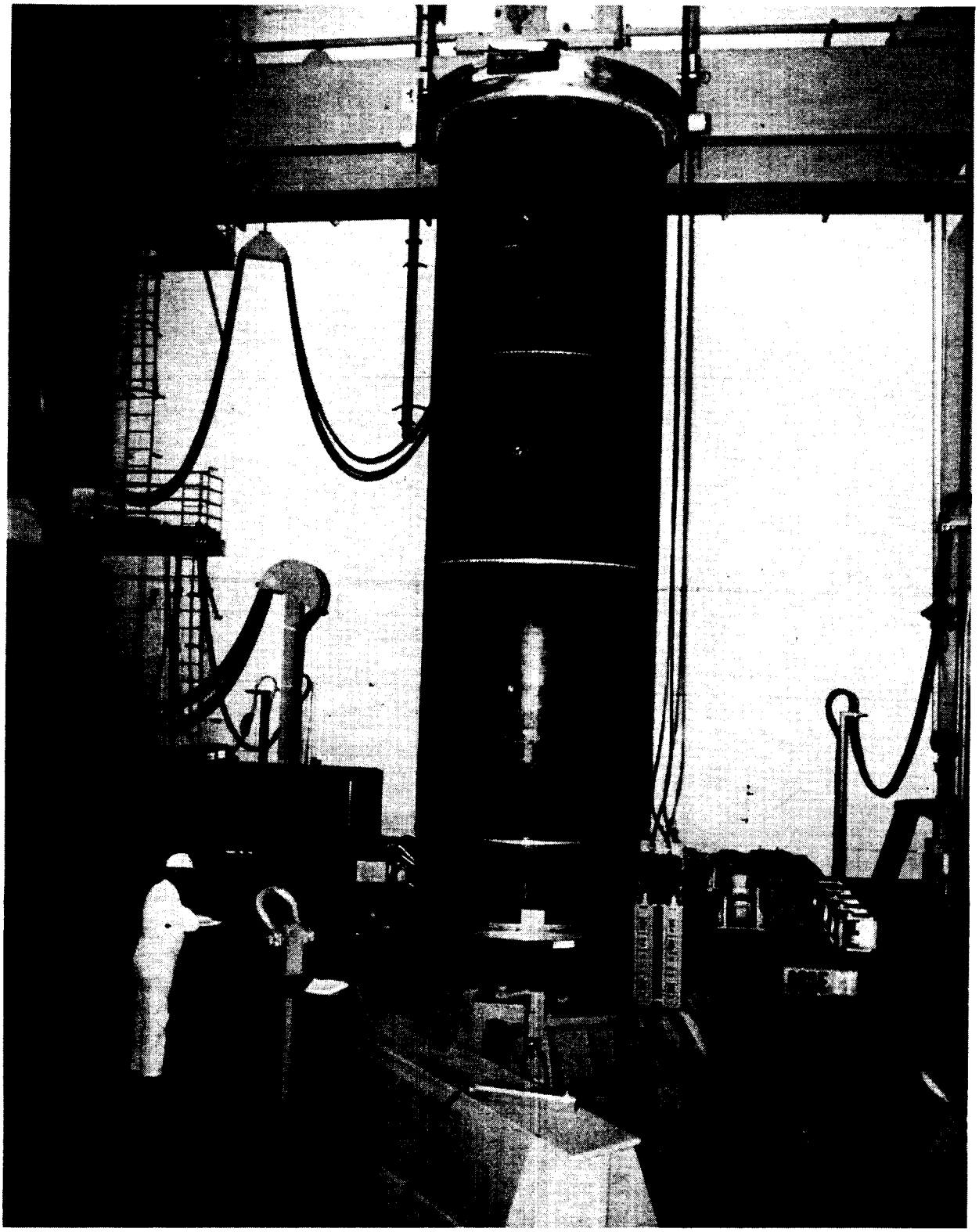
Facilities are sited as follows:
Bldg 15988: 225,000 lbs 1.1, 5,000 1.2, 300,000 1.3, 225, 1.4;
Bldg 15790: 50,000 1.1, 5,000 1.2, 60,000 1.3;
Bldg 15800: 50,000 1.1, 60,000 1.3.
Other facilities that support these operations are 15794, 15804, and 15987.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	40
Weapons, Conventional Missiles/Rockets	40
Weapons, Cruise Missiles	5
Weapons, Bombs	10
Weapons, Guns and Ammunition	5



Non-Destructive Ordnance Test Facility



Non-Destructive Ordnance Test Facility

Optics and Laser Research Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Guns and Ammunition Weapons, Directed Energy Space Systems, Satellites	Optics and Laser Research Facility Elements • Laser Devices and Effects Fac • Optical Materials and Components Characterization • Large Optics Test Fac • Laser Spectroscopy Fac	Yes	Yes	Yes	$17,600K = Total $ 4,700K = Buildings

Facility Description (contd.). The purpose of this facility is to conduct RDT&E of optical materials, components, subsystems, and systems addressing the requirements of the Navy and DOD. The laboratories and equipment in this facility provide capability for design, fabrication, characterization and evaluation, and research on new optical materials, fabrication and characterization techniques, instrumentation, and specific topics such as laser devices, laser interaction with matter, protection against laser radiation, and evaluation of contractor-supplied laser optics in support of the Navy's high-energy laser projects at HELSTF (WSMR). Elements include Optical Design and Fabrication, Diamond Turning, Optical Thin-Films, Optical Characterization, Laser Devices and Effects, Laser Spectroscopy and Large Optics.

This equipment is unique because the optics RDT&E capability assembled in this facility contains integrated capabilities for design, fabrication, and testing that do not exist elsewhere in the U.S. For example, the combination of surface finishing by diamond-single-point machining, reactive-sputtering coating, and precision measurement of surface finish and optical performance does not exist elsewhere. The Large Optics Test Facility is duplicated nowhere else in the Government.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	75
Weapons, Guns and Ammunition	5
Weapons, Directed Energy	12
Space Systems, Satellites	3

Life-Cycle Functions	Percentage
T&E	8
S&T	92
D&E	0
IE	0
T&D	0
Other	0

Optics and Laser Research Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Guns and Ammunition Space Systems, Satellites	Optics and Laser Research Facility Elements • Laser Devices and Effects Fac • Optical Materials and Components Characterization • Large Optics Test Fac • Laser Spectroscopy Fac	Yes	Yes	Yes	$17,600K = Total $ 4,700K = Buildings

Facility Description (contd.). The purpose of this facility is to conduct RDT&E of optical materials, components, subsystems, and systems addressing the requirements of the Navy and DOD. The laboratories and equipment in this facility provide capability for design, fabrication, characterization and evaluation, and research on new optical materials, fabrication and characterization techniques, instrumentation, and specific topics such as laser devices, laser interaction with matter, protection against laser radiation, and evaluation of contractor-supplied laser optics in support of the Navy's high-energy laser projects at HELSTF (WSMR). Elements include Optical Design and Fabrication, Diamond Turning, Optical Thin-Films, Optical Characterization, Laser Devices and Effects, Laser Spectroscopy and Large Optics.

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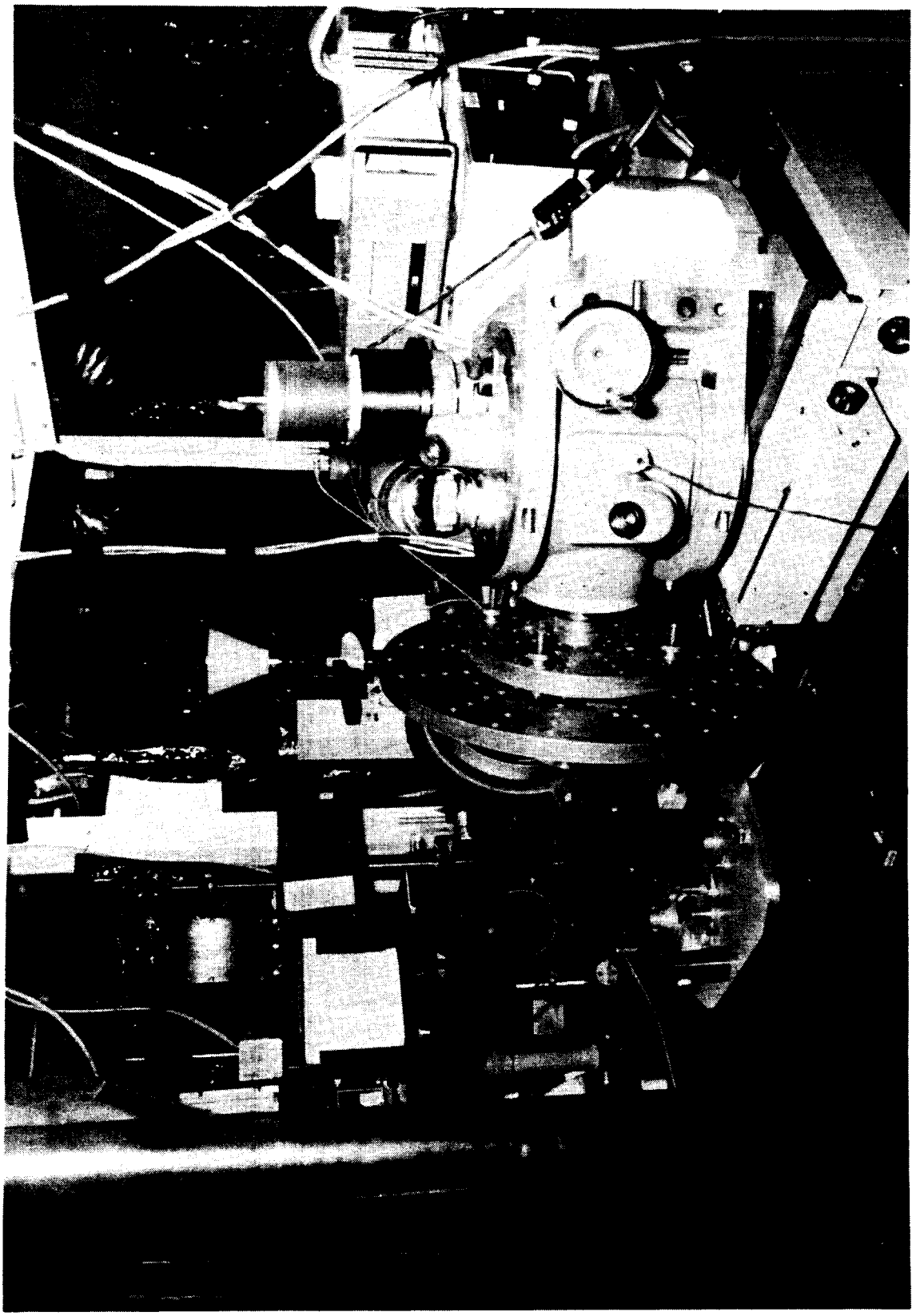
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	75
Weapons, Guns and Ammunition	5
Space Systems, Satellites	15



Optics and Laser Research Facility

Ordnance Assembly Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Assembly Facility	No	No	No	$ 464K = Total $ 444K = Buildings

Facility Description (contd.). This facility supports the flight tests of weapons, guns, and other ordnance items by assembling the item and performing preflight check out. From this facility the item is loaded on the aircraft for flight test. This facility has the capability to conduct weapons continuity and electrical test of weapons. This facility can support pre-flight operational check out of weapons systems.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	35
Weapons, Bombs	40
Weapons, Guns and Ammunition	25

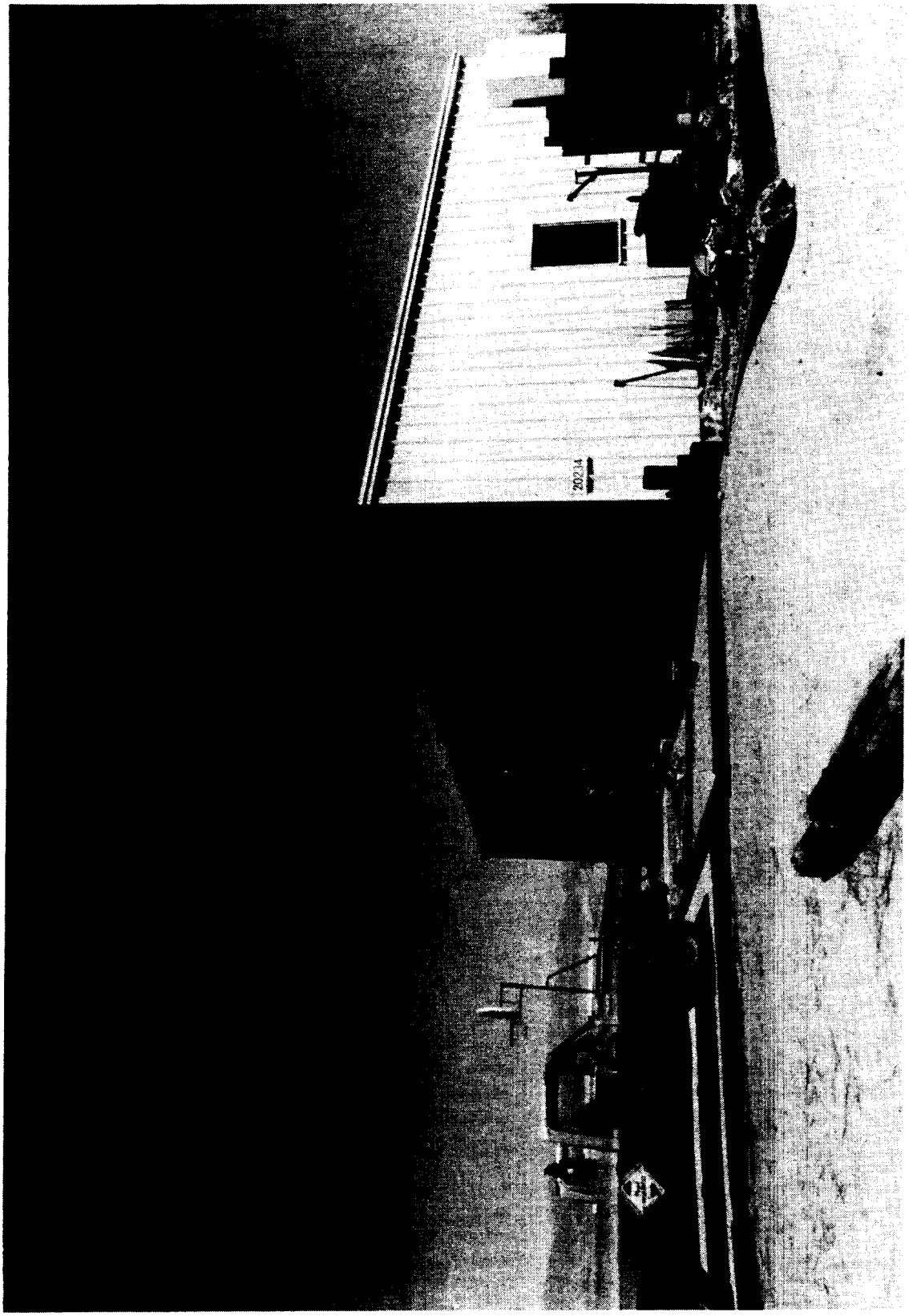
Life-Cycle Functions	Percentage
T&E	55
S&T	25
D&E	10
IE	10
T&D	0
Other	0

Ordnance Assembly Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Assembly Facility	No	No	No	$ 464K = Total $ 444K = Buildings

Facility Description (contd.). This facility supports the flight tests of weapons, guns, and other ordnance items by assembling the item and performing preflight check out. From this facility the item is loaded on the aircraft for flight test. This facility has the capability to conduct weapons continuity and electrical test of weapons. This facility can support pre-flight operational check out of weapons systems.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	35
Weapons, Bombs	40
Weapons, Guns and Ammunition	25



Ordnance Assembly Facility

Ordnance Breakdown Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Guns and Ammunition	Ordnance Breakdown Facility	No	No	No	$4,257K = Total $4,143K = Buildings

Facility Description (contd.). This facility is to perform breakdown of ordnance items and components for failure analysis and foreign military exploitation. The facility also includes an RCRA-authorized State of California permitted open burn/open detonation disposal area for disposing of scrap propellant, explosive, excess weapons, excess ordnance components, and other energetic materials. This facility supports weapons pre-flight/pre-condition inspection and electrical and continuity check out.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	90
Weapons, Guns and Ammunition	10

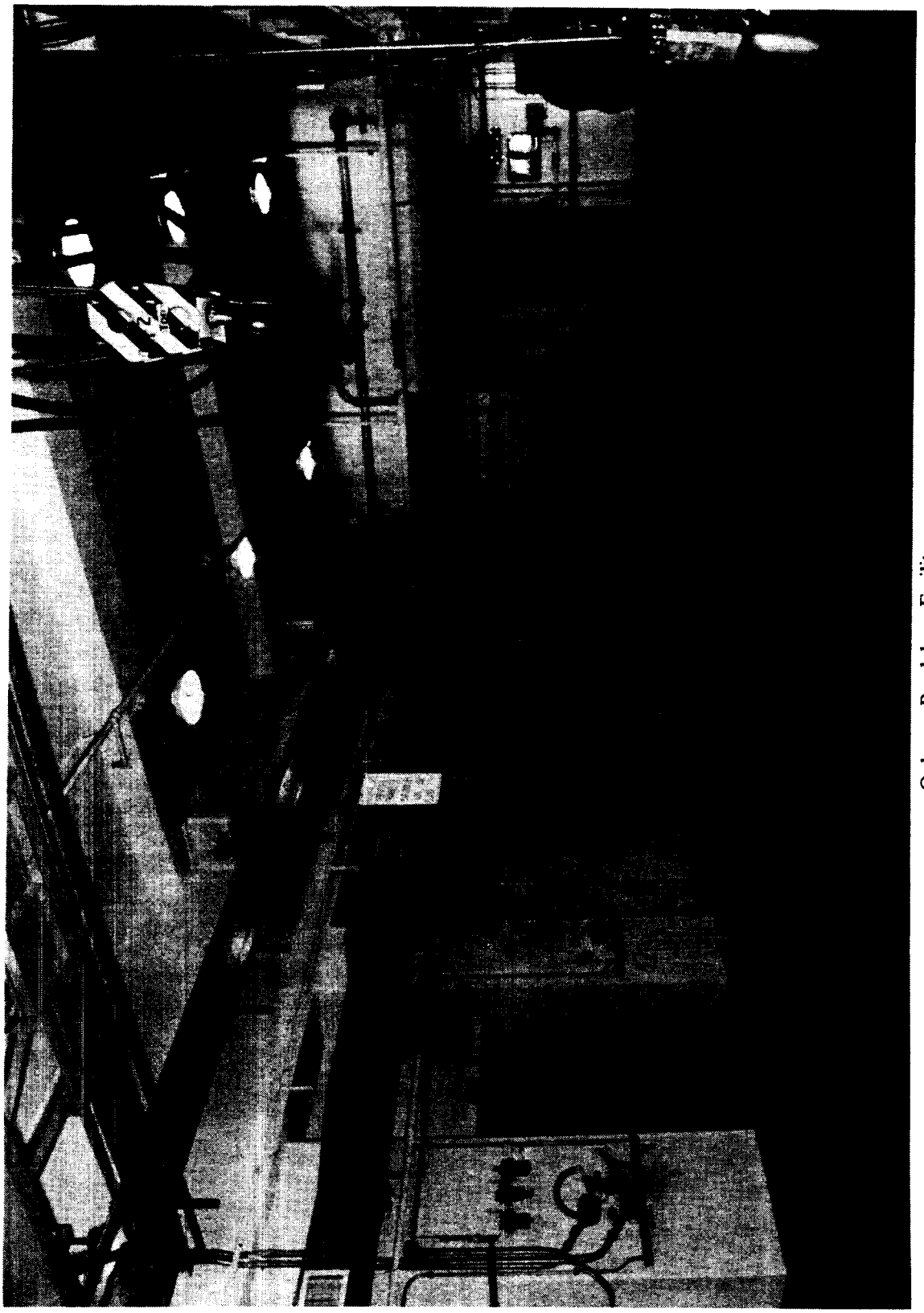
This facility is used mostly for R&D, but occasionally some support for T&E is provided. Exact percentages are not available.

Ordnance Breakdown Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Guns and Ammunition	Ordnance Breakdown Facility	No	No	No	$4,257K = Total $4,143K = Buildings

Facility Description (contd.). This facility is to perform breakdown of ordnance items and components for failure analysis and foreign military exploitation. The facility also includes an RCRA-authorized State of California permitted open burn/open detonation disposal area for disposing of scrap propellant, explosive, excess weapons, excess ordnance components, and other energetic materials. This facility supports weapons pre-flight/pre-condition inspection and electrical and continuity check out.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	90
Weapons, Guns and Ammunition	10



Ordnance Breakdown Facility

Ordnance Packaging Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Packaging Facility	No	No	No	$558K = Total $547K = Buildings

Facility Description (contd.). This facility has the shipping and receiving, packaging, and document preparation responsibility for all ordnance items and energetic material arriving at or leaving the Station.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	60
Weapons, Bombs	20
Weapons, Guns and Ammunition	20

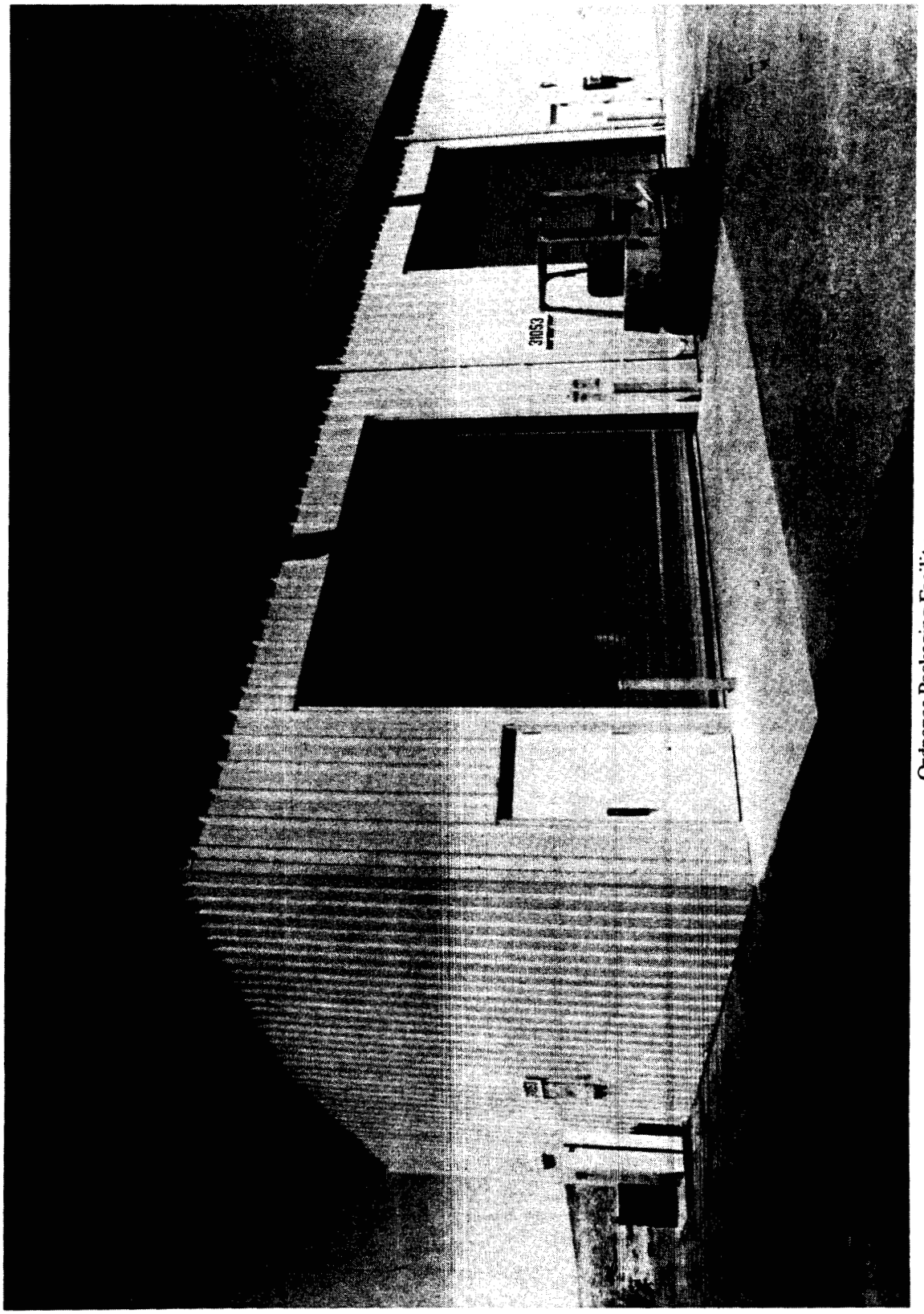
This facility is used for both R&D and T&E in roughly equal proportions, but exact percentages are not available.

Ordnance Packaging Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Packaging Facility	No	No	No	$558K = Total $547K = Buildings

Facility Description (contd.). This facility has the shipping and receiving, packaging, and document preparation responsibility for all ordnance items and energetic material arriving at or leaving the Station.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	60
Weapons, Bombs	20
Weapons, Guns and Ammunition	20



Ordnance Packaging Facility

Ordnance and Propulsion Foreign Materials Exploitation Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Directed Energy C4I Systems, Airborne C4I	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	$11,359K = Total $10,937K = Buildings

Facility Description (contd.). This facility consists of a group of buildings in the CLPL area of NAWCWPNS that has the capacity to test and evaluate foreign materiel solid and air-breathing motors, warheads, ignition systems, electronics, and thrust vector control systems. The facility provides the requisite safety (isolation, certification, process control) and security (isolation, perimeter fence, process control) for the exploitation of hardware up to the Secret level including both Class 1.1 and Class 1.3 explosives. The facility meets ordnance operation facility requirements including deluge systems, static grounding systems, explosive-proof electrical systems, and blow-out panels. Building construction permits simultaneous operations in adjacent test cells. Doors have safety interlock systems. Special security devices required for some projects.

Ordnance and Propulsion Foreign Materials Exploitation Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Space Systems, Satellites C4I Systems, Airborne C4I	Ordnance and Propulsion Foreign Materials Exploitation Lab	No	No	No	$11,359K = Total $10,937K = Buildings

Facility Description (contd.). This facility consists of a group of buildings in the CLPL area of NAWCWPNS that has the capacity to test and evaluate foreign materiel solid and air-breathing motors, warheads, ignition systems, electronics, and thrust vector control systems. The facility provides the requisite safety (isolation, certification, process control) and security (isolation, perimeter fence, process control) for the exploitation of hardware up to the Secret level including both Class 1.1 and Class 1.3 explosives. The facility meets ordnance operation facility requirements including deluge systems, static grounding systems, explosive-proof electrical systems, and blow-out panels. Building construction permits simultaneous operations in adjacent test cells. Doors have safety interlock systems. Special security devices required for some projects.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	16
Weapons, Directed Energy	4
C4I Systems, Airborne C4I	10

Life-Cycle Functions	Percentage
T&E	5
S&T	10
D&E	10
IE	0
T&D	0
Other	75

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	60
Weapons, Cruise Missiles	16
Space Systems, Satellites	4
C4I Systems, Airborne C4I	10

Ordnance and Propulsion FME Laboratory

Ordnance and Propulsion Plant Support Shops

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Projectiles Weapons, Bombs	Ordnance and Propulsion Plant Support Shops	No	No	No	$5,532K = Total $4,252K = Buildings

Facility Description (contd.). This facility contains maintenance shops providing a home base and work space for a full spectrum of industrial maintenance craftsmen. Shops contain tools, machinery, and parts storage to support craftsmen activities. The facility includes mobile equipment for excavation and lifting and transport of machinery, materials, and equipment.

Mission statement: Maintain and develop energetic materials, ordnance, and propulsion operating buildings and processing systems for research, development, testing, and evaluation of ordnance devices, propellants, and explosives. Conduct liaison activities with the Public Works Department on behalf of Code C27. Provide environmental controls for personnel and for hazardous operations by design, installation, and maintenance of environmental control systems.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	10
Weapons, Cruise Missiles	76
Weapons, Guided Projectiles	12
Weapons, Bombs	2

This facility is used mostly for R&D; however, it does provide some T&E support, but the exact percentages cannot be precisely defined.

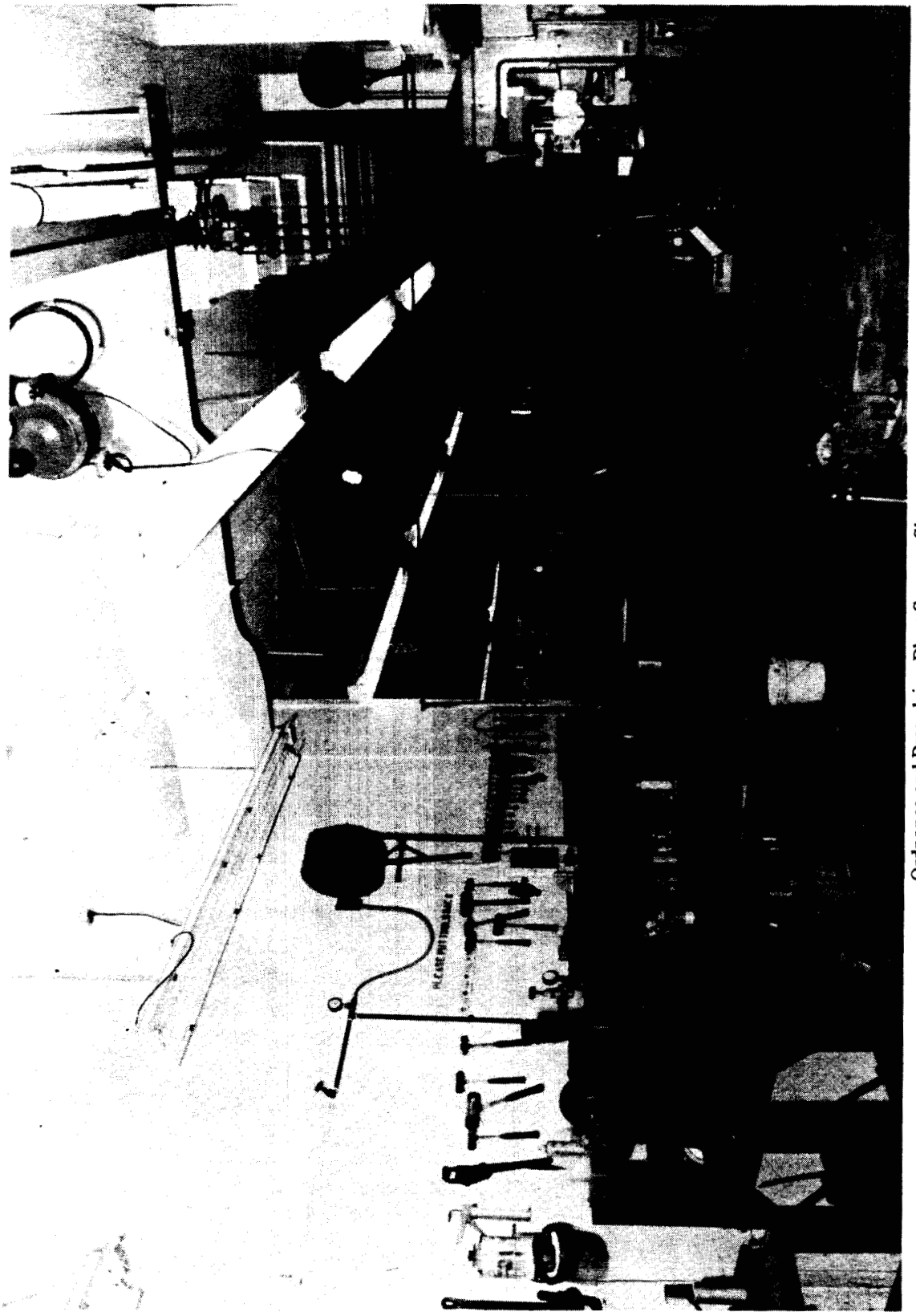
Ordnance and Propulsion Plant Support Shops

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Projectiles Weapons, Bombs	Ordnance and Propulsion Plant Support Shops	No	No	No	$5,532K = Total $4,252K = Buildings

Facility Description (contd.). This facility contains maintenance shops providing a home base and work space for a full spectrum of industrial maintenance craftsmen. Shops contain tools, machinery, and parts storage to support craftsmen activities. The facility includes mobile equipment for excavation and lifting and transport of machinery, materials, and equipment.

Mission statement: Maintain and develop energetic materials, ordnance, and propulsion operating buildings and processing systems for research, development, testing, and evaluation of ordnance devices, propellants, and explosives. Conduct liaison activities with the Public Works Department on behalf of Code C27. Provide environmental controls for personnel and for hazardous operations by design, installation, and maintenance of environmental control systems.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	10
Weapons, Cruise Missiles	76
Weapons, Guided Projectiles	12
Weapons, Bombs	2



Ordnance and Propulsion Plant Support Shops

Ordnance Stowage Facilities

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Stowage Facilities	No	No	No	$35,829K = Total $35,821K = Buildings

Facility Description (contd.). These facilities are earth-covered ammunition storage sites and ready service magazines that meet DOD explosive safety requirements. These facilities are capable of providing secure ammunition and energetic storage space. The materials stored in these facilities are in direct support of the mission for RDT&E endeavors.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	33
Weapons, Bombs	33
Weapons, Guns and Ammunition	34

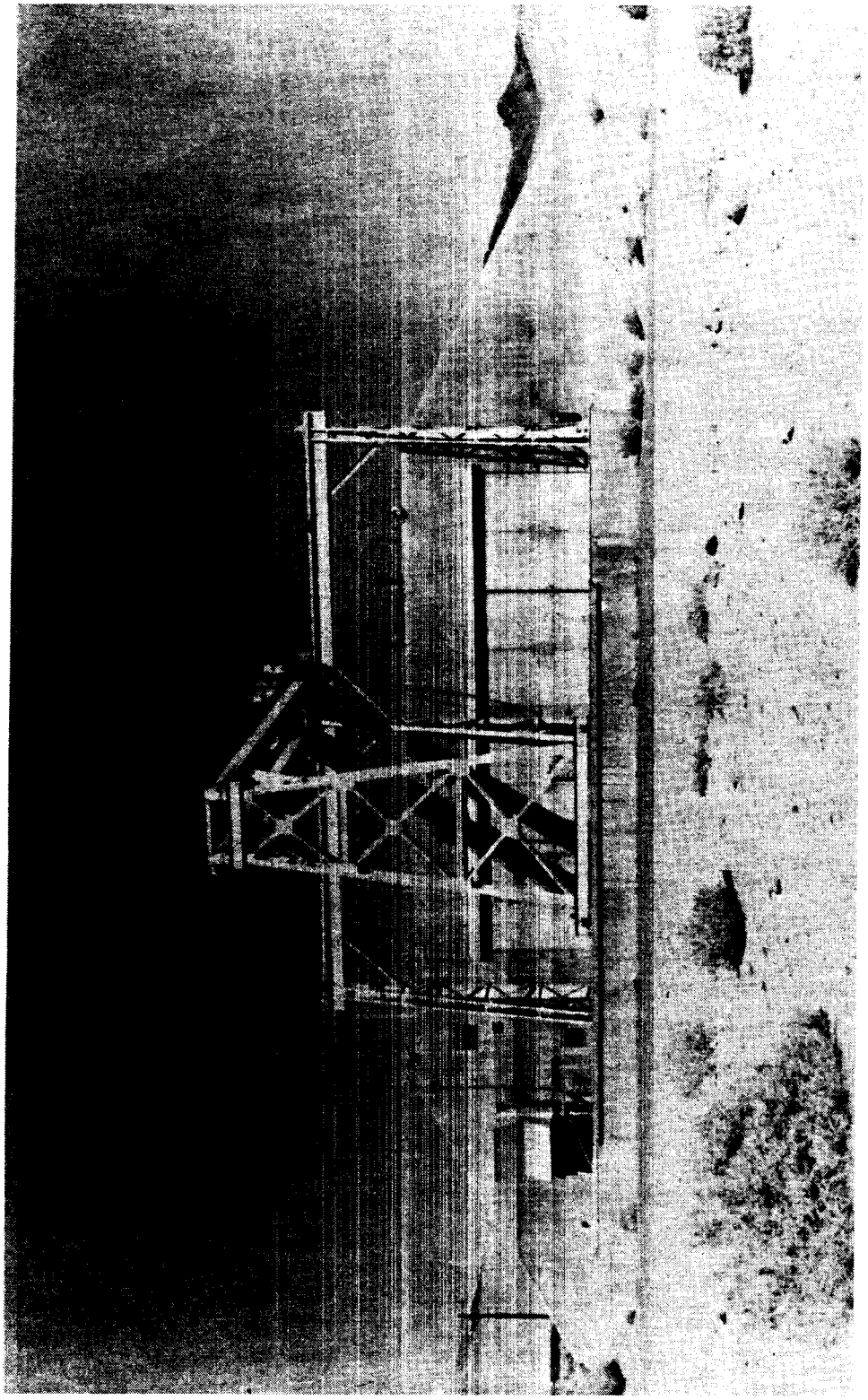
This facility is used to support both R&D and T&E. The percentages cannot be precisely defined.

Ordnance Stowage Facilities

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Stowage Facilities	No	No	No	$35,829K = Total $35,821K = Buildings

Facility Description (contd.). These facilities are earth-covered ammunition storage sites and ready service magazines that meet DOD explosive safety requirements. These facilities are capable of providing secure ammunition and energetic storage space. The materials stored in these facilities are in direct support of the mission for RDT&E endeavors.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	33
Weapons, Bombs	33
Weapons, Guns and Ammunition	34



Ordnance Stowage Facilities

Ordnance Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Test Complex Elements • Warhead Testing/Area R Fac • Warhead Test/Burro Canyon Areas • Warhead Test/CT-6 Test Area • Safety Test/Facilities CT-1 and CT-4	Yes	Yes	No	$5,588K = Total $3,905K = Buildings

Facility Description (contd.). The Ordnance Test Complex consists of five major geographic test areas consisting of 22 separate test sites or bays to perform a full spectrum of ordnance activation tests, including fast and slow cookoff, bullet impact, fragment impact, drop, sympathetic detonation, liquid fuel and fuel-air explosive mixtures, and large-scale arena detonations. There are 33 structures, including six control rooms supporting these test areas and with associated assembly and storage buildings. The facilities are geographically separated (22 miles maximum road distance), and all have expansion capabilities for future growth if necessary. Area R has the smallest ordnance siting of 200 pounds explosive, Classes 1.1 through 1.3 inclusive. Burro Canyon can test to 14,000 pounds of Classes 1.1 and 1.2 and 200,000 pounds of Class 1.3. The CT sites are capable of testing up to 3,000 pounds of all classes. All sites have sensors for test support (pressure, temperature, velocity, etc.) and photo coverage. High-speed photography up to 10,000,000 frames per second is available at Area R.

This equipment is unique because with the test arenas at Burro Canyon fully operational, there are no other government facilities specifically sited for this type of large static firing arena test capability. There are other activation sites, sited at lower explosive limits at other government agencies; however encroachment is rapidly taking them over. Burro Canyon and the CT test sites are still capable of expansion for test growth if required.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	5
Weapons, Conventional Missiles/Rockets	68
Weapons, Bombs	24
Weapons, Guns and Ammunition	3

Life-Cycle Functions	Percentage
T&E	100

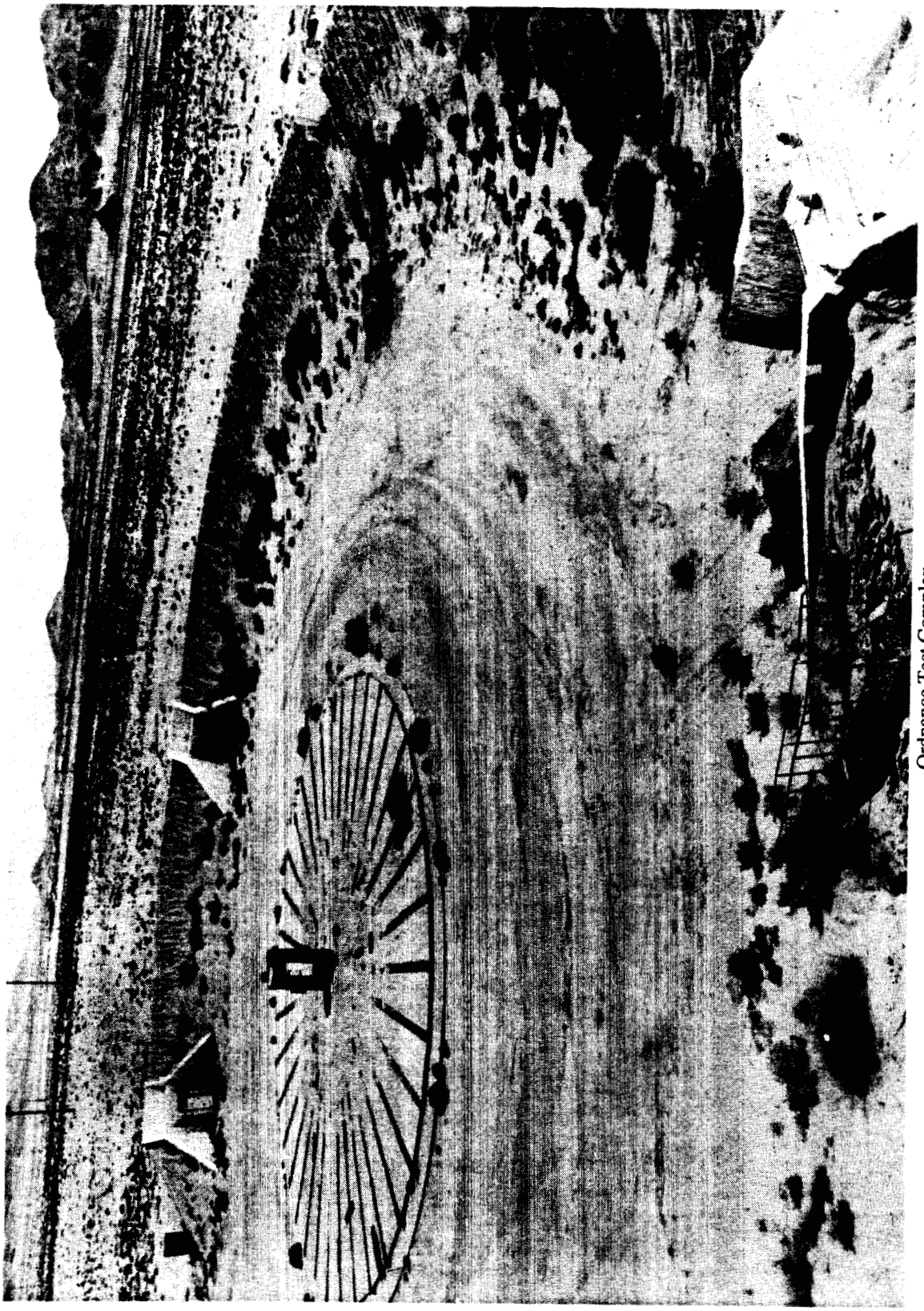
Ordnance Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Ordnance Test Complex Elements • Warhead Testing/Area R Fac • Warhead Test/Burro Canyon Areas • Warhead Test/CT-6 Test Area • Safety Test/Facilities CT-1 and CT-4	Yes	Yes	No	$5,588K = Total $3,905K = Buildings

Facility Description (contd.). The Ordnance Test Complex consists of five major geographic test areas consisting of 22 separate test sites or bays to perform a full spectrum of ordnance activation tests, including fast and slow cookoff, bullet impact, fragment impact, drop, sympathetic detonation, liquid fuel and fuel-air explosive mixtures, and large-scale arena detonations. There are 33 structures, including six control rooms supporting these test areas and with associated assembly and storage buildings. The facilities are geographically separated (22 miles maximum road distance), and all have expansion capabilities for future growth if necessary. Area R has the smallest ordnance siting of 200 pounds explosive, Classes 1.1 through 1.3 inclusive. Burro Canyon can test to 14,000 pounds of Classes 1.1 and 1.2 and 200,000 pounds of Class 1.3. The CT sites are capable of testing up to 3,000 pounds of all classes. All sites have sensors for test support (pressure, temperature, velocity, etc.) and photo coverage. High-speed photography up to 10,000,000 frames per second is available at Area R.

This equipment is unique because with the test arenas at Burro Canyon fully operational, there are no other government facilities specifically sited for this type of large static firing arena test capability. There are other activation sites, sited at lower explosive limits at other government agencies; however encroachment is rapidly taking them over. Burro Canyon and the CT test sites are still capable of expansion for test growth if required.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	5
Weapons, Conventional Missiles/Rockets	68
Weapons, Bombs	24
Weapons, Guns and Ammunition	3



Ordnance Test Complex

R

Propellants and Explosive Formulation Laboratories

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Propellants and Explosive Formulation Labs	No	No	No	$17,484K = Total $14,945K = Buildings

Facility Description (contd.). The facility's mission is to develop technology in new areas of propellant formulation and explosive formulation and assist in the application of these new propellants and explosives to current and future Navy tactical weapons, and to develop technology in new areas of high-temperature ordnance materials.

The facility is devoted to propellant and explosives formulation (weighing, mixing, casting, curing) and ingredient preparation and consists of three major laboratory buildings (13100, 10560, 15510); a fuels laboratory (13470); and a general chemistry laboratory (13060). The facility includes associated chemical storage buildings, magazines, shop, office building, etc. totaling some 60 structures spread over about 8 square miles. Six 1-pint , one 1-gallon , one 50-gram (1/10 pint), and one 1/4-pint Baker Perkins propellant/explosives mixers in eight mix bays, two explosives presses, three slurry kettles, a horizontal mixer/extruder and other equipment are housed and operated in the three major laboratory buildings.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	75
Weapons, Cruise Missiles	10
Weapons, Bombs	10
Weapons, Guns and Ammunition	5

This facility is currently used for R&D (including S&T, D&E, and IE).

Propellants and Explosive Formulation Laboratories

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Propellants and Explosive Formulation Labs	No	No	No	$17,484K = Total $14,945K = Buildings

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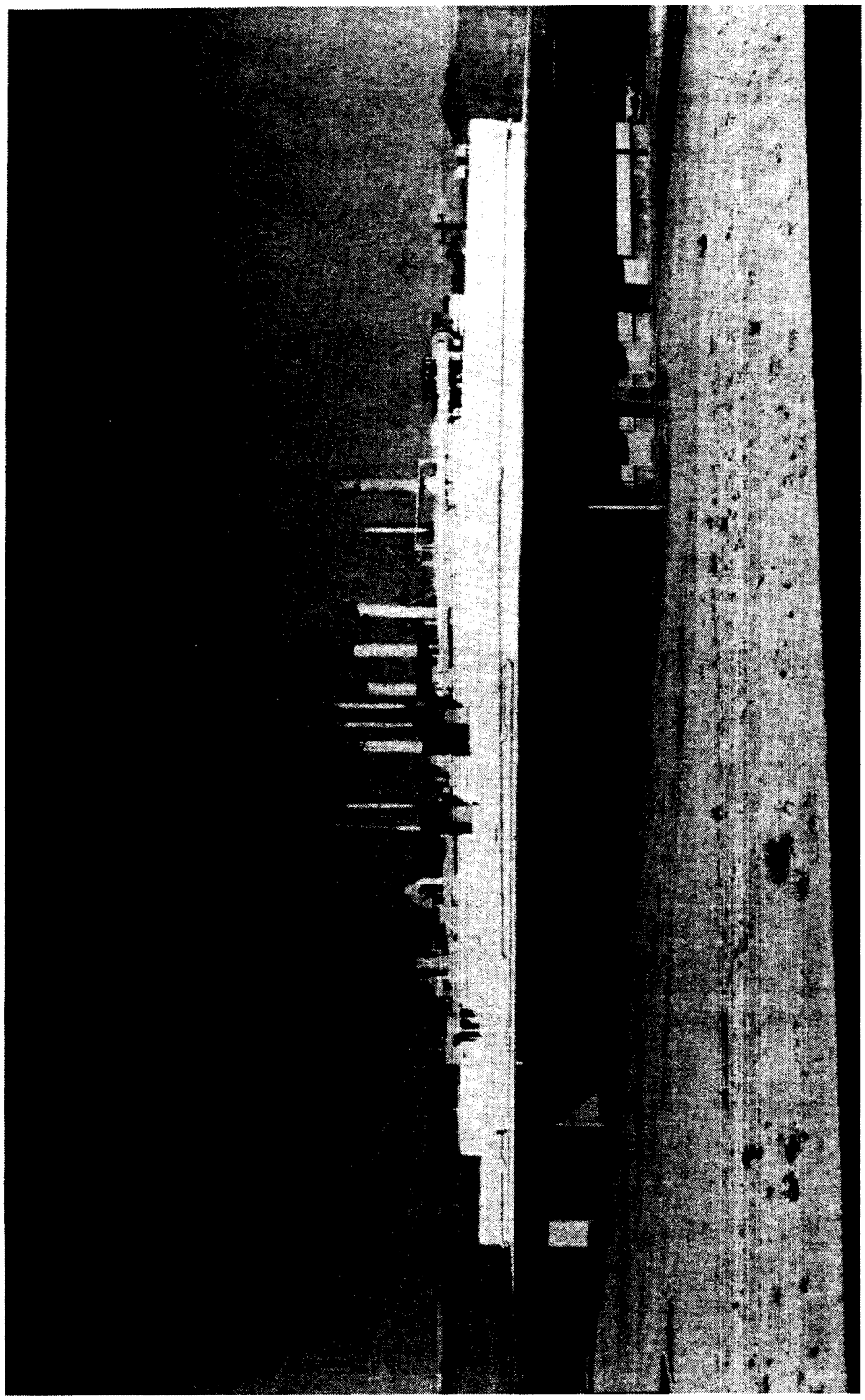
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	75
Weapons, Cruise Missiles	10
Weapons, Bombs	10
Weapons, Guns and Ammunition	5



Propellants and Explosive Formulation Laboratories

Propulsion and Energy Conversion Research Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Space Systems, Launch Vehicles Advanced Materials	Propulsion and Energy Conversion Research Facility Elements • Combustion Diagnostics and Plume Signature • Fire Research Test Fac • Propulsion Research Lab • Small-Scale Test Fac • Detonation Research Fac • Energetic Materials R&D	Yes	Yes	Yes	$43,020K = Total $22,820K = Buildings

Facility Description (contd.). This facility consists of seven major individual laboratory sites: 1) Energetic Material Synthesis; 2) Energetic Materials Formulation R&D Facility; 3) Small-Scale Test Facilities; 4) Detonation Sciences Research Laboratories; 5) Fire Research Test Facility; 6) Propulsion Research Laboratory; and 7) Combustion Diagnostics and Plume Signature Laboratory. In this agglomerate of unique facilities one can take a new energetic molecule from first conception and formulate and evaluate its performance and hazards for utilization in an all-up weapon. For example, CL-20 was recently evaluated in this fashion in a period of 3 to 5 years.

This equipment is unique because it is the only experimental combustion instability facility; the only air-breathing facility with integral diagnostic tools; the only shock diagnostic and detonation physics facility that can study up to 2 pounds of energetic material; and the only turn-to-violent reaction facility that can conduct full motor testing. This is the only facility capable of scaling up a new energetic ingredient and performing a complete evaluation of its hazards and performance as a propellant or explosive, complete hazards evaluation of energetic materials as well as real motors, and unique 3-D imaging of plume and flow fields time resolved imaging.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	50
Weapons, Conventional Missiles/Rockets	30
Weapons, Cruise Missiles	10
Weapons, Bombs	3
Space Systems, Launch Vehicles	2
Advanced Materials	5

This facility is currently used for R&D (including S&T, D&E, and IE).

Propulsion and Energy Conversion Research Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Space Systems, Satellites Advanced Materials	Propulsion and Energy Conversion Research Facility Elements • Combustion Diagnostics and Plume Signature • Fire Research Test Fac • Propulsion Research Lab • Small-Scale Test Fac • Detonation Research Fac • Energetic Materials R&D	Yes	Yes	Yes	$43,020K = Total $22,820K = Buildings

Facility Description (contd.). This facility consists of seven major individual laboratory sites: 1) Energetic Material Synthesis; 2) Energetic Materials Formulation R&D Facility; 3) Small-Scale Test Facilities; 4) Detonation Sciences Research Laboratories; 5) Fire Research Test Facility; 6) Propulsion Research Laboratory; and 7) Combustion Diagnostics and Plume Signature Laboratory. In this agglomerate of unique facilities one can take a new energetic molecule from first conception and formulate and evaluate its performance and hazards for utilization in an all-up weapon. For example, CL-20 was recently evaluated in this fashion in a period of 3 to 5 years.

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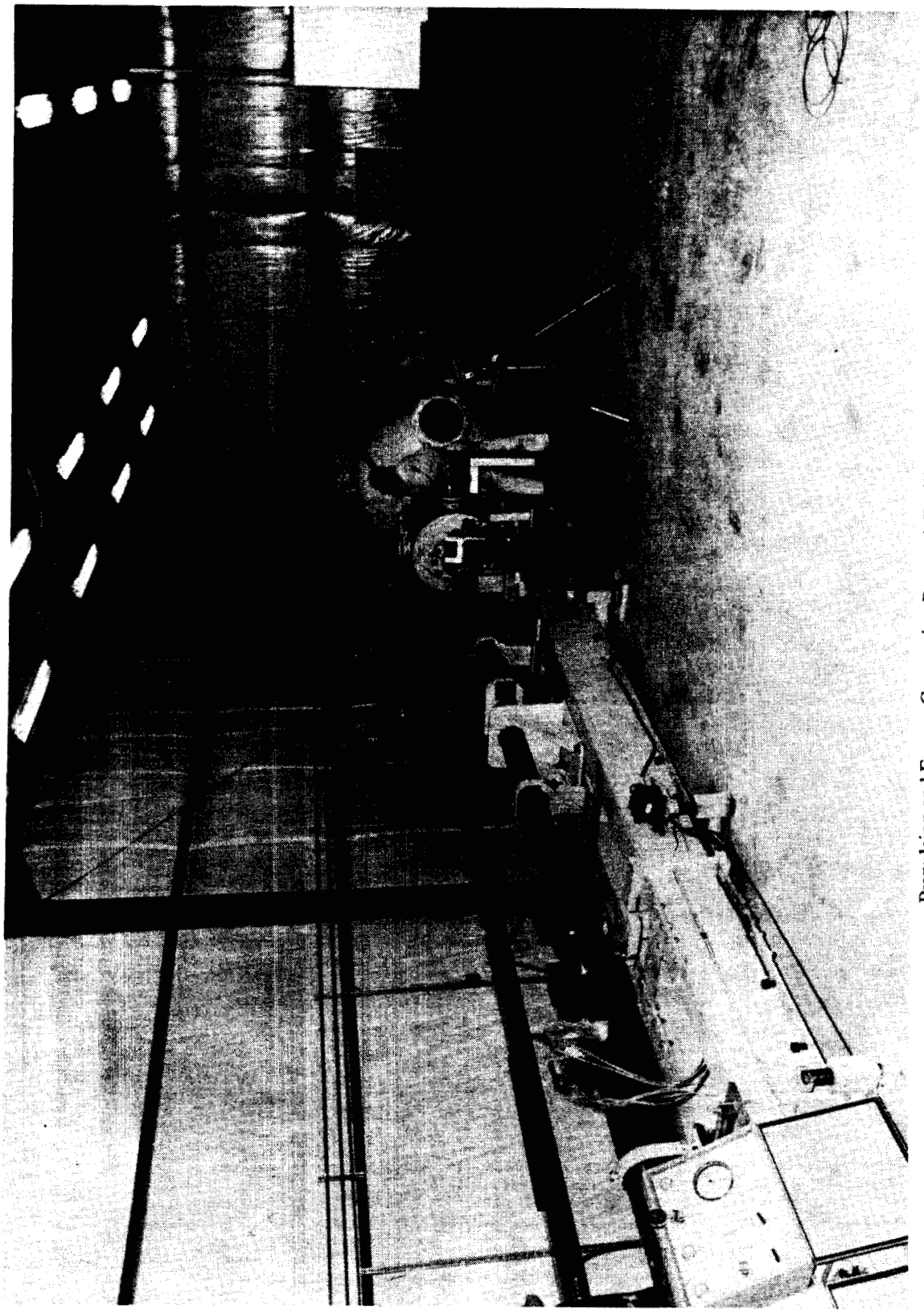
Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	50
Weapons, Conventional Missiles/Rockets	30
Weapons, Cruise Missiles	10
Weapons, Bombs	3
Space Systems, Satellites	2
Advanced Materials	5



Propulsion and Energy Conversion Research Facility

Recovery Systems Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Flight Subsystems Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Space Systems, Launch Vehicles	• Paraloft/Drying Tower • Drop Tower • Test Vehicle Build-Up Shop • QA Lab • Drop Zone	No	No	No	$1,400K

Facility Description (contd.). The facilities listed above are located either at main site or out on the test range at China Lake. They are instrumental in the RDT&E of recovery systems and related hardware.

The Paraloft/Drying Tower is adjacent to the airfield and is manned by qualified Navy test parachutists. Canopies up to 100 feet in diameter can be packed and repaired in the loft. The Drying Tower serves several purposes: drying parachutes after they have been cleaned or used in water-related missions, suspending aircrew personnel for proper sizing of MA-2 torso harnesses, and serving as a training arena for new test parachutist recruits.

The Drop Tower serves as a test platform to simulate parachute opening loads.

The Test Vehicle Build-Up Shop is the staging area for final preparation of test vehicles before testing.

The Quality Assurance Lab provides support to both R&D and Fleet Support Branches in the Division as well as serving as technical representative for ASO and DGSC procurement activities.

The Drop Zone is a 1-mile-diameter circle of cleared and leveled ground and is used for almost all personnel jumps and program work requiring a target area.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Flight Subsystems	40
Weapons, Conventional Missiles/Rockets	20
Weapons, Cruise Missiles	20
Space Systems, Launch Vehicles	20

This facility is used for R&D as well as T&E; however, the exact percentages are not available.

Recovery Systems Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Flight Subsystems Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Space Systems, Launch Vehicles	• Paraloft/Drying Tower • Drop Tower • Test Vehicle Build-Up Shop • QA Lab • Drop Zone	No	No	No	$1,400K

Facility Description (contd.). The facilities listed above are located either at main site or out on the test range at China Lake. They are instrumental in the RDT&E of recovery systems and related hardware.

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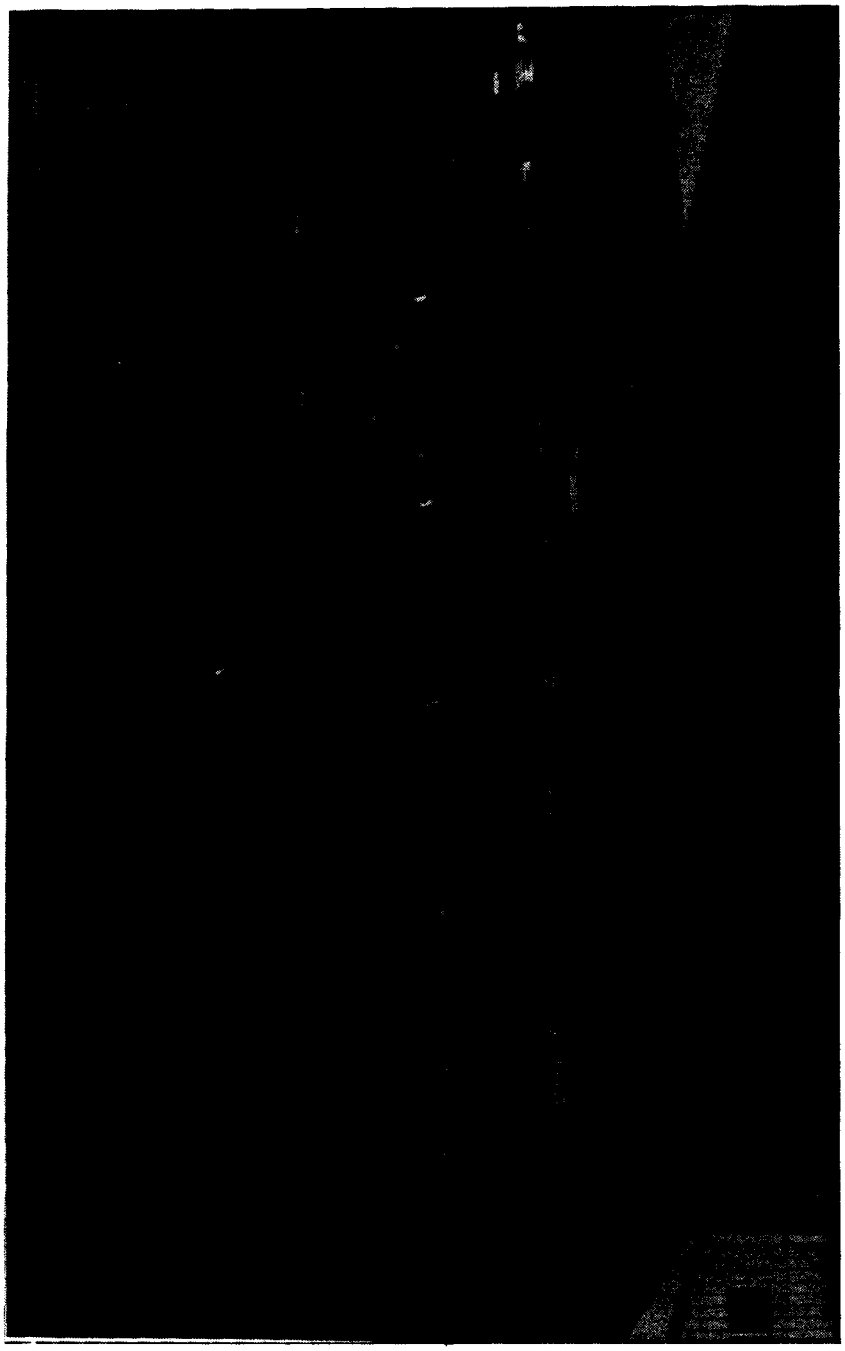
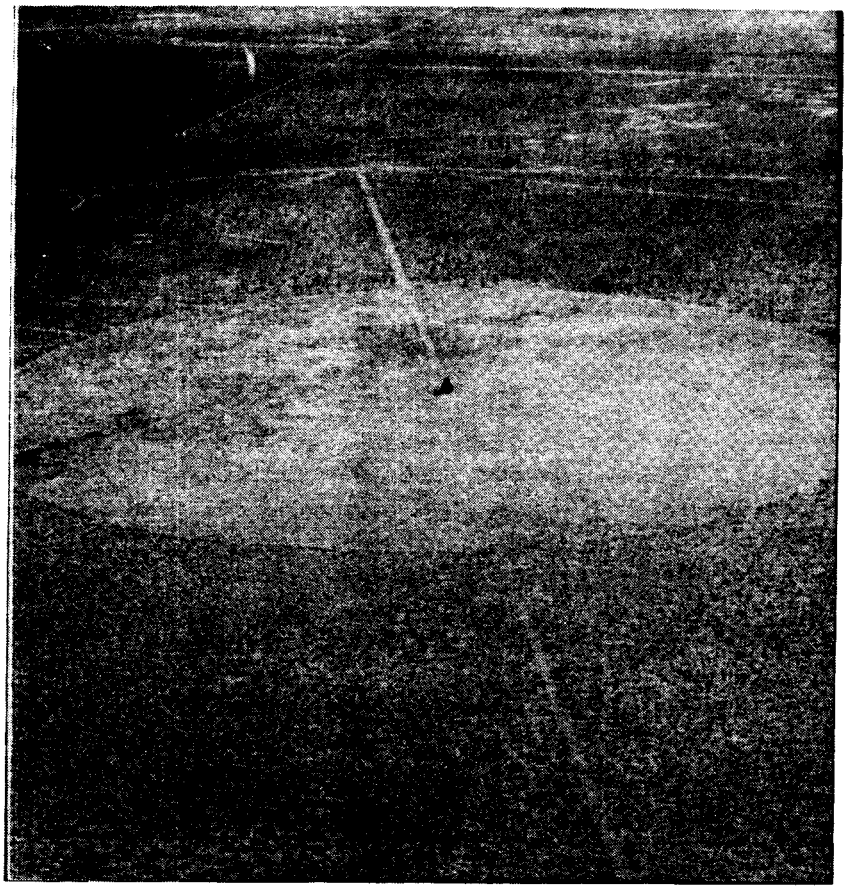
The Drop Zone is a 1-mile-diameter circle of cleared and leveled ground and is used for almost all personnel jumps and program work requiring a target area.

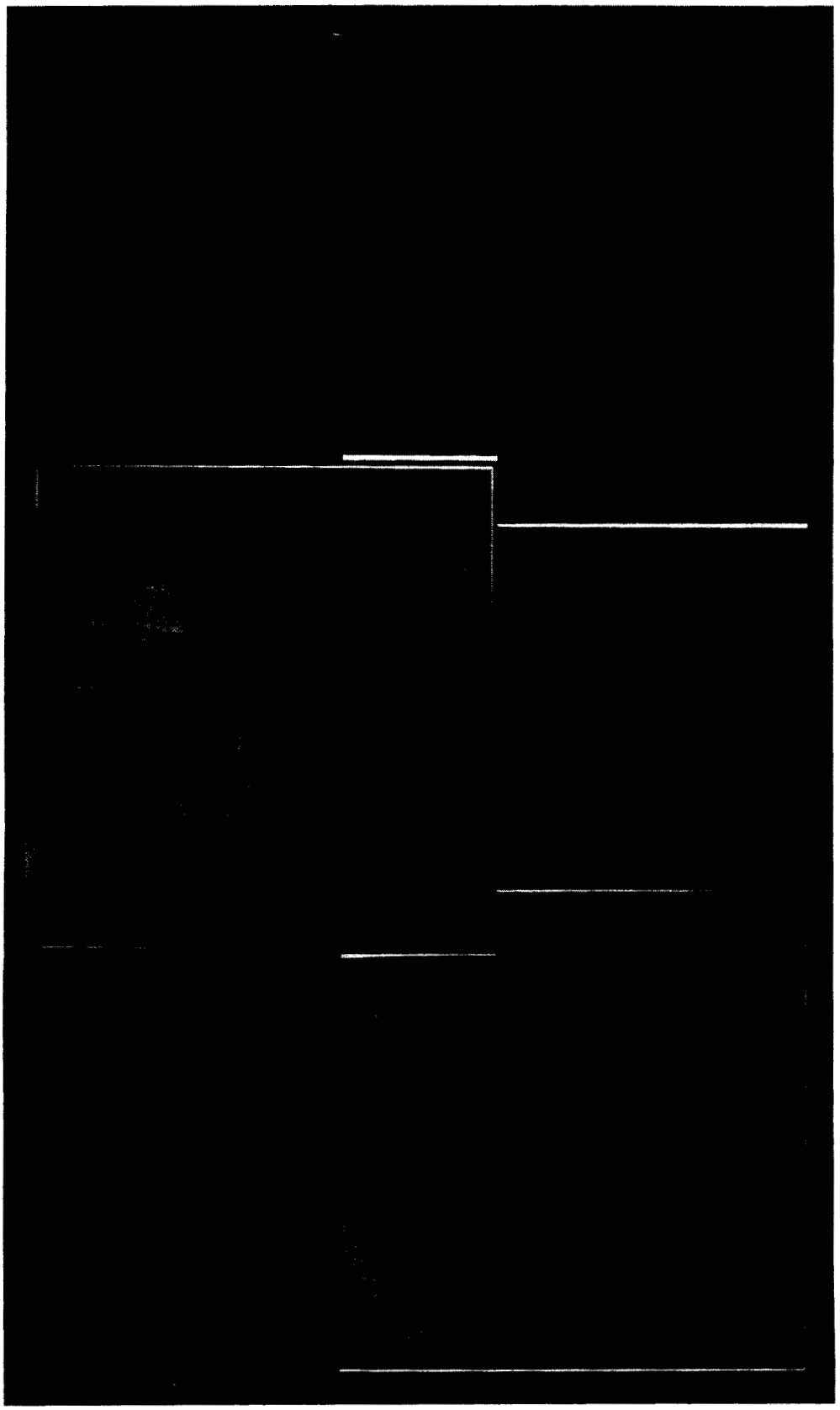
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Flight Subsystems	40
Weapons, Conventional Missiles/Rockets	20
Weapons, Cruise Missiles	20
Space Systems, Launch Vehicles	20



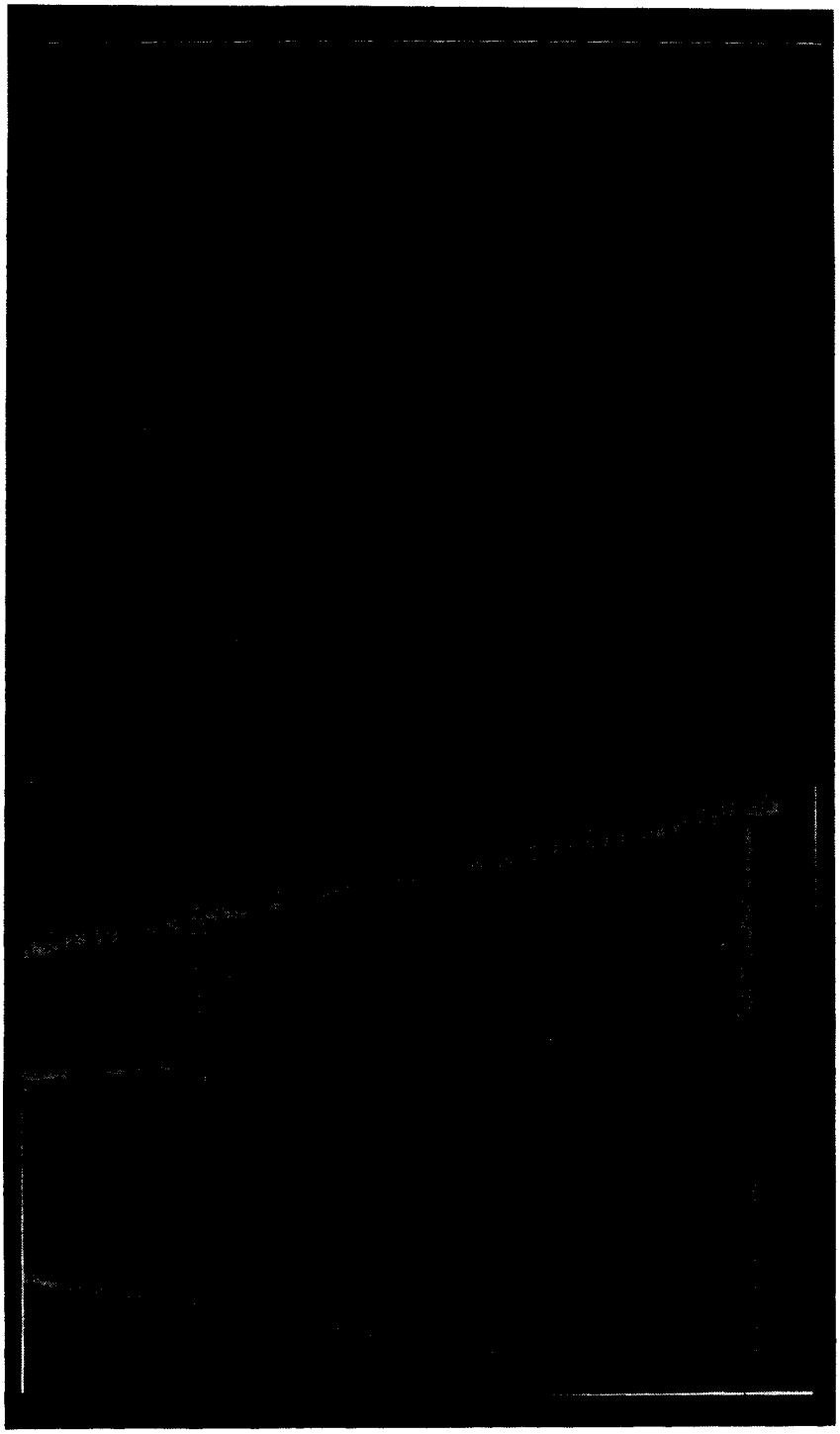
Recovery Systems Complex: Paraloft/Fabrication Building



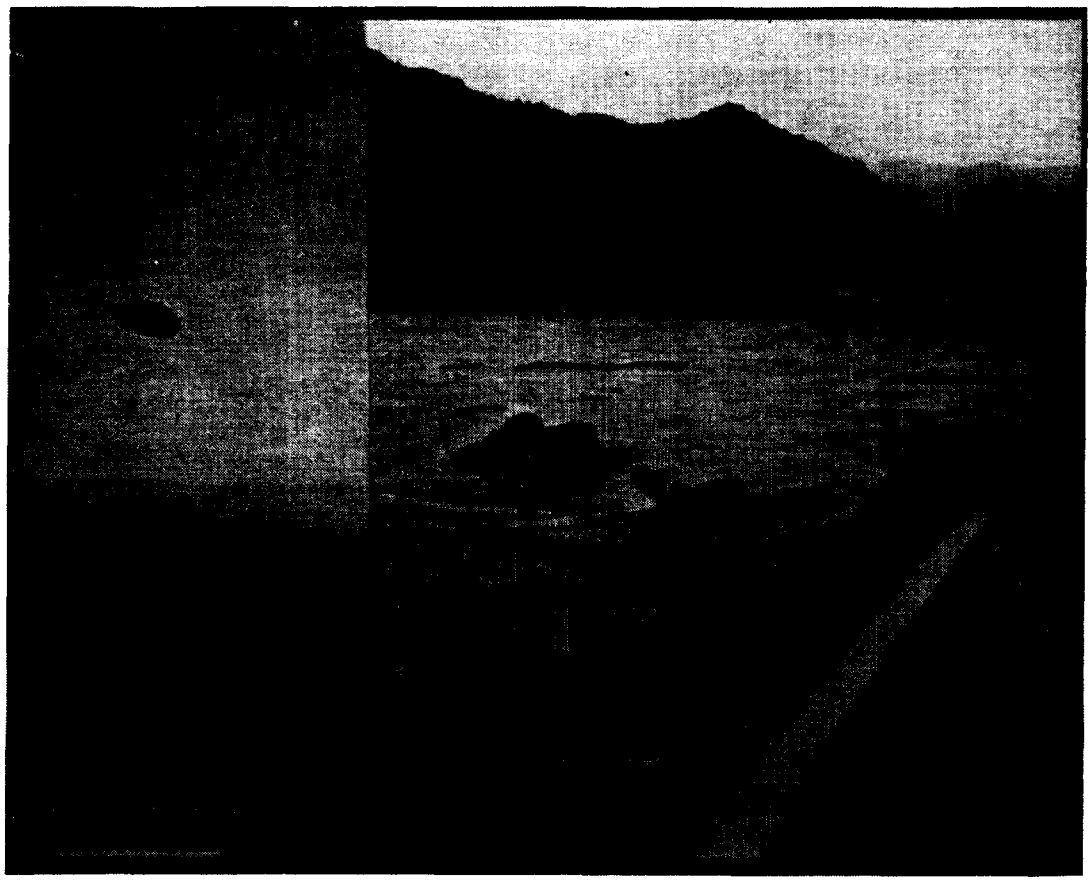
Recovery Systems Complex: Drop Zone



Recovery Systems Complex: Paraloft



Recovery Systems Complex: Drop Tower



Recovery Systems Complex: Water Drop Zone

Research Rockets Launch Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Space Systems, Launch Vehicles	Research Rockets Launch Complex	No	No	No	$10,000K

Facility Description (contd.). The mission of this launch complex is to support suborbital research rocket launches for NASA, AFGL, NRL, and commercial customers. This complex is sited at WSMR and includes facilities at Launch Complex (LC)-35, LC-36, and LC-37 supporting the buildup, integration, launch, and in-flight support of various high-altitude (up to 350 miles) suborbital research rockets. Launchers include one stool, one tower (160 foot rail), and two rail launchers (up to 40,000-pound capacity) at LC-36. Payload and ordnance buildup is supported with TMD facilities including a Missile Assembly Facility (MAF)-1 Bay, three hypergolic (liquid) fueling rooms, and an ordnance operating building at LC-37. Hardened blockhouses are located at LC-35 and LC-36 housing launch-control system, system monitoring equipments, range interface equipment, and configurable bays to meet unique payload monitoring and control requirements. Clean rooms support buildup of payloads. Launchers are environmentally enclosed providing weather protection and temperature control during buildup. Transient and permanent ordnance storage facilities are nearby. Some of these facilities are common to TMD Launch Complex elements.

Common Support Functions	Percentage
Space Systems, Launch Vehicles	100

Life-Cycle Functions	Percentage
T&E	100

Research Rockets Launch Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Space Systems, Launch Vehicles	Research Rockets Launch Complex	No	No	No	$10,000K

Facility Description (contd.). The mission of this launch complex is to support suborbital research rocket launches for NASA, AFGL, NRL, and commercial customers. This complex is sited at WSMR and includes facilities at Launch Complex (LC)-35, LC-36, and LC-37 supporting the buildup, integration, launch, and in-flight support of various high-altitude (up to 350 miles) suborbital research rockets. Launchers include one stool, one tower (160 foot rail), and two rail launchers (up to 40,000-pound capacity) at LC-36. Payload and ordnance buildup is supported with TMD facilities including a Missile Assembly Facility (MAF)-1 Bay, three hypergolic (liquid) fueling rooms, and an ordnance operating building at LC-37. Hardened blockhouses are located at LC-35 and LC-36 housing launch-control system, system monitoring equipments, range interface equipment, and configurable bays to meet unique payload monitoring and control requirements. Clean rooms support buildup of payloads. Launchers are environmentally enclosed providing weather protection and temperature control during buildup. Transient and permanent ordnance storage facilities are nearby. Some of these facilities are common to TMD Launch Complex elements.

Common Support Functions	Percentage
Space Systems, Launch Vehicles	100

Research Rockets Launch Complex

RF Seeker/Guidance/Control DDT&E Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Directed Energy	RF Seeker/Guidance/ Control DDT&E Complex Elements • Antenna Range • Diagnostic Chamber • Antenna/Radome Test Fac	Yes	Yes	Yes	$29,800K = Total $ 5,403K = Buildings

Facility Description (contd.). The primary purpose of this complex is to perform measurements of missile guidance/control systems, antennas (both missile and target), and antenna/radomes, and to perform RCS measurements of targets. The Diagnostic Chamber provides a powerful diagnostic tool to measure and reduce the effective RCS of an object. The Antenna Range supports the measurement and validation of prototype and existing antenna systems (both missile and target). The Antenna/Radome Test Facility provides measurement, evaluation, analysis, design, and prediction/simulation of microwave and millimeter wave antennas and radome subsystems (missile only). The Weapon Guidance/Control Lab provides specialized laboratory facilities and test equipment for multiple Sidewinder and RAM missile configurations.

This equipment is unique because the Diagnostic Chamber has the capability of making RCS and antenna measurements simultaneously. This is a very important feature because the Chamber can be used to reduce the RCS of antennas or measure the RCS with antennas present on the object. The Antenna Range is unique because it has two-way measurement capability, which involves measuring multiple channels simultaneously. The Antenna/Radome Test Facility is unique because it supports multiple programs. The Millimeter Wave Lab's work on solid state devices missile radar transmitters and related components is vital to future weapon systems.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	1
Weapons, Conventional Missiles/Rockets	98
Weapons, Directed Energy	1

Life-Cycle Functions	Percentage
T&E	16.5
S&T	40.2
D&E	41.3
IE	1.6
T&D	0.4
Other	0

RF Seeker/Guidance/Control DDT&E Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Space Systems, Satellites	RF Seeker/Guidance/ Control DDT&E Complex Elements • Antenna Range • Diagnostic Chamber • Antenna/Radome Test Fac	Yes	Yes	Yes	$29,800K = Total $ 5,403K = Buildings

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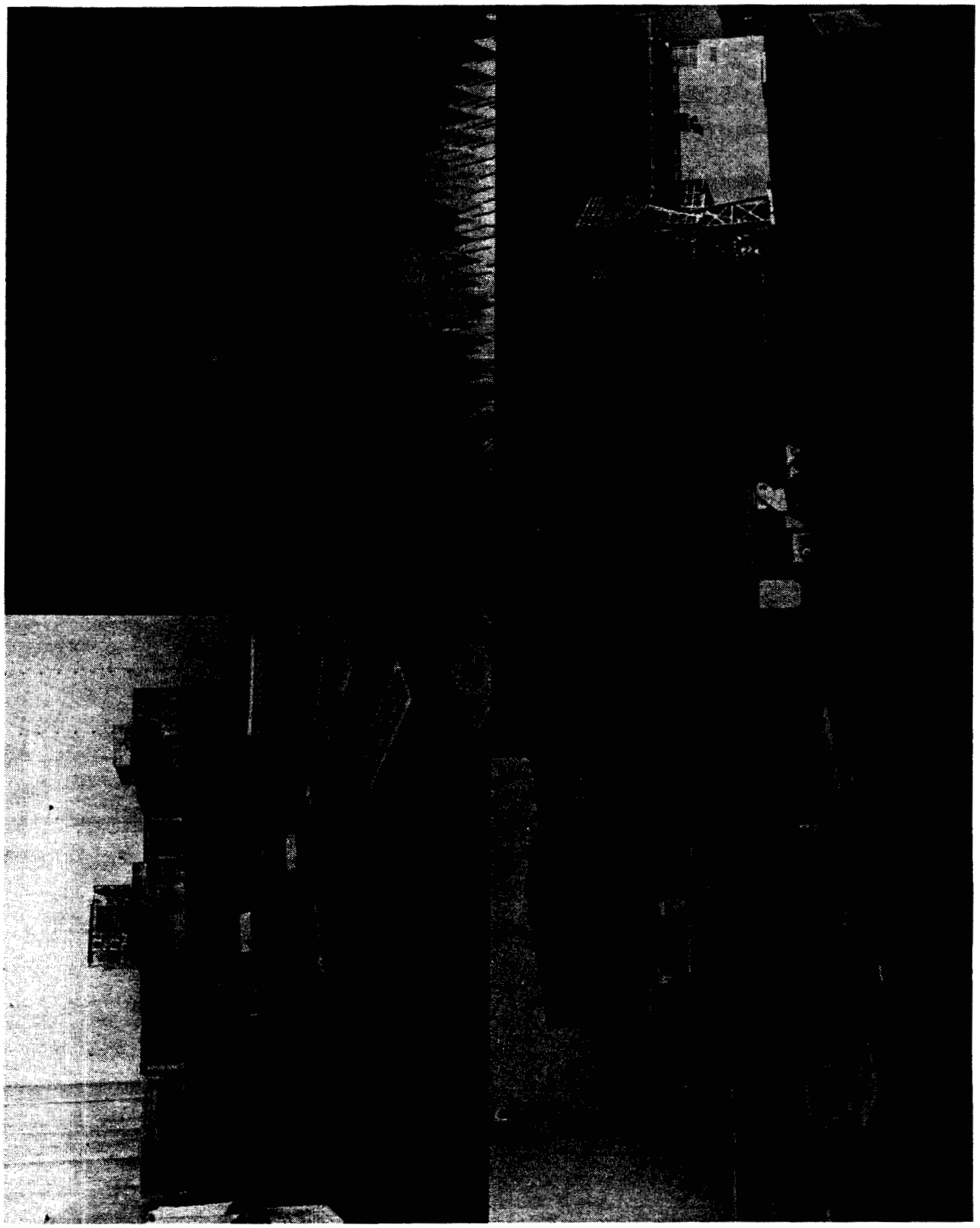
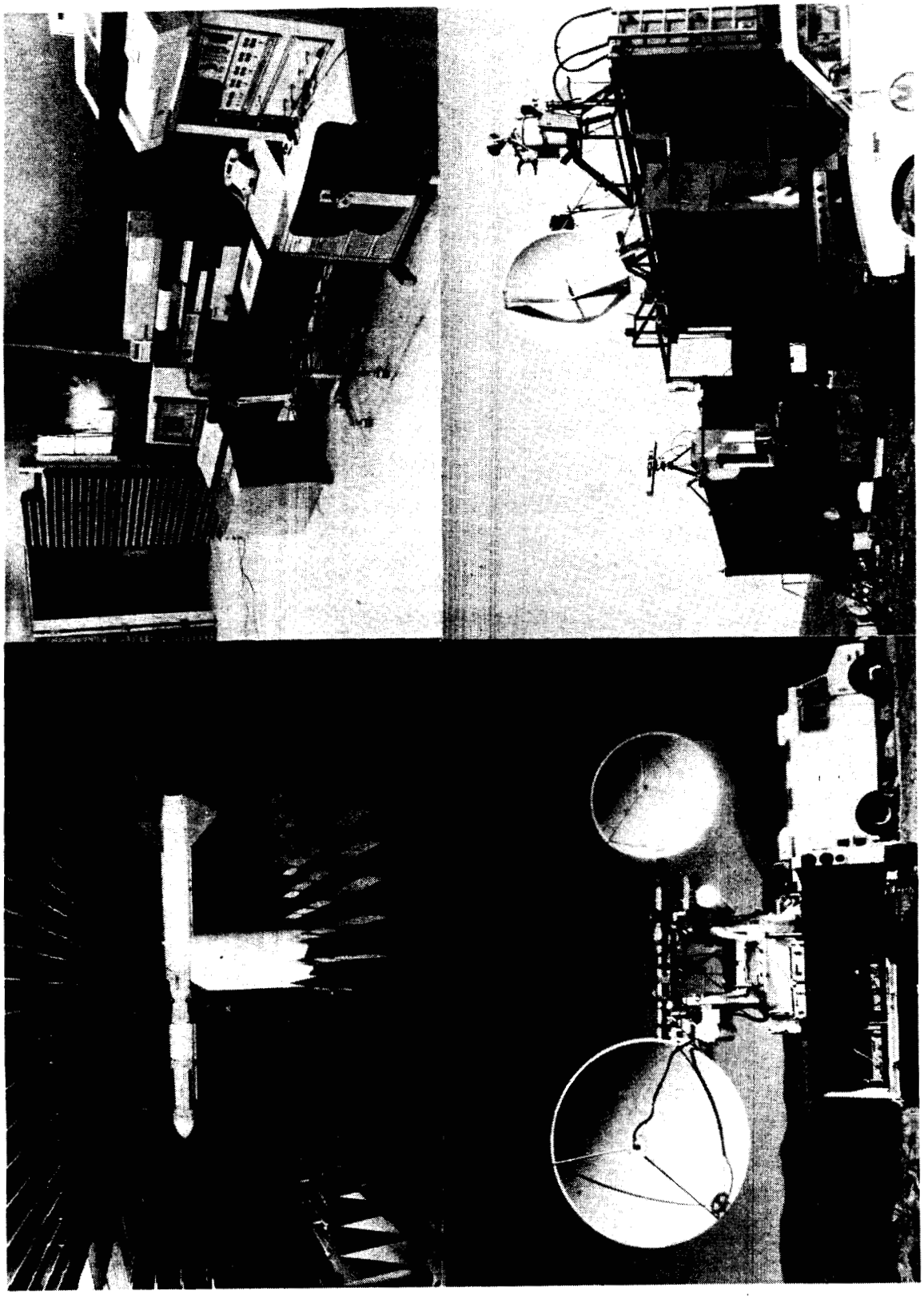
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	1
Weapons, Conventional Missiles/Rockets	98
Space Systems, Satellites	1



RF/Seeker/Guidance/Control DDT&E Complex



RF/Seeker/Guidance/Control DDT&E Complex

Sensor and Targeting Technology Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicle, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Guided Projectiles Electronic Devices	Sensor and Targeting Technology Facility Elements • Signal Exploitation Development Lab • Laser Sensors Lab • Crewstation Simulation Lab • Image Processing Lab • Signal Exploitation Development Lab • Multisensor Integration/ Correlation Lab • Targeting Lab • RF Sensor Development Lab	Yes	Yes	Yes	$13,520K = Total $ 3,760K = Buildings

Facility Description (contd.). The RF Sensor Active Array Lab performs development and T&E of advanced RF sensors and sensor modes for weapons and aircraft. The facility consists of a compact antenna measurement chamber, a fabrication and assembly area, RF and laboratory test equipment, and computer data acquisition equipment. Example activities include RF testing of radome and antenna for AV-8, testing of advanced EW receiver, beamforming experiments with both x-band and wideband active arrays, testing of advanced active array modes, and T&E of advanced sensors for weapon seekers.

The RF Sensor Near Field Lab performs development and T&E of advanced RF sensors for weapons and aircraft.

The mission of the RF Sensor Near Field Lab is to directly support the Fleet with modern signal-processing equipment and information, and to provide immediate intelligence for tactical indication and warning as well as up-to-date capability assessment. To accomplish this mission, the facility is equipped with two Top Secret SCI/TEMPEST-certified vaults and a variety of special equipment and software. The equipment includes general test equipment and specially built equipment and stations. The special equipment and software were developed internally to support this specific mission.

The Passive Electro Optical Sensors Lab contains facilities and equipment required for the evaluation of advanced electro-optic sensor systems and weapon systems.

The Multisensor Integration/Correlation Lab contains facility and equipment for the development of image-processing techniques applied to air-to-ground sensors and weapon systems, and simulation capabilities for evaluating and developing air-to-air multisensor tracker performance.

The Targeting Lab consists of a set of about 15 workstations networked together to provide 1) automatic target-recognition-algorithm and systems development capability, 2) processing of targeting data, and 3) simulation of automatic real-time target selection.

The Targeting Lab contains facilities and equipment required for the evaluation of advanced electro-optic sensor systems and weapon systems.

The Sensor and Targeting Technology Facility includes computer, videotape, optical disk, and related equipment required to support 6.2 research in the field of multisensor integration, image enhancement, and image correlation.

This equipment is unique because the RF Sensor Development Lab contains hardware and software to develop and test the country's largest wideband active array.

Common Support Functions	Percentage
Air Vehicle, Fixed Wing, Avionics	20
Weapons, Conventional Missiles/Rockets	25
Weapons, Cruise Missiles	30
Weapons, Guided Projectiles	15
Electronic Devices	10

Life-Cycle Functions	Percentage
T&E	13
S&T	57
D&E	16
IE	11
T&D	3
Other	0

The Targeting Lab consists of a set of about 15 workstations networked together to provide 1) automatic target-recognition-algorithm and systems development capability, 2) processing of targeting data, and 3) simulation of automatic real-time target selection.

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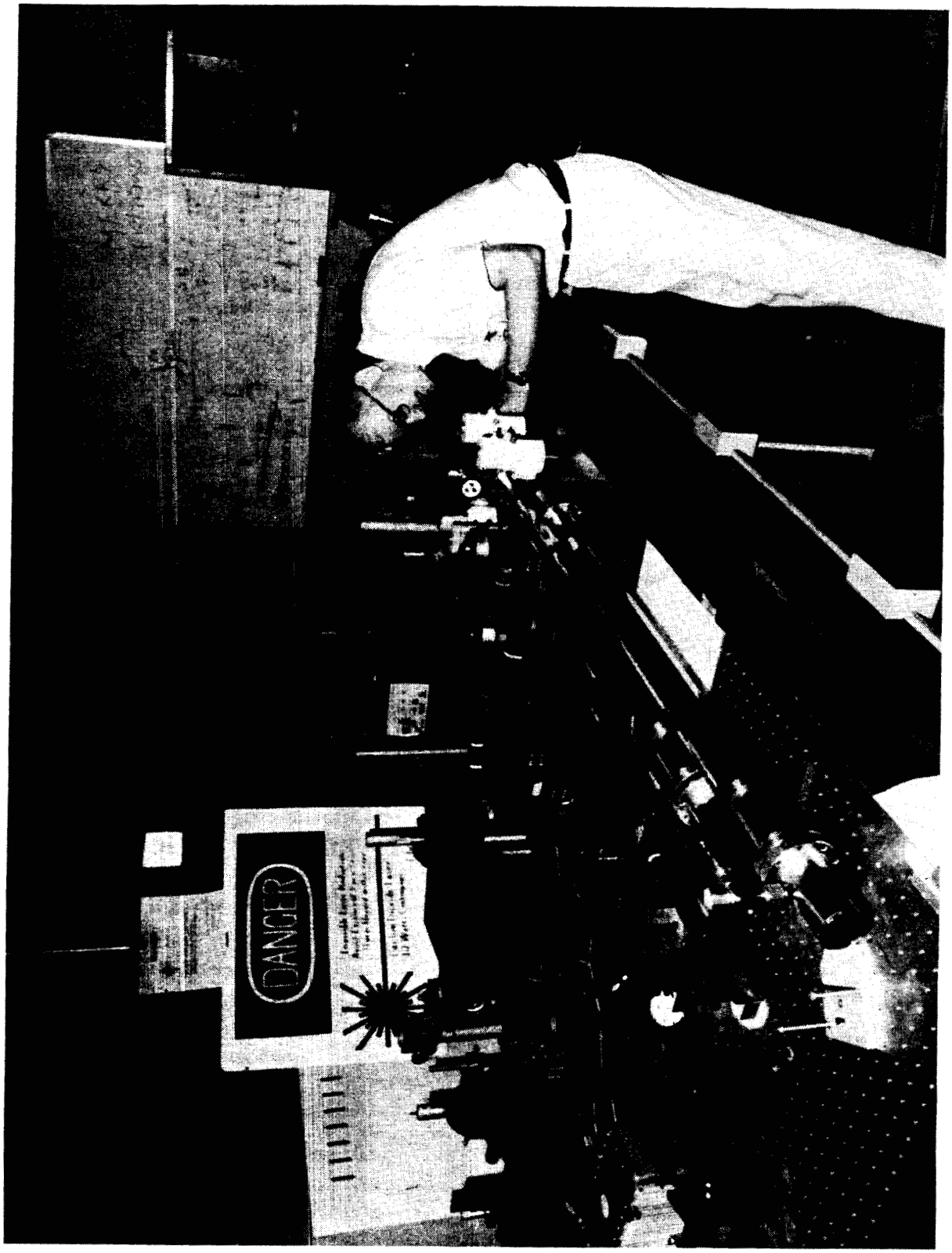
Common Support Functions	Percentage
Air Vehicle, Fixed Wing, Avionics	20
Weapons, Conventional Missiles/Rockets	25
Weapons, Cruise Missiles	30
Weapons, Guided Projectiles	15
Electronic Devices	10

Sensor and Targeting Technology Facility



Sensor and Targeting Technology Facility

Ship Self Defense Test Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Ship Self Defense Test Complex	Yes	Yes	Yes	$6,000K

Facility Description (contd.). NAWCWPNS White Sands Ship Self Defense Test Complexes two launch sites with southern and central locations at White Sands Missile Range support Ship Self Defense Surface-to-Air testing of Navy Weapon Systems. The mission of this facility supports the land-based developmental engineering and production surveillance of Navy self-defense ship-to-air missiles. Specifically, this test complex is the Land Based Test Site (LBTS) for the Rolling Airframe Missile (RAM) and Vertical Launch NATO Seasparrow. Site blockhouses are hardened for close-in live fire weapon test against low-/high-altitude single and multiple subscale, subsonic aerial targets. Short-range self-defense engagements are conducted with the target(s) directed radially inbound toward the weapon system. Weapon system equipments and personnel are located in hardened earth-covered bunkers with launchers, antenna, and other ancillary support equipments located above ground. Hazardous pretest ordnance assembly and missile system checks are safely performed at the NAWCWPNS Missile Assembly Facility. NAWCWPNS engineering, industrial, machine shop, and crane services fully support unique fabrication, installation and test activities.

This equipment is unique because this test complex is the Navy's only land-based test site for RAM and Vertical Launched NATO Seasparrow.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	100

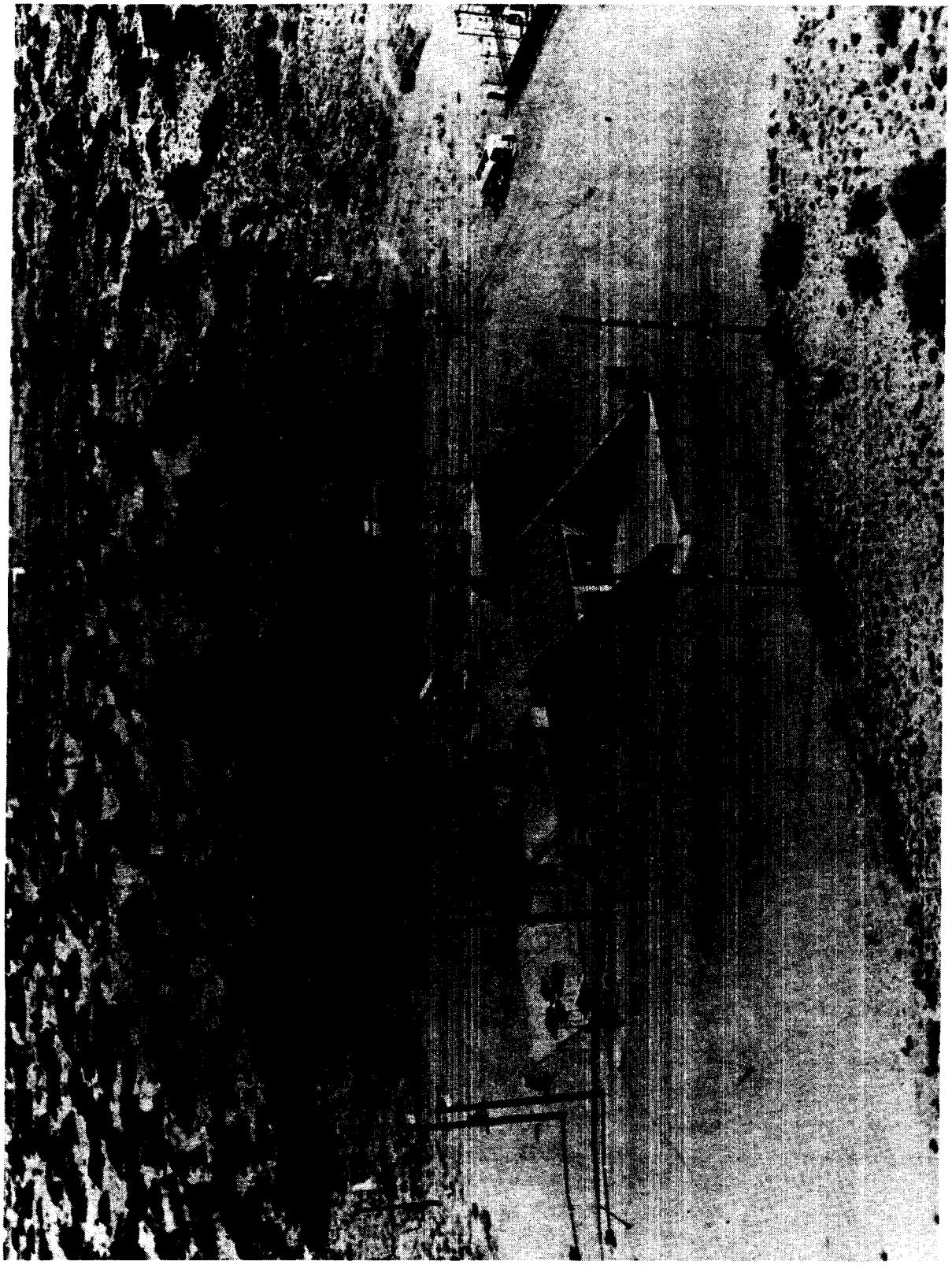
Ship Self Defense Test Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Ship Self Defense Test Complex	Yes	Yes	Yes	$6,000K

Facility Description (contd.). NAWCWPNS White Sands Ship Self Defense Test Complexes two launch sites with southern and central locations at White Sands Missile Range support Ship Self Defense Surface-to-Air testing of Navy Weapon Systems. The mission of this facility supports the land-based developmental engineering and production surveillance of Navy self-defense ship-to-air missiles. Specifically, this test complex is the Land Based Test Site (LBTS) for the Rolling Airframe Missile (RAM) and Vertical Launch NATO Seasparrow. Site blockhouses are hardened for close-in live fire weapon test against low-/high-altitude single and multiple subscale, subsonic aerial targets. Short-range self-defense engagements are conducted with the target(s) directed radially inbound toward the weapon system. Weapon system equipments and personnel are located in hardened earth-covered bunkers with launchers, antenna, and other ancillary support equipments located above ground. Hazardous pretest ordnance assembly and missile system checks are safely performed at the NAWCWPNS Missile Assembly Facility. NAWCWPNS engineering, industrial, machine shop, and crane services fully support unique fabrication, installation and test activities.

This equipment is unique because this test complex is the Navy's only land-based test site for RAM and Vertical Launched NATO Seasparrow.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



Ship Self Defense Test Complex

Signature Measurements and Evaluation

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets	Signature Measurements and Evaluation Elements • Track Mount and Instrumentation Van • Signature Measurement and Evaluation	Yes	Yes	Yes	$10,000K = Total $ 252K = Buildings

Facility Description (contd.). The facility consists of portable vans, trucks, laboratories, and buildings. The mission is to perform electro-optical infrared field measurements of targets and backgrounds in support of EO weapons development, evaluation, and testing, and to determine the effectiveness of EO weapons against targets. The facility uses actual domestic and foreign seeker systems as well as infrared spectrometer, imagers, and radiometers to produce these data. The facility provides support to all services in radiometrics, evaluation of target signatures and performance of both domestic and foreign seekers. The track mount instrumentation van consists of an M-45 mobile tracking camera mount and an instrumented test van that can be used to control the test, test sensors, and collect and record data.

This equipment is unique because the ability to exploit foreign IR seeker systems and use them to determine performance of domestic systems in a threat environment, coupled with truly calibrated IR measurement capability, certainly is unique.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	85

This facility is currently used for R&D (including S&T, D&E, and IE).

Signature Measurements and Evaluation

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets	Signature Measurements and Evaluation Elements • Track Mount and Instrumentation Van • Signature Measurement and Evaluation	Yes	Yes	Yes	$10,000K = Total $ 252K = Buildings

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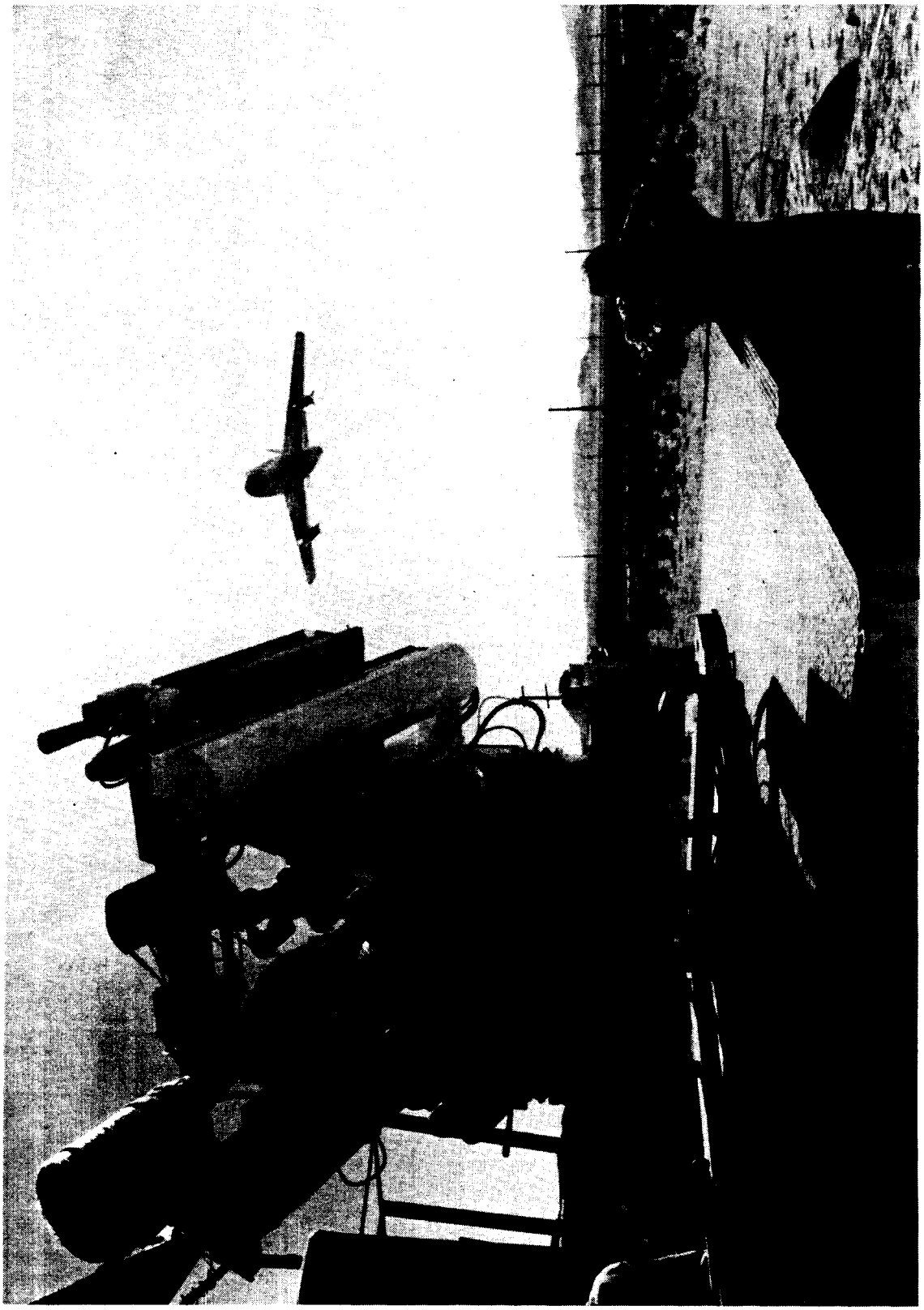
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	85



Signature Measurements and Evaluation

Simulation Laboratory—Missile HITL

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Simulation Laboratory—Missile HITL	Yes	Yes	Yes	$50,400K = Total $10,400K = Buildings

Facility Description (contd.). The China Lake Missile Simulation Laboratory (SIMLAB) is a fully equipped, state-of-the-art, hardware-in-the-loop simulation facility, the acquisition cost of which has been close to $30M spread over 20 years. The SIMLAB consists of three RF facilities, two IR/EO facilities, an inertial flight table for testing inertial sensor packages, an imaging systems laboratory, and an assortment of real-time simulation computers and engineering workstations. Each of the RF facilities includes an anechoic chamber; a flight motion table; a target motion system; and RF target, background, and CM generation equipment. Each of the IR/EO facilities similarly includes a flight motion table; a target motion simulator; and a target, background, and CM presentation capability in multiple spectral bands. The facility operates as an "open shop" where project people develop their own simulation and generate their own data. The mission is complete evaluation of missile hardware from component level to total system performance, pre/post-flight hardware testing, and digital simulation validation.

This equipment is unique because the target generation equipment and SIMLAB-WSSF real-time data link are unique. In addition, the combination of the HITL SIMLAB with the colocated digital modeling and simulation capability, the design capability, HITL simulation, aircraft avionics facilities, and open-air range testing, provides a total weapons RDT&E capability that exists nowhere else. This colocation of facilities substantially multiplies the effective productivity, efficiency, and output of the facilities.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	90
Weapons, Cruise Missiles	10

Life-Cycle Functions	Percentage
T&E	20
S&T	40
D&E	40
IE	0
T&D	0
Other	0

Simulation Laboratory—Missile HITL

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Simulation Laboratory—Missile HITL	Yes	Yes	Yes	$50,400K = Total $10,400K = Buildings

Facility Description (contd.). The China Lake Missile Simulation Laboratory (SIMLAB) is a fully equipped, state-of-the-art, hardware-in-the-loop simulation facility, the acquisition cost of which has been close to $30M spread over 20 years. The SIMLAB consists of three RF facilities, two IR/EO facilities, an inertial flight table for testing inertial sensor packages, an imaging systems laboratory, and an assortment of real-time simulation computers and engineering workstations. Each of the RF facilities includes an anechoic chamber; a flight motion table; a target motion system; and RF target, background, and CM generation equipment. Each of the IR/EO facilities similarly includes a flight motion table; a target motion simulator; and a target, background, and CM presentation capability in multiple spectral bands. The facility operates as an "open shop" where project people develop their own simulation and generate their own data. The mission is complete evaluation of missile hardware from component level to total system performance, pre/post-flight hardware testing, and digital simulation validation.

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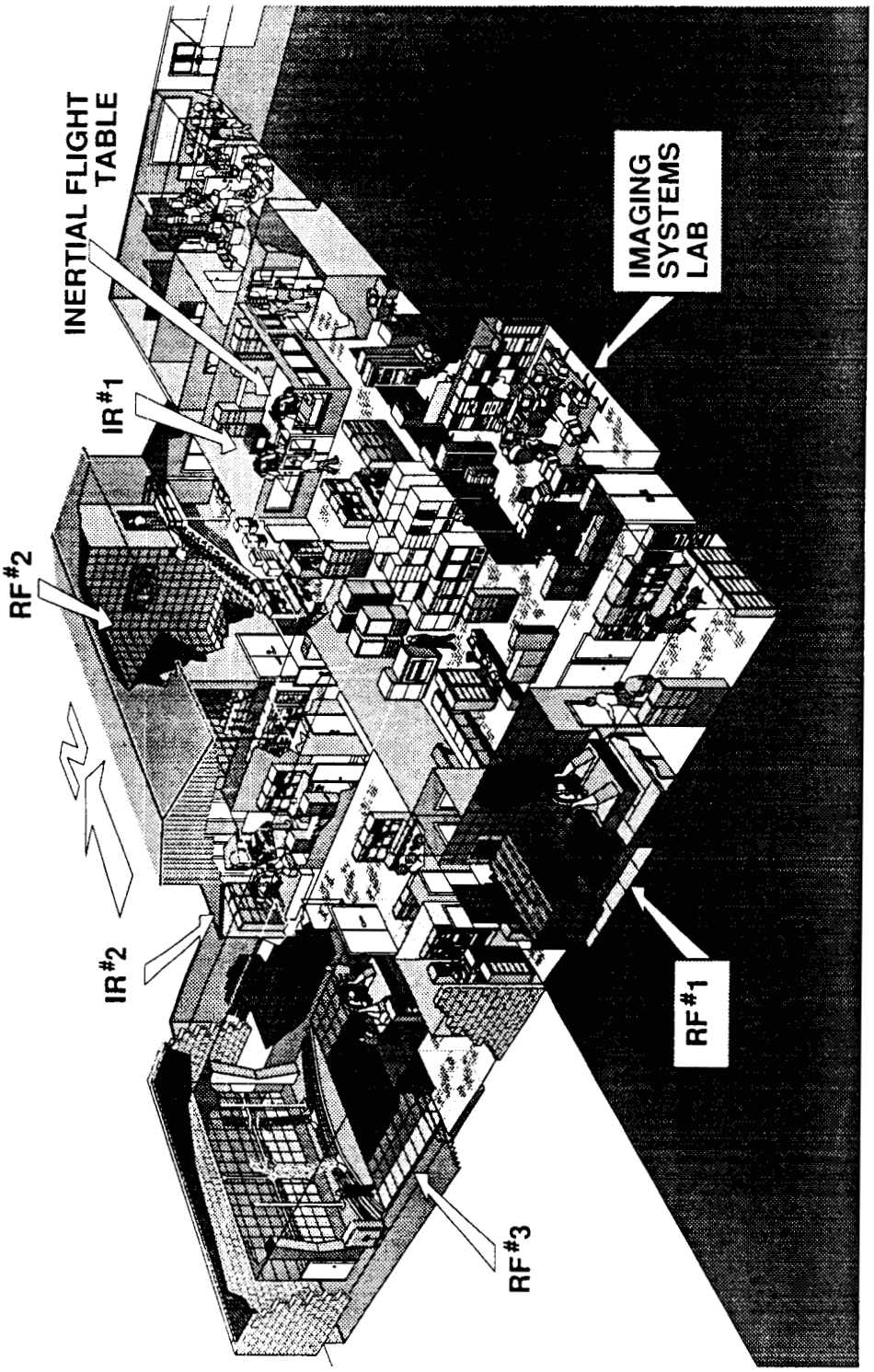
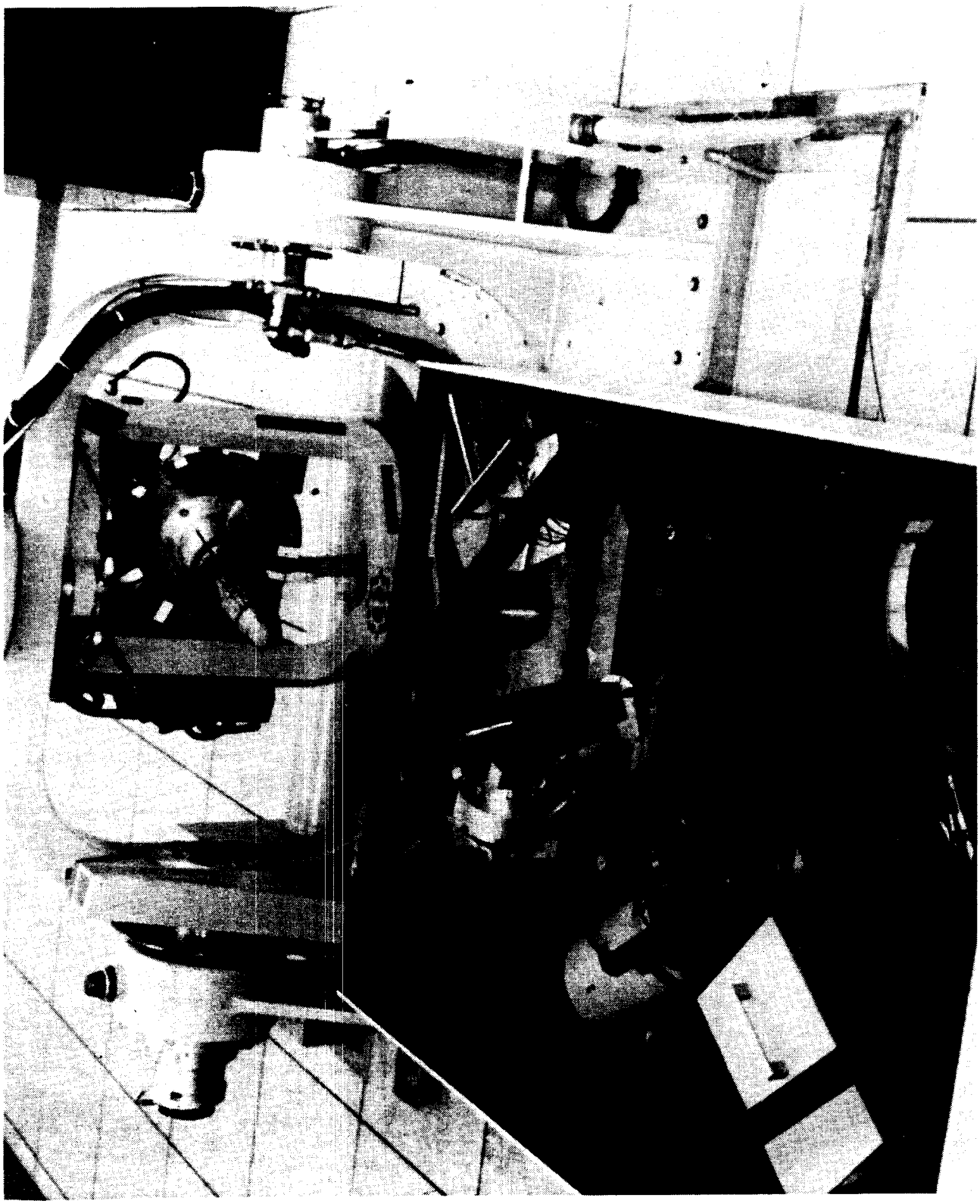
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	90
Weapons, Cruise Missiles	10



Simulation Laboratory—Missile HITL



Simulation Laboratory—Missile HITL

Sled Tracks

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Fixed Wing, Flight Subsystems Weapons, ICBMs/SLBMs Weapons Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Sled Tracks	No	No	No	$64,000K = Total $22,300K = Buildings

Facility Description (contd.). The 4-mile-long dual-rail Supersonic Naval Ordnance Research Track (SNORT) is the second-longest DOD sled track. In track testing, payloads and instrumentation are propelled by rocket-powered sleds along a set of straight, heavy-duty crane rails at speeds of up to 4,000 feet per second (Mach 3.5). Payloads normally weigh up to 25,000 pounds; however, depending on mission requirements, heavier payloads are possible. The length of the tracks allows support of relatively long-duration runs. A water brake is used to decelerate and recover sleds. A pair of 225-foot-tall steel towers are in place at trackside to suspend items over the track. The muzzle is readily reconfigured as an arena for warhead tests.

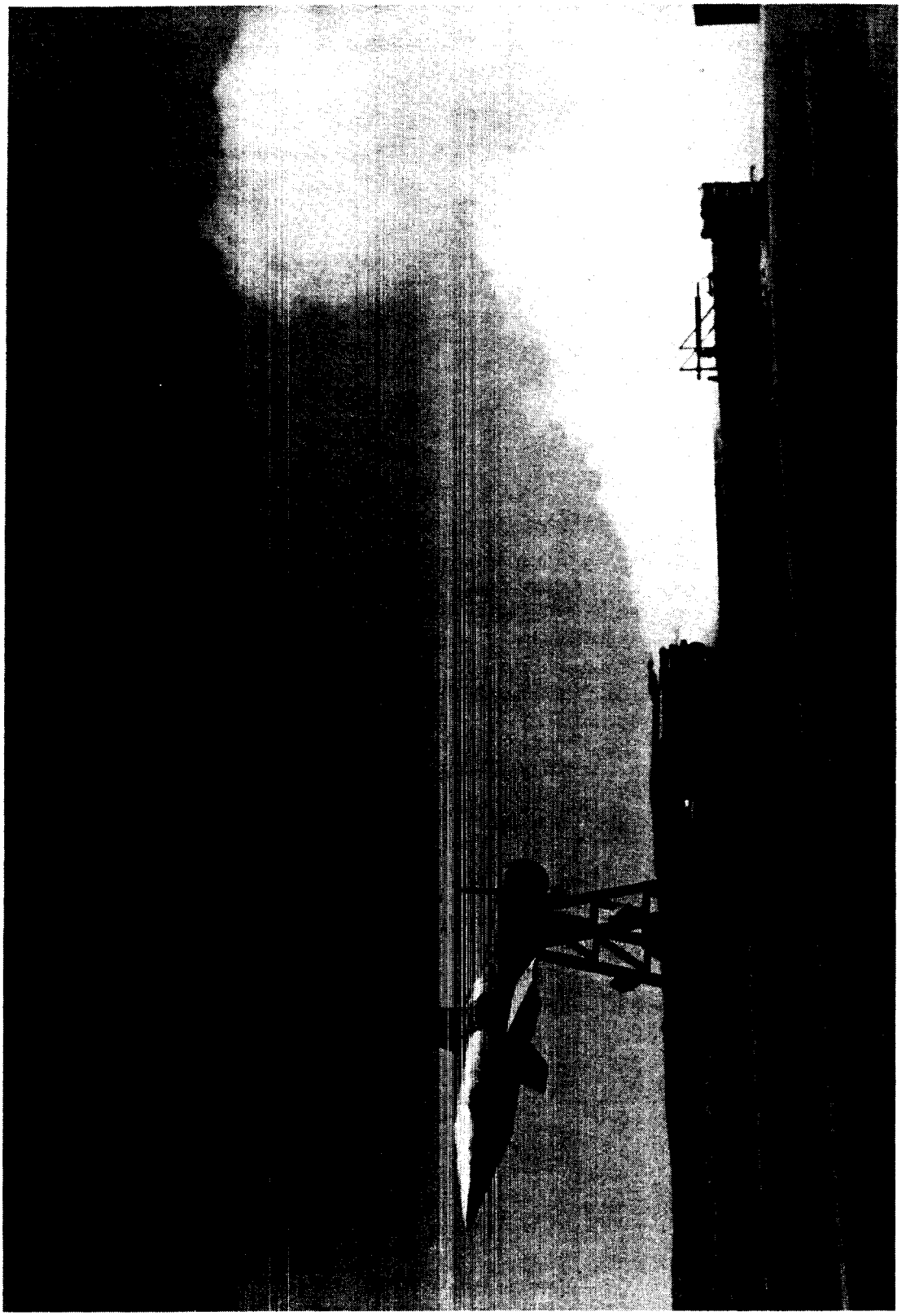
Several colocated facilities are operated by the Track Operations workforce and are available for on-demand service. These non-maintained facilities include the G-4 track, and accidental bomb release track, a vehicle barrier facility, a ramp launch facility, and a stationary test facility. The 3,000-foot-long dual-rail G-4 track is especially significant because it has the unique-in-the-nation capability of launching free-flight vehicles over a 500-foot-deep dry lake bed.

Major land areas available at all facilities can support detonations and/or free-flight release of weapons. Environmental concerns have not been a significant factor in operations.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	6
Air Vehicles, Fixed Wing, Flight Subsystems	8
Weapons, ICBMs/SLBMs	37
Weapons, Conventional Missiles/Rockets	36
Weapons, Cruise Missiles	10
Weapons, Bombs	2
Weapons, Guns and Ammunition	1

Life-Cycle Functions	Percentage
T&E	100

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	6
Air Vehicles, Fixed Wing, Flight Subsystems	8
Weapons, ICBMs/SLBMs	37
Weapons, Conventional Missiles/Rockets	36
Weapons, Cruise Missiles	10
Weapons, Bombs	2
Weapons, Guns and Ammunition	1



Sled Tracks

Standard Missile/VLS Test Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Standard Missile/VLS Test Complex	Yes	Yes	Yes	$30,000K (Incl. Equip)

Facility Description (contd.). This Test Complex includes the USS Desert Ship, LLS-1 (Launch Complex 35 West), Launch Complex 37, and the Missile Assembly Facility (MAF). The mission of this facility supports the land-based developmental engineering and production surveillance of many of the Navy's ship-to-air missiles as well as other missiles fired from the Mk 41 Vertical Launching System (VLS). Specifically, this test complex is the Land Based Test Site (LBTS) for the Standard Missile Program and VLS. Standard Missile fire control, Mk 41 VLS, a Mk 10 Rail Launcher systems and a Mk 39, 5"/54 gun are permanently installed at LC-35 West as well as a Target Monitor Station for verification of target augmentation and electronic countermeasures equipment. More than 10 versions of Standard Missile can be flight-tested, including SM-2 Blocks IIIA/IIIB and Block IV. Standard Missile Theater Missile Defense (TMD) capable rounds (SM-2 Block IVA-, and Block IVA) will be tested at this Test Complex starting in FY95. Other development T&E programs which use(d) or will use this facility include Vertical Launch (VL) ASROC, Evolved Seasparrow, Tomahawk, and Navy Gun Weapons Systems Program. Air and ground targets, industrial support, maintenance, and logistics support are all provided as part of this test complex.

The MAF is a four-bay ordnance operating building with two attached Type 1 test cells; it provides an integrated and efficient missile, rocket, and target buildup/assembly and test facility in support of the Standard Missile/VLS test complex. The MAF is used for field assembly and missile systems test and integration and can support production missile buildup and testing. LC-37 has a permanent bunker and concrete pad and is used for VLS restrained firings.

This equipment is unique because this test complex is the Navy's only site, including Navy ships, capable of firing all versions of Standard Missile. It is the only LBTS for Standard Missile, Vertical Launched NATO Seasparrow, and Vertical Launched ASROC.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	100

R

Standard Missile/VLS Test Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Standard Missile/VLS Test Complex	Yes	Yes	Yes	$30M (Incl. Equip.)

Facility Description (contd.). This Test Complex includes the USS Desert Ship, LLS-1 (Launch Complex 35 West), Launch Complex 37, and the Missile Assembly Facility (MAF). The mission of this facility supports the land-based developmental engineering and production surveillance of many of the Navy's ship-to-air missiles as well as other missiles fired from the Mk 41 Vertical Launching System (VLS). Specifically, this test complex is the Land Based Test Site (LBTS) for the Standard Missile Program and VLS. Standard Missile fire control, Mk 41 VLS, a Mk 10 Rail Launcher systems and a Mk 39, 5"/54 gun are permanently installed at LC-35 West as well as a Target Monitor Station for verification of target augmentation and electronic countermeasures equipment. More than 10 versions of Standard Missile can be flight-tested, including SM-2 Blocks IIIA/IIIB and Block IV. Standard Missile Theater Missile Defense (TMD) capable rounds (SM-2 Block IVA-, and Block IVA) will be tested at this Test Complex starting in FY95. Other development T&E programs which use(d) or will use this facility include Vertical Launch (VL) ASROC, Evolved Seasparrow, Tomahawk, and Navy Gun Weapons Systems Program. Air and ground targets, industrial support, maintenance, and logistics support are all provided as part of this test complex.

The MAF is a four-bay ordnance operating building with two attached Type 1 test cells; it provides an integrated and efficient missile, rocket, and target buildup/assembly and test facility in support of the Standard Missile/VLS test complex. The MAF is used for field assembly and missile systems test and integration and can support production missile buildup and testing. LC-37 has a permanent bunker and concrete pad and is used for VLS restrained firings.

This equipment is unique because this test complex is the Navy's only site, including Navy ships, capable of firing all versions of Standard Missile. It is the only LBTS for Standard Missile, Vertical Launched NATO Seasparrow, and Vertical Launched ASROC.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	100

Standard Missile/VLS Test Complex (White Sands)

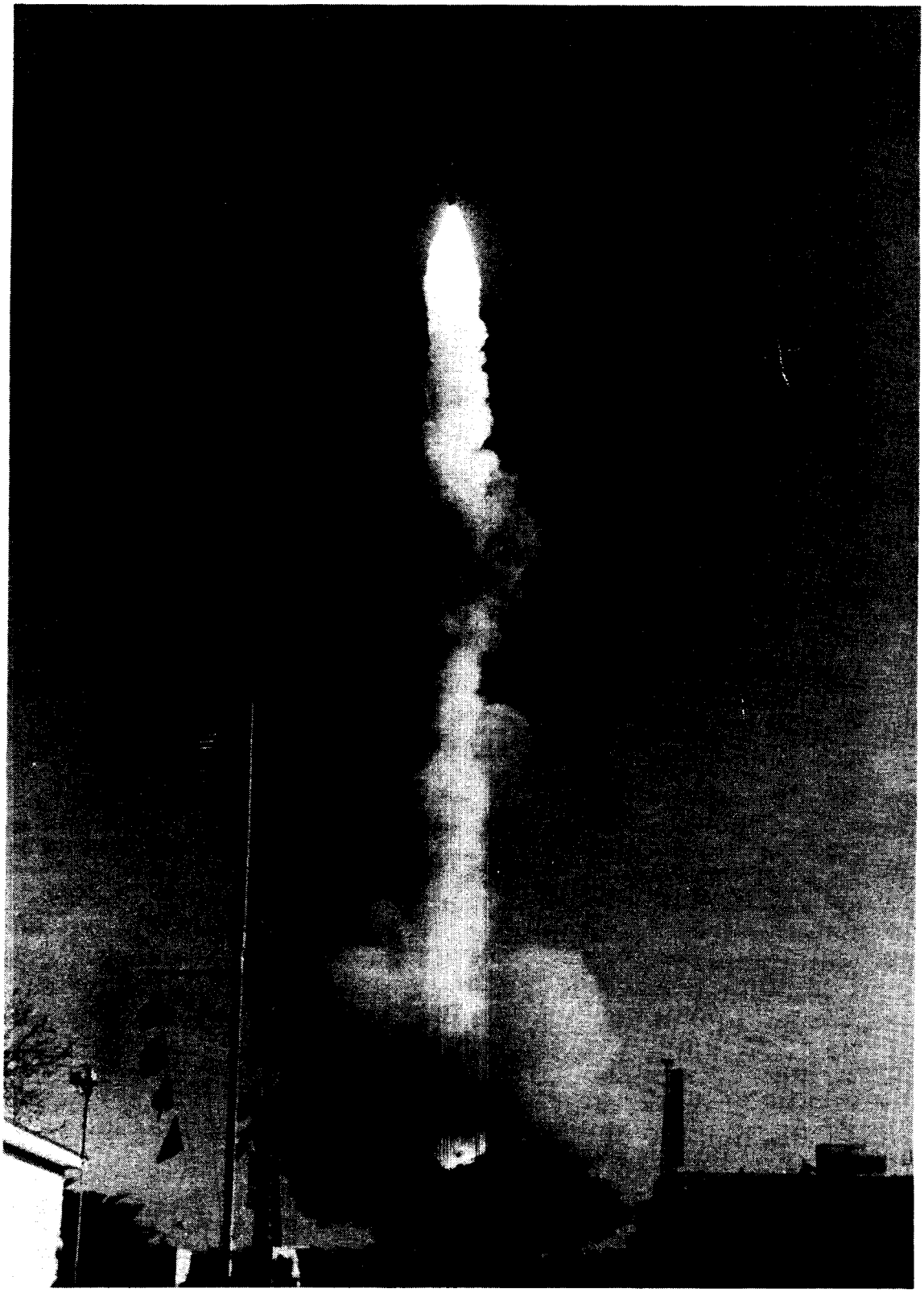
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Standard Missile/VLS Test Complex	Yes	Yes	Yes	$30M (Incl. Equip.)

Facility Description (contd.). This Test Complex includes the USS Desert Ship, LLS-1 (Launch Complex 35 West), Launch Complex 37, and the Missile Assembly Facility (MAF). The mission of this facility supports the land-based developmental engineering and production surveillance of many of the Navy's ship-to-air missiles as well as other missiles fired from the Mk 41 Vertical Launching System (VLS). Specifically, this test complex is the Land Based Test Site (LBTS) for the Standard Missile Program and VLS. Standard Missile fire control, Mk 41 VLS, a Mk 10 Rail Launcher systems and a Mk 39, 5"/54 gun are permanently installed at LC-35 West as well as a Target Monitor Station for verification of target augmentation and electronic countermeasures equipment. More than 10 versions of Standard Missile can be flight-tested, including SM-2 Blocks IIIA/IIIB and Block IV. Standard Missile Theater Missile Defense (TMD) capable rounds (SM-2 Block IVA-, and Block IVA) will be tested at this Test Complex starting in FY95. Other development T&E programs which use(d) or will use this facility include Vertical Launch (VL) ASROC, Evolved Seasparrow, Tomahawk, and Navy Gun Weapons Systems Program. Air and ground targets, industrial support, maintenance, and logistics support are all provided as part of this test complex.

The MAF is a four-bay ordnance operating building with two attached Type 1 test cells; it provides an integrated and efficient missile, rocket, and target buildup/assembly and test facility in support of the Standard Missile/VLS test complex. The MAF is used for field assembly and missile systems test and integration and can support production missile buildup and testing. LC-37 has a permanent bunker and concrete pad and is used for VLS restrained firings.

This equipment is unique because this test complex is the Navy's only site, including Navy ships, capable of firing all versions of Standard Missile. It is the only LBTS for Standard Missile, Vertical Launched NATO Seasparrow, and Vertical Launched ASROC.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



Standard Missile/Vertical Launching System (VLS) Test Complex

Strategic Propulsion Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets	Strategic Propulsion Test Complex Elements • Propulsion Test-Skytop Test Bay 1 • Propulsion Test-Skytop Test Bay 2 • Propulsion Test-Skytop Test Bay 2A • Propulsion Test-Skytop Test Bay 6 • Propulsion Test-Skytop Test Bay 7	Yes	Yes	Yes	$24,311K = Total $10,441K = Buildings

Facility Description (contd.). This test complex consists of a series of rocket motor test bays with supporting buildings, work pads, and flame chutes with quenching capability, each having a unique capability for test of solid rocket motors. Bay I, constructed in 1959, is a horizontal test facility that can test motors up to 1 million pounds of thrust. Bay II, built in 1961, tests rocket motors nozzle down, and with an integral Ormond stand, measures six-component thrusts. Bay IIA is a horizontal multistage pad with temperature conditioning capability. Bay VI is a strategic motor vertical test bay with tiltable firing platform, handling motors up to 1 million pounds of thrust, and has a movable service building and gantry crane for motor handling. A water deluge system and real-time radiography are capabilities. Bay VII is a horizontal strategic motor test bay capable of 1.5 million pounds of thrust and provides a movable temperature conditioning building; Bay VII also uniquely provides the ability to test missile stage electronics and transition ordnance. Ordnance siting ranges to 300,000 pounds, Class 1.3

This equipment is unique because Bay VI is the only facility of its kind in the U.S. Once installed on the tilt table, a motor can be fired horizontally or at 45, 85, or 90 attitudes.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	90
Weapons, Conventional Missiles/Rockets	10

Life-Cycle Functions	Percentage
T&E	100

Strategic Propulsion Test Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, ICBMs/SLBMs Weapons, Conventional Missiles/Rockets	Strategic Propulsion Test Complex Elements • Propulsion Test-Skytop Test Bay 1 • Propulsion Test-Skytop Test Bay 2 • Propulsion Test-Skytop Test Bay 2A • Propulsion Test-Skytop Test Bay 6 • Propulsion Test-Skytop Test Bay 7	Yes	Yes	Yes	$24,311K = Total $10,441K = Buildings

Facility Description (contd.). This test complex consists of a series of rocket motor test bays with supporting buildings, work pads, and flame chutes with quenching capability, each having a unique capability for test of solid rocket motors. Bay I, constructed in 1959, is a horizontal test facility that can test motors up to 1 million pounds of thrust. Bay II, built in 1961, tests rocket motors nozzle down, and with an integral Ormond stand, measures six-component thrusts. Bay IIA is a horizontal multistage pad with temperature conditioning capability. Bay VI is a strategic motor vertical test bay with tiltable firing platform, handling motors up to 1 million pounds of thrust, and has a movable service building and gantry crane for motor handling. A water deluge system and real-time radiography are capabilities. Bay VII is a horizontal strategic motor test bay capable of 1.5 million pounds of thrust and provides a movable temperature conditioning building; Bay VII also uniquely provides the ability to test missile stage electronics and transition ordnance. Ordnance siting ranges to 300,000 pounds, Class 1.3

This equipment is unique because Bay VI is the only facility of its kind in the U.S. Once installed on the tilt table, a motor can be fired horizontally or at 45, 85, or 90 attitudes.

Common Support Functions	Percentage
Weapons, ICBMs/SLBMs	90
Weapons, Conventional Missiles/Rockets	10

Strategic Propulsion Test Complex

Strategic Propulsion Test Complex

Strike Simulation and Modeling

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Strike Simulation and Modeling Elements • Strike Tech Lab • Strike Warfare Sim Lab • C281 Concurrent Engineering Lab • Threat Information Lab • Simulation Dev Fac • HPC Access • C281 Computing Fac • HARM Sim Fac • CFD Dev Lab	Yes	Yes	Yes	$6,211K = Total $2,530K = Buildings

Facility Description (contd.). This facility comprises many laboratories that are located at various building sites at NAWCWPNS China Lake to provide a computer computational capability in support of development and testing of strike weapons. This computation capability supports threat information development, trajectory simulation/kinematics envelope definition, tactics development, CFD, COEA support, 6-DOF studies, Pk analysis, target recognition analysis, HARM test support, weapon survivability analysis, weapon module development for TAMPS, and flight test support and evaluation and estimates of aerodynamics of various types of airframes. These laboratories consist of Strike Technology Lab, Strike Warfare Simulation Lab, C281 Concurrent Engineering Lab (CEL), Threat Information Lab, Simulation Development Lab, High Performance Computing Access (HPC) Lab, C281 Computing Lab, HARM Simulation Lab, and CFD Development Lab.

This equipment is unique because this facility is unique in its ability to perform the large number of trajectory runs required to support the HARM missile performance data requirements. Other facilities, i.e., Eglin and Point Mugu, have the HARM simulation but not the ability to handle the enormous number of trajectory runs demanded by the HARM user community. There are no other concurrent engineering analysis labs within DOD.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	35
Weapons, Bombs	15

Life-Cycle Functions	Percentage
T&E	33
S&T	44
D&E	20
IE	0
T&D	3
Other	0

Strike Simulation and Modeling

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Strike Simulation and Modeling Elements • Strike Tech Lab • Strike Warfare Sim Lab • C281 Concurrent Engineering Lab • Threat Information Lab • Simulation Dev Fac • HPC Access • C281 Computing Fac • HARM Sim Fac • CFD Dev Lab	Yes	Yes	Yes	$6,211K = Total $2,530K = Buildings

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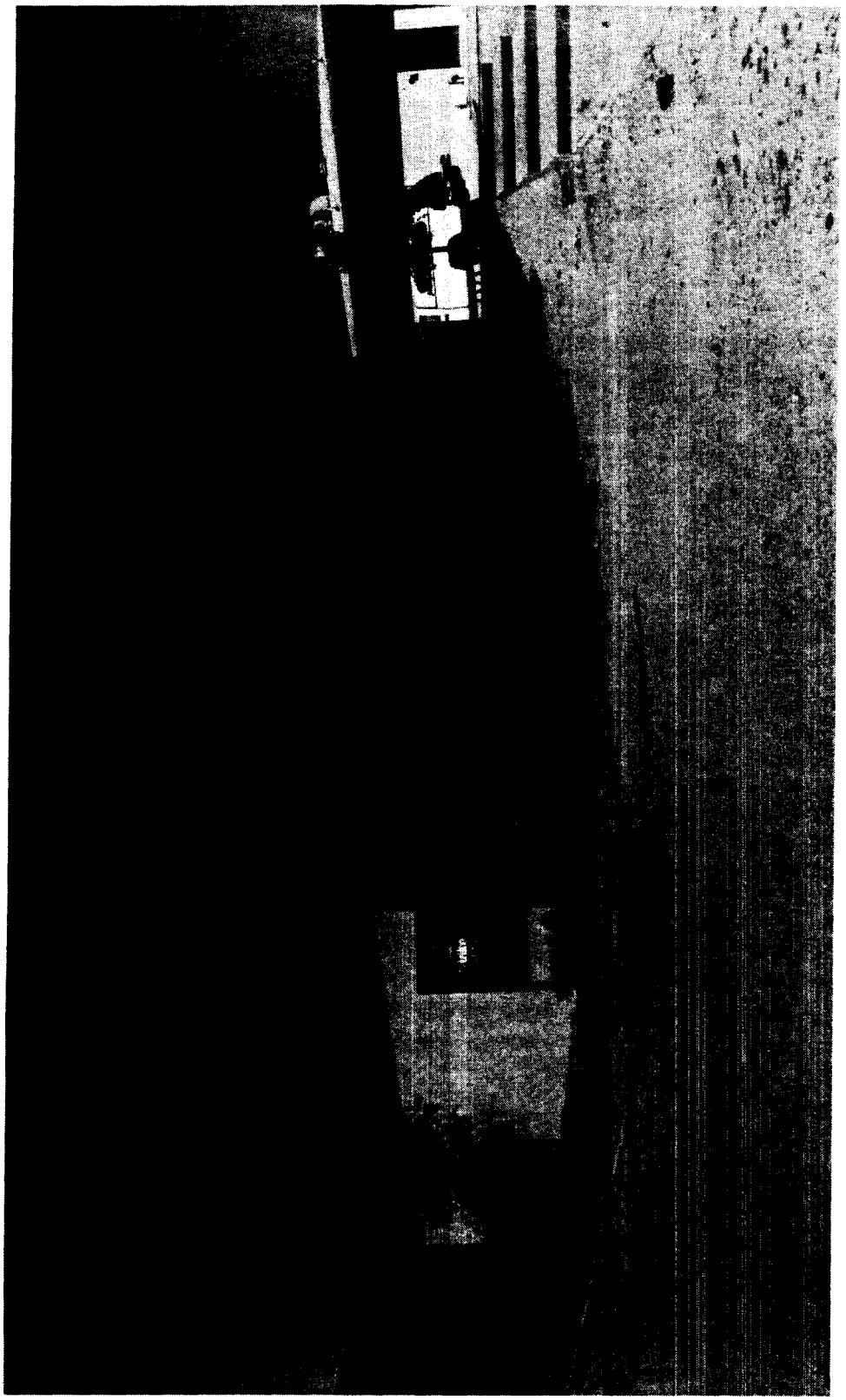
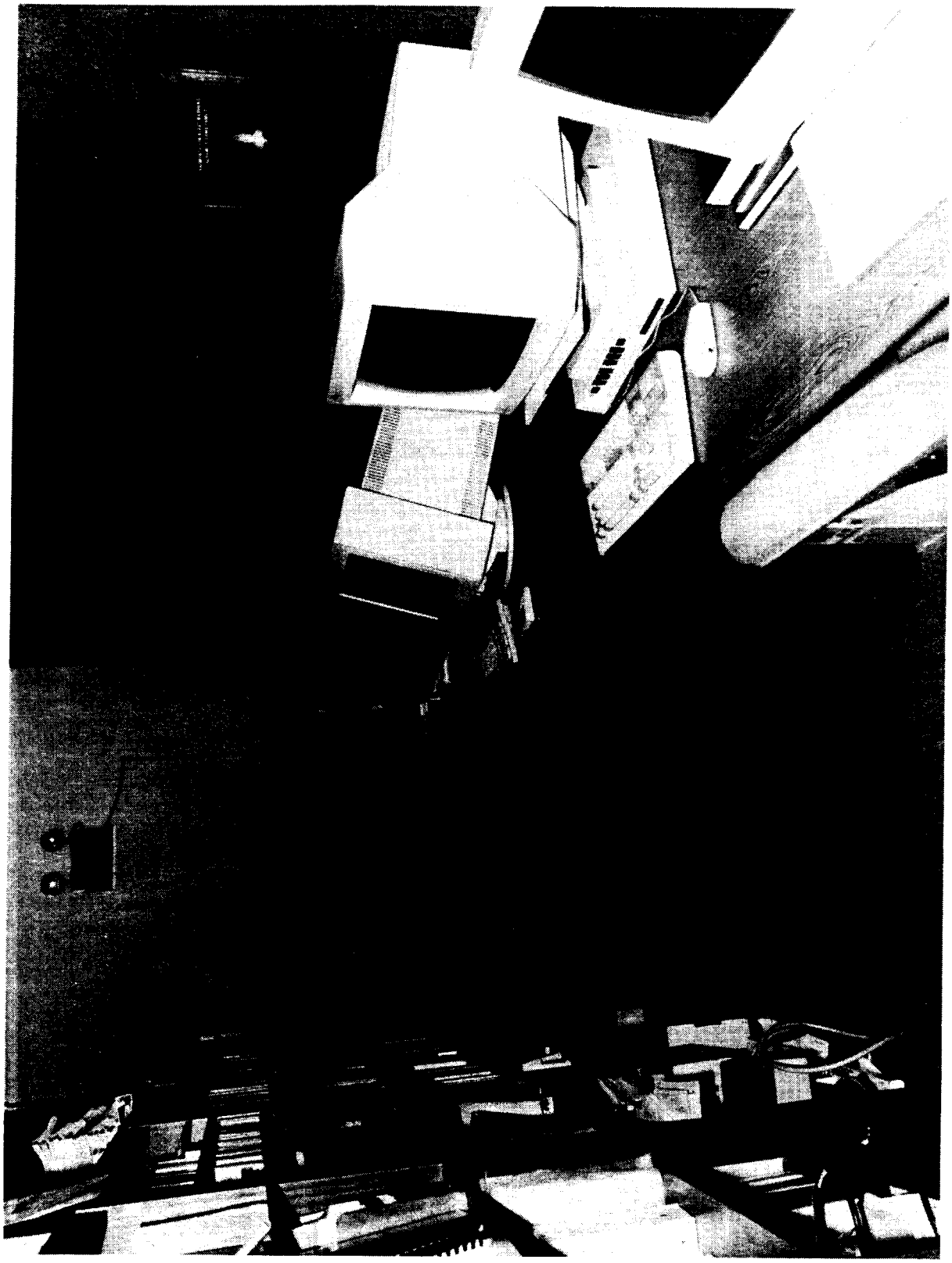
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	35
Weapons, Bombs	15



Strike Simulation and Modeling



Strike Simulation and Modeling

Strike Software/Simulation Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Strike Software/Simulation Facility Elements • HARM SW Support Fac • TLAM Sim Fac	Yes	Yes	Yes	$1,550K = Total $ 150K = Buildings

Facility Description (contd.). The HARM Software Support Lab supports DTE, verification and validation, and development of HARM missile, ELINT, and Command Launch Computer tactical software. Life-cycle support and distribution of HARM tactical software is supported. The HARM software support facility is composed of two Micro VAX 3100 model 80 computers. One VAX is a classified system and is used primarily for HARM development/simulation support, data reduction, and HARM software baseline management. The unclassified Micro VAX 3100/80 is used to provide access to NAWCWPNS' network for Code C28A/C2815 employees and for HARM documentation control and configuration management. A Micro VAX is used for ELINT file development.

The TLAM Simulation Lab: The Software Support Activity for the Tomahawk Land Attack missile performs post-deployment software support (PDSS), which includes the following: independent verification and validation (IV&V) of operational flight software (OFS) and missile identification retrieval software (MIRS), as well as configuration and release management of OFS, MIRS, Digital Scene Matching Area Correlation (DSMAC) Flight Software (DFS), Global Positioning System Flight Software (GFS) an Interpretive Simulation Program (ISP). The SSA provides maintenance of the ISP and facilities and support tools used to accomplish these tasks.

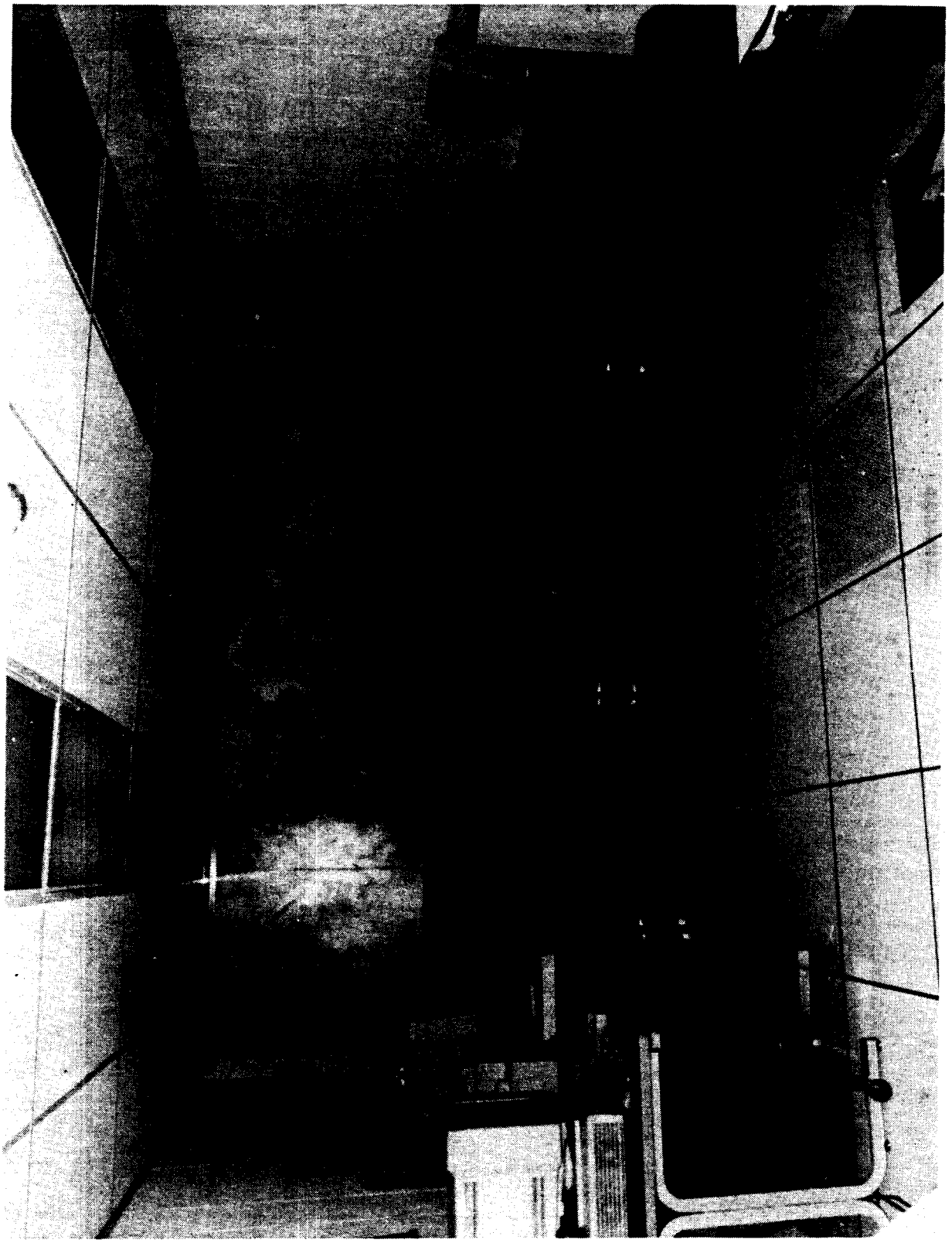
This equipment is unique because it has the only certified 6-DOF simulation that is capable of performing IV&V without modifications. Nuclear critical components (OFS) certifications are performed only at this facility.

This is the only facility in the U.S. that generates ELINT data for the CP1001 Command Launch Computer, and the only facility within DOD that generated OFP software updates for the CP-1001 Command Launch Computer.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	50
Weapons, Cruise Missiles	50

R

Life-Cycle Functions	Percentage
T&E	16.5
S&T	0
D&E	36.5
IE	47
T&D	0
Other	0



Strike Software/Simulation Facility

System Modeling and Signal Processing Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	System Modeling and Signal Processing Facility Element • IR System Modeling and Simulation • Signal Processing Design and Development • Signal Processing-in-the-Loop Lab • Circuit Sim Fac • IR Sim and TDD Development Fac • Standard Missile RF Fuze CAE Station	No	No	No	$420K = Total $552K = Buildings

Facility Description (contd.). This facility is used for developing modeling and simulation for IR weapon systems. The modeling includes the target, atmospherics, and a complete model of the seeker and associated signal-processing and tracking algorithms. This facility incorporates simulation programs such as SPIRITS, IRSTROM, EMAT, LOTRAN, and other IR modeling codes. Numerous computer workstations exist for designing these simulations that also allow real target imagery to be evaluated. This capability is to design and develop algorithms used for acquiring and tracking targets in backgrounds such as mountainous, clouds, urban, and rural backgrounds. In addition, such complex problems as reducing susceptibility to countermeasures and endgame tracking of targets are addressed. Infrared trackers have also been designed, which includes the control loop for slaving and tracking the seeker. Algorithms for interfacing dual-mode weapons—IR and RF—have been developed here, and the IR portion was also built and tested here. Other functions include data reduction and analysis of digital video and telemetry data from guidance and control system (GCS) performance tests, including captive flight and free flight (launch) tests, environmental tests, and functional tests utilizing direct digital video and telemetry data link with GCS integration lab rate table test.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	25
S&T	25
D&E	50
IE	0
T&D	0
Other	0

System Modeling and Signal Processing Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	System Modeling and Signal Processing Facility Element • IR System Modeling and Simulation • Signal Processing Design and Development • Signal Processing-in-the-Loop Lab • Circuit Sim Fac • IR Sim and TDD Development Fac • Standard Missile RF Fuze CAE Station	No	No	No	$420K = Total $552K = Buildings

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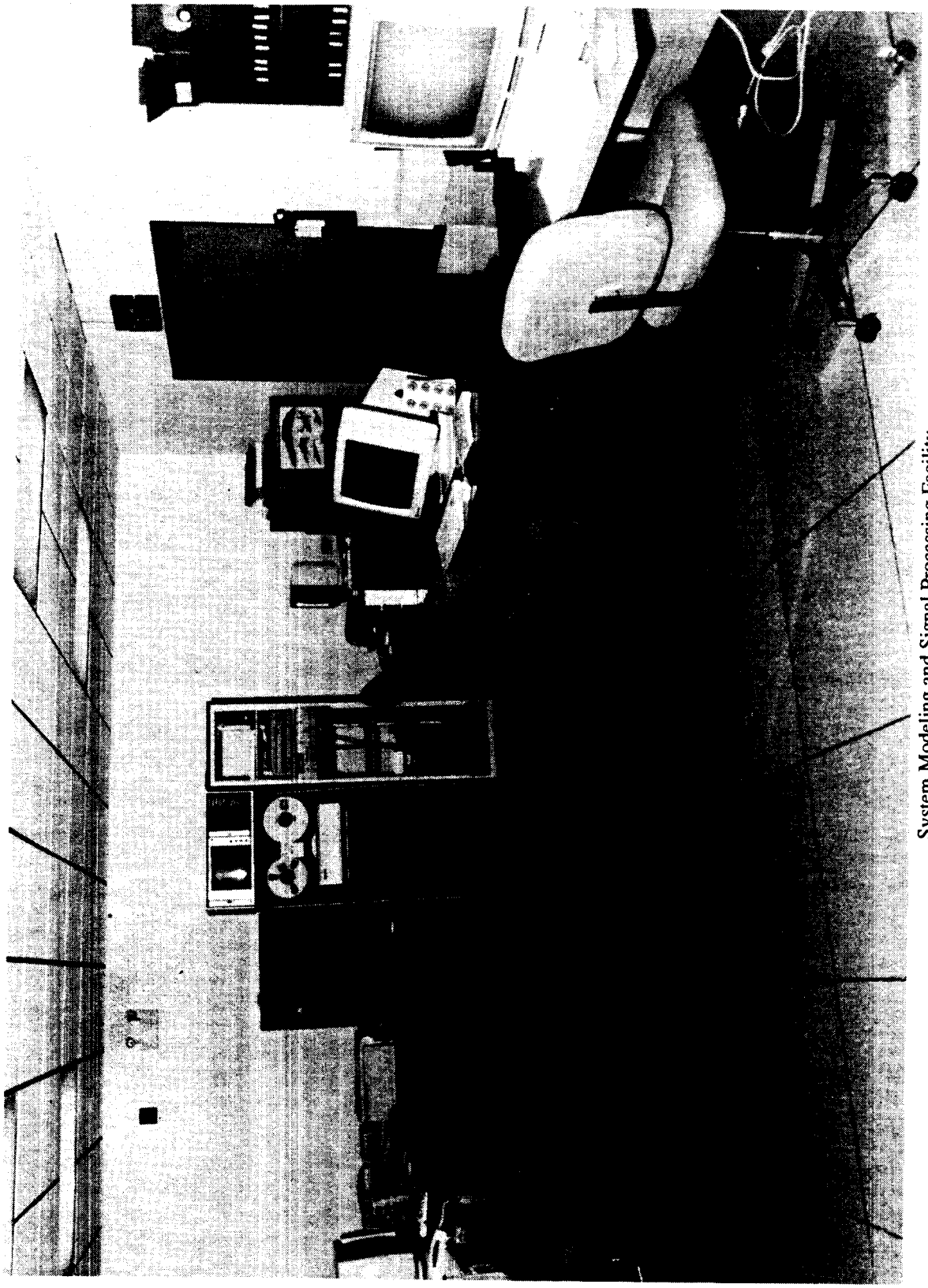
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



System Modeling and Signal Processing Facility

Tactical Propulsion Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Tactical Propulsion Test Facility	No	No	No	$4,650K = Total $1,878K = Buildings

Facility Description (contd.). The mission of this eight-facility test site is to conduct static firings of rocket motors in support of DOD RDT&E programs.

Bay IV provides the capability to static-fire tactical-sized rockets up to 80,000 pounds of thrust. Bay IV has test pads for firing in both the horizontal and vertical nozzle-down attitudes. A wide variety of thrust stands are available, or can be designed and fabricated on site, to handle any DOD tactical-sized motor. Temperature conditioning is provided by portable chambers and conditioning equipment providing a range of -65°F to 185°F. A real-time radiography (RTR) capability is permanently installed in the facility. This bay is currently used for solid rocket motors only. Liquid motors have been fired in the past in Bay IV. The facility is sited for 18,000 pounds of 1.1 or 30,000 pounds of 1.3 materials. The facility is permitted through the Mojave Air Quality Control District for air emissions. No permits are necessary for use of cooling or quench water. The Bay IV control room is scheduled to be upgraded to support the Plume Measurement Facility scheduled for completion in FY97.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Life-Cycle Functions	Percentage
T&E	100

Tactical Propulsion Test Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	Tactical Propulsion Test Facility	No	No	No	$4,650K = Total $1,878K = Buildings

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Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

Tactical Propulsion Test Facility

TARIF/Combat Environment

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	TARIF/Combat Environment	Yes	Yes	Yes	$14,359K = Total $ 4,819K = Buildings

Facility Description (contd.). The primary purpose of the TARIF/Combat Environment Simulation facility is to provide equipment and software support activity functions for use in the development, integration, and functional testing of EC threat simulators for joint-service test and evaluation ranges, and the Air Force Air Combat Training System (ACTS) and Navy Tactical Aircrew Combat Training System (TACTS) and surface shipcrew EC training enhancements. There is an RF screen room, a high bay radar integration facility, open-air high-power radiation pads, and computer facilities all interconnected by fiber-optic data lines. There is also a 36-aircraft TACTS/ACTS tracking and debrief system consisting of aircraft pod interrogation stations on the China Lake North Range also data-linked to the computer facilities for flight tests. The mission is to provide development and life-cycle support of EW threat simulation systems for land and sea ranges for weapon systems test and evaluation and operational training, and to provide RDT&E and life-cycle support of joint-service aircraft tracking and aircrew debrief systems for tactical training.

This equipment is unique because TARIF/Combat Environment Simulation is a joint service program. EC Threat Simulators are developed under OSD-funded programs that remain transportable OSD assets, as well as Navy-funded threat simulators. In addition, TARIF operates under an Air Force-Navy MOA for joint interoperability and provides EC threat integration and software support activity functions for the Air Force and Navy aircrew tactical training ranges. As such this capability is the only one in the DOD for this function.

TARIF/Combat Environment

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition Training Systems	TARIF/Combat Environment	Yes	Yes	Yes	$14,359K = Total $ 4,819K = Buildings

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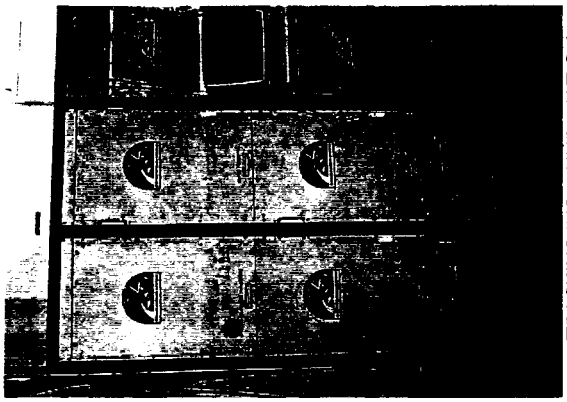
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	70
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	10
Weapons, Bombs	5
Weapons, Guns and Ammunition	10

This facility is currently used for R&D (including S&T, D&E, and IE).

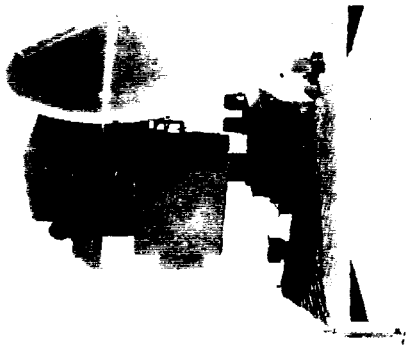
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	10
Weapons, Bombs	5
Weapons, Guns and Ammunition	5
Training Systems	70

This facility is currently used for R&D (including S&T, D&E, and IE).

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	5
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	10
Weapons, Bombs	5
Weapons, Guns and Ammunition	5
Training Systems	70



TRACKING INSTRUMENTATION SUBSYSTEM MASTER



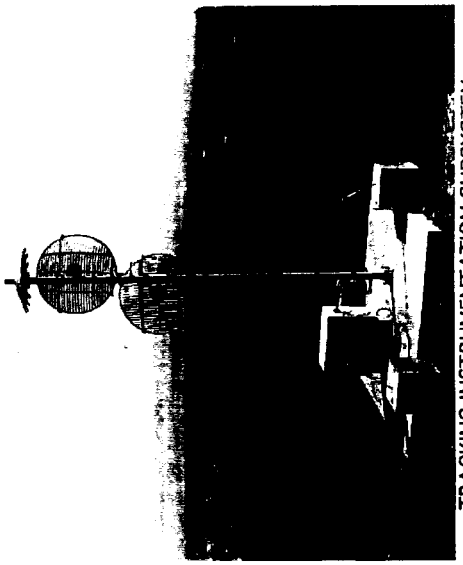
THREAT RADAR EMITTER SIMULATOR

DISPLAY & DEBRIEFING SUBSYSTEM

AIRBORNE INSTRUMENTATION SUBSYSTEM

TARIF/Combat Environment

CONTROL & COMPUTATION SUBSYSTEM



TRACKING INSTRUMENTATION SUBSYSTEM REMOTE

TDD DDT&E Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs	TDD DDT&E Complex Elements • TDD Backscatter/Pole Range • Over Water Target Detector Measurement • TDD Data Acquisition System • Portable Outdoor TDD Test and Dev Station	Yes	Yes	Yes	$1,100K = Total $0K = Buildings

Facility Description (contd.). This capability consists of five facilities designed to perform/support field testing of TDDs or proximity fuzes. The facilities include an indoor pool that is used to measure target detector response to the water surface, two open-air TDD ranges for testing TDD performance against full-size targets suspended in the air, a portable TDD test laboratory for measurement of fuze performance against aircraft in free flight, and a data acquisition and logging system for waveform analysis.

The mission of the capability is to support exploratory, advanced, and EMD development of TDDs to support intercept weapon development.

This equipment is unique because one of the five facilities, the portable outdoor TDD development laboratory, represents the only portable capability of its type for measuring TDD capabilities against free-flying aircraft. The other four facilities have duplicates or substitutes elsewhere.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	97
Weapons, Bombs	3

This facility is largely used for R&D; however, it is occasionally used for T&E.

TDD DDT&E Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs	TDD DDT&E Complex Elements • TDD Backscatter/Pole Range • Over Water Target Detector Measurement • TDD Data Acquisition System • Portable Outdoor TDD Test and Dev Station	Yes	Yes	Yes	$1,100K = Total $0K = Buildings

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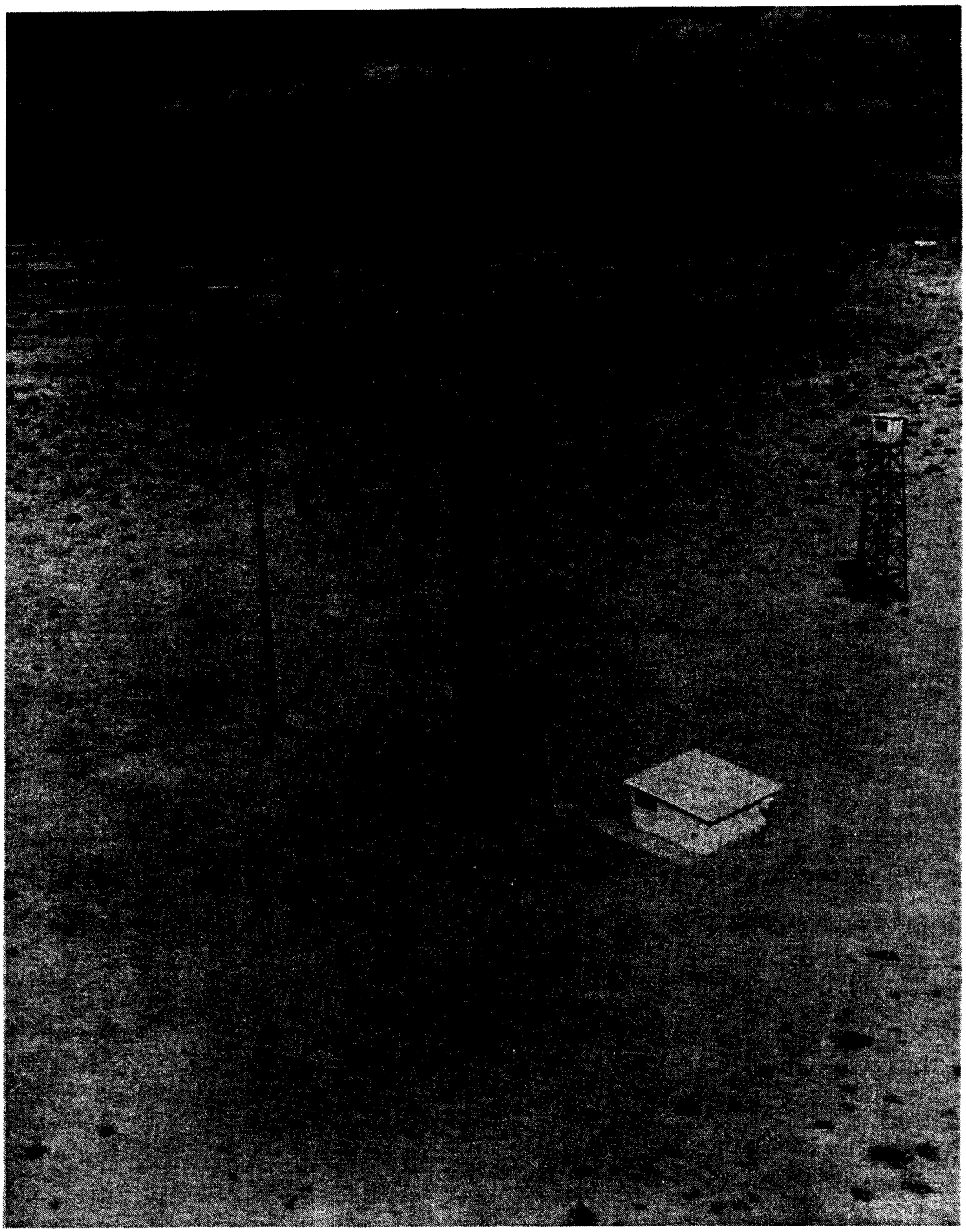
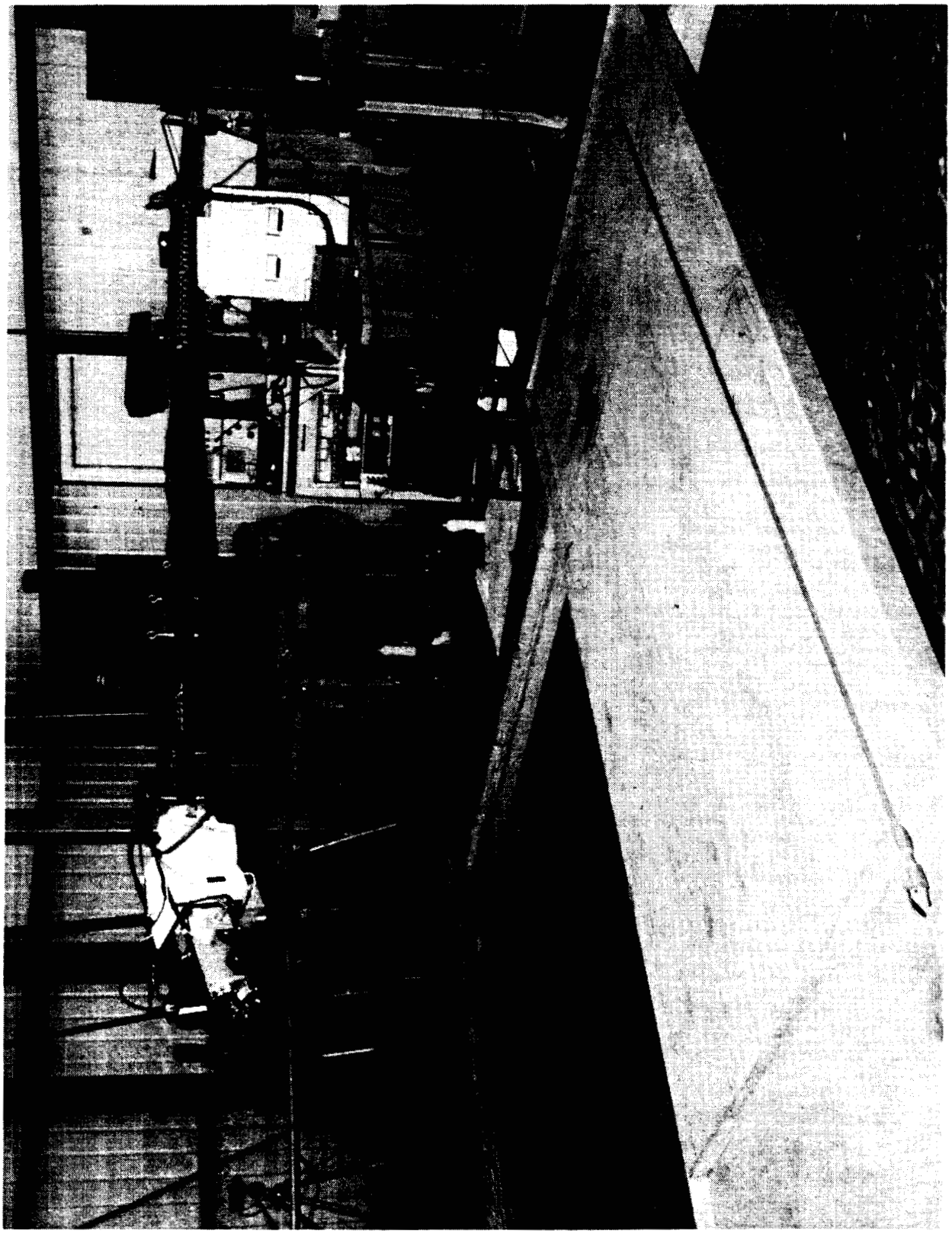
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	97
Weapons, Bombs	3



TDD DDT&E Complex



TDD DDT&E Complex

TDD Exploratory Development Facility (IR)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs	TDD Exploratory Development Facility	No	No	No	$2,810K = Total $ 810K = Buildings

Facility Description (contd.). This facility is composed of five laboratory areas including secure spaces for classified development, an optical tunnel with an external access door, an optical table room with calibration and measurement equipment, a test and data reduction laboratory area, and a general-purpose electronic and signal-processing and test area.

The mission of this facility is to create, design, analyze, and test state-of-the-art technological solutions to enhance the performance of TDDs for U.S. missiles. This is accomplished through the creation of critical experiments, analysis, and test of new technologies, sensors, and signal-processing methods.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	97
Weapons, Bombs	3

This facility is currently used for R&D (including S&T, D&E, and IE).

TDD Exploratory Development Facility (IR)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Bombs	TDD Exploratory Development Facility	No	No	No	$2,810K = Total $ 810K = Buildings

Facility Description (contd.): This facility is composed of five laboratory areas including secure spaces for classified development, an optical tunnel with an external access door, an optical table room with calibration and measurement equipment, a test and data reduction laboratory area, and a general-purpose electronic and signal-processing and test area.

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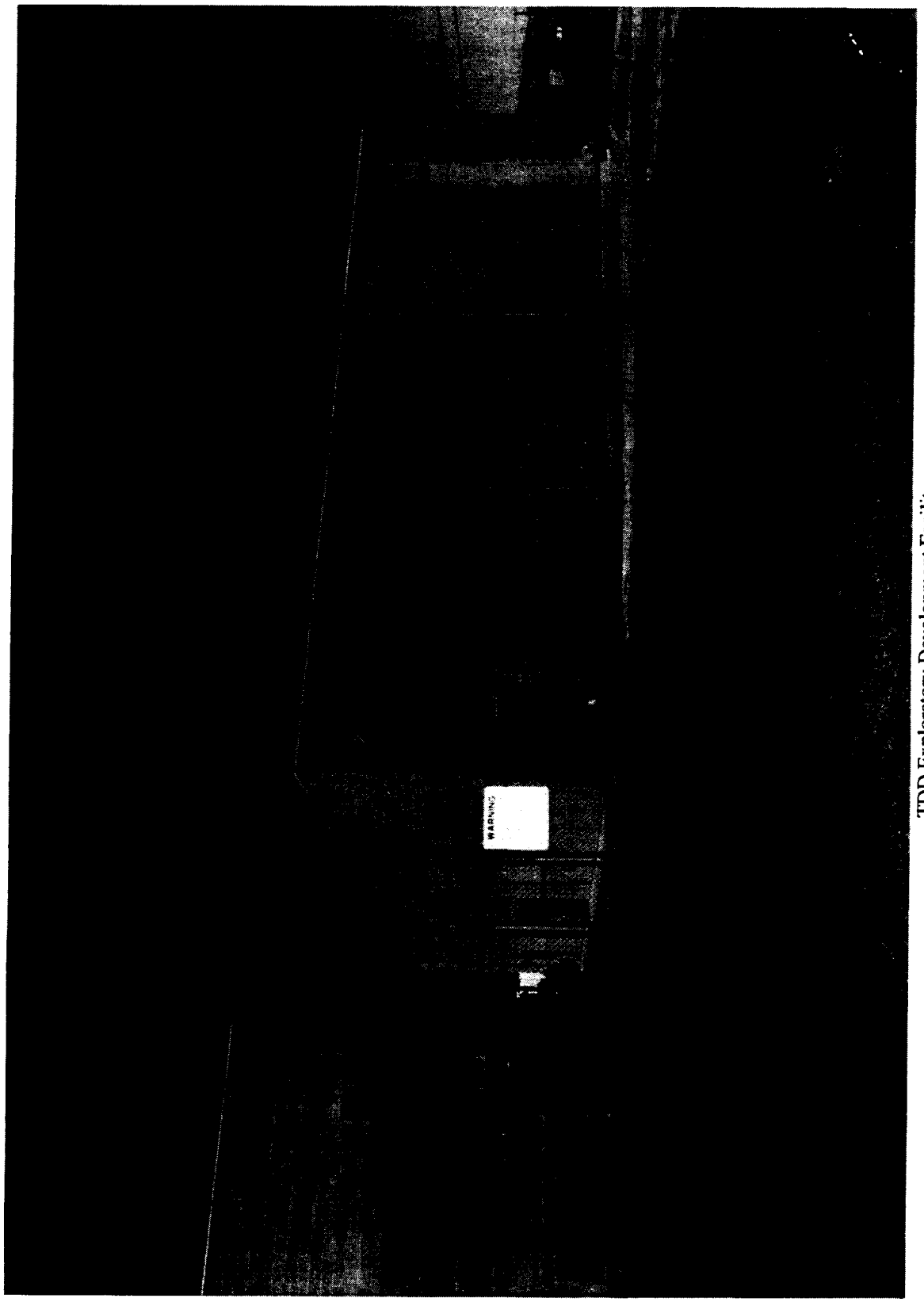
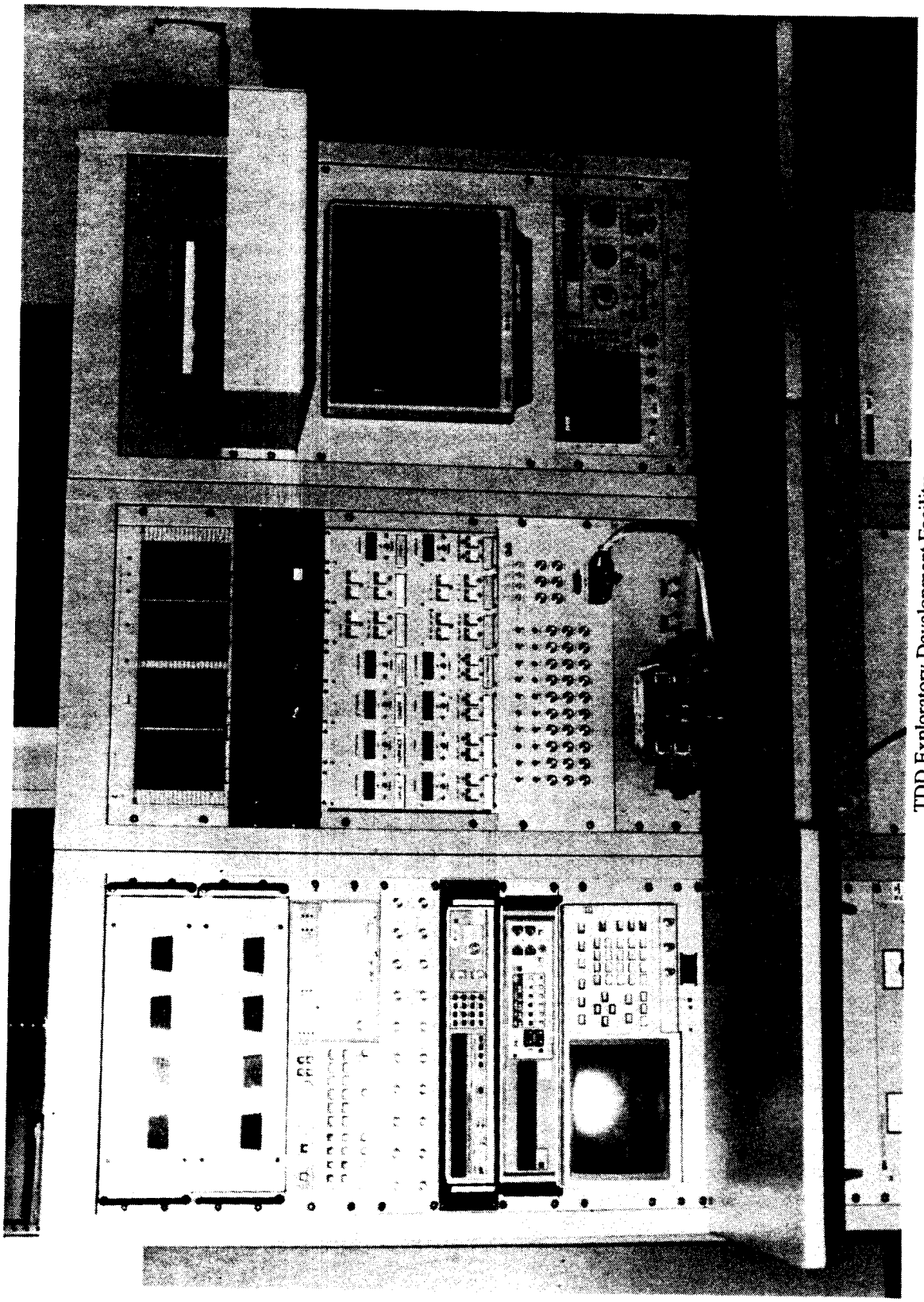
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	97
Weapons, Bombs	3



TDD Exploratory Development Facility



TDD Exploratory Development Facility

TDD Performance Evaluation Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	TDD Performance Evaluation Laboratory	Yes	Yes	No	$5,609K = Total $ 764K = Buildings

Facility Description (contd.). The TDD Performance Evaluation Laboratory utilizes several individual RF and active optical test sets designed to test the TDD or proximity fuze used on the Sparrow, AMRAAM, Phoenix, Sidewinder, and RAM missiles. The test sets provide a diagnostic tool to analyze the performance of the TDD in the laboratory. The test sets can do production acceptance testing along with specialized engineering tests to ensure that the TDD will meet its specified performance. The test set is designed as an engineering tool for use in the development of the TDDs. The TDD model used for generating missile lethality is based on the performance data taken from the test set.

The mission is to provide each missile's technical management (NAVAIR/NAVSEA) with accurate, independent performance evaluations to support the development of the optimum TDD within the missiles' operational envelope.

This equipment is unique because the Sparrow and AMRAAM TDD test sets were designed and built for the in-house development and/or evaluation of the TDDs. The test sets were used as a design development tool and as the tool to measure the end-item performance. They are one-of-a-kind sets within the government.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100

This facility is largely used for R&D; however, it is occasionally used for T&E.

TDD Performance Evaluation Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets	TDD Performance Evaluation Laboratory	Yes	Yes	No	$5,609K = Total $ 764K = Buildings

Facility Description (contd.). The TDD Performance Evaluation Laboratory utilizes several individual RF and active optical test sets designed to test the TDD or proximity fuze used on the Sparrow, AMRAAM, Phoenix, Sidewinder, and RAM missiles. The test sets provide a diagnostic tool to analyze the performance of the TDD in the laboratory. The test sets can do production acceptance testing along with specialized engineering tests to ensure that the TDD will meet its specified performance. The test set is designed as an engineering tool for use in the development of the TDDs. The TDD model used for generating missile lethality is based on the performance data taken from the test set.

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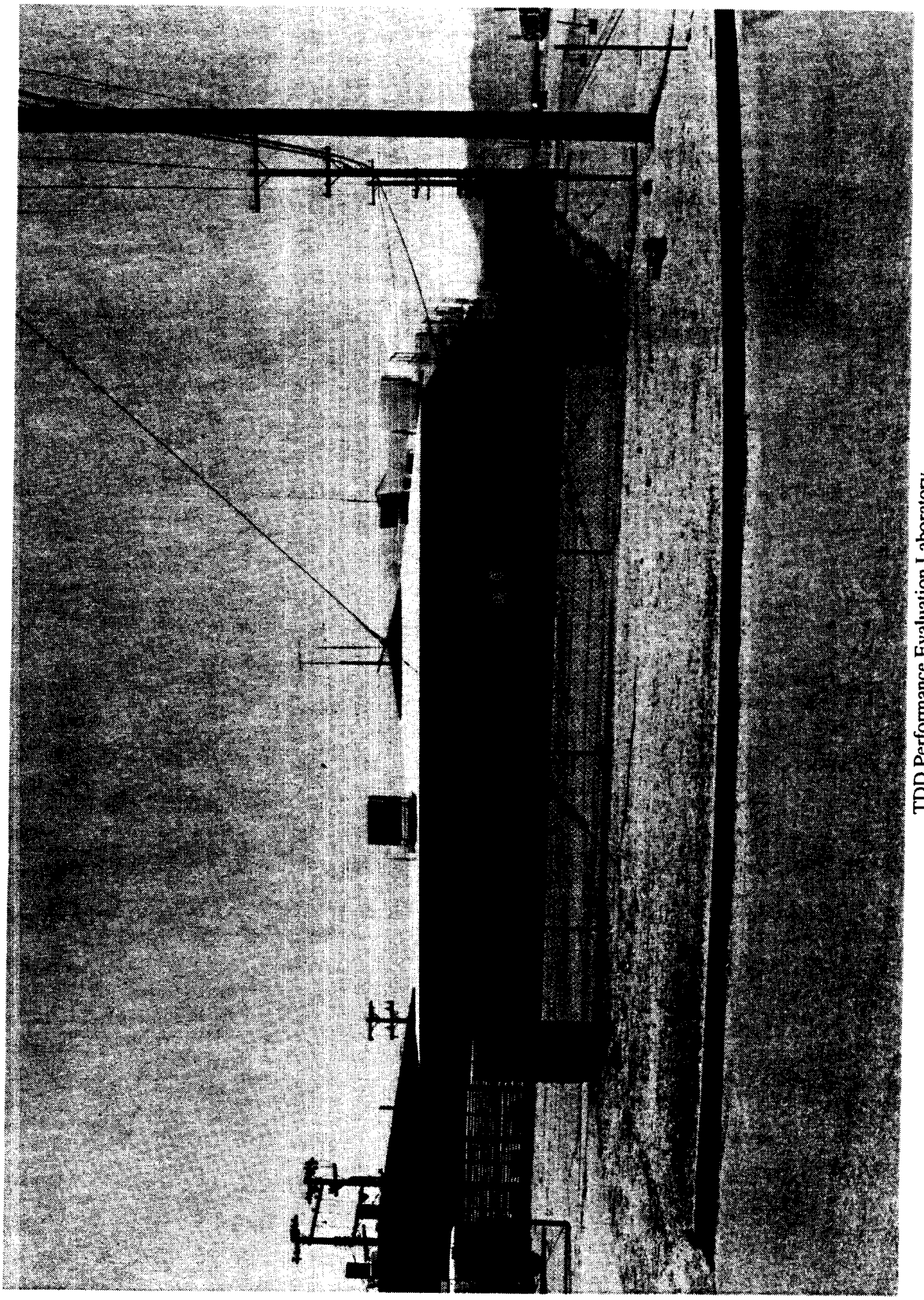
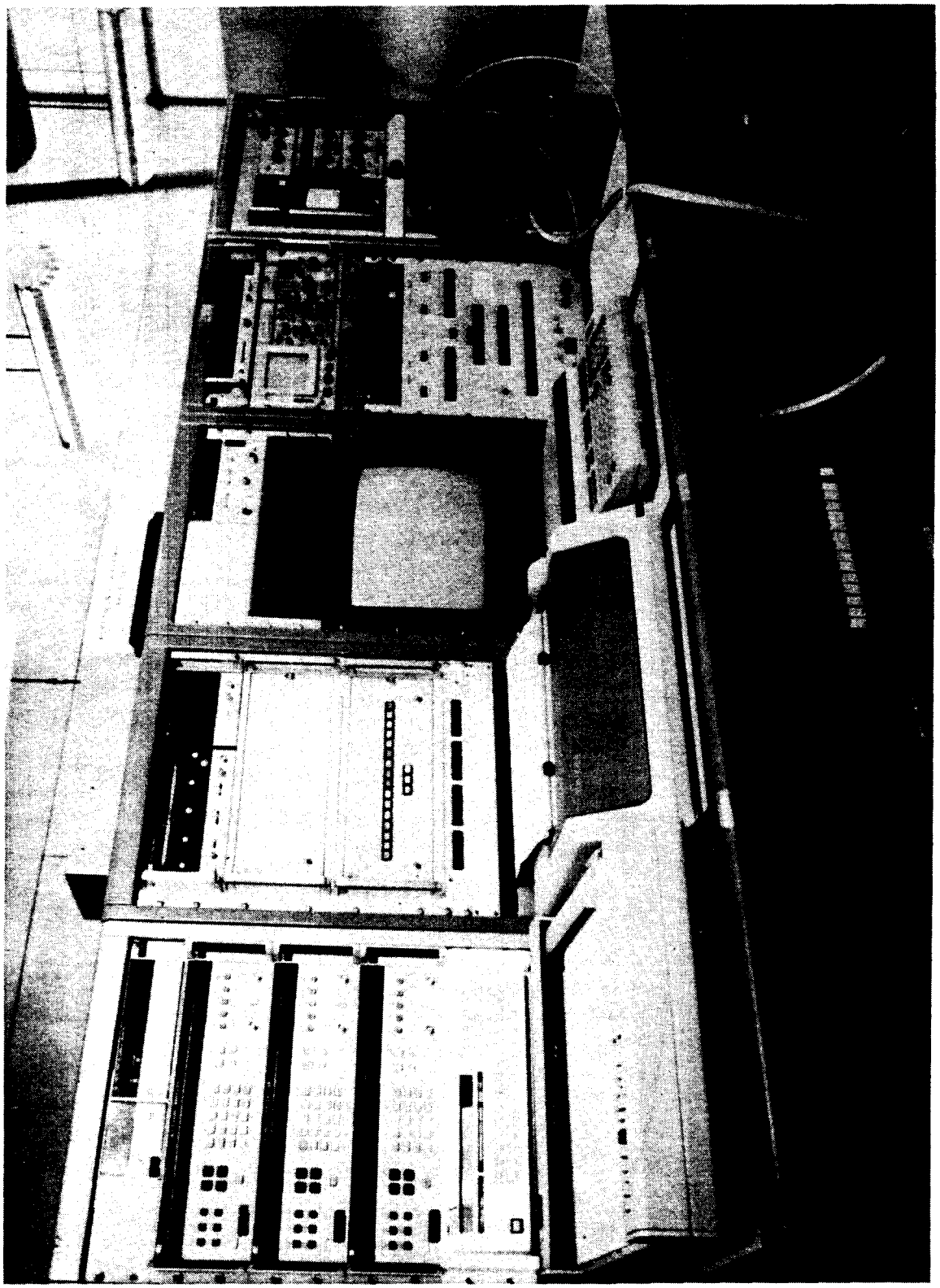
Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	100



TDD Performance Evaluation Laboratory



TDD Performance Evaluation Laboratory

Telemetry Development Laboratory

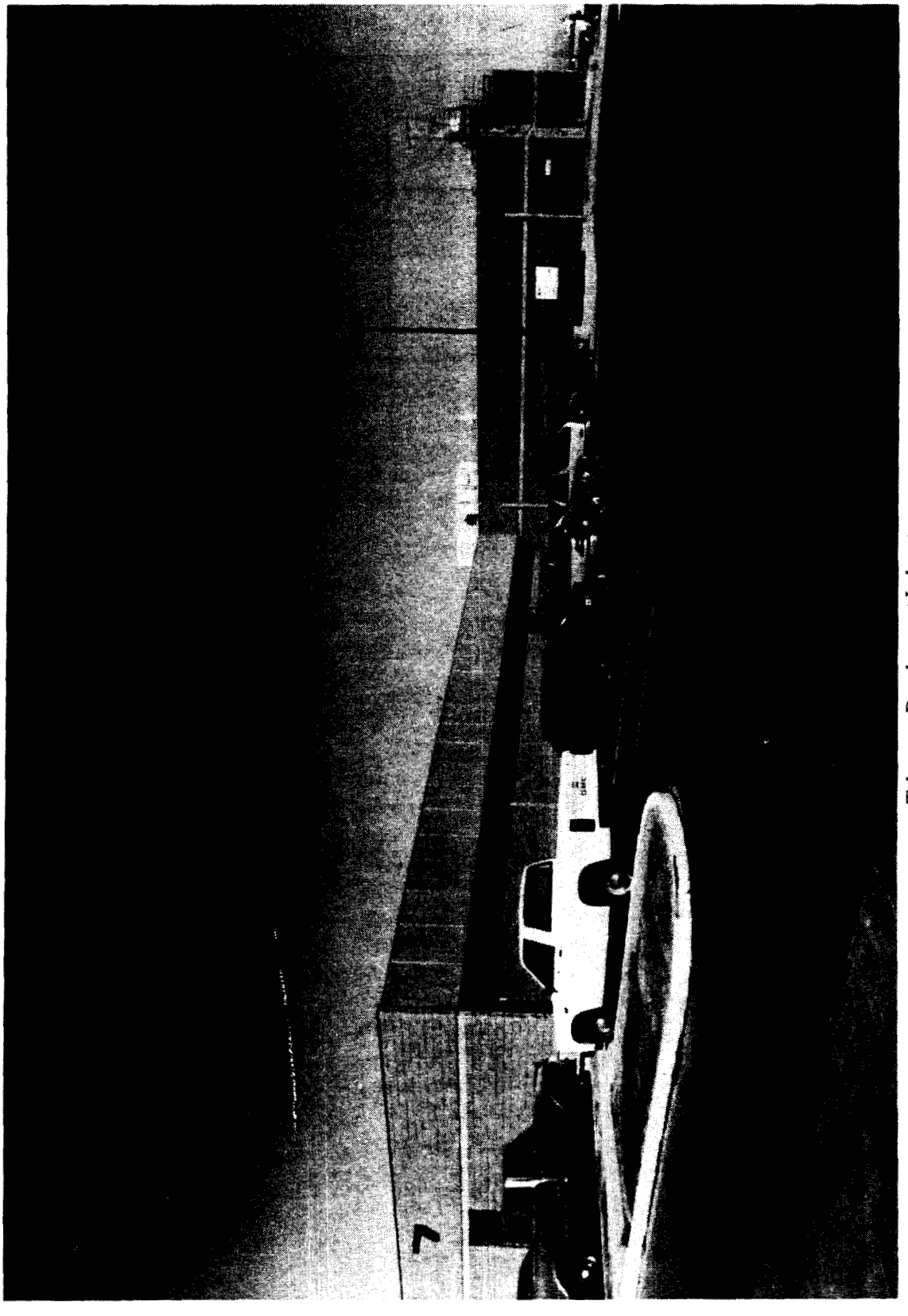
Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs Weapons, Guns and Ammunition	Telemetry Development Lab	Yes	Yes	Yes	$9,106K = Total $2,340K = Buildings

Facility Description (contd.). The Telemetry Development Lab provides for design, development, fabrication, and application of instrumentation systems technology to airborne weapons for gathering diagnostic information in support of test and evaluation programs. The Telemetry Development Lab facilities are housed in three separate buildings: the Instrumentation Lab Building (ILB), which is shared with another group; Telemetry Facility and Transducer Calibration Lab; and three mobile labs. The ILB houses major assets required for the design of secure (encrypted) telemetry systems. It contains five RF screen rooms, a walk-in vault used to store COMSEC assets used in the design and development of secure telemetry systems, environmental ovens, and specialized equipment for component and system testing. The Telemetry Facility contains office space, a video encryption laboratory, an RF transmitter laboratory, and a documentation control room. The Transducer Calibration Laboratory contains office and laboratory space.

This equipment is unique because the Telemetry Development Lab provides the following: ensure/certify range compatible and interpretable telemetry and flight termination systems; design, development, and standardization of telemetry encryption techniques compatible with NSA and weapons development data requirements; ensure/certify that contractor-developed telemetry systems are interoperable on the T&E ranges; support NAWCWPNS weapons/platform R&D development and evaluation with quick-response design/development of telemetry and related instrumentation; support to the Range Commander's Council for development of Range Standards for Range Safety, Telemetry, Telecommunication, Frequency Management, and Optical Systems; and development of standard picture video digitization techniques.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	19
Weapons, Conventional Missiles/Rockets	54
Weapons, Cruise Missiles	5
Weapons, Bombs	2
Weapons, Guns and Ammunition	15

Life-Cycle Functions	Percentage
T&E	20
S&T	0
D&E	80
IE	0
T&D	0
Other	0



Telemetry Development Laboratory

TMD Launch Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Space Systems, Launch Vehicles	TMD Launch Complex	No	No	No	$10,000K

Facility Description (contd.). The mission of this complex is to support BMDO science and technology demonstrations and Navy, BMDO, Army, and SSDC Theater Missile Defense (TMD) interceptor development testing. This test complex sited at WSMR includes Sulf Site, Launch Complex (LC)-36, an ordnance assembly building (LC-37), and Missile Assembly Facility (MAF) (one bay). Assembly/test and launch of one- and two-stage suborbital rockets with TMD target re-entry vehicles is supported. The two Launch Complexes, Sulf Site, and LC-36 have existing blockhouses, and rail and stool launchers (adaptable) with removable environmental (weather) protection buildings. The STORM target system is the primary TMD target launched from this complex. The LEAP (combined kinetic kill vehicle and target) program was fired from this test complex. The ordnance assembly buildings provide a total of three bays for full missile assembly and test capability. Each has installed overhead cranes and meet all current ordnance safety requirements for electrical grounding, physical security, and explosive safety quantity/distance siting. Three areas are available for hypergolic (liquid) fueling.

This equipment is unique because it is the only overland test site capable of testing TMD technology.

Common Support Functions	Percentage
Space Systems, Launch Vehicles	100

Life-Cycle Functions	Percentage
T&E	100

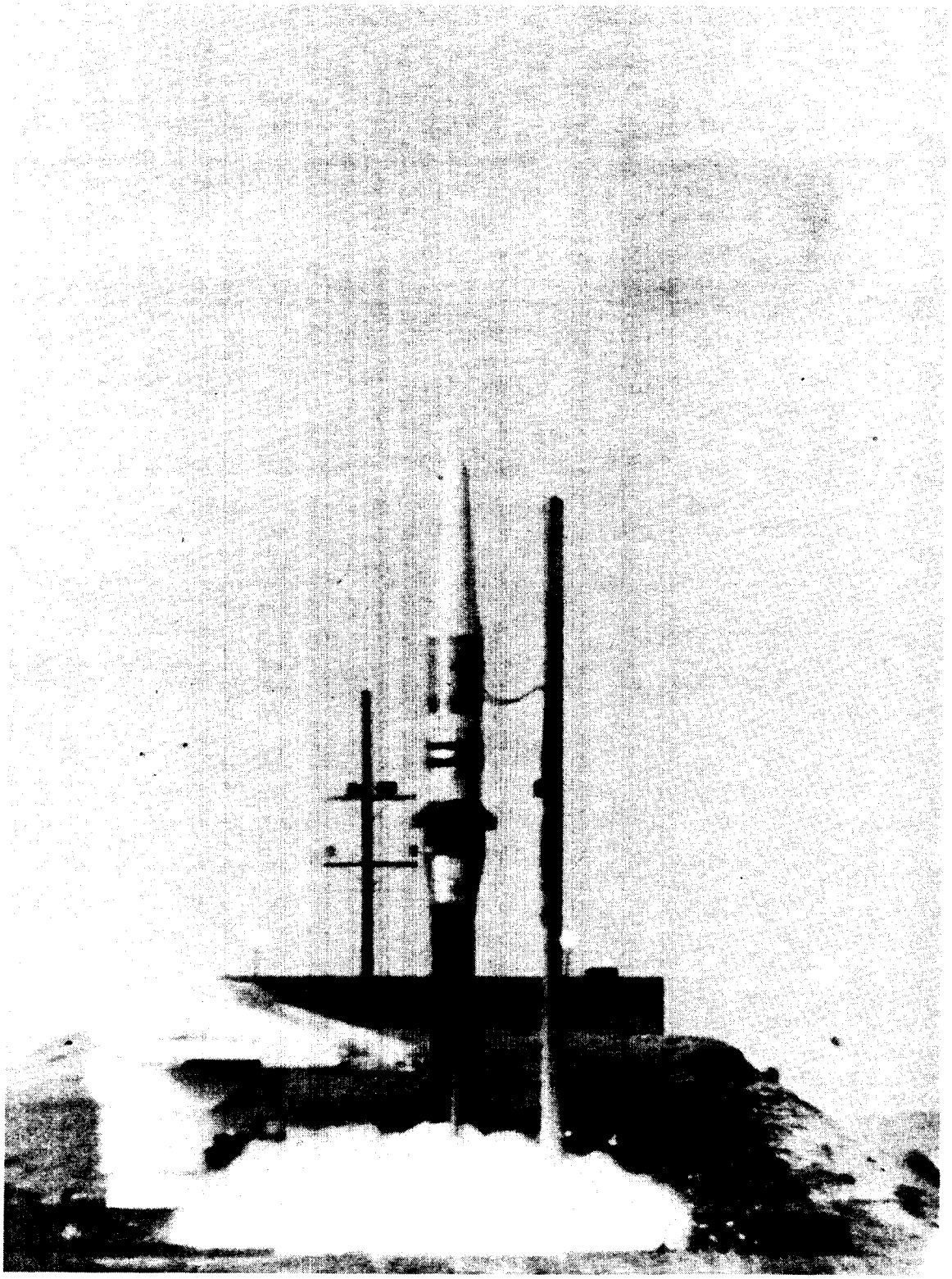
TMD Launch Complex (White Sands)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Space Systems, Launch Vehicles	TMD Launch Complex	No	No	No	$10,000K

Facility Description (contd.). The mission of this complex is to support BMDO science and technology demonstrations and Navy, BMDO, Army, and SSDC Theater Missile Defense (TMD) interceptor development testing. This test complex sited at WSMR includes Sulf Site, Launch Complex (LC)-36, an ordnance assembly building (LC-37), and Missile Assembly Facility (MAF) (one bay). Assembly/test and launch of one- and two-stage suborbital rockets with TMD target re-entry vehicles is supported. The two Launch Complexes, Sulf Site, and LC-36 have existing blockhouses, and rail and stool launchers (adaptable) with removable environmental (weather) protection buildings. The STORM target system is the primary TMD target launched from this complex. The LEAP (combined kinetic kill vehicle and target) program was fired from this test complex. The ordnance assembly buildings provide a total of three bays for full missile assembly and test capability. Each has installed overhead cranes and meet all current ordnance safety requirements for electrical grounding, physical security, and explosive safety quantity/distance siting. Three areas are available for hypergolic (liquid) fueling.

This equipment is unique because it is the only overland test site capable of testing TMD technology.

Common Support Functions	Percentage
Space Systems, Launch Vehicles	100



TMD Launch Complex

R

TSSAM Hardware-in-the-Loop

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets	TSSAM Hardware-in-the Loop	Yes	Yes	Yes	$10,250K = Total $ 250K = Buildings

Facility Description (contd.). This facility is designed to test, evaluate, and assist in the development of the TSSAM weapon system hardware and software throughout the life cycle of the program. Capabilities include launch platform integration, guidance and control, and terminal area performance. This is the only facility that will be able to exercise the full range of TSSAM missile capabilities using actual missile hardware and software. The facility contains a computer network including 22 Sun workstations, five Silicon Graphics workstations, two Micro VAX computers, four PCs, and two Macintosh PCs. In addition, there are 30 embedded computer systems contained within the facility.

This equipment is unique because this is the only existing facility that can fully exercise the TSSAM weapon system in a laboratory environment using actual system hardware and software.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Weapons, Conventional Missiles/Rockets	90

Life-Cycle Functions	Percentage
T&E	50
S&T	0
D&E	50
IE	0
T&D	0
Other	0

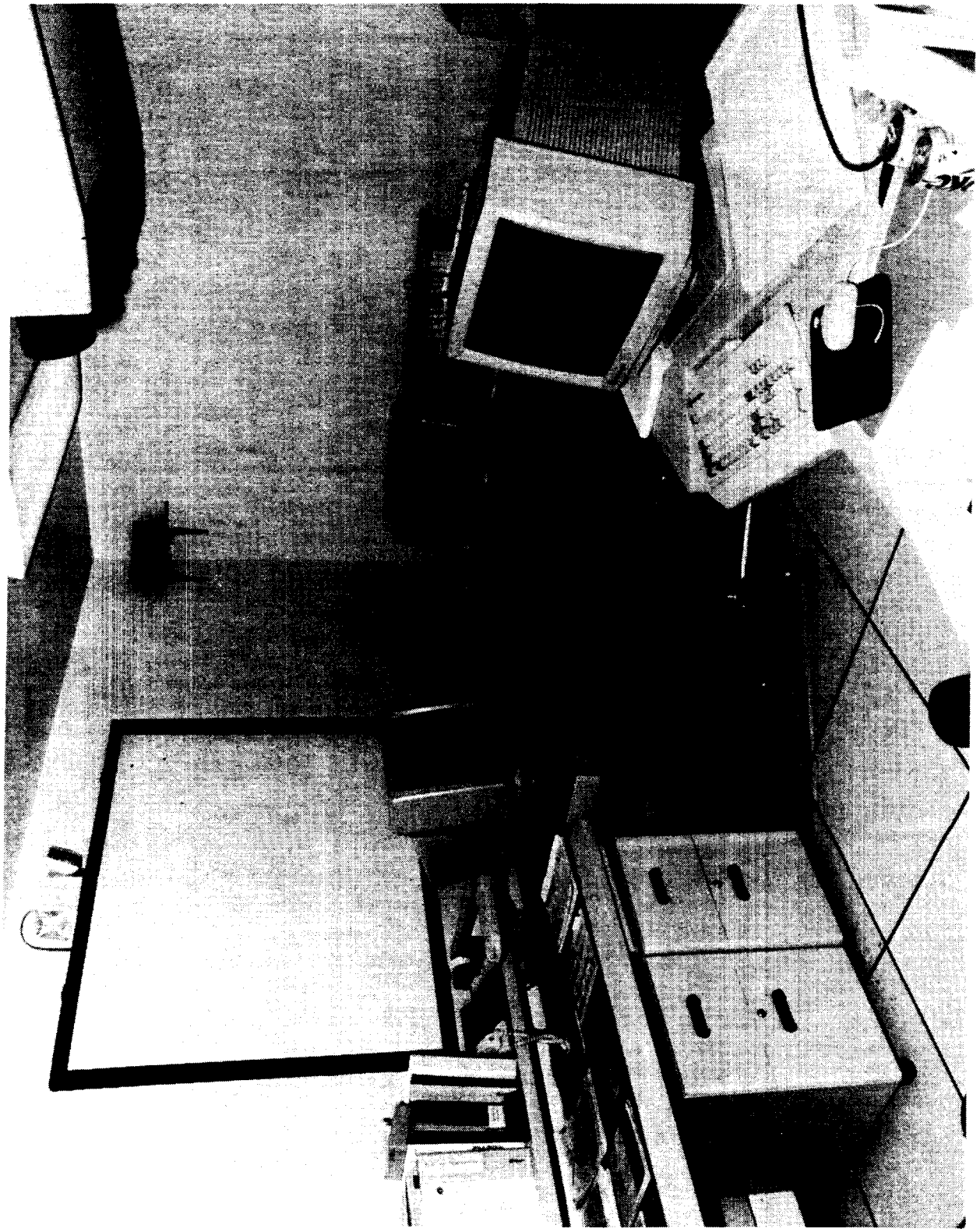
TSSAM Hardware-in-the-Loop

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets	TSSAM Hardware-in-the Loop	Yes	Yes	Yes	$10,250K = Total $ 250K = Buildings

Facility Description (contd.). This facility is designed to test, evaluate, and assist in the development of the TSSAM weapon system hardware and software throughout the life cycle of the program. Capabilities include launch platform integration, guidance and control, and terminal area performance. This is the only facility that will be able to exercise the full range of TSSAM missile capabilities using actual missile hardware and software. The facility contains a computer network including 22 Sun workstations, five Silicon Graphics workstations, two Micro VAX computers, four PCs, and two Macintosh PCs. In addition, there are 30 embedded computer systems contained within the facility.

This equipment is unique because this is the only existing facility that can fully exercise the TSSAM weapon system in a laboratory environment using actual system hardware and software.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	10
Weapons, Conventional Missiles/Rockets	90



TSSAM Hardware-in-the-Loop

R

TSSAM Mission Planning Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Cruise Missiles	TSSAM Mission Planning Facility	No	No	No	$400K = Total $ 88K = Buildings

Facility Description (contd.). This facility is designed to develop, test, support, and maintain TSSAM mission planning software. The development/test facility contains a Sun Sparc-10 server with peripherals and eight Sun LX workstations. In addition, the facility contains a TAMPS DTC-II system with two terminals and peripherals for producing actual TAMPS/TSSAM mission plans.

This equipment is unique because it is the only one in government.

Common Support Functions	Percentage
Weapons, Cruise Missiles	100

Life-Cycle Functions	Percentage
T&E	25
S&T	0
D&E	50
IE	25
T&D	0
Other	0

TSSAM Mission Planning Facility

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Cruise Missiles	TSSAM Mission Planning Facility	No	No	No	$400K = Total $ 88K = Buildings

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Common Support Functions	Percentage
Weapons, Cruise Missiles	100

TSSAM Mission Planning Facility

VHF Anechoic Chamber

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Directed Energy C4I Systems, Airborne C4I	VHF Anechoic Chamber	Yes	Yes	Yes	$22,500K = Total $19,800K = Buildings

Facility Description (contd.). The primary purpose of this facility is the free space measurement of RF signals in a signals free atmosphere. RF signal measurements can consist of spatial transmissions that are received by a singular antenna or can be a combination of known signals. Thus measurements can be as simple as antenna characteristic measurements up to the complex waveforms required by weapon systems and countermeasures against these systems. It is imperative that whatever signals are being measured can mathematically described.

This equipment is unique because there is no other low-frequency chamber of this type. It was designed by W. Emmerson (based on a U.S. patent) and represents the highest performance chamber for the UHF-VHF frequency range for ARM missiles, precision DF systems, and other electronic systems.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	15
Weapons, Conventional Missiles/Rockets	75
Weapons, Directed Energy	5
C4I Systems, Airborne C4I	5

Life-Cycle Functions	Percentage
T&E	15
S&T	60
D&E	25
IE	0
T&D	0
Other	0

VHF Anechoic Chamber

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Space Systems, Satellites C4I Systems, Airborne C4I	VHF Anechoic Chamber	Yes	Yes	Yes	$22,500K = Total $19,800K = Buildings

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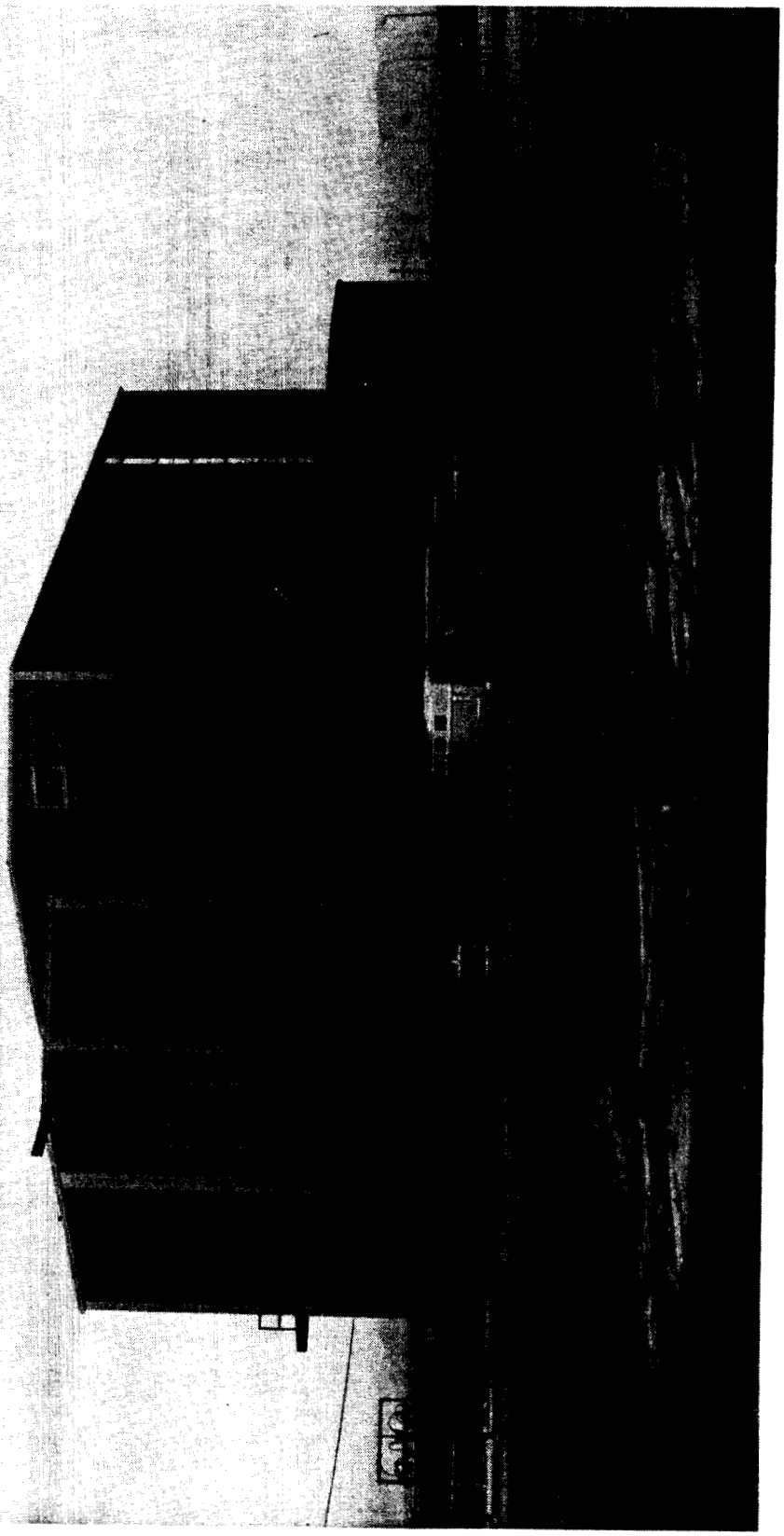
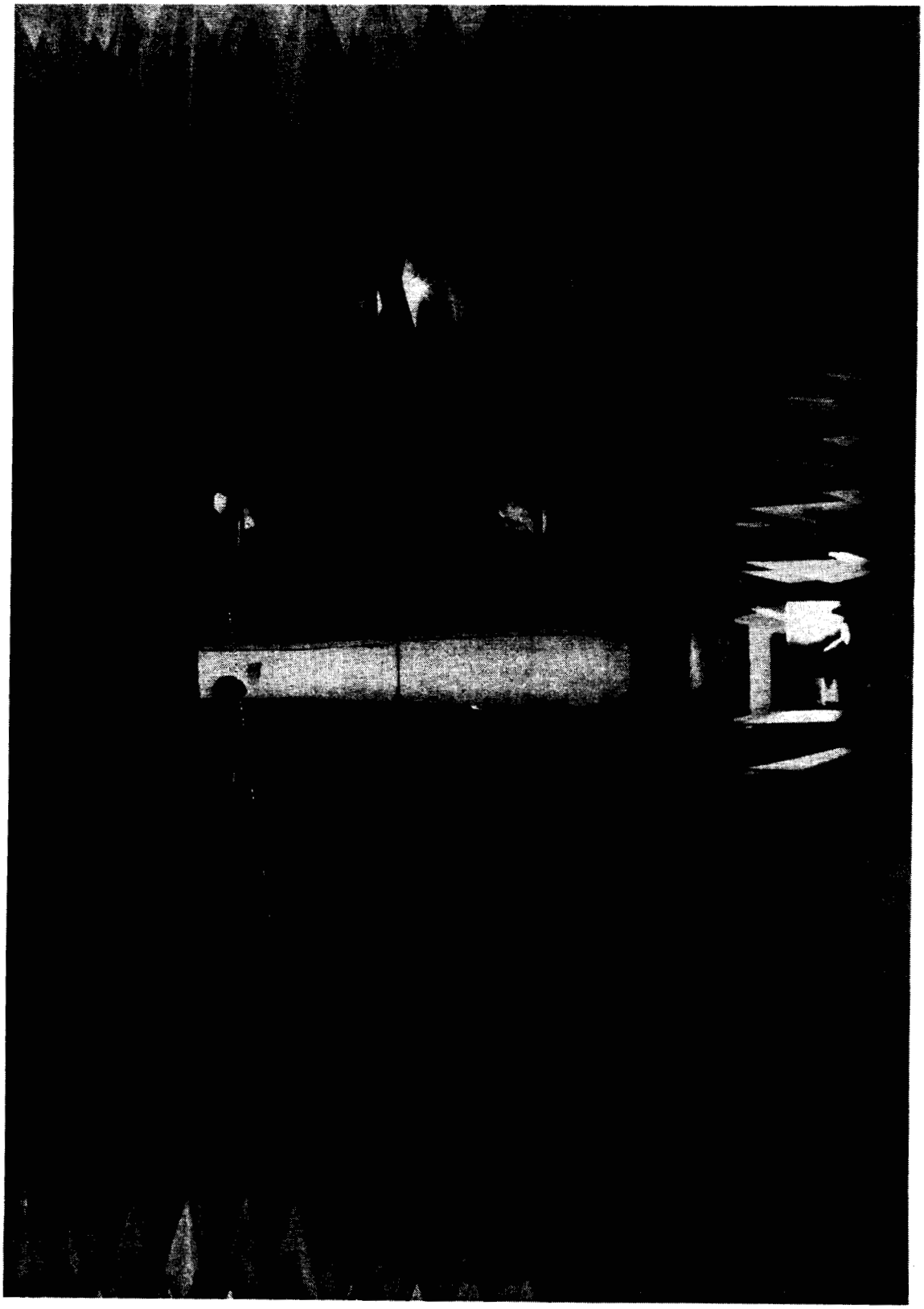
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	15
Weapons, Conventional Missiles/Rockets	75
Space Systems, Satellites	5
C4I Systems, Airborne C4I	5



VHF Anechoic Chamber



VHF Anechoic Chamber

Warhead/Bomb Assembly/Integration Facilities

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Warhead/Bomb Assembly/Integration Facilities	No	No	No	$13,900K = Total $13,855K = Buildings

Facility Description (contd.). These facilities are composed of three assembly buildings (Explosives/Weapon/Hardware), four large explosive storage docks, four explosive storage magazines, three small magazettes for less than 50 pounds of explosive storage, and one large concrete explosive component assembly building with access to four explosive magazines and three magazettes with 50-pound explosive capacities. These facilities have in the past been used for T&E support; however, the current mission is S&T and Development Engineering (DE) for explosive devices, warheads, various munitions, and weapon systems and subsystems. Classified materials are accommodated. This facility supports warhead, explosive component, and munitions assembly and checkout without explosive detonation tests. Explosive components and munitions test hardware handling and storage are accommodated. Modifications are limited to removal/replacement of components and subassemblies. Modifications to explosive devices/hardware requires removal to remote control/handling areas. The facilities and equipment provide for design, design modeling, computer analysis, and data analysis in support of its weapon integration mission.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	40
Weapons, Cruise Missiles	25
Weapons, Bombs	35

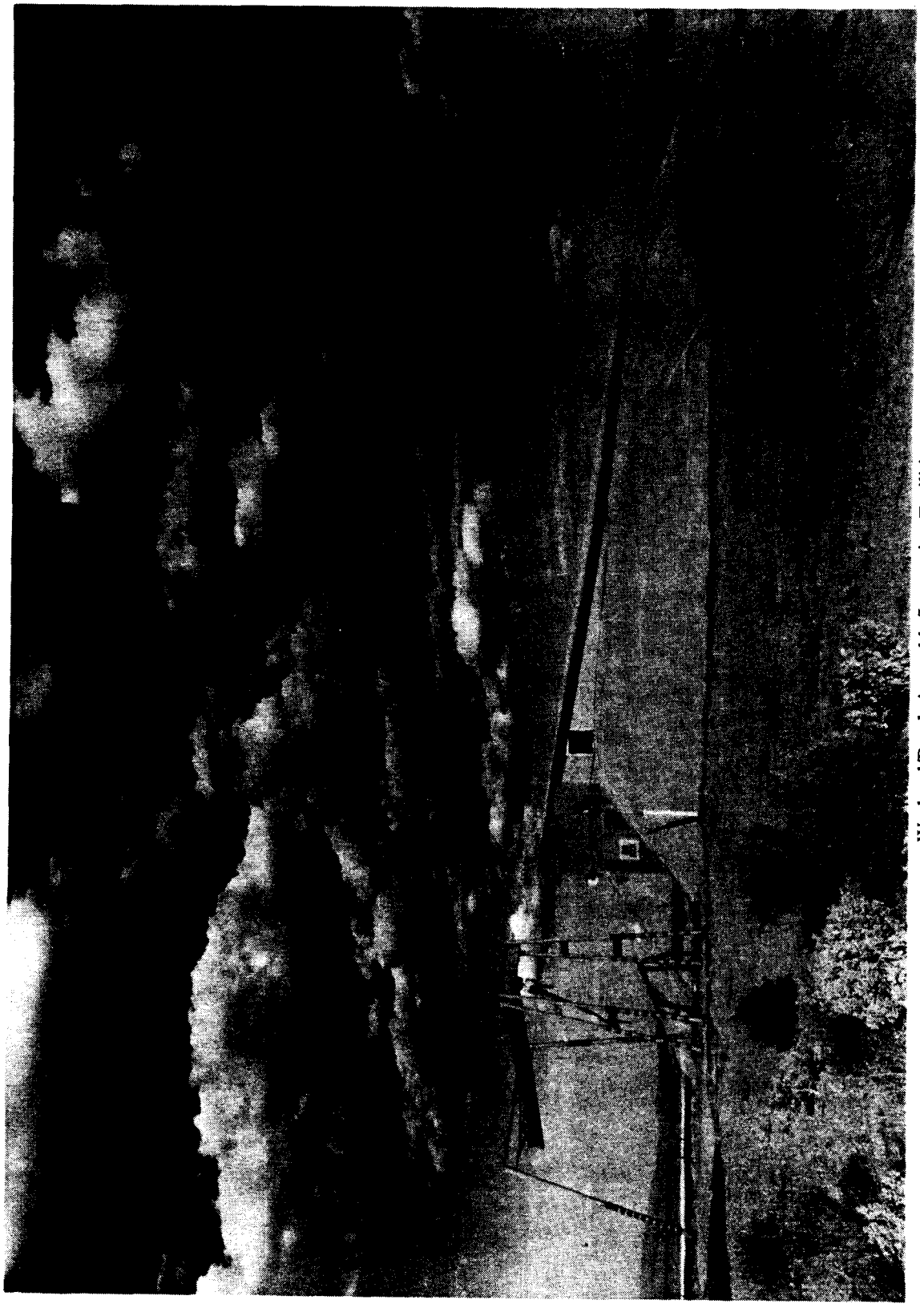
Life-Cycle Functions	Percentage
T&E	50
S&T	15
D&E	30
IE	5
T&D	0
Other	0

Warhead/Bomb Assembly/Integration Facilities

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles Weapons, Bombs	Warhead/Bomb Assembly/Integration Facilities	No	No	No	$13,900K = Total $13,855K = Buildings

Facility Description (contd.). These facilities are composed of three assembly buildings (Explosives/Weapon/Hardware), four large explosive storage docks, four explosive storage magazines, three small magazettes for less than 50 pounds of explosive storage, and one large concrete explosive component assembly building with access to four explosive magazines and three magazettes with 50-pound explosive capacities. These facilities have in the past been used for T&E support; however, the current mission is S&T and Development Engineering (DE) for explosive devices, warheads, various munitions, and weapon systems and subsystems. Classified materials are accommodated. This facility supports warhead, explosive component, and munitions assembly and checkout without explosive detonation tests. Explosive components and munitions test hardware handling and storage are accommodated. Modifications are limited to removal/replacement of components and subassemblies. Modifications to explosive devices/hardware requires removal to remote control/handling areas. The facilities and equipment provide for design, design modeling, computer analysis, and data analysis in support of its weapon integration mission.

Common Support Functions	Percentage
Weapons, Conventional Missiles/Rockets	40
Weapons, Cruise Missiles	25
Weapons, Bombs	35



Warhead/Bomb Assembly/Integration Facilities

Weapon System Support Facility Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Bombs Weapons, Guns and Ammunition	Weapon System Support Facility Complex	Yes	Yes	Yes	$159,886K = Total $ 5,941K = Buildings

Facility Description (contd.). The F/A-18 Weapon System Support Facility (WSSF) is composed of a group of computer-based laboratories and hot benches with real integrated avionics used to perform system and subsystem level test and evaluation of the F/A-18 avionics embedded computer systems (mission computer and stores management) and their associated Operational Flight Programs. It is a completely integrated facility capable of supporting system engineering, software engineering, avionics and weapons integration, software maintenance and incorporation of new systems, technology and concepts. The F/A-18 WSSF is the primary tool used to provide development testing, verification and validation, and safety of flight testing, quick-response investigations of Fleet-reported problems, corrections of errors and deficiencies, investigation of changes, integration and test of new technology and weapons. The F/A-18 WSSF supports the following test capability requirements: rapid pre- and postflight testing in support of OAR testing, hot bench mockup accommodation, MIL-STD-1760 transparency, scenario synchronization, MIL-STD-1553 avionics bus simulation, MIL-STD-1760 weapons interface bus simulations, munitions and avionics imagery video simulation, GPS constellation simulator, high-fidelity (6-DOF) flight motion simulation, system-under-test data collection, and real-time interrelated scenario parameter measurement.

The F/A-18 Sensors Facility is a multiuse facility supporting integration, validation, and development of Operation Flight Programs. The facility directly supports the APG-65 Radar Set, APG-73 Radar Set, FLIR/NAVFLIR/TINS Pods, ALR-67/ASPJ/ALE-47 EW suites, and Stores Management Set of the F/A-18 aircraft through integration of actual avionics. The facility can also support any armament/munitions that can be physically connected to the integration benches or simulated through various test sets. The Sensors Facility encompasses four workstations: 1) APG-65 Radar, 2) APG-73 Radar, 3) FLIR Bench, and 4) Special Projects. Each lab is capable of independent operation or integration with the capabilities of any of the other labs. APG65 and 73 workstations timeshare the Stores Management Set and EW Suite components. Integral to the Special Projects is the Flight Test Ground Station, which is capable of performing telemetry and data analysis tasks to assist in Flight Test Operations.

The A-6 WSSF is composed of a group of computer-based laboratories and hot benches with real integrated avionics used to perform system and subsystem level test and evaluation of the A-6 avionics embedded computer systems and their associated Operational Flight Programs. It is a completely integrated facility capable of supporting system engineering; software engineering; avionics and weapons integration; software maintenance; and incorporation of new systems, technology, and concepts. The A-6 WSSF is the primary tool used to provide quick-response investigations of Fleet-reported problems, corrections of errors and deficiencies, investigation of changes, integration and test of new technology and weapons, development testing, verification and validation, and safety of flight testing. The A-6 WSSF supports the following test capability requirements: rapid pre- and postflight testing in support of OAR testing, hot bench mockup accommodation, scenario synchronization, MIL-STD-1553 avionics bus simulation, munitions and avionics imagery video simulation, GPS constellation simulator, high-fidelity (6-DOF) flight motion simulation, system-under-test data collection, and real-time interrelated scenario parameter measurement.

The AV-8 Radar Facility supports testing of the APG-65 Radar into the AV-8 embedded systems. By interconnecting to the radar system of the stores management system, the workstation can be rapidly converted to provide hot bench capability for both the radar and the SMS. The workstation has the ability to provide complete dynamic and static test capability for all the major embedded systems on the AV-8B.

The AV-8 WSSF consists of two AV-8B Day Attack Integration Workstations, a Night Attack Integration Workstation, a radar AV-8B hot bench, Day Attack Stores Management System (SMS) hot bench, and a combination Day/Night SMS hot bench. The AV-8 WSSF has the capability of complete dynamic and static testing of all the avionics on the three (Day/Night/Radar) versions of the AV-8B with the exception of the INS and ADC. INS and ADC models are provided for complete system functionality. Four weapons simulators are used to simulate the aircraft armament and munitions. Real weapons may be connected to the workstations for a variety of ground tests. The types of testing include preflight, postflight, integration testing, and subsystem testing, in both dynamic and static modes. Data can be logged for post analysis. Bomb scoring algorithms can be tested interactively or in batch mode.

The AH-1 Facility has one Control Display System hot bench, one combination integrated GPS and Inertial Navigation System (IGI) hot bench, and one combination integration/hot bench for the CDS and CCS systems. A Night Targeting System (NTS) hot bench is ready for use (awaiting aircraft avionics for completion of bench software and user certification).

Rapid prototyping and evaluation of crewstation systems related to aircraft and weapon control. This functional area includes survivability and lethality aspects of mission performance for air-to-air and air-to-surface weapons. The criticality of this functional area will continue to increase as weapon systems increase in number and complexity, while aircrew capabilities remain constant.

This equipment is unique because NAWCWPNS is the principal site for the F/A-18, AV-8B, A-6, and AH-1 aircraft. As such, their system-level integration and test facilities are located at China Lake. Each platform's WSSF is unique to the aircraft platform. Although each facility has been built using a similar architecture, hardware, and software, the uniqueness of each platform's avionics dictates that the avionics integration facility be specifically tailored to the host aircraft. The U.S. Navy is the only agency that has a requirement to support avionics integration on Navy fighter, attack, and Foreign Military Sales (FMS) aircraft. Each platform's prime contractor has facilities to perform lower-level module and integration tests. The prime contractors and FMS countries use the WSSF complex for design, development, and system integration testing.

Additionally, the WSSF complex is used exclusively for verification and validation testing of U.S. Navy and FMS versions of Operational Flight Software.

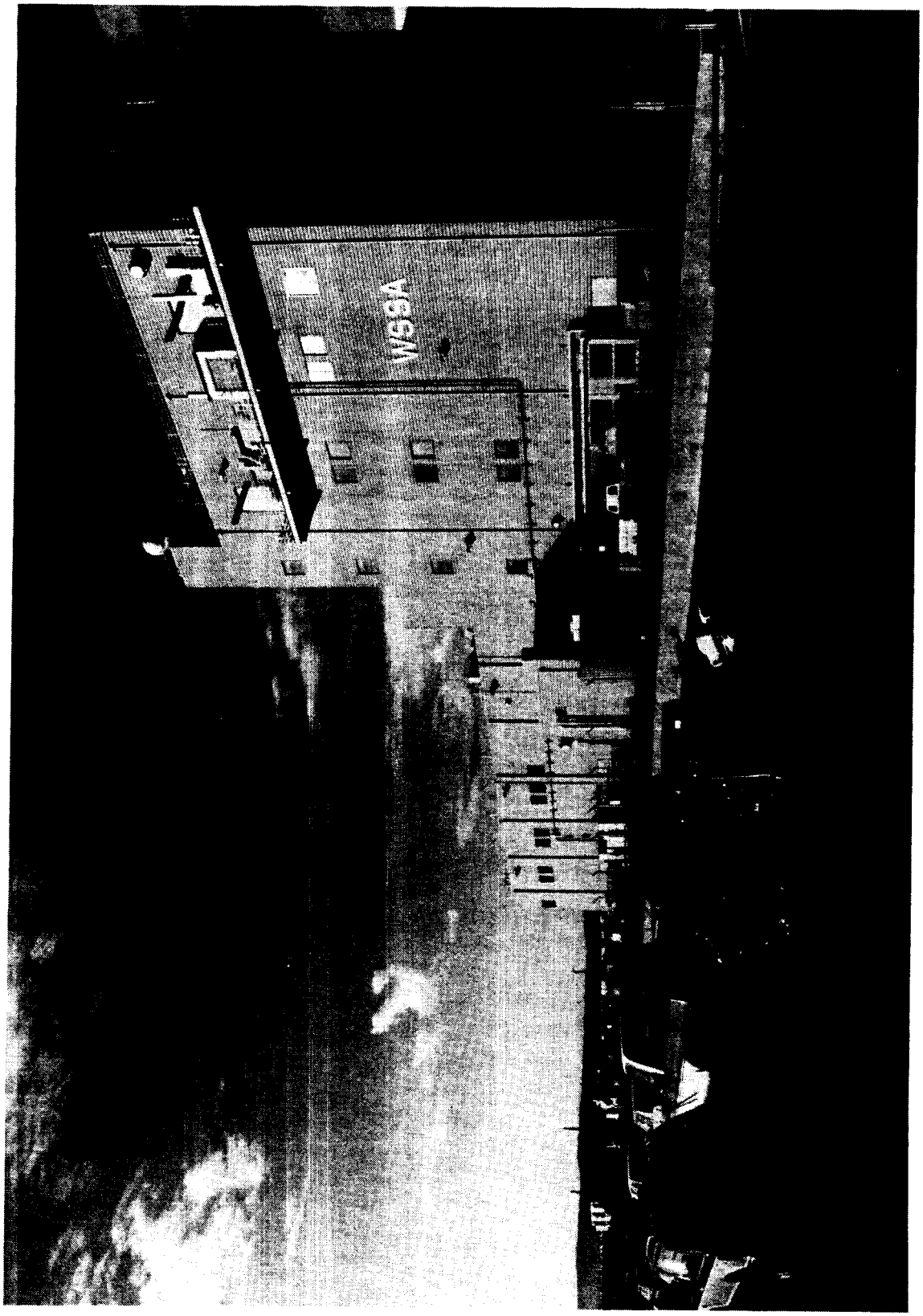
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	85
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	6
Weapons, Bombs	3
Weapons, Guns and Ammunition	1

Life-Cycle Functions (Percentages)

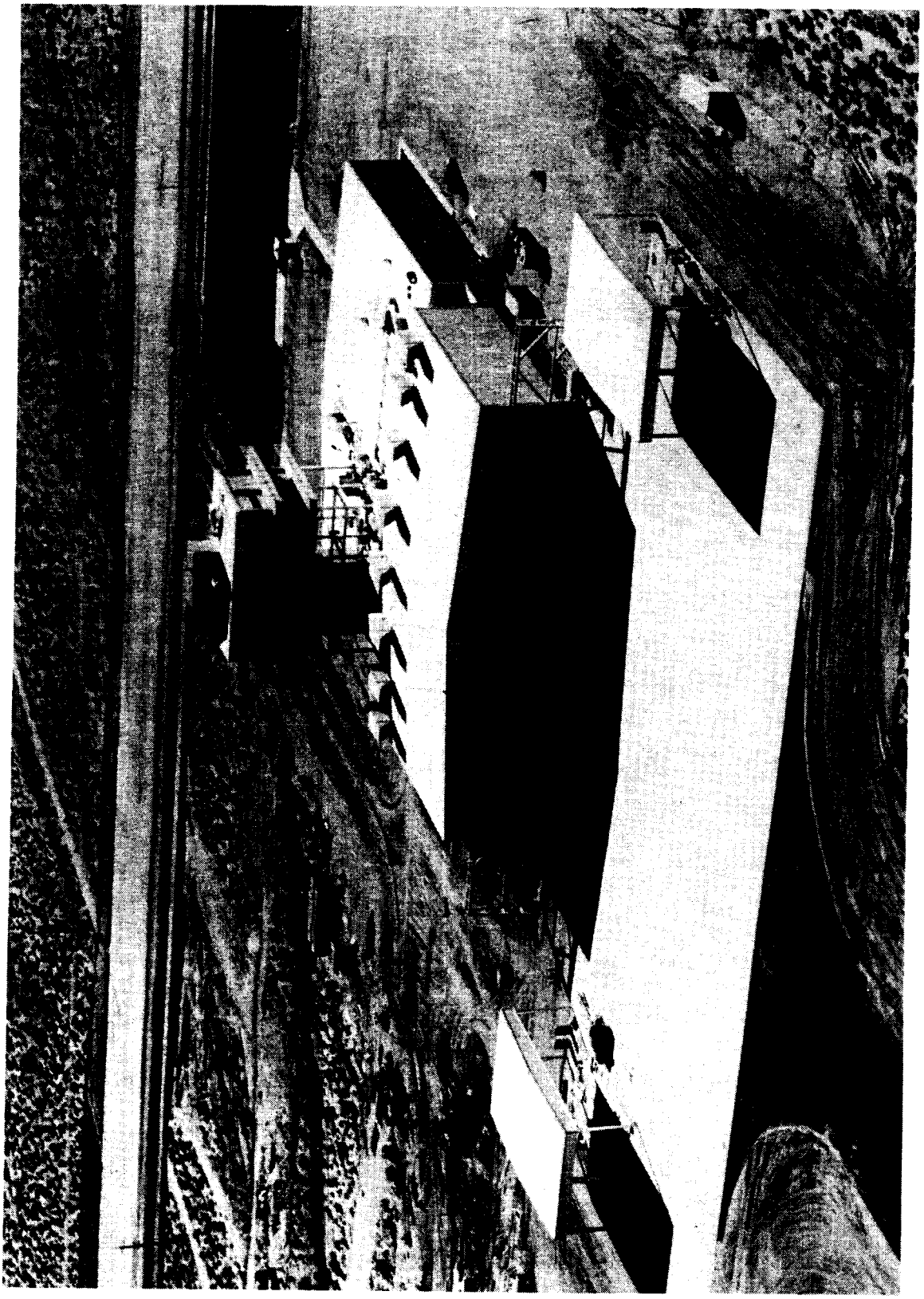
	Aircraft Type			
	A-6	AH-1	AV-8	F/A-18
T&E	34	47.5	35	38
S&T	0	2.4	0	0
D&E	54	13.2	24	48
IE	12	13.6	36	3
T&D	0	0	0	0
Other	0	23.3	5	11

Additionally, the WSSF complex is used exclusively for verification and validation testing of U.S. Navy and FMS versions of Operational Flight Software.

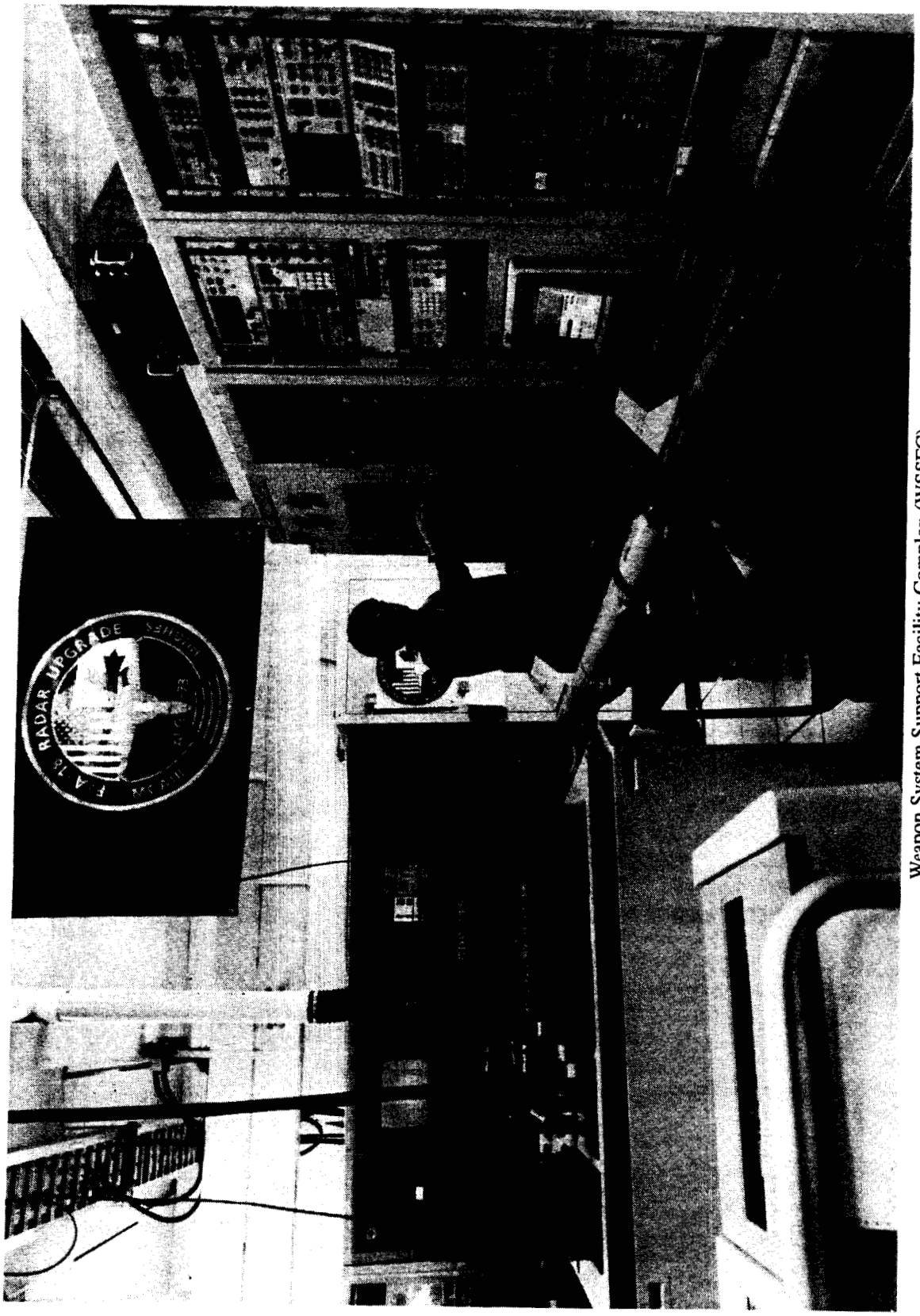
Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	85
Air Vehicles, Rotary Wing, Avionics	5
Weapons, Conventional Missiles/Rockets	6
Weapons, Bombs	3
Weapons, Guns and Ammunition	1



Weapon System Support Facility Complex (WSSFC)



Weapon System Support Facility Complex (WSSFC)



Weapon System Support Facility Complex (WSSFC)

Weapon System Support Facility Complex (WSSFC)

Weapons Guidance/Control/Seeker Integration Laboratory

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Air Vehicles, Rotary Wing, Avionics Weapons, Conventional Missiles/Rockets	Weapons Guidance/Control/Seeker IL Elements • Electro-Optics Clean Room • Missile G&C Systems Integ Lab • Dual Mode Fac • Wpns/Aircraft Integ Lab	Yes	Yes	Yes	$15,234K = Total $ 3,214K = Buildings

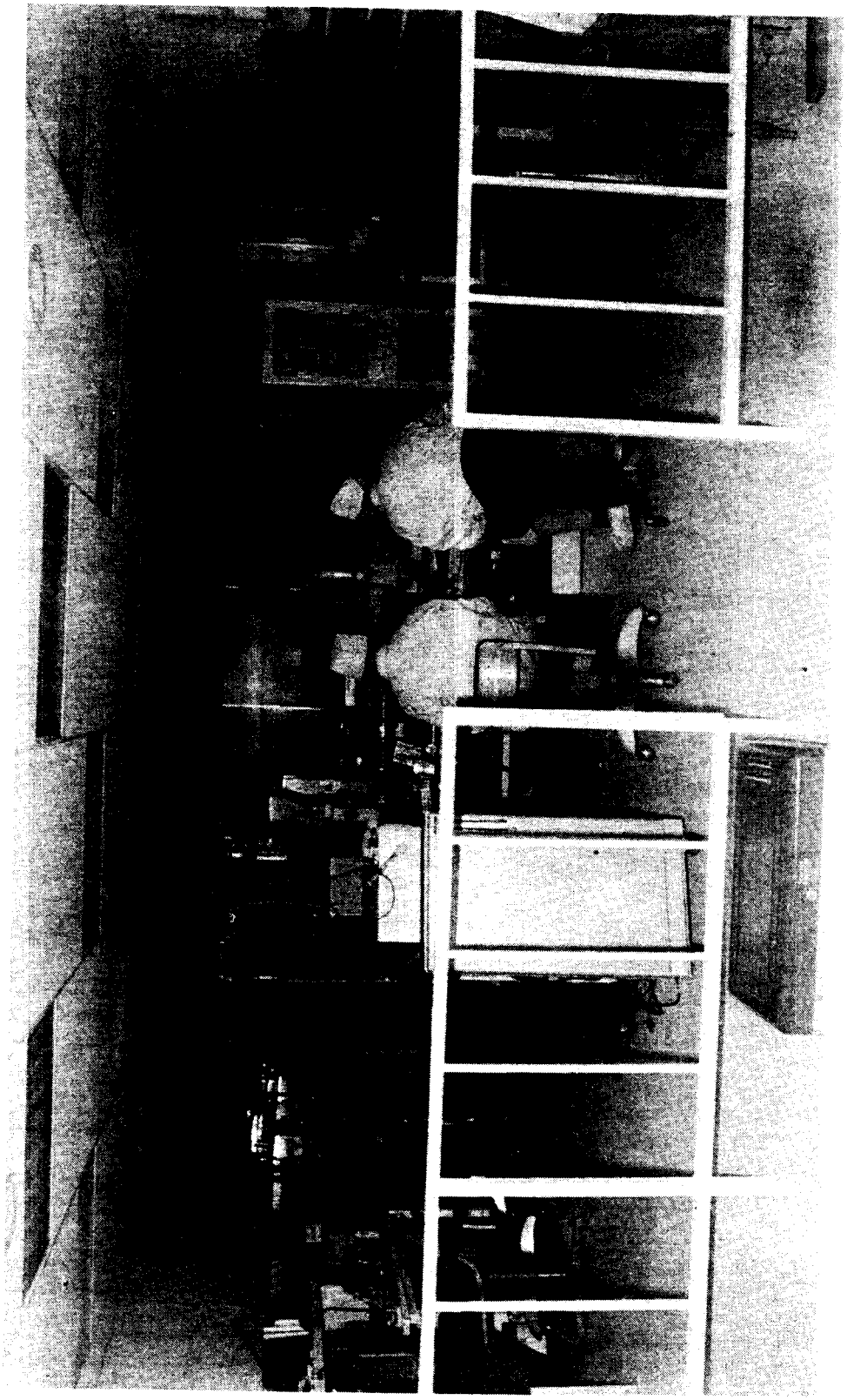
Facility Description (contd.). This laboratory provides full integration and test support (cradle to grave) for EO, IR, RF, and IR/RF missile seeker/guidance/control systems. Development, integration, and testing is provided on rate tables (for EO and IR) and in the Dual Mode Facility (for RF and IR/RF); all provide digital data retrieval, storage, and processing capability, which allows real-time evaluation and analysis. In addition, this laboratory has the facilities and equipment, including an integration van, for Sidewinder missile build-up and aircraft integration support as well as factory level electronics manufacturing. This laboratory also supports assembly, repair, and test of EO/IR/RF seekers. This includes maintaining an expertise in clean-room procedures, bearing replacement, lubrication and test, optics assembly and test, inspection of mechanical and optical parts, and exploitation/repair of foreign EO seekers. Systems-level 6-DOF fly-out simulation, circuit design analysis, and missile transfer functions are also done. Special signal analysis on a variety of systems is performed.

This equipment is unique because RF and RF/IR missile guidance systems integration/test of any RF and RF/IR missile from 5 to 15 inches in diameter is done in one facility. Systems not previously tested can be done without building an entire test set. Sidewinder development/test/evaluation, engineering/manufacturing development, and in-service engineering is provided by this laboratory. Simultaneous line-of-sight (LOS) rate and roll rate testing done on one modified rate table permits evaluation of short-range IR guidance/control systems under laboratory conditions that would otherwise require expensive captive-carriage flight testing on board an aircraft. The resident signature library use for the Special Signal Processing Lab is unique.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	3
Air Vehicles, Rotary Wing, Avionics	2
Weapons, Conventional Missiles/Rockets	95

R

Life-Cycle Functions	Percentage
T&E	42
S&T	22
D&E	32
IE	4
T&D	0
Other	0



Weapons Guidance/Control/Seeker Integration Laboratory

Weapons Signal Processing Design Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Weapons, Directed Energy C4I Systems, Airborne C4I	Weapons Signal Processing Design Complex Elements • ARM Design, Analysis and Eval Fac • Optical Computing Ctr • Neural Network Workstation • Radiometry Measurement Fac	Yes	Yes	Yes	$6,550K = Total $5,100K = Buildings

Facility Description (contd.).
The Optical Computing Center supports the development, testing, and evaluation of automatic target recognition techniques based on ultra-high-speed, real-time optical computing. Sensors that image a target (such as FLIR, video, radar and LADAR) can be tested with the optical computing system.

The Neural Network Workstation has a neural network/digital signal processing system based on VME bus integrated with image data acquisition hardware. These items are controlled by, and the resulting data are evaluated with, several standard computer sets, including Sun Sparcstation (an IBM PC-compatible) and a Silicon Graphics workstation.

The ARM Design, Analysis, and Evaluation Facility contains microwave anechoic chambers, high-speed digital development workstations, digital signal signal processing, precision analog test equipment, microwave network analyzers, RF target simulators, concurrent engineering workstations, antenna finite element modeling, and analog and digital circuit modeling workstations. The facility also contains specialized IF and microwave test equipment and spectrum analyzers.

The Microwave Radiometer Laboratory provides test, evaluation, and development capability for microwave and millimeter-wavelength radiometric sensing for imaging, targeting, and remote sensing. The facility has laboratory space for test and integration of systems and has access to a variety of ranges and targets for field testing.

This equipment is unique because:
Neural Network Workstation—The combination of hardware and experience is not duplicated elsewhere. We have reached a point where we are frequently pushing the technology beyond what its manufacturer envisioned, and the manufacturer is looking to us for input.

ARM Design, Analysis, and Evaluation—This is the only integrated design, analysis, and evaluation team dedicated to ARM guidance seekers.

Weapons Signal Processing Design Complex

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets Space Systems, Satellites C4I Systems, Airborne C4I	Weapons Signal Processing Design Complex Elements • ARM Design, Analysis and Eval Fac • Optical Computing Ctr • Neural Network Workstation • Radiometry Measurement Fac	Yes	Yes	Yes	$6,550K = Total $5,100K = Buildings

Facility Description (contd.).
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This equipment is unique because:
Neural Network Workstation—The combination of hardware and experience is not duplicated elsewhere. We have reached a point where we are frequently pushing the technology beyond what its manufacturer envisioned, and the manufacturer is looking to us for input.

ARM Design, Analysis, and Evaluation—This is the only integrated design, analysis, and evaluation team dedicated to ARM guidance seekers.

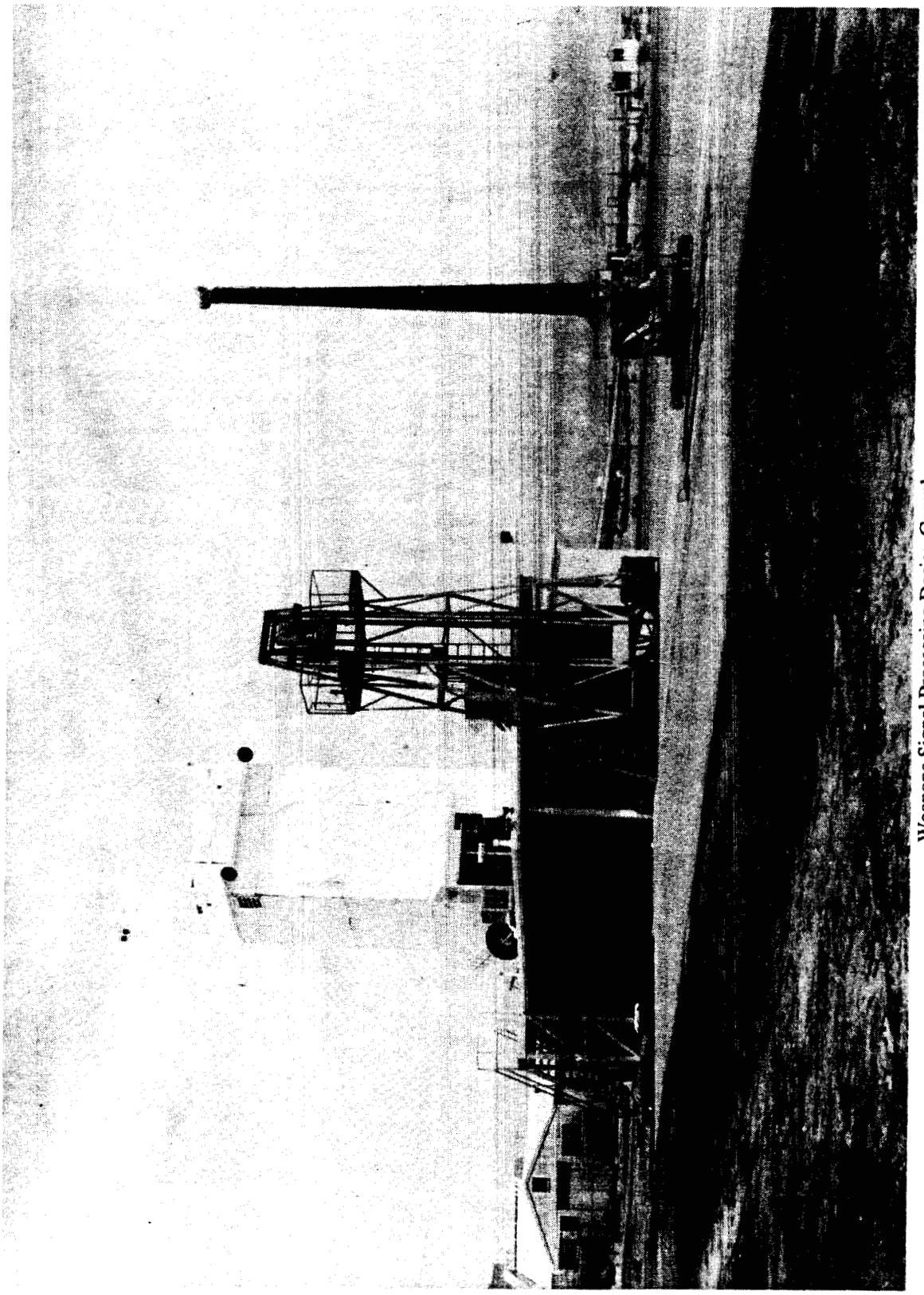
Microwave Radiometer Laboratory—This is the only government facility in the U.S. engaged in the test, evaluation, and development of sensors and systems to exploit naturally occurring and unintentional emissions from natural and manmade objects.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	15
Weapons, Conventional Missiles/Rockets	78
Weapons, Directed Energy	2
C4I Systems, Airborne C4I	5

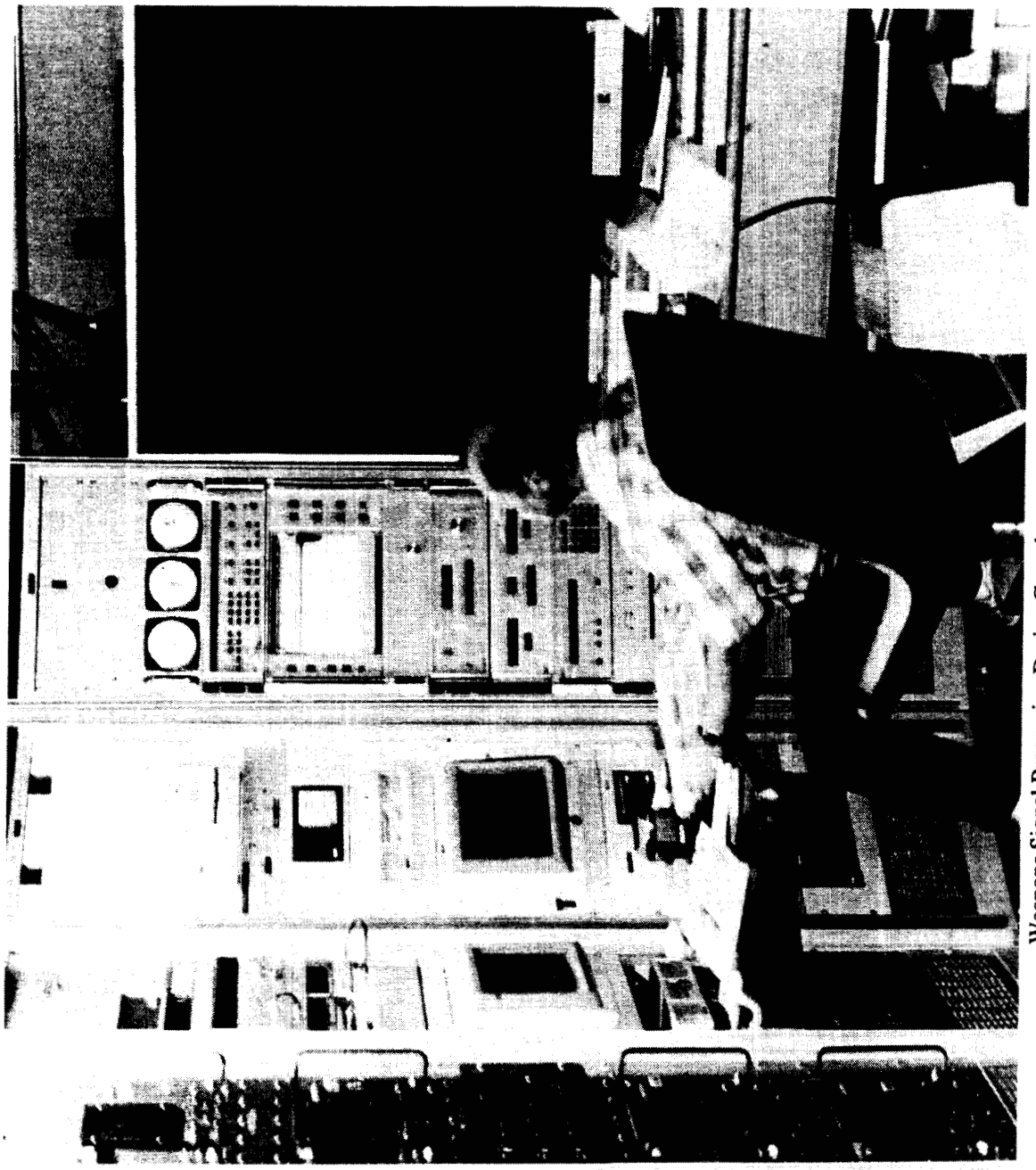
Life-Cycle Functions	Percentage
T&E	10
S&T	25
D&E	65
IE	0
T&D	0
Other	0

Microwave Radiometer Laboratory—This is the only government facility in the U.S. engaged in the test, evaluation, and development of sensors and systems to exploit naturally occurring and unintentional emissions from natural and manmade objects.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing, Avionics	15
Weapons, Conventional Missiles/Rockets	78
Space Systems, Satellites	2
C4I Systems, Airborne C4I	5



Weapons Signal Processing Design Complex



Weapons Signal Processing Design Complex

Weapons Survivability Laboratory (WSL)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicle, Fixed Wing, Avionics Air Vehicle, Fixed Wing, Flight Subsystems Air Vehicle, Rotary Wing, Avionics Air Vehicle, Rotary Wing, Flight Subsystems Weapons, Conventional Missiles/Rockets Weapons, Cruise Missiles	Weapons Survivability Lab (WSL)	Yes	Yes	Yes	$70,771K = Total $ 5,665K = Buildings

Facility Description (contd.). The Weapons Survivability Laboratory (WSL) is a complex of test facilities that provides realistic vulnerability and lethality testing as well as controlled, repeatable weapons separation, parachute deployment, and weapons retardation device testing. Tests are conducted under dynamic conditions on operational aircraft, weapons systems, aircraft structures, propulsion systems, and aircraft subsystems and components. The WSL is a unique capability within the DOD in that it is capable of conducting tests with actual and simulated threat munitions ranging from small arms to full-up (air-to-air) missile warheads. The facility regularly supports all three services and the aerospace industry in conducting Congressionally mandated Live Fire Testing to collect empirical data on the survivability of aircraft to actual threats. The FAA and foreign programs are expected to utilize the WSL in future joint programs.

The facility can operate full up aircraft, or individual subsystems, remotely with man-in-the-loop scenarios to include operation of engines at military power settings (including afterburner). Aircraft structures, such as wings, are tested under both airflow and simulated flight loads through the use of special load fixtures.

The High Velocity Airflow System (HIVAS) provides up to 600 knots over test articles simulating in-flight conditions and enabling examination of airflow effects on damaged structures and materials. HIVAS is mounted on a turntable that facilitates it servicing each of the WSLs three major test pads. Test pads can accommodate full-scale tactical and transport fixed and rotary wing aircraft.

Some key test equipment includes a fuel temperature conditioning unit for realistic test conditions; test stands and load cells for operating jet, turbojet, and turboprop engines; overhead mounting for drones, free fall weapons; and, full-scale aircraft mounts. The test pad architecture facilitates positioning of test specimens and threats (guns, warheads, etc.) in virtually any relative position desired to achieve realistic relationships representative of actual threat engagements.

The facility is in close proximity to the China Lake facilitating delivery of up to transport size aircraft directly to the WSL for testing. It includes office spaces, a machine shop, classified storage and fabrication facilities that provide the capability to develop test hardware of all types, including detailed replicas, surrogates modified from existing hardware, and complex simulators. A full instrumentation capability exists and is augmented by real-time video and high-speed photography. Environmental protection is provided by a fully licensed 5,000-gallon-capacity system to recover and separate fuel and fire fighting constituents. Remote visually monitored fire-fighting systems ensure a controlled and safe test environment.

Common Support Functions	Percentage
Air Vehicle, Fixed Wing, Avionics	10
Air Vehicle, Fixed Wing, Flight Subsystems	50
Air Vehicle, Rotary Wing, Avionics	3
Air Vehicle, Rotary Wing, Flight Subsystems	17
Weapons, Conventional Missiles/Rockets	10
Weapons, Cruise Missiles	10

Life-Cycle Functions	Percentage
T&E	20
S&T	10
D&E	70
IE	0
T&D	0
Other	0

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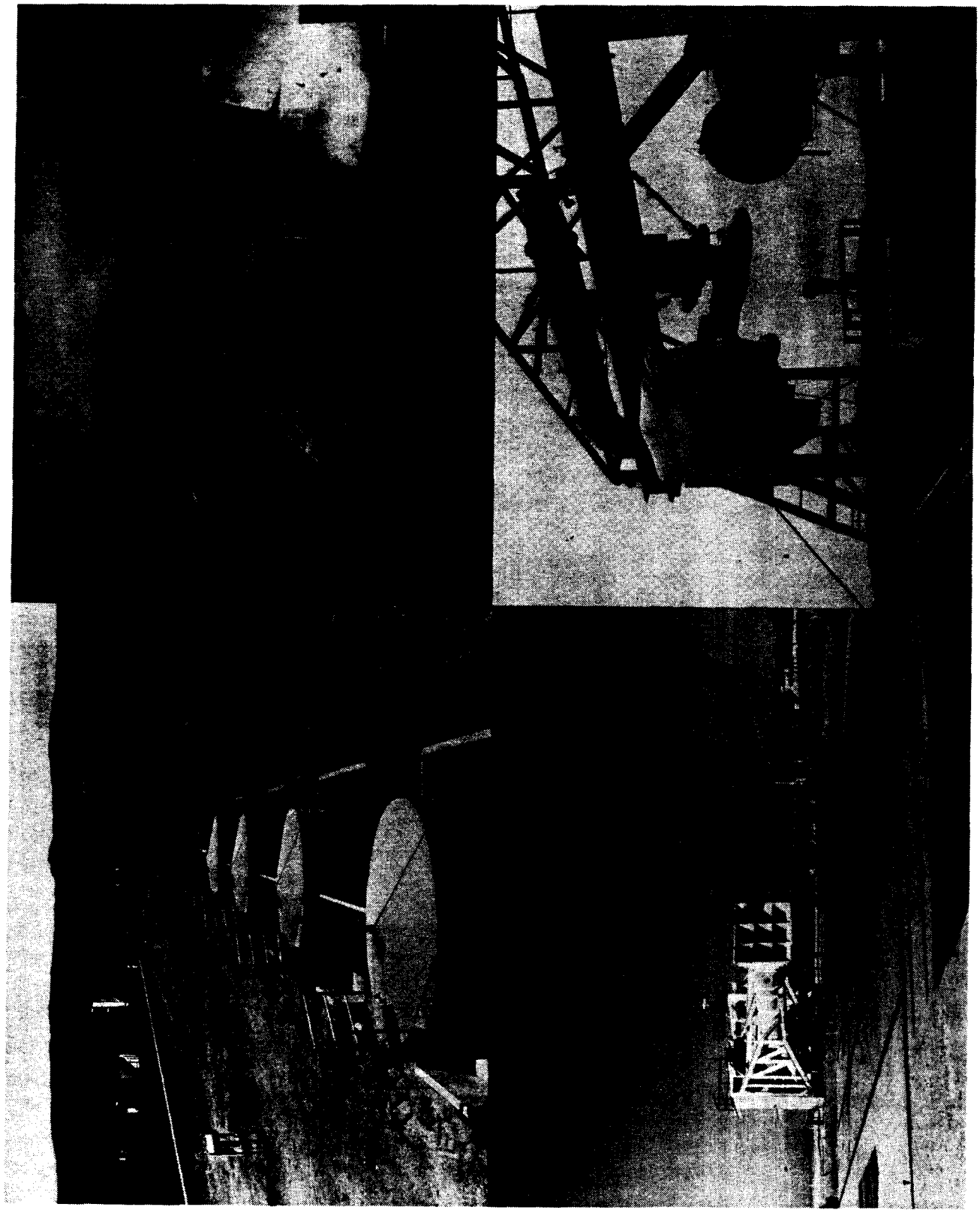
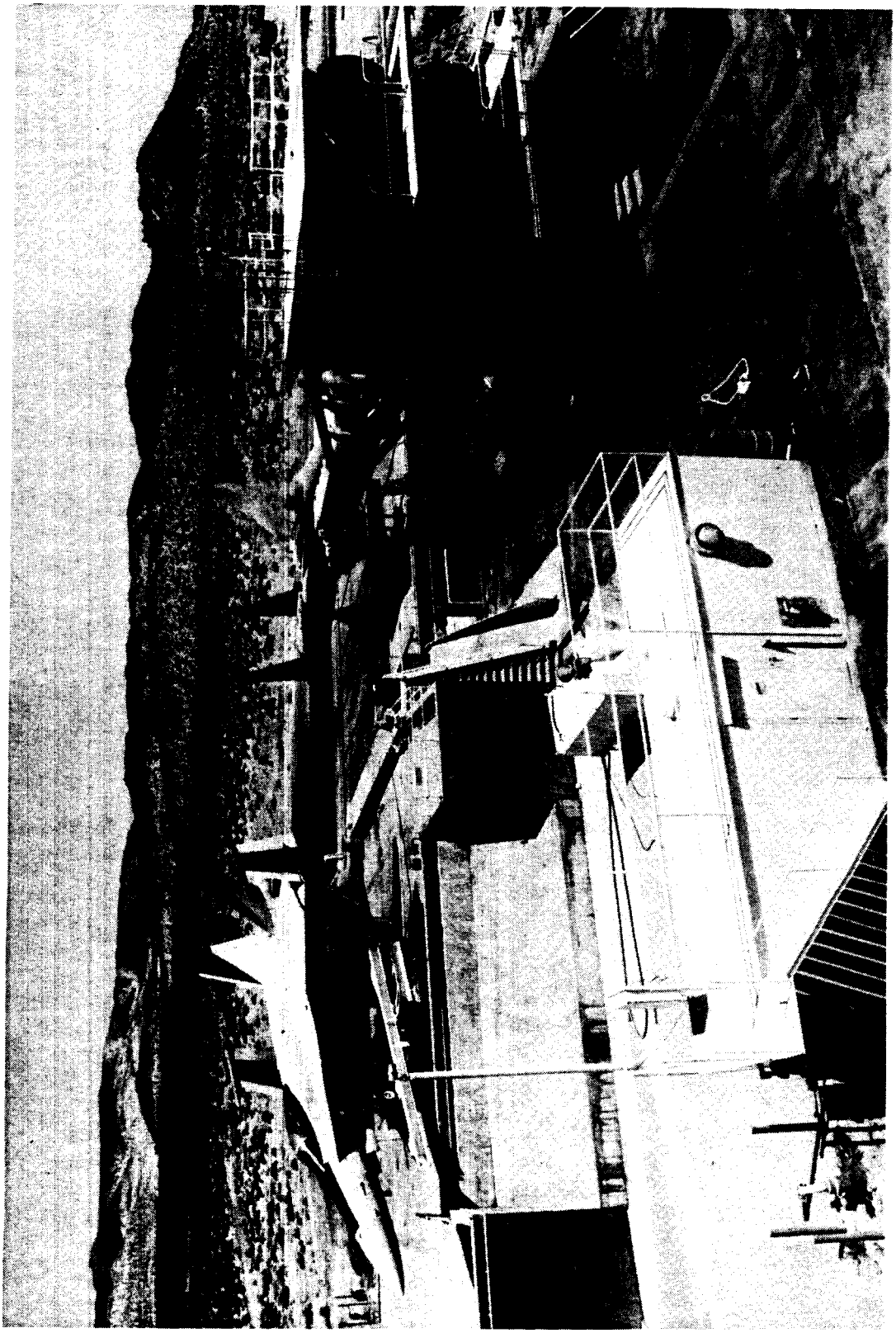
Air Vehicle, Rotary Wing, Avionics	3
Air Vehicle, Rotary Wing, Flight Subsystems	17
Weapons, Conventional Missiles/Rockets	10
Weapons, Cruise Missiles	10



Weapons Survivability Laboratory (WSL)



Weapons Survivability Laboratory HIVAS Facility

Weapons and Tactics Analysis Center (WEPTAC)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
		DOD	Federal Gov't	U.S.	
Air Vehicles, Fixed Wing, Structure Air Vehicles, Fixed Wing, Avionics Weapons, Conventional Missiles/Rockets	Weps and Tactics Analy Ctr (WEPTAC)	Yes	Yes	Yes	$8,000K = Total $1,500K = Buildings

Facility Description (contd.). The Weapons and Tactics Analysis Center (WEPTAC), located at China Lake, is an interactive wargaming and analysis capability in use since the early 1980s to support RDT&E. Fleet and other service tacticians are used as wargame players. WEPTAC is supported by a software and analysis staff, conducts projects to the level of Top Secret compartmented programs, and operates in three physical facilities. WEPTAC is used to support T&E of air-to-air and air-surface weapon systems.

This equipment is unique because WEPTAC provides a capability not duplicated in any other part of the government, based on the following collective attributes: tactical battle-level interactive wargames, military customer-in-the-loop, Top Secret multicompartmented classification capability, ability to internet with other simulations, in-house development and maintenance of the facility, and an in-house analysis staff.

Common Support Functions	Percentage
Air Vehicles, Fixed Wing Structure	10
Air Vehicles, Fixed Wing Avionics	15
Weapons, Conventional Missiles/Rockets	75

Life-Cycle Functions	Percentage
T&E	25
S&T	50
D&E	0
IE	0
T&D	25
Other	0

Weapons and Tactics Analysis Center (WEPTAC)

Common Support Function	Major Facility or Equipment Description	Unique To			Replacement Cost ($K)
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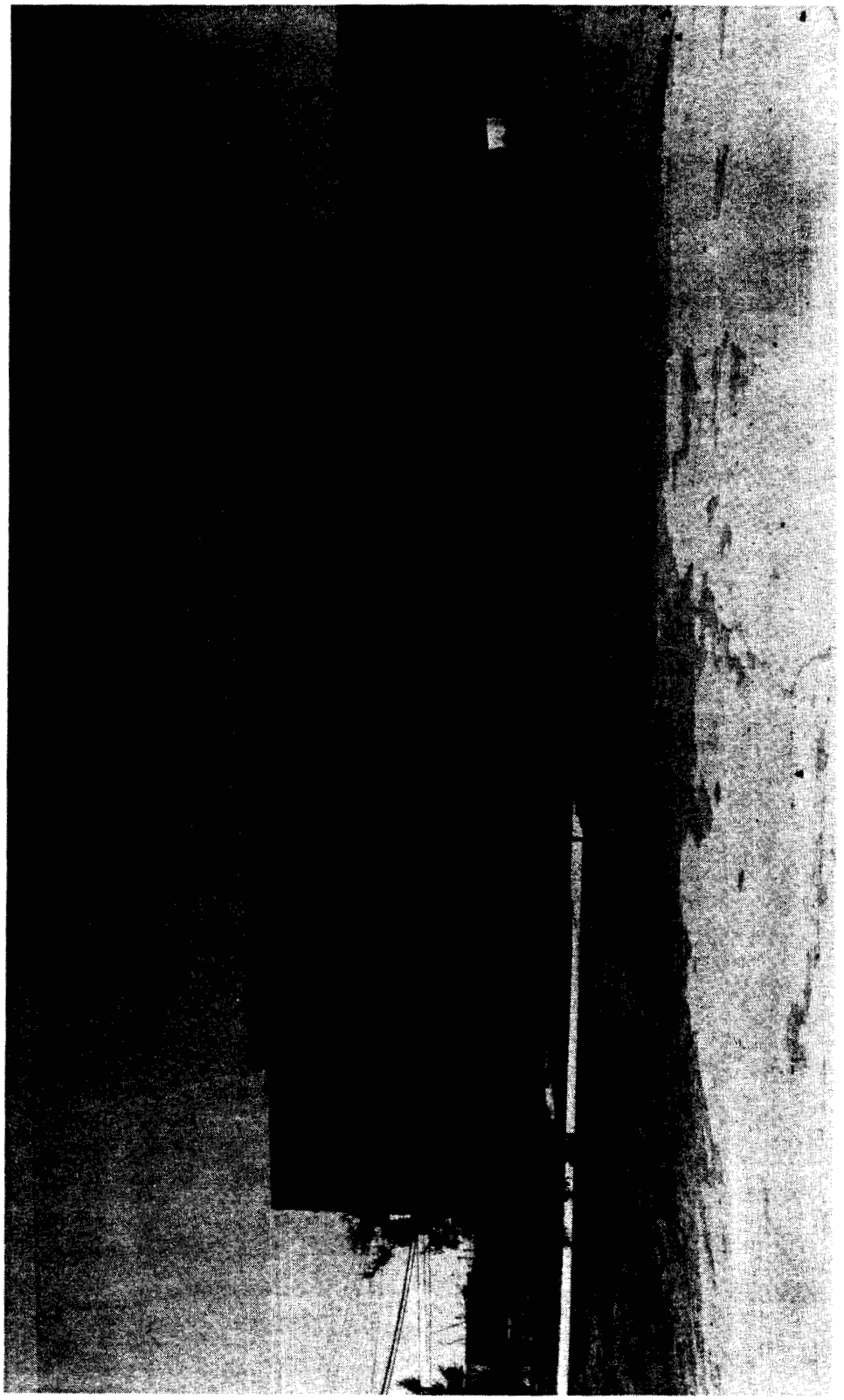

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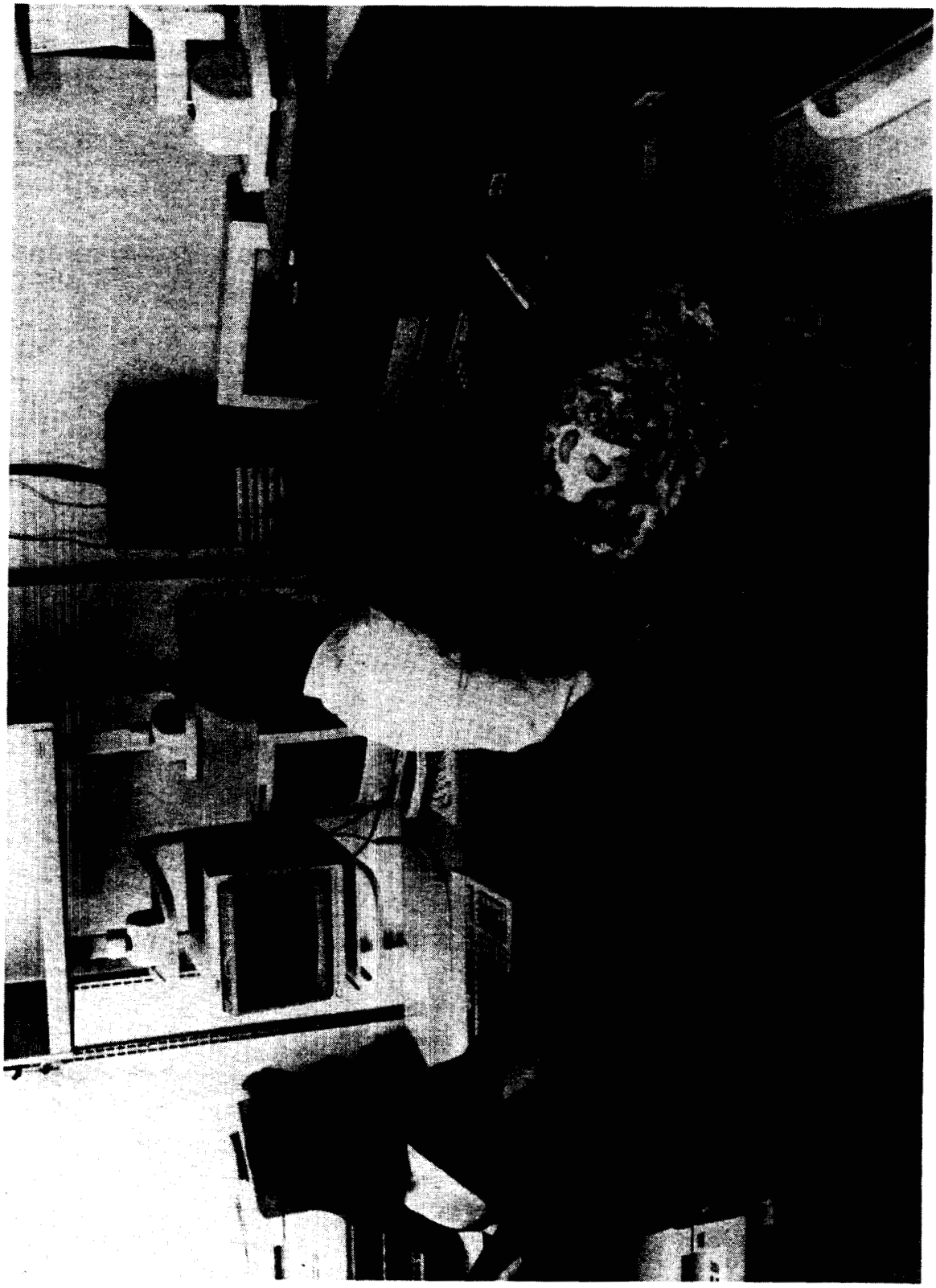

Weapons and Tactics Analysis Center (WEPTAC)

R

3.5 Expansion Potential

3.5.1 Laboratory Facilities: *Use facilities records as of fourth-quarter FY93 in answering the following (in sq ft) for each CSF: (BRAC Criteria II)*

Common Support Function	Facility or Equipment Description	Type of Space	Space Capacity (KSF)		
			Current	Used	Excess
Air Vehicles • Fixed Wing, Structure • Fixed Wing, Propulsion • Fixed Wing, Avionics • Fixed Wing, Flight Subsystems • Rotary Wing, Avionics • Rotary Wing, Flight Subsystems	Includes 80 buildings	Admin Storage Technical Utility	0 10 198 4	0 10 196 4	0 0 2 0
Weapons • ICBMs/SLBMs • Conventional Missiles/Rockets • Cruise Missiles • Guided Projectiles • Bombs • Guns and Ammunition • Directed Energy Space Systems • Launch Vehicles • Satellites C4I Systems • Airborne Electronic Devices Human Systems Training Systems Environmental Quality Advanced Materials	Includes 460 buildings	Admin Storage Technical Utility	10 152 984 17	9 151 896 17	1 1 88 0

Space capacity information is the result of a recently completed (March 1994) Base Facilities Requirements (BFR)/Space survey for all facilities at NAWCWPNS China Lake. This survey identified the 92,000 square feet of Class 2 Lab space and an additional 378,000 square feet total base excess. As China Lake has evolved over the past 50 years, we have often converted numerous buildings such as base housing or dorms into very serviceable laboratory space, even including clean rooms. Therefore, even though the above table shows 92,000 square feet of excess space, it is pointed out that there is, in actuality, a much greater amount that could be utilized for lab space.

The lab space at China Lake is often multiuse and not dedicated to a single CSF. For example, an environmental test lab may be used to test conventional missiles, bombs, and cruise missiles. This

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means the 90,000 square feet of immediately available "Weapons" CSF-type lab space could be readily configured to accommodate many/multiple CSFs. Of the currently used 1,163,000 square feet of weapons lab space at China Lake, over 80% is predominately associated with the Weapons, Conventional Missiles/Rockets CSF.

The Weapons Training Systems Lab is a multipurpose building used presently for all types of weapons training. The lab has two fully equipped classrooms (easy to upgrade) for lectures, theory, and maintenance/operation training. Training is accomplished presently and will continue. The available space to grow and enhance exists. Additionally, the surrounding grounds are suitable for development of static/dynamic training devices and outdoor presentations for future training evolutions.

3.5.1.1 Expansion Capacity: *Describe the capacity of your activity to absorb additional similar workyears categorized in the same common support function with minor facility modification. If major modification is required, describe to what extent the facilities would have to be modified. (Use FY97 workyears as your requirement) (BRAC Criteria III)*

The excess space capacity reported for the two major CSFs, Air Vehicles and Weapons, is based on a zero base Base Facilities Requirements (BFR) space study that was completed in March 1994. This space study looked at current missions, current staffing levels, special purpose/unique facilities, special equipment, and bench lab space, and determined facilities requirements based on the NAVFAC P-80 for each facility category code. All facilities on board NAWCWPNS China Lake were surveyed to verify current facilities assets. The current assets were compared to the facilities requirements to determine our excess capacity. The number of additional man-years that can be absorbed was determined by comparing the amount of excess space for each Common Support Function to the amount of space required per person. The amount of space required per person was based on NAVFAC P-80 standards and current operational requirements. The number of in-house man-years reported in response to question 3.5.1.1 is the number of man-years that can be absorbed with only minor facility modification and no use of leased space or relocatable buildings. If the ability to grow is based on past experience, and if contractors are included, this number could roughly double. There is approximately 350,000 square feet of space in the City of Ridgecrest that is currently vacant because of the drawdown of the contractor workforce from the peak year of 1988 (approximately 2,000).

Assessed on the basis of square footage of facilities, there is an ability to take on an additional 650 workyears in FY95. Given the expected attrition of 5% per year (applied to the "Lab" workforce of approximately 2,400), this will grow to approximately 900 by FY97. These workyears could be in any combination or mix within the CSFs as follows.

CSF: WEAPONS (ICBMs/SLBMs, Conventional Missiles/Rockets, Cruise Missiles, Guided Projectiles, Bombs, Guns and Ammunition)

Missile G&C/Simulation. Additional workyears can be accommodated in G&C design, modeling, and simulation; airframe and control modeling and simulation; missile system analysis and assessment; analysis of flight test/telemetry data; test equipment design and certification, missile hardware-in-the-loop, and acquisition support.

Proximity Fuze Design/Evaluation. Additional workyears can be accommodated in design, analysis, evaluation of proximity fuzes, and acquisition support by utilization of the target detection device (TDD) laboratories and ESL/MESA facility. (This facility is the only one in the world where performance of proximity fuzing sensors can be measured under controlled, repeatable conditions against full-size air targets.)

Energetic Materials (Design, Development, and Acquisition Support for Propulsion, Warheads, and Ordnance Components). Extensive specialized facilities exist in this area, plus miles of open space, that facilitate safe storage, handling, and testing of energetic materials. Included are laboratories for formulation, scale-up, and quality assurance; mixers of various sizes; machining capability for energetic materials; and test firing complexes.

RCS and IR Signature Measurement. This area is fully facilitized, with capabilities in measurement of precision infrared signatures, radar cross-section (Junction Ranch facility), and emitter signatures. Junction Ranch could double current capacity with minor modifications.

Prototype Fabrication. A major capability exists to fabricate prototype hardware for S&T, engineering development support, in-service engineering, and test. Concurrent engineering techniques with CAD/CAM support are integrated with the fabrication facilities and with

configuration control/documentation facilities. Direct interfaces with numerically controlled machines are employed. Included are metrology, calibration, gages, and product assurance.

Weapon Integration/Combat System Testing and Acquisition Support. The Weapon System Support Facilities, which support both weapons integration and testing and avionics work, are internetted with both the weapons HIL simulation laboratories and with the Electronic Combat Range. This facility can perform end-to-end weapon system testing, starting with controlled, laboratory environments and culminating in live fire on the colocated NAWCWPNS ranges. As weapon systems become much more complex, requiring standoff, integration with GPS, remote data links between launch aircraft and the weapon, and "man-in-the-loop" target selection, the area of integration of weapons and their associated launch platforms is expected to grow greatly for all phases of the acquisition cycle.

Electronic Combat Range. In addition to performing test and evaluation, the Electronic Combat Range facility supports engineering development and in-service engineering of aircraft weapons and weapon systems. The facility can conduct evaluations of weapons and sensors in a realistic combat environment. It is also internetted to the Weapon System Support Facilities for computer-in-the-loop evaluations.

Figure 13 shows the facility interconnectivity with other sites.

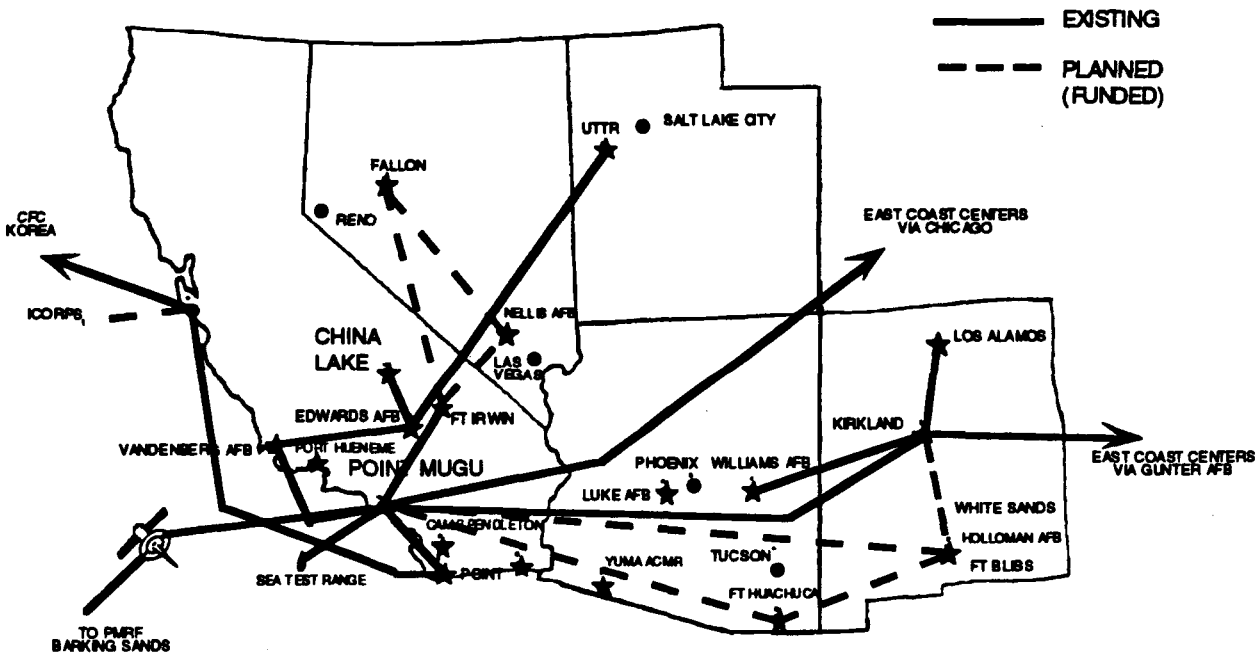

FIGURE 13. Interconnectivity With Other Sites.

CSF: AIR VEHICLES (Fixed Wing Structures, Propulsion, Avionics, and Flight Subsystems; Rotary Wing Avionics and Flight Subsystems)

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Weapons survivability Laboratory (WSL). The WSL facility can grow significantly to support all phases of the acquisition process, S&T and in-service engineering, and testing. Sufficient real estate is available for both minor and major modification based on requirements. Recent expansion provides residual capacity to conduct testing on large transport aircraft (up to C-17 size). An overflow facility is currently available and easily expandable to support a wide range of tests. Contract vehicles are in place to facilitate rapid growth in the workyears available to support all requirements. Environmental permits and systems are in place and capable of supporting workload increase of at least 50 percent of current workload. Minor modifications to the overflow site could increase workload capacity to twice the current capacity.

CSF: SPACE SYSTEMS, LAUNCH VEHICLES

For the Space Systems, Launch Vehicles, CSF, China Lake performs work on parachutes. The only current deterrent to expanded capacity is technical manpower. Technical personnel skilled and formally educated in parachute/recovery technology are a rare commodity, and man power drawdown and retirements coupled with the freeze on hiring new engineers have reduced this resource. Facilities and equipment are available at China Lake to handle almost any recovery system program. Completion of the dirt runway at Echo Range and construction of a whirl tower would further enhance capabilities and productivity. Contracting out would also be difficult; because of the austere financial conditions, industry has little to offer in the way of parachute R&D.

CSF: SPACE SYSTEMS, SATELLITES

The proposed SELENE laser is planned to incorporate two independent tunnels for high-power laser beams. This dual-use facility provides for concurrent commercial operation to service satellites and for ongoing development of high-power laser system technologies.

CSF: C4I

Given the current small workload in C4I, and the abundance of general-purpose space available, tactically related C4I work including modeling and simulation (WEPTAC) and R&D related to tactical system (including mission planning) interfaces could double or quadruple without major impact to other efforts.

CSF: ELECTRONIC DEVICES

Our facilities in electronic devices could absorb 12 additional workyears with minor modifications in facilities. Our ability to perform in this area is solely a function of funding levels and not one of facilities.

CSF: HUMAN SYSTEMS

A rough estimate is that 10 additional workyears can be accommodated in the Crew System, Image Processing, and Night Vision Goggle Laboratories without major construction.

CSF: TRAINING SYSTEMS

Additional training can be accomplished within available space at the Training Lab. All types of air-launched weapons training can transition from multisited events presently practiced to this one site, because available resources and facilities exist. The Training lab can accommodate the various curricula including maintenance, loading, handling, aircrew, and EOD. The Lab will accommodate multiservice, as it occasionally does at present; Air Force; Army; FMS; and other agencies.

Initiatives are now in progress to identify Joint Service training for air-launched weapons. The Air Force and Navy commonalities are being reviewed and initial data appear to indicate many common areas of practice for air-launched weapon loading, handling, release and control, support, and test equipment. The obvious differences with less commonality are in maintenance; however, the procedures can become close in practice based on common environments and individual cases for the different missions.

The Air Force has proximity to our location within the T&E evolutions by virtue of Nellis AFB, Edwards AFB, and others. The Training Systems Project Office is currently working issues with the Air Force with new joint procurements of weapons for training and future training evolutions.

The Training Systems Project Office is presently developing processes and capabilities with COMNAVAIRSYSCOM to embrace the Captive Air Training Missiles (CATMs) for life-cycle maintenance and management. The CATMs are training assets but are entrapped with the tactical rounds for attention. This activity considers this issue as a positive method of better managing a necessary asset, and China Lake has the resources and capability to ensure the endurance of CATM for the Navy.

The TARIF/Combat Environment support facilities are capable of supporting software and hardware development in the Training Systems, Air Vehicles, and Weapons CSFs. As weapons and avionics become more complex, the capability of simulating air-to-air, air-to-ground, and electronic warfare environments will make development and testing of these systems more feasible and cost effective through the use of the TARIF/Combat Environment facilities. In addition, the TARIF has been internetted to the Point Mugu F-14 software integration laboratory to provide a multilaboratory test capability.

CSF: ENVIRONMENTAL QUALITY

Additional workyears are not only available but are actively being sought in this CSF. Workyears can be accomplished from basic research through advanced development in all aspects of this CSF. This is a growth area for China Lake and a thrust area added to the mission of this activity.

CSF: ADVANCED MATERIALS

NAWCWPNS is currently expanding its work in Advanced Materials to encompass characterization of waste materials by becoming a State-certified site for testing. Another area of growth for NAWCWPNS is in composite materials design and fabrication.

As a result of the Navy downsizing effort over the past several years, several laboratory spaces are not being utilized. Work spaces for eight scientists, chemists, or materials engineers are currently available with little or no modification required.

CSF: WEAPONS, DIRECTED ENERGY

Growth in optical metrology for high-energy lasers and beam directors could easily be accommodated. China Lake has some nationally unique facilities for large optics characterization, thin film coatings and component fabrication, and optical component survivability work.

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3.5.1.2 Additional Supportable Workyears: *If there is capacity to absorb additional workyears, how many additional workyears can be supported? (BRAC Criteria III)*

By 1997 there will be capacity to absorb approximately 900 workyears with only minor facility modifications. A hypothetical distribution by each CSF of the 900 excess workyears is shown in the following tables (for FY97). It must be emphasized that the distribution of workyears into each CSF is estimated based on past experience, and that considerable flexibility exists to adjust to different ratios of work for each CSF. If contractor workyears in local contractor spaces are included, these numbers could at least double and probably triple.

Furthermore, we have demonstrated the capability over the past several decades to accommodate significant growth of workload through minor additions to existing laboratory buildings ($200K modules), the conversion of housing units to lab space, use of relocatable buildings, and acquisition of leased space in the City of Ridgecrest.

Functional Area	Work-years	CSF					
		Air Vehicles					
		Fixed				Rotary	
		Structures	Avionics	Propulsion	Flight Support	Avionics	Flight Support
Survivability Testing	10				X		X
Air Breathing Propulsion for Targets	5			X			
Signature measurement • IR • RCS • Emitter	15		X	X		X	
Prototype Fabrication • CAD/CAM • Concurrent Engineering • Advanced Machining • Composite Material Fabrication • Reverse Engineering • Metrology • Gages • Acquisition Support	20	X	X	X	X	X	X
Weapons Integration/Combat System Testing • Weapon Avionics Integration • Internetted Simulation • End-to-End Testing • Acquisition Testing	125		X			X	
Electronic Combat Range • Sensor/Weapon Evaluation in Realistic Environments • Internetted Simulation	35		X			X	
Subtotal	210						

Functional Area	Work-years	CSF Weapons					
		ICBMs SLBMs	Conven. Missiles/ Rockets	Cruise Missiles	Bombs	Guns & Ammo.	Guided Projectiles
Missile G&C/Simulation • Flight Analysis • Test Equipment • Modeling And Simulation • HWIL Simulation • Systems Assessment • Acquisition Support	180		X	X	X	X	
Proximity Fuze Design/Evaluation • Flight Analysis • Design/Fabrication • ESL/MESA Test • Analysis and Modeling • Acquisition Support	80		X		X		
Energetic Materials • Energetic Materials • S&T • Scale-Up • Pilot Production • Warheads/Rocket Motors/Ordnance Components • Design • Analysis • Fabrication • Storage • Test • Acquisition Support	250	X	X	X	X	X	X
Signature measurement • IR • RCS • Emitter	15	X	X	X			
Prototype Fabrication • CAD/CAM • Concurrent Engineering • Advanced Machining • Composite Material Fabrication • Reverse Engineering • Metrology • Gages • Acquisition Support	50	X	X	X	X	X	X
Electronic Combat Range • Sensor/Weapon Evaluation in Realistic Environments • Internetted Simulation	35		X			X	
Subtotal	610						

Functional Area	Work years	CSF			
		Space Systems		C41 Airborne	Weapons, Directed Energy
		Launch Vehicles	Satellites		
Parachute RDT&E	5	X			
Laser Optics Characterization	5		X		X
High-Power Laser Facility Engineering	15		X		X
• Signal Exploitation • Multisensor Fusion • Data Links • Airborne Testing • Fleet Environment Testing • Distributed Data Bases • Decision Aids	5			X	
Subtotal	30				

Functional Area	Work years	CSF		
		Space Systems		C41 Airborne
		Launch Vehicles	Satellites	
Parachute RDT&E	5	X		
Laser Optics Characterization	5		X	
High-Power Laser Facility Engineering	15		X	
• Signal Exploitation • Multisensor Fusion • Data Links • Airborne Testing • Fleet Environment Testing • Distributed Data Bases • Decision Aids	5			X
Subtotal	30			

Functional Area	Work years	CSF				
		Pervasive Functions				
		Electronic Devices	Human Systems	Training Systems	Environ. Quality	Advanced Materials
Microelectronics	10	X				
• Crew Systems Lab • Night Vision Goggles Lab • Image Processing Lab	10		X			
• Training for weapons loading, handling, support equipment, and maintenance	10			X		
• Aircrew proficiency Development of combat range equipment				X		
• Incineration of ordnance, propulsion, and energetic materials • Demilitarization • Ozone-Depleting Compound Reduction • Emission Monitoring	10				X	
• Metals Characterization • Composite Research • Materials Engineering and Failure Analysis • Stress Testing • Hazardous Waste Sample Testing • Mass Spectrometry • NMR Lab Work • Polymer Synthesis • X-Ray Defraction	10					X
Subtotal	50					

3.5.1.3 Construction Projects: *For 3.5.1.1 and 3.5.1.2 (above) describe the impact of military construction programs or other alteration projects programmed in the FY95 PBS. (BRAC Criteria II)*

The list in the left-hand column of the following tables contains those projects that are currently programmed in the FYDP and that represent capital improvements (affect capacity). Not listed are major repair (includes environmental remediation) projects that do not add to capacity. If the construction project contributes to the increased capacity of a CSF, it is indicated by an x in the table.

Detailed descriptions of projects follow the tables.

Project No.	Title	CSF					
		Air Vehicles					
		Fixed Wing				Rotary Wing	
		Structure	Propulsion	Avionics	Flight Subsystems	Avionics	Flight Subsystems
P-289	Guided Missile Ordnance Range Facilities						
P-356	Child Development Center						
P-369	Missile Engagement Simulation Arena (MESA)						
P-428	Secure Projects Facility						
P-431	Advanced Weapons Laboratory			x			
P-454	Integrated Naval Air Defense (INADS) Facilities						
P-469	Aircraft Ready Fuel Storage Facility						
P-484	CLPL/SW Industrial Waste Water Collection/Treatment System						
C02-4304	Construct Waste Water System, Bldg. 00005						
C29-4308	Construct Engr. Support Facility						
C29-4307	Construct Lab Facility						
C28-4203	Construct Secure FME Building						
C32-4655	Construct Vehicle Build-Up Shop						
C28-4901	Construct Aerodynamics Facility						
C28-4905	Construct Mechanical Facility						
C32-5603	Construct Remote Camera Crew Building						
C32-5708	Construct Office/Control Building						
C33-5010	Construct Radar Spares Facility						
C32-5604	Construct M60/M209 Camera Mounds						
C83-6002	Repair by Replacement Well No. 18B						
	Rehab Nimitz Bachelor Quarters						
	New Commissary						
	Construct and Repair Bike Paths						
	Golf Complex						
	Rehab Steam Plant						
	New Navy Exchange						
	Neighborhoods of Excellence (NOE) Projects						
	Construct Tot Lots						

Project No.	Title	CSF					
		Weapons					
		ICBMs/ SLBMs	Conv. Missiles/ Rockets	Cruise Missiles	Bombs	Guns and Ammo.	Guided Proj- ectiles
P-289	Guided Missile Ordnance Range Facilities		x			x	x
P-356	Child Development Center						
P-369	Missile Engagement Simulation Arena (MESA)		x	x			
P-428	Secure Projects Facility		x				
P-431	Advanced Weapons Laboratory		x				
P-454	Integrated Naval Air Defense (INADS) Facilities		x				
P-469	Aircraft Ready Fuel Storage Facility						
P-484	CLPL/SW Industrial Waste Water Collection/Treatment System	x	x	x	x	x	x
C02-4304	Construct Waste Water System, Bldg. 00005						
C29-4308	Construct Engr. Support Facility		x				
C29-4307	Construct Lab Facility		x				
C28-4203	Construct Secure FME Building		x				
C32-4655	Construct Vehicle Build-Up Shop		x				
C28-4901	Construct Aerodynamics Facility		x				
C28-4905	Construct Mechanical Facility		x				
C32-5603	Construct Remote Camera Crew Building		x				
C32-5708	Construct Office/Control Building		x				
C33-5010	Construct Radar Spares Facility		x				
C32-5604	Construct M60/M209 Camera Mounds		x				
C83-6002	Repair by Replacement Well No. 18B						
	Rehab Nimitz Bachelor Quarters						
	New Commissary						
	Construct and Repair Bike Paths						
	Golf Complex						
	Rehab Steam Plant						
	New Navy Exchange						
	Neighborhoods of Excellence (NOE) Projects						
	Construct Tot Lots						

Project No.	Title	CSF			
		Space Systems		C4I	Weapons
		Launch Vehicles	Satellites	Airborne	Directed Energy
P-289	Guided Missile Ordnance Range Facilities				
P-356	Child Development Center				
P-369	Missile Engagement Simulation Arena (MESA)				
P-428	Secure Projects Facility				
P-431	Advanced Weapons Laboratory				
P-454	Integrated Naval Air Defense (INADS) Facilities				
P-469	Aircraft Ready Fuel Storage Facility				
P-484	CLPL/SW Industrial Waste Water Collection/Treatment System				
C02-4304	Construct Waste Water System, Bldg. 00005				
C29-4308	Construct Engr. Support Facility				
C29-4307	Construct Lab Facility				
C28-4203	Construct Secure FME Building				
C32-4655	Construct Vehicle Build-Up Shop				
C28-4901	Construct Aerodynamics Facility				
C28-4905	Construct Mechanical Facility				
C32-5603	Construct Remote Camera Crew Building				
C32-5708	Construct Office/Control Building				
C33-5010	Construct Radar Spares Facility				
C32-5604	Construct M60/M209 Camera Mounds				
C83-6002	Repair by Replacement Well No. 18B				
	Rehab Nimitz Bachelor Quarters				
	New Commissary				
	Construct and Repair Bike Paths				
	Golf Complex				
	Rehab Steam Plant				
	New Navy Exchange				
	Neighborhoods of Excellence (NOE) Projects				
	Construct Tot Lots				

Project No.	Title	CSF		
		Space Systems		C4I
		Launch Vehicles	Satellites	Airborne
P-289	Guided Missile Ordnance Range Facilities			
P-356	Child Development Center			
P-369	Missile Engagement Simulation Arena (MESA)			
P-428	Secure Projects Facility			
P-431	Advanced Weapons Laboratory			
P-454	Integrated Naval Air Defense (INADS) Facilities			
P-469	Aircraft Ready Fuel Storage Facility			
P-484	CLPL/SW Industrial Waste Water Collection/Treatment System			
C02-4304	Construct Waste Water System, Bldg. 00005			
C29-4308	Construct Engr. Support Facility			
C29-4307	Construct Lab Facility			
C28-4203	Construct Secure FME Building			
C32-4655	Construct Vehicle Build-Up Shop			
C28-4901	Construct Aerodynamics Facility			
C28-4905	Construct Mechanical Facility			
C32-5603	Construct Remote Camera Crew Building			
C32-5708	Construct Office/Control Building			
C33-5010	Construct Radar Spares Facility			
C32-5604	Construct M60/M209 Camera Mounds			
C83-6002	Repair by Replacement Well No. 18B			
	Rehab Nimitz Bachelor Quarters			
	New Commissary			
	Construct and Repair Bike Paths			
	Golf Complex			
	Rehab Steam Plant			
	New Navy Exchange			
	Neighborhoods of Excellence (NOE) Projects			
	Construct Tot Lots			

Project No.	Title	CSF				
		Pervasive Functions				
		Electronic Devices	Human Systems	Training Systems	Environ. Quality	Advanced Materials
P-289	Guided Missile Ordnance Range Facilities					
P-356	Child Development Center					
P-369	Missile Engagement Simulation Arena (MESA)					
P-428	Secure Projects Facility					
P-431	Advanced Weapons Laboratory					
P-454	Integrated Naval Air Defense (INADS) Facilities					
P-469	Aircraft Ready Fuel Storage Facility					
P-484	CLPL/SW Industrial Waste Water Collection/Treatment System				x	x
C02-4304	Construct Waste Water System, Bldg. 00005	x				x
C29-4308	Construct Engr. Support Facility					
C29-4307	Construct Lab Facility					
C28-4203	Construct Secure FME Building					
C32-4655	Construct Vehicle Build-Up Shop					
C28-4901	Construct Aerodynamics Facility					
C28-4905	Construct Mechanical Facility					
C32-5603	Construct Remote Camera Crew Building					
C32-5708	Construct Office/Control Building					
C33-5010	Construct Radar Spares Facility					
C32-5604	Construct M60/M209 Camera Mounds					
C83-6002	Repair by Replacement Well No. 18B					
	Rehab Nimitz Bachelor Quarters					
	New Commissary					
	Construct and Repair Bike Paths					
	Golf Complex					
	Rehab Steam Plant					
	New Navy Exchange					
	Neighborhoods of Excellence (NOE) Projects					
	Construct Tot Lots					

Note 1: MILCON Projects currently under construction or programmed in the FYDP (CNO Resource Sponsor program):

MILCON PROJECT: P-289
SPONSOR/PROG. YR.: N091/FY99
TITLE: GUIDED MISSILE ORDNANCE RANGE FACILITIES
COST: $5.10M
SIZE: 13,984 SF
TYPE: REPLACEMENT/NEW
BLDGS/SQ FT REPL.: 2 BLDGS/5,922 SF
DESCRIPTION: This project constructs a complex of facilities located in the remotely situated guided missile range area, and includes one 7,000-square-foot guided missile assembly/checkout building; a 2,184-square-foot facility to house two high-explosive guided missile test cells, including a control room; and a 4,800-square-foot rocket/gun ammunition ordnance assembly building. The project will provide new capabilities and improve current operations.
ESTIMATED AWARD DATE: 1999
PLANED BENEFICIAL OCCUPANCY DATE: 2001

MILCON PROJECT: P-356
SPONSOR/PROG. YR.: N1/FY97
TITLE: CHILD DEVELOPMENT CENTER
COST: $3.70M
SIZE: 19,466 SF
TYPE: REPLACEMENT/NEW
BLDGS./SQ FT REPL.: 5 BLDGS/17,592 SF
DESCRIPTION: This project constructs a 19,466-square-foot building to consolidate the Station's child care program currently operating in five geographically dispersed and substandard facilities into a safe and modern facility to accommodate 238 children, infants to five years old. The new, modern facility will meet current health and safety standards; reduce the number of personnel required to adequately supervise the children; and at the same time increase the operational capacity, be an added inducement for recruitment, boost morale of both the military and civilian personnel, and improve retention of employees.
PROJECT UNDER DESIGN
ESTIMATED AWARD DATE: 1997
PLANNED BENEFICIAL OCCUPANCY DATE: 1998

MILCON PROJECT: P-369
SPONSOR: N091
TITLE: MISSILE ENGAGEMENT SIMULATION ARENA (MESA)
COST: $16.85M
SIZE: 92,910 SF
TYPE: NEW
BLDGS/SQ FT REPL: N/A
DESCRIPTION: This project consists of a 73,200-square-foot high-bay test arena, a 15,260-square-foot low-bay support area, and a 4,450-square-foot loft. The MESA will provide a large indoor arena for measuring the performance of advanced fuzing and guidance technologies against physical models of airborne threats. The MESA provides a unique capability for the Department of Defense, providing for testing of missile fuzing, missile guidance, and sensor programs assigned to NAWCWPNS China Lake and in support of programs for the joint services, other services, and industry. This facility replaces the Encounter Simulation Lab (ESL) located at Corona, California. The ESL is a 34,472-square-foot facility that was constructed in 1967 and has become obsolete in supporting advanced technologies.
EQUIPMENT OVER $500,000: Control system ($600,000) and radar system ($600,000)
PROJECT UNDER CONSTRUCTION
PLANNED BENEFICIAL OCCUPANCY DATE: 18 Sep 1994

MILCON PROJECT: P-428
SPONSOR/PROG. YR.: N091/FY99
TITLE: SECURE PROJECTS FACILITY
COST: $12.90M
SIZE: 33,750 SF
TYPE: NEW
BLDGS/SQ FT REPL: N/A
DESCRIPTION: This project provides for construction of a new 33,750-square-foot facility including building, security fencing, employee parking lot, and utilities to support special secure programs at the Station. This facility will provide vaulted work spaces, laboratories, and conference space in accordance with DIAM 50-3, "Physical Security Standard for Sensitive Compartmented Information Facility," to meet the growing workload for special secure programs.
DESIGN ON HOLD AT 35%
ESTIMATED AWARD DATE: Mar 1999
PLANNED BENEFICIAL OCCUPANCY DATE: Mar 2001

MILCON PROJECT: P-431
SPONSOR: N88
TITLE: ADVANCED WEAPONS LABORATORY
COST: $ 14.0 M
SIZE: 84,000 SF
TYPE: NEW
BLDGS/SQ FT REPL: N/A
DESCRIPTION: The Advanced Weapons Laboratory, under construction, is a multiprogram Weapons Systems Support Facility that provides secure, computer-type laboratories, personnel offices, and aircraft spaces to support the F/A-18 program. This facility will contain upgraded current computerized software development/validation systems that were built to support the A/B and C/D aircraft, and secure spaces that will support the new F/A-18 E/F aircraft. In addition, this facility is provided with a multilevel tower to support radar, IR, and EW development/validation sensor testing.
PROJECT UNDER CONSTRUCTION
PLANNED BENEFICIAL OCCUPANCY DATE: Dec 1994

MILCON PROJECT: P-454
SPONSOR: N091
TITLE: INTEGRATED NAVAL AIR DEFENSE (INADS) FACILITIES
COST: $12.76M
SIZE: 38,300 SF
TYPE: REPLACEMENT/NEW
BLDGS/SQ FT REPL: 6,240 SF (TRAILERS)
Description: This project provides facilities for six additional threat radars and five emitter simulator (ES) systems at the Sea Site 3 Detection Systems Laboratory. In addition, the separate Engineering Support Facility provides space to maintain all the threat, ES, gun control, acquisition, and reference radars valued at over $500M (replacement cost) that comprise the Electronic Combat Range. This facility also provides new space well suited to Foreign Material Exploitation (FME).
EQUIPMENT OVER $500,000: CGR/SATS missile threat system, close support missile/gun weapon system radar, pulse Doppler (TAR/TER) weapon system radar, C3 long-range early warning radar, and multifrequency generator emitter simulator.
PROJECT UNDER CONSTRUCTION
PLANNED BENEFICIAL OCCUPANCY DATE: 12 Aug 1994

MILCON PROJECT: P-469
SPONSOR/PROG. YR.: N091/FY95
TITLE: AIRCRAFT READY FUEL STORAGE FACILITY
COST: $ 6.10M (1995)
SIZE: N/A
TYPE: REPLACEMENT/NEW
BLDGS/SQ FT REPL: N/A
DESCRIPTION: This project provides for new above-ground steel fuel storage tanks, combined storage capacity of 400,000 gallons of JP-8 fuel, with associated piping and appurtenances, aircraft truck fueling and receiving facility, site work, roads, fencing, testing laboratory/office, and support facilities. The new tanks will comply with State, local, and national regulations for storage of jet fuel, which will not allow us to operate out of existing facilities after 1995.
PROJECT UNDER DESIGN
ESTIMATED AWARD DATE: Jan 1995
PLANNED BENEFICIAL OCCUPANCY DATE: Jun 1996

MILCON PROJECT: P-484
SPONSOR/PROG. YR.: N091/FY96
TITLE: CLPL/SW INDUSTRIAL WASTE WATER COLLECTION/TREATMENT SYSTEM
COST: $3.64M
SIZE: N/A
TYPE: REPLACEMENT
BLDGS./SQ FT REPL.: N/A
DESCRIPTION: The project provides for the collection, treatment, and disposal of industrial waste water from existing R&D facilities in China Lake Propulsion Laboratory (CLPL) and the Salt Wells (SW) area in accordance with Federal, State, and local environmental regulations.
ESTIMATED AWARD DATE: 1996
BENEFICIAL OCCUPANCY DATE: 1997

Note 2: Special Projects and other projects currently programmed in the FYDP that will influence capacity are listed below.

SCN#: C02-4304
SP#: E66-94
TITLE: CONSTRUCT WASTE WATER SYSTEM, BLDG. NO. 00005
COST: $500K
TYPE: NEW INSTALLATION
DESCRIPTION: Installation of package unit for treatment of hazardous waste.
ESTIMATED AWARD DATE: Sep 1994
ESTIMATED CONST. START: Jan 1995
BENEFICIAL OCCUPANCY DATE: Aug 1995

SCN#: C29-4308
SP#: CA50-94
TITLE: CONSTRUCT ENGR. SUPPORT FACILITY
COST: $300K
SIZE: 3000 SF
TYPE: NEW
DESCRIPTION: New construction.
ESTIMATED AWARD DATE: Jul 1994
ESTIMATED CONST. START: Aug 1994
BENEFICIAL OCCUPANCY DATE: Dec 1994

SCN#: C29-4307
SP#: CA49-94
TITLE: CONSTRUCT LAB FACILITY
COST: $300K
SIZE: 3,000 SF
TYPE: NEW
DESCRIPTION: New construction.
ESTIMATED AWARD DATE: Jul 1994
ESTIMATED CONST. START: Aug 1994
BENEFICIAL OCCUPANCY DATE: Dec 1994

SCN#: C28-4203
SP#: CA45-94
TITLE: CONSTRUCT SECURE FME BLDG.
COST: $300K
SIZE: 3,000 SF
TYPE: NEW
DESCRIPTION: New construction.
ESTIMATED AWARD DATE: Sep 1994
ESTIMATED CONST. START: Oct 1994
BENEFICIAL OCCUPANCY DATE: Feb 1995

SCN#: C32-4655
SP#: CA53-94
TITLE: CONSTRUCT VEHICLE BUILD-UP SHOP
COST: $220K
SIZE: 3,000 SF
TYPE: NEW
DESCRIPTION: New construction.
ESTIMATED AWARD DATE: Jul 1994
ESTIMATED CONST. START: Aug 1994
BENEFICIAL OCCUPANCY DATE: Dec 1994

SCN#: C28-4901
SP#: CA46-94
TITLE: CONSTRUCT AERODYNAMICS FACILITY
COST: $300K
SIZE: 3,700 SF
TYPE: NEW
DESCRIPTION: Provides laboratory office space via new construction.
PROJECT UNDER CONSTRUCTION
BENEFICIAL OCCUPANCY DATE: Dec 1994

SCN#: C28-4905
SP#: CA47-94
TITLE: CONSTRUCT MECHANICAL FACILITY
COST: $300K
SIZE: 3,700 SF
TYPE: NEW
DESCRIPTION: Provides laboratory office space via new construction.
PROJECT UNDER CONSTRUCTION
BENEFICIAL OCCUPANCY DATE: Dec 1994

SCN#: C32-5603
TITLE: CONSTRUCT REMOTE CAMERA CREW BLDG.
COST: $300K
TYPE: NEW
DESCRIPTION: Constructs a new, approximately 2,000-square-foot remote camera crew building.
ESTIMATED AWARD DATE: FY95

SCN#: C32-5708
TITLE: CONSTUCT OFFICE/CONTROL BUILDING
COST: $200K
TYPE: NEW
DESCIPTION: Constructs a new, approximately 1,500-square-foot remote office/control building.
ESTIMATED AWARD DATE: FY95

SCN#: C33-5010
TITLE: CONSTRUCT RADAR SPARES FACILITY
COST: $200K
TYPE: NEW
DESCRIPTION: Constructs a new, approximately 1,500-square-foot remote radar spares building.
ESTIMATED AWARD DATE: FY95

SCN#: C32-5604
TITLE: CONSTRUCT M60/M209 CAMERA MOUNDS
COST: $80K
TYPE: NEW
DESCRIPTION: Constructs new remotely located camera mounds.
ESTIMATED AWARD DATE: FY95

SCN#: C83-6002
TITLE: REPAIR BY REPLACEMENT WELL NO. 18B
COST: $400K
TYPE: REPAIR/REPLACEMENT
DESCRIPTION: This project replaces an existing deteriorated water well with a new well.
ESTIMATED AWARD DATE: FY96

NOTE 3: Quality of Life projects that are scheduled for near-term completion and that should be considered in relation to expanded capacity are listed below.

TITLE: CHILD DEVELOPMENT CENTER (see MILCON P-356 above)

TITLE: REHAB NIMITZ BACHELOR QUARTERS
COST: $2,600K
TYPE: ALTERATION/REPAIR
DESCRIPTION: Major repairs and alterations to buildings 02242 and 02244 to provide approximately 27,000 square feet of additional bachelor quarters.
PROJECT UNDER CONSTRUCTION
BENEFICIAL OCCUPANCY DATE: Oct 1994

TITLE: NEW COMMISSARY
COST: $2,500K
TYPE: REPLACEMENT/NEW
DESCRIPTION: Constructs a new 20,000-square-foot Commissary.
ESTIMATED CONSTRUCTION START: May 1994
BENEFICIAL OCCUPANCY DATE: Jan 1995

TITLE: CONSTRUCT AND REPAIR BIKE PATHS
COST: $500K
TYPE: REPAIR/NEW
DESCRIPTION: Constructs new and repairs approximately 10 miles of existing bicycle paths.
ESTIMATED AWARD DATE: FY95

TITLE: GOLF COMPLEX
COST: $2,600K
TYPE: REPAIR/NEW/REPLACEMENT
DESCRIPTION: BUPERS/NAF funding. Constructs a new clubhouse and repairs the existing irrigation system.
ESTIMATED AWARD DATE: FY95

TITLE: REHAB STEAM PLANT
COST: $1,000K
TYPE: REPAIR/ALTERATION
DESCRIPTION: A two-phased project that repairs/rehabs the existing abandoned 6,000-square-foot boiler/steam plant into a fitness facility.
ESTIMATED AWARD DATES: FY95 and FY96

TITLE: NEW NAVY EXCHANGE
COST: $4,000K
TYPE: NEW/REPLACEMENT
DESCRIPTION: Constructs a new Navy Exchange, approximately 20,000 square feet.
ESTIMATED AWARD DATES: FY97

TITLE: NEIGHBORHOODS OF EXCELLENCE (NOE) PROJECTS
COST: $40,000K (includes repairs $) through FY01
DESCRIPTION: Repair, alteration, and construction projects in relation to Military Family Housing improvements funded through the NOE program.
STATUS: Projected funding from FY94 through FY01.
The following lists those NOE alteration and construction projects that affect capacity and are already identified for accomplishment:

SCN#: C83-5024
TITLE: CONSTRUCT TOT LOTS
COST: $164K
TYPE: NEW
DESCRIPTION: This project constructs new playgrounds in the military family housing areas.
ESTIMATED AWARD DATE: FY95

3.5.2 Land Use: *Provide number of buildable acres for additional laboratory/administrative support construction at your installation. (BRAC Criteria II)*

Planning Area	Developed Land (acres)	Developable Land (without constraints)
Mainsite	1,650	900
Housing Area	(420)	(50)
Airfield	2,300	1,860
Propulsion Lab	850	550
Randsburg Wash	700	250
Other		250
Immediate Buildable/Developable Acres w/o Constraints		3,910

Mainsite (including housing) 6,400 acres. Mainsite contains the HQ and Directorate offices, principal laboratories, and most of the industrial/administrative functions of NAWS, and is the largest cohesive developed area. It is the focus of personnel and Station support activities.

3.5.2 Land Use: *Provide number of buildable acres for additional laboratory/administrative support construction at your installation. (BRAC Criteria II)*

Planning Area	Developed Land (acres)	Developable Land (without constraints)
Mainsite	1,650	900
Housing Area	(420)	(50)
Airfield	2,300	1,860
Propulsion Lab	850	550
Randsburg Wash	700	250
Other (test ranges)		250
Immediate Buildable/Developable Acres w/o Constraints		3,910

Mainsite (including housing) 6,400 acres. Mainsite contains the HQ and Directorate offices, principal laboratories, and most of the industrial/administrative functions of NAWS, and is the largest cohesive developed area. It is the focus of personnel and Station support activities.

A breakout of what buildable land areas are applicable to each CSF is as follows.

CSF	Mainsite	Airfield	Propulsion Lab	Randsburg Wash	Other
Air Vehicles					
Fixed Wing					
Structure					X
Propulsion			X		
Avionics		X		X	
Flight Subsystems		X			X
Rotary Wing					
Avionics		X		X	
Flight Subsystems		X			X
Weapons					
ICBMs/SLBMs	X		X		
Conv. Missiles/ Rockets	X		X	X	
Cruise Missiles	X		X		
Bombs	X		X	X	
Guns and Ammunition	X		X		
Guided Projectiles	X		X		
Directed Energy	X				X*
Space Systems					
Launch Vehicles	X				X
Satellites	X				X*
C4I					
Airborne	X	X		X	X
Pervasive Functions					
Electronic Devices	X				
Human Systems	X	X			
Training Systems	X	X			
Environ. Quality	X		X		
Advanced Materials	X		X		

* The Birchum Mesa area of the China Lake North Range has been selected for the SELENE high-power laser site.

A breakout of what buildable land areas are applicable to each CSF is as follows.

CSF	Mainsite	Airfield	Propulsion Lab	Randsburg Wash	Other
Air Vehicles					
Fixed Wing					
Structure					x
Propulsion			x		
Avionics		x		x	
Flight Subsystems		x			x
Rotary Wing					
Avionics		x		x	
Flight Subsystems		x			x
Weapons					
ICBMs/SLBMs	x		x		
Conv. Missiles/ Rockets	x		x	x	
Cruise Missiles	x		x		
Bombs	x		x	x	
Guns and Ammunition	x		x		
Guided Projectiles	x		x		
Space Systems					
Launch Vehicles	x				x
Satellites	x				x*
C4I					
Airborne	x	x		x	x
Pervasive Functions					
Electronic Devices	x				
Human Systems	x	x			
Training Systems	x	x			
Environ. Quality	x		x		
Advanced Materials	x		x		

* The Birchum Mesa area of the China Lake North Range has been selected for the SELENE high-power laser site.

3.5.3 Utilities: *Provide an estimate of your installation's capability to expand or procure additional utility services (electric, gas, water). Estimates should be provided in appropriate units -- e.g. KWH of electricity. (BRAC Criteria II)*

The Naval Air Weapons Station China Lake, referred to below as "the Station," performs the base-keeper function for NAWCWPNS and as such prepares and administers utilities.

Utility systems on Station are capable of handling the current load and have reserve capacity to handle expansion. Future expansion and growth within the Station can be accommodated without large expenditures of funds for major expansion of the utility systems. The on-Station population has declined over the past 20 years. Initially, civilian personnel assigned to China Lake were housed on Station. The vast majority of civilian personnel assigned to China Lake now live in the surrounding communities. Due to this decline of on-Station population, the utility systems now have excess capacity which can be utilized to meet future demand. Growth potential for some areas of the Station will require the expansion and extension of some of the distribution systems.

The electrical distribution system on Station is served by two active and one inactive 34,500-volt circuits. The Station presently uses a maximum of approximately 23.7 MW of electrical power of the 30 MW contracted under the reduce electrical rate structure with Southern California Edison and California Energy Company. Approximately 6.7 MW of electrical power on the reduce rate schedule is available for growth at China Lake. Additional electrical power, above the 30 MW is available to the Station through SCE at normal commercial electrical rates. The existing electrical supply circuits to the Station can handle an approximately 50% increase in load. To handle a load increase of this magnitude, the Station's switching station will require some modifications.

The natural gas system on Station handles a maximum demand for natural gas of approximately 113,000 CFH. The distribution system can handle an increase to 350,000 CFH without major modifications to the system. However the contracts with Pacific Gas and Electric, the gas supplier for core services and transportation contractor for all gas, and DFSC, the supplier of all commercial gas, will require modification to furnish and transport this additional capacity. Both PG&E and DFSC have indicated that the additional natural gas supplies can be provided to the Station.

Domestic sewage treatment and treatment provided by contract with the City of Ridgecrest. Sewage treatment and disposal are presently limited by contract to a maximum flow of 2,830,000 gallons per day to the City of Ridgecrest treatment plant. The plant is near its capacity. The City is presently conducting an engineering study to determine the most practical manner to expand the plant and increase its capacity. The expanded plant capacity should be available within the next few years. Approximately 260,000 gallons of contracted sewage treatment and disposal is available to the Station without modification of the existing contract with the City.

Potable water is provided by ground water from deep wells by the Station's own permitted water system. The system has the potential of furnishing in excessive of 18 million gallons of water per day with all wells operating. The daily peak demand approaches 5.3 million gallons per day during the summer months. The existing water distribution systems are capable of handling flows in approximately 10 million gallons per day without modifications.

Steam is furnished to three distinct areas on Station by three separate boiler plants. Numerous small boilers are also utilized on Station that provide hot water or steam to individual facilities. Each of the boiler plant's peak demand is approximately 33% of the plant's capacity. Additional load can be carried by each of the plants with no adverse impact. The following reserve capacities are available: Boiler Plant No. 2 serving Mainsite, reserve capacity of 59.2 lbm/hr at 120 psi (based on present peak load of 31.8 lbm/hr at 120 psi and a maximum capacity 90 lbm/hr at 120

psi); Boiler Plant No. 3 serving the airfield area, reserve capacity of 22.8 lbm/hr at 100 psi (based on present peak load of 7.2 lbm/hr at 100 psi and a maximum capacity 30 lbm/hr at 100 psi); Boiler Plant No. 4 serving the Salt Wells, reserve capacity of 23.5 lbm/hr (based on a present peak load of 11.5 lbm/hr at 100 psi and a maximum capacity is 35 lbm/hr at 100 psi.). The existing steam distribution systems and condensate return systems were initially sized to handle the boiler plants full load.

Road systems and parking on Station are maintained in overall good condition. The road network and utility systems were designed and built when the majority of personnel working at China Lake lived on Station. During the last 20 years a large portion of the personnel working on Station have moved off Station into the Indian Wells Valley. Since the roads and other utility systems were designed and constructed, the overall number of personnel living and working on Station has declined. This reduction in personnel on Station accounts for the Station's ability to expand the service provided by the utility systems.

The table below summarizes NAWCWPNS' capability to expand utility services without any major upgrades (by CSF) over and above current usage.

CSF	Utility					
	Electric Power	Natural Gas	Domestic Sewage	Potable Water	Steam	Roads and Parking
(Applies to any combination of the following CSFs)	50%	300%	9%*	350%	200%	est. 200%
Air Vehicles	X	X	X	X	X	X
Fixed Wing						
Stuructures						
Propulsion						
Avionics						
Fleet Subsystems						
Rotary Wing						
Avionics						
Fleet Subsystems						
Weapons						
ICBMs/SLBMs						
Conventional Msls & Rockets						
Cruise Missiles						
Bombs						
Guns & Ammunition						
Guided Projectiles						
Directed Energy						
Space Systems						
Launch Vehicles						
C4I						
Airborne						
Pervasive Functions						
Electronic Devices						
Human Systems						
Training Systems						
Environmental Quality						
Advanced Materials						
Space Systems Satellites (SELENE)	See Note 1	N/A	See Note 2	See Note 3	N/A	See Note 4

*Upgrades are being planned.

NOTES:

1. Power. The Coso Geothermal Facility provides power to the NAWS site via the Southern California Edison grid. Access to considerable additional power is available out of the SCE power pool. A 115-kV transmission line is planned for SELENE from the existing substation at Inyokern, Calif., located on the boundary of NAWCWPNS China Lake.

2. Sewage Disposal. With an anticipated facility population of 200 people at the SELENE facility, four septic tanks with leach lines will be used, with a capacity of 10,000 gallons per day.

3. Water. Two water sources are planned. Identified potable water sources will produce a projected water quantity of 105 gal/min. An industrial water source of over 1,000 acre feet/year from the city of Ridgecrest will be used for cooling and general service water.

4. Road Access. Access from the eastern boundary of NAWCWPNS China Lake's North Range for the SELENE site has been planned via BLM land and would require construction of a new road. Access from the west can be accommodated by improvements to existing roads on base.

CSF	Utility					
	Electric Power	Natural Gas	Domestic Sewage	Potable Water	Steam	Roads and Parking
(Applies to any combination of the following CSFs)	50%	300%	9%*	350%	200%	est. 200%
Air Vehicles	X	X	X	X	X	X
Fixed Wing						
Stuructures						
Propulsion						
Avionics						
Fleet Subsystems						
Rotary Wing						
Avionics						
Fleet Subsystems						
Weapons						
ICBMs/SLBMs						
Conventional Msls & Rockets						
Cruise Missiles						
Bombs						
Guns & Ammunition						
Guided Projectiles						
Space Systems						
Launch Vehicles						
C4I						
Airborne						
Pervasive Functions						
Electronic Devices						
Human Systems						
Training Systems						
Environmental Quality						
Advanced Materials						
Space Systems	See Note 1	N/A	See Note 2	See Note 3	N/A	See Note 4
Satellites (SELENE)						

*Upgrades are being planned.

NOTES:

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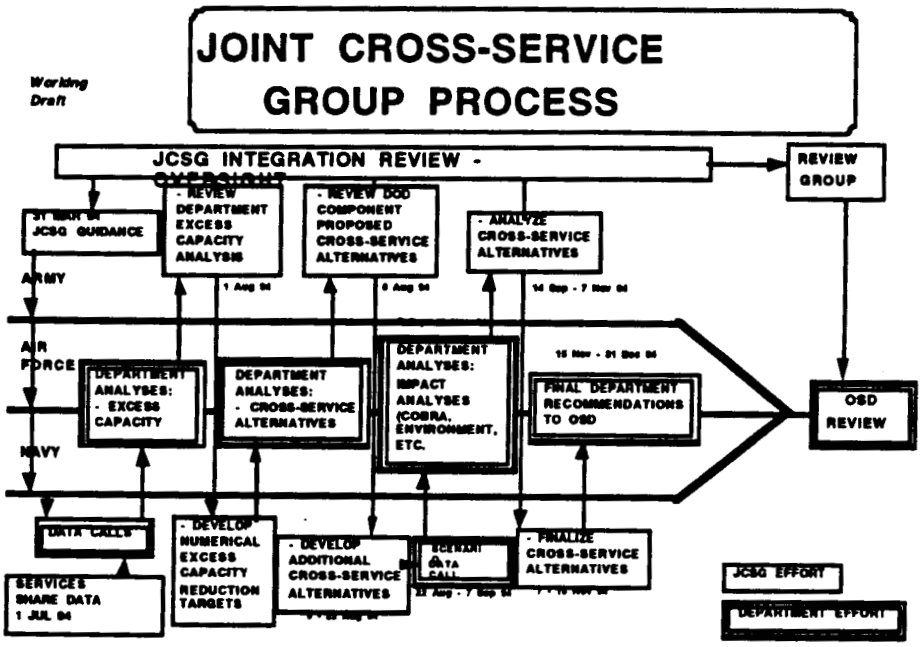
SECTION IV: APPENDICES

A. Macro Process/Schedule
B. List of Activities
C. Common Support Functions
D. Accomplishments

APPENDIX A

MACRO PROCESS/SCHEDULE



APPENDIX B

LIST OF ACTIVITIES

AIR FORCE

1. Armstrong Lab, Brooks AFB
2. Armstrong Lab, Tyndall AFB
3. Armstrong Lab, Wright-Patterson AFB
4. Armstrong Lab, Williams AFB
5. Human Systems Center, Brooks AFB
6. Wright Lab, Wright-Patterson AFB
7. Wright Lab, Eglin AFB
8. Aeronautical Systems Center, Wright-Patterson AFB
9. Aeronautical Systems Center, Eglin AFB
10. Oklahoma City Air Logistics Center, Tinker AFB (In-service engineering)
11. Ogden Air Logistics Center, Hill AFB (In-service engineering)
12. San Antonio Air Logistics Center, Kelly AFB (In-service engineering)
13. Sacramento Air Logistics Center, McClellan AFB (In-service engineering)
14. Warner-Robins Air Logistics Center, Robins AFB (In-service engineering)
15. Phillips Lab, Kirtland AFB
16. Phillips Lab, Hanscom AFB
17. Phillips Lab, Edwards AFB
18. Space & Missile Center, Los Angeles AFB
19. Space & Missile Center, Norton AFB
20. Sacramento Air Logistics Center, Peterson AFB
21. Rome Lab, Griffiss AFB
22. Rome Lab, Hanscom AFB
23. Electronic Systems Center, Hanscom AFB
24. Sacramento Air Logistics Center, Peterson AFB (In-service engineering)

ARMY

1. Army Research Lab (ARL), Adelphi, MD
2. ARL, Aberdeen Proving Grounds (APG), MD
3. ARL, White Sands Missile Range, NM
4. ARL, NASA Langley, VA
5. ARL, NASA Lewis, OH
6. Natick Research, Development and Engineering Center, Natick, MA
7. Aviation Research, Development and Engineering Center, St Louis, MO
8. Aviation Troop Command, Aeroflight Dynamics Directorate, Moffitt Field, CA
9. Aviation Troop Command, Aviation Applied Technology Directorate, Fort Eustis, VA
10. Edgewood Research, Development and Engineering Center, Aberdeen Proving Ground, MD
11. Communications Electronics Command Research, Development and Engineering Center, Ft Mammoth, NJ
12. Communication Electronics Command Research, Development and Engineering Center - Night Vision EO Directorate, Ft Belvoir, VA
13. Missile Research, Development and Engineering Center, Redstone Arsenal, AL
14. Armaments Research, Development and Engineering Center, Picatinny Arsenal, NJ
15. Armaments Research, Development and Engineering Center, Benet Labs, Watervliet Arsenal, NY

16. Tank-Automotive Command Research, Development and Engineering Center, Warren, MI
17. USA Research Institute of Infectious Diseases, Ft Detrick, MD
18. Walter Reed Army Institute of Research, Washington D.C.
19. USA Institute of Surgical Research, Ft Sam Houston, TX
20. USA Aeromedical Research Lab, Ft Rucker, AL
21. Medical Research Institute of Chemical Defense Aberdeen Proving Grounds, MD
22. USA Research Institute of Environmental Medicine, Natick, MA
23. Construction Engineering Research Laboratory, Champaign, IL
24. Cold Regions Research and Engineering Lab, Hanover, NH
25. Topographic Engineering Center, Alexandria, VA
26. Waterways Experiment Station, Vicksburg, MS
27. USA Research Institute for Behavioral & Social Sciences, Alexandria, VA
28. Simulation, Training and Instrumentation Command (STRICOM), Orlando, FL

NAVY

1. Naval Air Warfare Center, Weapons Division, China Lake
2. Naval Air Warfare Center, Weapons Division, Point Mugu
3. Naval Air Warfare Center, Aircraft Division, Patuxent River
4. Naval Air Warfare Center, Aircraft Division, Indianapolis
5. Naval Air Warfare Center, Aircraft Division, Lakehurst
6. Naval Research Lab, Washington D.C.
7. Naval Research Lab Detachment, Bay St Louis
8. Naval Surface Warfare Center, Carderock Division, Bethesda
9. Naval Surface Warfare Center, Carderock Detachment, Annapolis
10. Naval Surface Warfare Center, Crane Division
11. Naval Surface Warfare Center, Crane Detachment, Louisville
12. Naval Surface Warfare Center, Dahlgren Division
13. Naval Surface Warfare Center, Dahlgren Detachment, Panama City
14. Naval Surface Warfare Center, Indian Head Division
15. Naval Surface Warfare Center, Port Hueneme Division
16. Naval Command, Control, and Ocean Surveillance Center, RDT&E Division, San Diego
17. Naval Command, Control, and Ocean Surveillance Center, In-Service Engineering, West Coast Division, San Diego
18. Naval Command, Control, and Ocean Surveillance Center, In-Service Engineering Division, Charleston
19. Naval Aerospace Medical Research Center, Pensacola
20. Naval Biodynamics Lab, New Orleans
21. Naval Dental Research Lab, Great Lakes
22. Naval Health Research Center, San Diego
23. Naval Medical Research Institute, Bethesda
24. Naval Undersea Warfare Center, Keyport Division, WA
25. Naval Surface Warfare Center, Carderock, Philadelphia Detachment
26. Naval Undersea Warfare Center, Newport, RI
27. Naval Undersea Warfare Center (Newport), New London, CT
28. Naval Personnel Research and Development Center, San Diego, CA

DEPARTMENT OF DEFENSE

1. Armed Forces Radiobiology Research Institute (AFRRI), Bethesda, MD

APPENDIX C

COMMON SUPPORT FUNCTIONS (DEFINITIONS LISTED FOLLOWING PAGES)

Product Functions

1. Air Vehicles
   - Fixed
     -- Structure
     -- Propulsion
     -- Avionics
     -- Flight Subsystems
   - Rotary
     -- Structure
     -- Propulsion
     -- Avionics
     -- Flight Subsystems

2. Weapons
   - ICBMs/SLBMs
   - Conventional Missiles/Rockets
   - Cruise Missiles
   - Guided Projectiles
   - Bombs
   - Guns and Ammunition
   - Directed Energy
   - Chemical/Biological

3. Space Systems
   - Launch Vehicles
   - Satellites
   - Ground Control Systems

4. C4I Systems
   - Airborne C4I
   - Fixed Ground-Based C4I
   - Ground Mobile C4I

Pervasive Functions

1. Electronic Devices
2. Environmental Sciences
3. Infectious Diseases
4. Human Systems
5. Manpower and Personnel
6. Training Systems
7. Environmental Quality
8. Advanced Materials

DEFINITIONS

COMMON SUPPORT FUNCTIONS

Product Functions

1. Air Vehicles. Air vehicles are broken out into common support functions for fixed wing and rotary wing. Includes but not limited to all science and technology, demonstration and validation, engineering development, and production activities which support employment and in-service engineering of air vehicles. Included are all air vehicles including their application as UAVs and targets.

- Structures. Includes but not limited to all air vehicles structure technology, engineering and production efforts. Include technology and engineering practices which advance structural design and analysis; advanced structural concepts and fabrication techniques; and structural integrity.

- Propulsion. Includes but not limited to all technology, engineering and production efforts associated with air vehicle propulsion such as turbine engine, rotorcraft power drive, and hypersonic propulsion components. Such components include compressors, inlets and nozzles, turbines, mechanical systems and control, gears, bearings, shafts, and clutches. In addition, include associated subsystems activities such as turborocket, turboramjet and rotorcraft transmissions; and supporting technical and engineering disciplines.

- Avionics. Includes but not limited to all technology, engineering and production efforts associated with the air platform's integrated avionics system. The avionics suite includes but is not limited to weapon delivery systems, electronic warfare, navigation, communications, radar, electro-optic sensors, signal/data processing and associated software system and support. Includes efforts associated with developing the integrated avionics system (i.e. optimizing functional partitioning, distribution and integration of avionics/related functions).

- Flight Subsystems. Includes but not limited to all technology, engineering and production efforts for air vehicle support systems such as landing gear; transparent crew enclosures; egress systems; mechanical equipment integrity; electrical component integrity; subsystem integration; and aircraft power, pressurization, and temperature control systems.

2. Weapons. Includes but not limited to all science and technology, demonstration and validation, engineering development, and production activities which support employment and in-service engineering of ICBMs/SLBMs, conventional missiles and rockets, cruise missiles, guided projectiles, bombs, guns and ammunition, directed energy and chemical/biological munitions. Include with each weapon as appropriate, all related technology, engineering and production activities such as fusing/safe and arm, missile propulsion, warheads and explosives, and guidance and control.

3. Space. Includes but not limited to all science and technology, demonstration and validation, engineering development, and production activities which support employment and in-service engineering of launch vehicles, satellites and associated ground control systems (satellite control only; ground systems for telemetry of data included in C4I). Include under satellites, all technology, engineering and production activities associated with space communications and space-based surveillance (and associated sensors) and space-based C4I.

4. C4I. Includes but not limited to all science and technology, demonstration and validation, engineering development, and production activities which support employment

and in-service engineering of airborne, fixed ground-based and mobile ground based C4I systems. Include all technology, engineering and production activities associated with communications networks, radios and links, distributed information systems, data fusion, decision aids, and associated computer architectures.

Pervasive Functions (6.1, 6.2, and 6.3)

1. Electronic Devices. Includes but not limited to all science and technology activities supporting development of semiconductor and superconductor materials for optoelectronic, acoustic and microwave devices. Include all associated electronic materials/device fabrication and processing.

2. Environmental Sciences. Includes but not limited to all science and technology activities to improve measurement, characterization and modeling of the earth atmosphere and space environment. Examples include global prediction systems, space effects, and celestial backgrounds/astronomical reference sources.

3. Infectious Diseases. Includes but not limited to all science and technology activities which preserve manpower and performance by the prevention and treatment of militarily important infectious diseases that occur naturally worldwide.

4. Human Systems. Includes but not limited to all science and technology activities to enable, protect, sustain and enhance human effectiveness in DOD operations. The focus of this pervasive, multi-disciplinary area is the human and therefore impacts all DOD systems and operations. This area includes: (1) human performance definition, assessment, and aiding; (2) physiologic bioeffects of toxic hazards, ionizing and non-ionizing radiation, biodynamic (bio-mechanical) stress, and extreme environments; (3) military operational medicine; and (4) generic, human-centered design standards/methodologies for crew station subsystems, information management and display, and life support.

5. Manpower and Personnel. Includes but not limited to all science and technology activities which support four broad areas: (1) selection and classification of DOD personnel (including pilots); (2) identification of operational tasks performed and requirements for skills, knowledge, and aptitudes; (3) matching the right people with the jobs they are best suited for according to the needs of DOD, (4) and developing techniques for measuring and enhancing the productivity of the operational force.

6. Training Systems. Includes but not limited to all science and technology which support training of personnel, including training strategies, devices and simulators, and computer aided intelligent tutoring systems.

7. Environmental Quality. Includes but not limited to all science and technology activities which support the development of technologies to reduce the environmental costs of DOD operations while ensuring mission accomplishment is not jeopardized by adverse environmental impacts. Specifically, this area encompasses technologies to: (1) identify and cleanup sites contaminated with hazardous materials as a result of DOD operations (cleanup); (2) ensure DOD compliance with current and anticipated local, national, and international environmental laws and treaties (compliance); (3) minimize DOD use of hazardous materials and reduce DOD hazardous waste generation (pollution prevention); and (4) provide for protection of natural resources under DOD stewardship (conservation).

8. Advanced Materials. Includes but not limited to all science and technology activities related to structural, high temperature, electromagnetic protection, electronic, magnetic,

optical, and biomolecular materials. Note: excludes materials areas which were included in DDR&E decision of 18 Mar 94 related to the Army's Materials Research Facility at Aberdeen Proving Ground and the Navy's Materials Facility at Carderock.

APPENDIX D

ACCOMPLISHMENTS

AIR-TO-AIR WEAPONS

Sidewinder. China Lake designed and developed all Navy versions of the weapon, as well as the first version of the Army Chaparral, a derivative of Sidewinder. Below is more detail on the various versions.

Sidewinder AIM-9B. Infrared (IR) homing missile. (Initial AIM-9A version was developed in 1956 but quickly gave way to much-improved AIM-9B.) China Lake designed the entire weapon. Tube electronics, no rollerons, small solid-rocket motor, uncooled PbS detector.

Sidewinder AIM-9C. China Lake designed a semiactive radar homing version of Sidewinder. Initial operational capability (IOC) was 1964.

Sidewinder AIM-9D. Improved IR-homing Sidewinder, IOC 1964. Cooled PbS detector, larger motor, improved aerodynamics. China Lake design.

Sidewinder AIM-9E, 9J. Air Force versions of Sidewinder during 1960s and 1970s. Evolution from AIM-9B.

Sidewinder AIM-9G. China Lake design. Evolution of the AIM-9D. IOC was 1968.

Sidewinder AIM-9H. Solid-state version of the AIM-9G, increased maneuverability, entered service in 1973. China Lake design.

Sidewinder AIM-9L. Major change in Sidewinder, more revolution than evolution. All-aspect acquisition capability, increased maneuverability. China Lake was lead field activity, designer, and technical manager.

DSU-15A/B. Active-optical target-detecting device (TDD) for AIM-9L and AIM-9M. Released for service use in 1979. China Lake design.

Sidewinder AIM-9M. Upgrade of AIM-9L. Incorporation of counter-countermeasure capability, with producibility improvements. Released to Fleet in 1981. China Lake design.

Sidewinder AIM-9M-8/9. Retrofit of AIM-9M to improve counter-countermeasure performance. Released to Fleet in 1993. China Lake design.

Sidewinder AIM-9P. Air Force version of Sidewinder, an evolution of AIM-9J.

Reduced-Smoke Rocket Motor. For AIM-9M. Released to production in 1982.

AIR-TO-SURFACE WEAPONS

Tiny Tim. An 11.75-inch aircraft rocket developed during World War II and modified for better performance by China Lake after the War.

Mighty Mouse (2.75-Inch Folding-Fin Aircraft Rocket (FFAR). Aircraft rocket, deployed 1952; still in use around the world. Many millions of these rockets have been produced. China Lake was developer and lead laboratory.

ZUNI (5-Inch FFAR). FFAR designed, developed, and initially produced at China Lake. IOC 1956. Used all over the world; prodigious production figures.

General-Purpose Projectile, 20-mm. China Lake development of an improved 20-mm projectile during the 1960s.

Gladeye. A modular weapon dispenser, designed at China Lake and completed in 1963.

Snakeye. Retarding tail assemblies for general-purpose bombs; IOC 1964. China Lake developed and was lead laboratory.

Shrike (AGM-45). First antiradiation missile (ARM) weapon, deployed 1965. Some versions are still in inventory. China Lake developed and was lead laboratory. Shrike Mods 3B and 4 IOC 1968; Mod 7 in 1969; Mod 6 in 1970; Mods 8 and 9 in 1974.

Walleye 1. TV-homing glide bomb, deployed in 1967. Heavily used in Vietnam. China Lake designed. China Lake role was lead technical activity.

Rockeye II. Cluster bomb; IOC 1968. Heavily used in SEA. China Lake was lead laboratory.

Helicopter Trap Weapon. For clearing helicopter landing zones. Deployed 1969. China Lake was lead laboratory.

FAE (Fuel-Air Explosive) (CBU-55/B and CBU-72/B). Free-fall weapons providing blast effect against varied ground targets, based on China Lake technology and with China Lake as principal field activity during development. IOC 1970 for CBU-55/B, IOC 1973 for CBU-72B; still in inventory.

Walleye II. Larger warhead than Walleye I, IOC 1973 with considerable use in Vietnam. China Lake design with the China Lake designated as lead technical activity.

Extended-Range Walleye. Incorporates data link and other changes to extend Walleye standoff range. China Lake designed and was lead technical activity. IOC 1974 for Extended-Range Walleye II; 1983 for Extended-Range Walleye I.

APAM (Antipersonnel/Antimaterial Cluster Weapon CBU-59). Rockeye dispenser with a more formidable payload, different bomblet. China Lake was lead field activity. IOC 1974.

Skipper (AGM-123A). Combination of Shrike motor, conventional bomb, paveway front end. China Lake developed in early 1980s. Skipper 2 version IOC 1983. Saw considerable use in Mediterranean/Gulf.

HARM (AGM-88A). Intended as replacement for Shrike and Standard ARM. Originally called Shrike 73. China Lake was initially lead laboratory and technical manager and designed and fired

the first three missiles before contracting with industry. After several years China Lake was brought back into a stronger role in the program. First production deliveries in 1983.

High-Speed Antiradiation Missile (HARM) Low Cost Seeker. A China Lake design to reduce the cost of the HARM system.

FMU-139/B Electronic Bomb Fuze. Approved for limited production in 1983.

HARM Secure Telemetry Section. Designed and produced at China Lake for HARM test vehicle launches. Completed in 1986.

Mk 83 GP Bomb Fill. Loaded with new explosive PBXN-109. Released to limited production in 1986.

FMU-140/B Bomb Fuze. Approved for limited production in 1986.

Sidearm (AGM-122A). Short-range antiradiation weapon for helicopters and light aircraft. Approved for limited production in 1986.

Air-Inflatable Retarder (BSU-85/B). High- or low-drag capability for delivery of the 1,000-pound Mk 83 bomb. Approved for limited production in 1987.

TARGET-ACQUISITION/FIRE-CONTROL SYSTEMS

AFCS Mk 16/EX 16. Armament fire-control systems developed for various strike aircraft (analog computer systems) during 1950s and 1960s. China Lake was lead laboratory.

AWA-3 Missile Envelope. Computer for F8/Sidewinder, F4/Sparrow, Sidewinder.

Bomb Director AN/ASB-7. Bombing/navigation system for the A3D heavy-attack aircraft. China Lake was a participant in the development. IOC 1956.

Bomb Directing System Mk 9/Mk 10. Mk 9 was the forerunner of the CP-741A. These earlier systems were developed at China Lake prior to 1958.

SWAT (Sidewinder Acquisition and Track) System. Sidewinder aircraft integration. IOC 1960.

CP-741/A. Weapon-release computer for strike aircraft. IOC 1966. China Lake developed and was lead laboratory.

SIDS (Shrike Improved Display System). Display system for Shrike, deployed 1967. China Lake was lead laboratory.

TIAS (Target Identification and Acquisition System) AN/APS-117. For Shrike and Standard ARM, effectively used in SEA. IOC 1969. China Lake was lead laboratory.

CP-841/A. Weapon-release computer for strike aircraft. IOC 1969. China Lake developed and was lead laboratory.

TDS (Target Designator System). Later called LST for Laser Spot Tracker. A laser-based system with IOC 1970. China Lake was lead laboratory.

NOGS (Night Observation Gunship). Modification of a Marine Corps OV-10A aircraft to include a forward-looking infrared (FLIR) sensor and a 20-mm gun slaved to the FLIR aimpoint. Successfully demonstrated in combat in 1971. (Later became the OV-10D version of the OV-10 aircraft, which went into production in 1978.)

A-7E FLIR System. A light-attack system incorporating a FLIR sensor/display. Entered the Fleet in 1978.

A-6E TRAM. All-weather day/night attack system for the A-6E, incorporating FLIR sensor/display and a laser ranging and designating system. Entered the Fleet in 1979.

ARBS (Angle Rate Bombing System). Originally conceived at China Lake. Subsequently lead field activity in overseeing contractor development of the system. Used by A-4M and AV-8B aircraft. Introduced into the Fleet in 1983.

AIRCRAFT SOFTWARE AND AVIONICS SYSTEMS AND OTHER AIRCRAFT SYSTEMS

OFP (Operational Flight Program) E 120. For A-6 aircraft, 1984.

OFP E 220. For A-6 aircraft, 1983.

OFP E 230. For A-6 aircraft, in OPEVAL 1985.

EA-6B/HARM Integration. 1986.

A-6E System/Weapon Improvement Program (SWIP). 1987-89. Integrated HARM, Harpoon, IR/Laser Maverick into the OFP which became operational in 1988.

OFP NWC-2F. For A-7 aircraft, 1983.

OFP NWC-4. For A-7 aircraft, 1983.

OFP NWC-5. For A-7 aircraft, 1986.

"Assembly 23." Update for the A-4M OFP, IOC 1986.

OFP. For the AV-8B aircraft, 1987-89. Day attack and night attack. Various additional weapon options.

Omnibus 3 OFP. For AV-8B aircraft, 1986. (Navigation improvements, improved air-to-ground symbology, resolution of display discrepancies.)

Omnibus 4 OFP. For the AV-8B aircraft, 1987. (Improved rocket accuracy, even-ripple spacing, Laser Maverick corrections, added BDU-33, BDU-48, corrected all-weather landing system, added engine monitoring system.)

Omnibus 6+ OFP. For AV-8B, 1990.

Omnibus 6+A OFP. For AV-8B, 1990.

Omnibus 6+B OFP. For AV-8B, 1994.

Omnibus 7 OFP. For AV-8B, 1991.

Omnibus R1 OFP. For AV-8B, 1993.

Omnibus R2 OFP. For AV-8B, 1994.

Omnibus 6+C OFP. For AV-8B, 1994.

Day/Night Mission File Conversion Tool. China Lake created a tool to support conversion of mission files between NAMPS and AMPS for AV-8B.

OFP for the F/A-18 Aircraft. Major enhancement of F/A-18 combat capabilities, 1985-1989. Originally the F/A-18 could carry only AIM-7F/9L missiles and iron bombs. This effort added capability to carry AIM-7M, AIM-9M, Walleye, Harpoon, BLU-80, CBU-78/B, BSU-85/86, PUU-28B, mines, FMU-139, IR/Laser Maverick, Shrike, AN/AWW-9/12/13, SLAM, DSU-30, and Advanced Medium-Range Air-to-Air Missile (AMRAAM). New targeting and avionics capabilities include laser tracker, air-to-air FLIR, AN/ALQ-126. Among the insertions into the F/A-18 are algorithm for FLIR passive ranging, algorithm for active/passive detect and track, cued/supercued, video processor and algorithm for FLIR to infrared search and track (IRST), fighter-to-fighter data link, multisensor correlation.

F/A-18 89A System Software. The F/A-18 Weapon System Support Activity (WSSA) at China Lake designed and developed and then deployed the 89A System Software. Released in 1991.

92A System Software. China Lake designed and developed. Has performed an interim release of the 92A system software in 1994.

AH-1W. China Lake has delivered OFP CDS 4.0 (1992 Fleet delivery) and has developed the AH-1W Laboratory, for use in software development and weapons integration.

AN/ALR-45F. Countermeasures warning and control system, incorporating China Lake-designed ALR-67 processor with existing ALR-45 components. Released in 1982.

Drone Aircraft Developments. China Lake developed QF-86H/F, QT-38, QF-4; 42 QF-86s by 1983. First flight of QF-4 drone compatible with Integrated Target Control System (ITCS), 1983.

Survivability Model and Simulation Verification and Validation Process. Susceptibility Model Assessment and Range Test (SMART). Project developed a robust modeling and simulation verification and validation (V&V) process. It is currently being used by DOD and industry to support survivability model and simulation (M&S) V&V. Documented products include accreditation support packages at three levels of detail for three subject models currently being investigated by SMART.

Developed processes to convert Failure Modes and Effects Analysis (FMEA) data into input Computation of Vulnerable and Repair Times model for vulnerability analysis. This is used widely by DOD and industry in conducting baseline survivability assessments and is a DOD standard.

Developed a nearfield fuzing algorithm using the Geometric Theory of Diffraction (GTD) code fuze simulation. This code has been supplied to several contractors.

Significant responsibility in developing the output processes and formats for the joint missile endgame models MECA and JSEM, and developed the encounter generators widely used with the

MECA and JSEM models. Developed numerous improvements for the endgame models (MECA and JSEM) including multifragment calculations, low-altitude fuzing methods, and internal fuzing.

Developed the process for establishing "not-to-exceed" vulnerable areas (Av) for inclusion in the Survivability Annex of the purchase specification for new aircraft. This Av calculation defines for industry the Navy's vulnerability requirements with firm numbers and identifies the methodology to be used in their calculation. It has been used in the MV-22, A-12, P-7, NATF, and F/A-18E/F survivability specifications.

Developed a unique load fixture that simulated flight loads using dynamic, low-cost air bag actuators, allowing structural weaknesses to be resolved before production. This process has been refined and is now a standard procedure for existing and new aircraft and used by industry. Examples include the A-6, F-14, F/A-18, AV-8B, P-3, and MV-22.

Low-Signature Launcher Mechanism. Trapeze Launch Mechanism (Patent No. 440365) was developed by the Systems Survivability Program Office (C21803), and proof-of-concept hardware was built. Data from this program (Advanced Launcher Concepts, NWC TM 4534, J. Holtrop) were used in the launcher designs for the F-117, B-2, A-12, NATF, and F-22.

Jam-Resistant Flight Control Actuator. Conventional metal hydraulic flight control actuators can be jammed by ballistic damage. C21803 developed and prototyped a graphite epoxy design that resists jamming and weighs less (around 25%) than metal designs. This technology (Patent No. 4867044, J. Holtrop), has been applied to the F/A-18E/F, C-17, and F-22 programs and has generated substantial commercial interest due to weight savings.

Fire and Explosion Suppression. China Lake has lead an aggressive R&D program aimed at reducing ullage explosions and dry bay fires in aircraft. The results of this effort are found on the MV-22, AH-1, F/A-18E/F, A-6F, F-16, and F-22 programs. The latest suppressers are based on China Lake-developed inert gas generators that use low-cost automotive air bag technology.

NWC Ballistic Algorithm is used for ballistic weapon delivery by all Navy attack aircraft and by many USAF and foreign aircraft. Also, the processes we have devised for maintaining the algorithm through parameter optimization are used by other government agencies, industry, and foreign defense organizations.

> *A Ballistic Trajectory Algorithm for Digital Airborne Fire Control,* NWC TP 5416, September 1972 (updated 1990).

Reprogrammers. Over the past 5 to 6 years, China Lake designed and has delivered a series of reprogrammers for avionics computer ultraviolet erasable programmable read-only memory (UVEPROM) memory units. The kits are in use by the AV-8B Intermediate and Depot levels.

> *Computer Memory Loader-Verifier Test Set an/ASM-607(V)7 Ultraviolet Erasable Programmable Read-Only Memory Programming Set 1692AS000-2 for AV-8B Aircraft 163853 and Up*", NAWCWPNS TM 7676.

AN/ALR-67. Deployed in its entirety in 1985.

Memory Loader/Verifier. Primary GSE item to load and verify programs in aircraft and weapon computers. Complete in 1986.

Cheap Night. 1987. Integrated FLIR, night-vision goggles in a TA-7 cockpit with modified cockpit lighting, heads-up/heads-down display. Basis for night capability, which entered the Fleet in AV-8B and F/A-18 in 1989.

FLARES/COUNTERMEASURES

Mk 42/Mk 43 IR Countermeasure Flares. IOC 1962.

Mk 46 Infrared Countermeasures (IRCM) Flare. Urgent requirement during Vietnam conflict for a decoy flare. Deployed 1967. Successfully used in Vietnam.

BRITEYE. A very high-intensity flare supported by a hot-air balloon to increase hovering time. IOC 1970.

SOID (Ships Ordnance Infrared Decoy). A modification to a marker flare for Vietnam use. IOC 1971.

Mk 50 IRCM Flare. Quick response to a Vietnam requirement for an IRCM flare that could be fired from a flare pistol. Credited with saving many lives. Deployed in 1972.

EJECTION SEATS, AIR RETARDATION DEVICES

Rocket Catapult Mk 1. Ejection seat for the A-4D and F-104 aircraft. Deployed 1959. China Lake was lead laboratory for development.

SEAWARS. Parachute release system for over-ocean utilization. IOC 1984.

SURFACE-TO-AIR WEAPONS.

CHAFFROC (Shipboard Chaff Decoy Rocket System). A quick-response effort to meet a Vietnam requirement. IOC 1967. Quick Bloom Mk 84 CHAFFROC chaff package IOC 1970.

Chaparral (MIM-72A). Short-range air-defense system for the Army, based on the Sidewinder AIM-9D missile. IOC 1970. China Lake was lead laboratory for the Army.

Sea Chaparral. Modified version of the Army Chaparral, installed on a number of ships during 1972-73 as a result of a Vietnam requirement. This was another quick-response program with China Lake serving as lead laboratory.

SURFACE-TO-SURFACE WEAPONS

Rocket-Thrown Line Charge. For clearing minefields; 1,750-pound rocket-deployed explosive charge on nylon line. IOC 1962.

RAP (Rocket-Assisted Projectile). To extend the range of existing 5-inch guns. IOC 1968.

BOMROC (Bombardment Rocket). An extended-range rocket for shore bombardment, for example, in amphibious operations.

SLUFAE (Surface-Launched Unit, Fuel-Air Explosive). Rocket-propelled system for clearing mines and booby traps by blast effect. China Lake was lead laboratory for the weapon portion of the system (the Army was to design the fire-control system and launcher).

Universal Arming/Firing Mechanism for Ship-Launched Missiles. 1983.

ANTISUBMARINE WARFARE (ASW) WEAPONS

ASROC (Antisubmarine Rocket). A rocket with a torpedo payload. China Lake was lead laboratory. China Lake did the rocket portion of the system. IOC 1962.

Extended-Range ASROC. As implied, a longer-range version of ASROC. Substantial propulsion work was done at China Lake.

UNIQUE OR SPECIAL APPLICATION SYSTEMS, MISCELLANEOUS ITEMS

TIARA. Chemiluminescent systems for various night applications. China Lake was active in chemiluminescence studies since 1960 and developed numerous special devices, e.g., MARSTICKS, a China Lake/DuPont development in 1962 (a luminous marking crayon). China Lake's Project CHLOE (Chemiluminescent Light from Oxalate Esters), carried out in collaboration with American Cyanamid, led to the commercial production of Chemlite light sticks, now used in large quantities around the world.

CYCLOPS. Weather-modification device developed by China Lake. Experimental units employed in Project Stormfury, modified/weaponized hardware saw limited use in SEA. 1960s.

Transit. Ground-receiving equipment to support satellite navigation systems. China Lake built a number of ground tracking systems. IOC 1962. Sponsored by Advanced Research Projects Agency (ARPA) and directed by Applied Physics Laboratory/John Hopkins University (APL/JHU).

Deep Jeep. A deep-diving submersible developed at China Lake—first U.S.-built submersible capable of diving to 2,000 feet. IOC 1965. Transferred to Scripps Institute for Oceanographic Research in 1966. China Lake was lead laboratory.

ROCOZ. A rocket ozonesonde developed for NASA to take observations of ozone distribution at extremely high altitudes. Utilization began in 1965.

Scuttling and Equipment Destruct System. Quick-response project during the Vietnam conflict for scuttling vessels carrying sensitive/intelligence materials. 1968.

Radio Firing Device Mk 100 Mod 0. IOC 1968.

Swimmer Weapon Systems. For the Navy Sea-Air-Land (SEAL) Teams. China Lake developed an array of specialized items for the SEAL Teams, including special explosive configurations, limpet mines, rocket launchers, and a Swimmer Delivery Vehicle (SDV) during the 1960s and 1970s, before cognizance over Swimmer Weapon Systems was transferred to the Naval Coastal Systems Center. SDV Mk 7 Mod 6. IOC 1975.

Fuel Gelling Unit. For producing gelled flame-weapon fuel from aviation gasoline (AVGAS) or JP-5. Prototype in Vietnam in 1968. Highly successful. Released to production in 1969.

SUU 53. Cartridge dispenser for weather modification. Carries/fires 52 catalyst generators for cloud seeding. IOC 1974.

North-Finding Module. Man-portable gyrocompass. Approved for service use in 1983.

Laser Leakage Detector. "Sniffing" laser leakage for eye hazard assessment. China Lake designed and produced 35 units. 1983.

Multifunction Digital/Video Scan Converter. Designed in 1983, now in production as "Folsom System 5000."

FAST (Floating At-Sea Target). A quick-response task to develop a shipboard-assembled radar target with miss-distance scoring capability. Design completed in 1982.

Safe-Arm Inspection Gage. China Lake designed, qualified, and manufactured a rocket motor safe-arm spring pin inspection gage to allow Navy and Air Force squadrons to detect loose pins prior to failure. The tool is currently in Fleet use.

Coupling Ring Assembly Tool. China Lake designed and manufactured a tool to allow improved assembly of the Sidewinder missile at weapons stations. The new tool applies uniform pressure all around the ring, preventing bending of the ring bosses. The Navy is currently using this tool.

TS-4044/D. China Lake developed the TS-4044/D microprocessor-based filed test set, which is used in Air Force missile shops to test Sidewinder guidance and control units.

TS-4044A/D. China Lake has upgraded the TS-4044/D test set. The TS-4044A/D is currently in production.

Fleet Telemetry. China Lake designed the AN/DKT-58 telemetry set, which is used during many Fleet test firings of Sidewinder missiles.

Department of Navy (DON) Data Element Standardization Training Manual. Developed in FY93. In use by DON organizational and functional data administrators in Navy and United States Marine Corps (USMC), NISMC project staff.

DON Data Element Standardization Coordination Process. Implemented in FY93. In use by DON organizational and function data administrators in Navy and USMC to coordinate development, approval, and use of standard data elements for input to the DOD Data Repository System.

Directive Radio Frequency (RF) Antenna System. Built on a quick-response basis to meet an urgent requirement of a naval security facility overseas in 1984. (Minimal contracting, less cost, and far less time than such a development would normally entail.)

Information Flow-Modeling Techniques. Used since the late 1970s as part of the Shipboard Combat System Simulation and the systems-level air-to-air tactical simulation to determine weapon system requirements.

Weapons and Tactics Analysis Center (WEPTAC). A wargaming simulation used extensively by the Fleet, OPNAV, and other military customers.

Artificial Neural Network Chip. The first computer that literally works like an organic neural network was demonstrated at China Lake in 1989. Intel, Inc., is producing the Electronically Trainable Artificial Neural Network (ETANN) chip, designed jointly by Intel and China Lake.

Digital Neural Network Algorithms and Software. Adaptive Solutions, Inc., is producing a digital neural network system incorporating China Lake algorithms and software.

Rule-Based Systems and Object-Oriented Data Structures. Used throughout the world by the simulation community in a new extended form of the SIMSCRIPT language, an important tool of artificial intelligence.

Optical Measurement Techniques. Used by all major optical houses as measurement standards. Used by the electronics industry as a step-height standard.

Joint Munitions Effectiveness Manuals (JMEM). China Lake employees have been significantly involved with the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) since that organization was conceived in 1963. The JTCG/ME is organized into three major working groups: Air-to-Surface, Surface-to-Surface, and Antiair. There are also support groups like Publications and Surface Target Vulnerability and affiliate groups like Special Operations and Basic Manual. China Lake holds the Chairmanship of the Antiair Group (Mr. Burt Galloway, C024) and is thoroughly involved in each of the four Antiair subgroups. Mr. A. S. Gould, Jr., (C2817) is the Co-Chairman of the Air-to-Surface Group, and within this group, Mr. Bill Tonkin (C28104) is Co-Chairman of the Methodology Working Group and Head of the Small Computer Methods Group; Mr. Rex Randolph (C2817) is Co-Chairman of the Systems Characteristics Working Group; Dr. Jim DeSante (C2196) is Head of the Delivery Accuracy Working Group; and Lt. Overton (VX-5) is Co-Chairman of the Operational Users Working Group. Mr. Mel Keith (C28104) has served as Chairman of perhaps the most important of the JTCG/ME support groups, the Surface Target Vulnerability Group, for more than 20 years. China Lake employees have been or are currently active members of almost all of the affiliate groups. While there are a number of support products produced by the working groups, by far the most important products are the JMEMs, which are used extensively by the Fleet.

Probabilistic Radar Image Inverse Scattering Methods. Algorithms developed at China Lake have transitioned to industry (A. J. Devaney and Associates) and formed the basis for successful phase I and II Small Business Innovative Research (SBIR) programs.

An Asymmetrical Quantum Well Structure. Developed by China Lake for use as a photodetector (U. S. Patent No. 5,036,371). Martin Marietta Inc. has been using the photodetector design in 128-by-128 IR imaging arrays and for IR cameras.

T. S. Faska, J. W. Little, W. A. Beck, K. J. Ritter, A. C. Goldberg, and R. LeBlanc, in Innovative Long Wavelength Infrared Detector Workshop, Pasadena, Calif., 7-9 April 1992.

A Technique for the Determination of the Energies of Critical Points in the band structure of materials, electroreflectance, was developed at China Lake and has become a standard tool for the characterization of alloy semiconductors.

J. I. Pankove, *Optical Processes in Semiconductors* (Dover Press, New York, NY), 1971, Chapter 18.

Wavelets. Patent application for "Signal Alignment Apparatus and Method Using Wavelets" is in process (NC7411, 1993). Texas Instruments (Dallas) and Systems and Processes Engineering Corp. (Austin, Texas) have expressed an interest in this work.

Pole Expansion Methods for Glint Reduction algorithms originally developed at China Lake have been used by Cullen Lee at Sandia National Laboratory.

A Standard Glint/Radar Cross-Section Target Model developed at China Lake has been used by a number of industrial investigators.

A Calculation Tool Based Upon R-Matrix Propagation that addresses numerical instabilities encountered in calculating optical properties of multilayer stacks as well as quantum mechanical states in semiconductor heterostructures has been used in a number of industrial modeling codes.

"Defect Damage Precursors in Visible-Wavelength Mirrors", Laser-Induced Damage in Optical Materials (1983 NBS Special Publ. 688). The Video-Microimaging technology was developed for identifying weak areas in an optical coating that could lead to poor performance of a high-power laser or propagate to laser-induced damage. A patent was applied for but not granted. The Japanese have since patented the technology and are using it for quality control for compact discs.

Calibration Technique for Passive Resonators is used in many applications from high-precision reflectometers to laser gyros (U.S. Patent No. 4624573 (25 November 1986)). Used by laser gyro manufacturers, i.e., Litton and Honeywell, for quality control of mirrors/cavities used for laser gyros.

Fiber-Optic Gyro analysis and technology for enhanced performance at reduced unit cost. Several Navy patents. Cooperative Research and Development Agreement (CRADA) with Optiphase on technology transfer/prototyping. Kearfott and Optiphase are examples of companies utilizing the analysis/technology.

Optical Scattering Software that analysis and predicts the performance of radiation scattering from optical surfaces. Applications include scattering within optical systems and optical coatings. Non-exclusive license agreement with the Optical Coating Laboratory Incorporated for use of the software.

NAWCWPNS TP 8084, October 1992.

Optical Ceramic Joining. A new joining technique for ceramics to metal was developed with Raytheon. The technique is currently used in Hughes' Sparrow Missile Homing Improvement Program (MHIP).

The Joining of IR Optical Materials to RF Transmitting Materials Raytheon, NAWCWPNS TP 8073.

Near Net-Shaped Sapphire Domes. SAPHIKON fabricated and sold near-net-shaped sapphire domes to the Sparrow MHIP.

Characteristics and Fabrication of Sapphire as a Missile Dome Using the Edge-Defined Film-Fed Growth Technique, J. Locher, H. E. Bennett, W. R. Compton, C. T. Newmyer, NAWCWPNS TP 8001, December 1992.

Yttria and Lanthana-Doped Yttria Domes. Yttria and Lanthana-Doped Yttria domes are in production by Raytheon for Hughes' Sparrow MHIP.

Development of Yttria and Lanthana-Doped Yttria as Infrared-Transmitting Materials, D. C. Harris, NWC TP 7140, March 1991.

Di(t-butyl)telluride. Morton CVD produces and sells Di(t-butyl)telluride as a CVD source for the fabrication of mercury cadmium telluride.

Preparation of Ditertiarybutyl Telluride, K. T. Higa and D. C. Harris, U.S. Patent No. 4,946,994, 15 August 1990.

Di(allyl)telluride. Morton CVD produces and sells Di(allyl)telluride as a CVD source for the fabrication of mercury cadmium telluride.

Synthesis of Diallyl Telluride and Diorgano Tellurides, K. T. Higa and D. C. Harris, U.S. Patent No. 5,035,874 30, June 1991.

Diallyl Telluride, K. T. Higa and D. C. Harris, U.S. Patent No. 5,043,476, 27 August 1991.

Methyl(allyl)telluride. Morton CVD and Air Products produce and sell Methyl(allyl)telluride as a CVD source for the fabrication of mercury cadmium telluride.

Methyl Allyl Telluride, K. T. Higa and D. C. Harris, U.S. Patent No. 5,043,477, 27 August 1991.

Dimethyl(t-butyl)antimony. Air Products manufactures and sells Dimethyl(t-butyl)antimony as an antimony CVD source.

"Tertiarybutyldimethylantimony: Process for Preparing and Use as a Precursor for the Organometallic Vapor Phase Epitaxial Growth of Antimony-Containing Semiconductors," R. W. Gedridge, Jr., Navy Case No. 73803.

Tri(isopropyl)indium as a CVD Source. Air Products and Morton CVD manufacture and sell this compound as an indium source and dopant.

"Triisopropylindium: Use as a Dopant Precursor in the Chemical Vapor Deposition of Semiconductor Materials," R. W. Gedridge, Jr., K. T. Higa, S. J. C. Irvine, R. Korenstein, Navy Case No. 74444.

Citric Acid Tablets. China Lake invented a citric acid formulation that is being used for shipboard treatment of water systems that prevents the build-up of calcium deposits in the plumbing.

Calcification Prevention in Shipboard Collection, Holding, and Transfer System Collection Piping: Citric Acid Tablet Development, G. A. Lindsay, M. S. Hasting, D. Paull, R. F. Kubin, M. Pietrak, NWC TP 7199, November 1991.

CL-20. CL-20 explosive was invented at China Lake and subsequently developed jointly with a number of other DOD, Department of Energy (DOE), industrial, and academic laboratories. Thiokol Corp. is currently manufacturing and selling CL-20.

Naval Weapons Center. *Polynitropolyaza Caged Explosives*, Part 7 (U), by A. T. Nielsen, M. L. Chan, K. J. Kraeutle, C. K. Lowe-Ma, R. A. Hollins, M. P. Nadler, R. A. Nissan, W. P. Norris, D. J. Vanderah, and R. Y. Yee. NWC TP 7020, November 1989, publication CONFIDENTIAL.

Propellant Combustion Test Instrument. Instrument design used in propulsion industry for measurement of propellant burn rates as a function of pressure and temperature.

Propellant Damage Assessment Instrument. Device design being transferred to French and Canadian energetic material laboratories who are currently building the instrument.

"Hydrostatic Compression Tester for Isotropic Materials," Albert Lepie. Navy Case No. 69215, 2 April 1985.

"A New Hydrostatic Compression Tester for Anisotropic Filled Polymers," A. H. Lepie and M. B. Moran, *J. Appl. Polymer Sci..*, Vol. 30 (1985), pp. 3153-3161.

Thermal Diffusivities. Developed unique device for the measurement of temperature dependent thermal diffusivities of electrically insulating materials including energetic materials. Described in Joint Army, Navy, NASA, and Air Force (JANNAF) paper and disseminated to industry via Government-Industry Data Exchange Program (GIDEP) database. Information also delivered directly to Talley Systems, Dr. Robert Glick.

"Condensed Phase Temperature Profiles in Deflagrating HMX," D. M. Hanson-Parr and T. P. Parr, *Proceedings of the 20th JANNAF Combustion Meeting*, Naval Postgraduate School, Monterey, California, CPIA Publication 383, Vol. I, pp. 281-291, October 1983.

Combustion Response Measurements and Techniques. Solid propellant combustion response measurements of candidate propellants for many solid motors including Polaris, Poseidon, Trident, Minuteman, Space Shuttle, Standard Missile, Sidewinder, Tomahawk, Harpoon, SUBROC, AMRAAM, Advanced Air-to-Air Missile (AAAM), Sentry, Sea Lance, Penguin, HARM, ASROC, Agile, Sparrow, Shrike, and many more. Newer inexpensive methods to perform the measurements have also been transferred. This information was transferred to industry via NAWC memorandums and numerous JANNAF publications. The following are several recent publications.

"Aluminum Combustion Effects on Combustion Instability of High Burn Rate Propellants," F. S. Blomshield, K. J. Kraeutle, R. A. Stalnaker, M. W. Beckstead, and B. Stokes, *28th JANNAF Combustion Meeting*, CPIA Pub. No. 573, Vol. III, November 1991.

"Radiant Heat Flux Combustion Response of Oxidizers HMX, RDX and ADN at One Atmosphere," J. C. Finlinson, D. Hanson-Parr, Tim Parr, and F. S. Blomshield, *29th JANNAF Combustion Meeting*, CPIA Publication No. 593, Vol. III., October 1992.

"T-Burner Combustion Response of Insensitive Munition Propellants," F. S. Blomshield and R. A. Stalnaker, *30th JANNAF Combustion Meeting*, Naval Postgraduate School, Monterey, California, November 1993.

Particle-Size Analysis. Particle-size analysis of the combustion products of solid propellants. This data has been used by industry and NASA on a multitude of systems similar to those mentioned above. The data have been transferred to industry via NAWC memorandums and papers.

"Aluminum Combustion Effects on Combustion Instability of High Burn Rate Propellants," F.S. Blomshield, K.J. Kraeutle, R.A. Stalnaker, M.W. Beckstead, B. Stokes, *28th JANNAF Combustion Meeting*, CPIA Publication No. 573, Vol. III, November 1991.

Combustion Instability Design Guidelines. Numerous guidelines to avoid combustion instability have been developed by China Lake and transferred to industry.

"Lessons Learned in Solid Rocket Combustion Instability," F. S. Blomshield, *29th JANNAF Combustion Meeting*, CPIA Publication No. 593, Vol. IV, October 1992.

Elliptic Nozzles. Noncircular nozzles developed by China Lake to enhance mixing in ramjet combustors were utilized by United Technologies Chemical Systems in their SFIRR Full-Scale Direct-Connect Heavyweight Combustor program with substantial performance improvement. The same concept was also adopted by NASA Langley Research Center for noise reduction and the Supersonic Civil Transport Program.

"Enhancement of Mixing in reacting Fuel-Rich Plumes issued from Elliptic Nozzles, " K. C. Schadow, K. J. Wilson, M. J. Lee, and E. Gutmark, Journal *of Propulsion and Power*, Vol. 3, No. 2, pp. 145-149.

"Mixing Characteristics of a Ducted, Elliptical Jet with Dump", K. C. Schadow, K. J. Wilson, T. P. Parr, and E. Gutmark, *Journal of Propulsion and Power*, Vol. 4, No. 4, pp. 328-333, July-August 1988.

Tapered Nozzles. A China Lake tapered nozzle design that produced longitudinal vortices for fine-scale mixing enhancement was used by Atlantic Research Corporation in its Solid Fueled Ramjet demonstration project. The tests showed large improvements in combustion efficiency with reduced pressure losses relative to conventional designs.

"Flow Characteristics of Orifice and Tapered Jets," E. Gutmark and K. C. Schadow, *Physic of Fluids*, Vol. 30, pp. 3448-3454, November 1987.

"Combustion Enhancement by Axial Vortices," E. Gutmark, K. C. Schadow, T.P. Parr, D. Hanson-Parr, and K. Wilson, *Journal of Propulsion and Power*, Vol. 5, No. 5, pp. 555-560, September-October 1989.

Compact Incineration Technology. A compact shipboard incinerator concept was developed based on controlled ramjet technology. Improved destruction efficiency was demonstrated. Energy and Environmental Research Corporation and Sono Thec, Inc., are currently working with NAWC to commercialize this technology.

"Soot Formation in Turbulent Flames," E. Gutmark, T. P. Parr, D. M. Hanson-Parr, and K. C. Schadow, 1992 Fall Meeting of WSS/Combustion Institute, Berkeley, California, 1992.

Propellant Fire Hazard Technology. Studies were conducted in ship/magazine simulators to assess the effects of shipboard propellant fires. Results of these studies have been incorporated into NAVSEA ship design methodology.

Thermal Environments Generated By Combustion of Solid Rocket Propellant in Shipboard Compartments, Kent R. Farmer, Howard L. Bowman, Dr. Joseph T. Leonard, Robert L. Darwin and Robert E. Burns, NAWCWPNS TP 8097, 57 pp., December 1993.

Mk 50 Lithium Fire Hazard Technology. Studies were conducted by China Lake to assess the fire threat posed to shipboard magazines from the outbreak a lithium fire due to damage to the Mk 50 torpedo boiler assembly. These studies have resulted in changes to the methods for fighting fire aboard U.S. Navy ships and in the development of a new fire extinguisher for use on lithium fires.

Mk 50 Torpedo Propulsion System Fire/Hazard Study in a Sprinkled Shipboard Compartment/Magazine, K. R. Farmer, NWC TM 6998, 105 pp., August 1991.

Fuel Tank Vulnerability to Shaped-Charge Jet Attack Technology. Studies were conducted by China Lake to assess the vulnerability of shipboard fuel to shaped-charge jets and to shaped charge jet follow-through. Results of these studies are being used to alter ship design methodologies for planned and future Navy ship designs.

Shipboard Vulnerability to Shaped-Charge Jet Attack, H. L. Bowman, R. L. Darwin, and Dr. J. T. Leonard, NAWCWPNS TP (in process).

Injection Loading Technology. Loading of viscous plastic-bonded explosives (PBX) slurries into munitions and warheads by injection loading was pioneered at China Lake. The second-generation loading machine was designed, programmed, and demonstrated at Yorktown, Virginia. A third machine is currently being installed at China Lake under CRADA with Alliant Technologies to transition the technology to them.

Operating Instructions for the Injection Loader (U), J. C. Finlinson, Naval Weapons Center report, 7 December 1988.

Injection Loading Project at the Naval Weapons Center, T. I. Mahoney, NWC TP 6998, April 1989.

Burn-to-Violent Reaction. This is a pseudo one-dimensional experiment that allows for the assessment and quantification of in-bore propellant reactions. The reactions seen include no reaction, violent burn, deflagration detonation, and others. This experiment has been extensively used as part of the Insensitive Munitions (IMAD) propellant characterization program.

"An Experimental Study of Hypervelocity and Impactor Material Influences on Multiple Fragment Penetration Processes," S. A. Finnegan, M. D. Alexander, J. K. Pringle, and H. Cronin, 14th *International Ballistics Symposium*, Quebec, Canada, 26-29 September 1993.

"A Study of Obliquity Effects on Perforation and Ricochet Processes in Thin Plates Impacted by Compact Fragments," S. A. Finnegan, O. E. R. Heimdahl, L. Dimaranan, and J. K. Pringle, *14th International Ballistics Symposium*, Quebec, Canada, 26-29 September 1993.

Fragment Impact/Munition Response Analysis (FRAGMAP). A fragment hazards assessment computer code based on test data and analytical studies. This code can be used to assess weapons vulnerability and design mitigation measure. FRAGMAP has been used in Sidewinder, Penguin, AMRAAM, Sea Sparrow, HARM, Tomahawk, and many others.

TP 7185, 1991, O. E. R. Heimdahl.

Chemiluminescent Devices. China Lake developed chemiluminescent devices (cold light created by chemical reaction), which now have important military and commercial applications. The primary uses within the Navy include emergency lights, underway ship-to-ship replenishment, man-overboard float lights, helicopter landing zone marking, night parachute and paradrop operations, and as a covert vision device—radiation source using a near-infrared dye. Current military usage is

in the millions of units per year. Commercial uses include deep-sea fishing lures and novelty and entertainment items.

Electronic Warfare Threat Environment Simulation (EWTES). Known as "Echo Range" and operational since 1968, EWTES used by the Fleet to evaluate systems and tactics against the sea-based antiaircraft threat.

IR Technology. China Lake has been the center of excellence for IR technology in the Navy since the 1940s, originally for air-to-air applications (Sidewinder). In 1966 China Lake initiated efforts leading to the first Navy infrared display of surface targets under nighttime conditions in a demonstration that incorporated considerable advances in IR technology. The FLIR system evolved from this effort, as well as the Navy's aircraft night-attack capability.

Explosives. Major research contributions have been made by China Lake scientists in the theory of nonlinear thermodynamics, statistical validation of testing procedures, programs for predicting the results of combustion processes, and other basic research achievements in the fields of explosives and propellants. A considerable part of today's industrial manufacturing procedures for explosives and propellants was originated at China Lake. Major contributions were made in the development of shaped charge warheads. Controlled fragmentation warhead technology originated at China Lake. The first PBX, and most that are now in use, were originally formulated at China Lake. The list below is from *List of Explosives for U.S. Naval Weapons* (U), NAVSEA OP 3613.

PBXN-1
- Polaris A-3
- Poseidon

PBXN-103
- Sidewinder
- Chaparral
- Sidearm

PBXN-104
- Sparrow

PBXN-5
- TARTAR
- FAE Weapons
- Mk 1 Destructor
- FMU-88/B

PBXN-6
- APAM

PBXN-101
- SHRIKE

PBXN-104
- Phoenix

PBXN-107
- HARM
- Tacit Rainbow
- Tomahawk (BLU-97/B)

PBXN-201
FAE Weapons

PBXN-202
Smoke Warheads

PBXN-301
Sidewinder
Chaparral
Sidearm

PBXN-109
GBU-24
Mk 80

Explosive Bonding. China Lake developed techniques for explosive bonding of metals, which subsequently resulted in the widely used industrial technique of explosive welding. (These techniques are known in the former U.S.S.R. as "Pearson Welding," after the China Lake scientist who was the principal in their development.)

Insensitive Munitions (IM). China Lake has done extensive work in developing and evaluating insensitive munitions systems.

SLAM Weapon System. Fully IM compliant when missiles are stored in the new Mk 724 Mod 1 extruded aluminum shipping container, the weapon is eligible for IM certification.

Harpoon Insensitive Munitions Program, Harpoon Warhead Sympathetic Detonation Evaluation in Extruded Aluminum Shipping Containers, NWC TP 7035.

AMRAAM Weapons System. Shipping container has been modified with additional barriers to prevent sympathetic detonation in stacks. This fix has been implemented into the CNU-415/E container.

Sympathetic Detonation Analysis of AMRAAM Warheads in Stacked CNU-415/E Shipping Container, NWC TP 7011.

Penguin Missile. Deployed in the CNU-443/E shipping container that has been modified with additional barriers to mitigate sympathetic detonation.

NAWCWPNS Reg Memorandum, 8020, 3894/008 dtd 10 March 92.

FRAGMAP Engineering Code. Provides computational tools used to conduct the sympathetic detonation analyses and size barrier requirements.

Fragment Impact/Munition Response Analysis for Guidance in Mitigation Assessment Program (FRAGMAP) User's Manual Version 1.0, NWC TP 7185.

SMERF Hydrocode. Provides computational tools used to conduct the sympathetic detonation analyses and size barrier requirements.

SMERF, a Two-Dimensional Eulerian Code for Reactive Flow, NAWCWPNS TP 8202.

Harpoon Missile. Outgassing liner coupled with stress riser and vented Mk 44 Mod 1 fuze booster to achieve mild response (burning only) of WDU-18/B warhead in a cookoff environment (both fast and slow).

Final Report on Development of WDU-18/B Warhead for Harpoon Missile, NWC TP 5961, four volumes.

ORDNANCE TECHNOLOGY

Reactive Case. A concept to utilize the high combustion energy found in metals/metal alloys. Was investigated for warhead application from 1967 to 1984 to determine what increases in performance could be practically gained from their use over steel cases. This technology was transitioned into the Tomahawk Block III warhead and is under development for the Standoff Land Attack Missile (SLAM) ER missile.

Aimable Ordnance. A concept to focus warhead fragmentation into a vary narrow azimuthal direction by first deforming the warhead circumferentially and then initiating the explosive on the opposite side. This concept was investigated during 1970-1982 and involved advancing technology in the areas of explosive, warhead structure and fragmentation, initiation, case deformation, and target azimuthal acquisition. This concept is currently in advanced development as the Deformable Ordnance Section Project for NAVSEA.

Fuel-Air Explosion (FAE). FAE disperses liquid fuel into air and detonates the resulting cloud of mixture to provide overpressure (blast) of a much greater magnitude than was available from explosives. Several concepts were produced. Current status is looking at solid fuels vice liquids and doing the mixing and detonation as a single event.

Linear-Shaped Charge. A concept that forces metals to collide from a V-shaped linear configuration and flow as a jet of material at very high velocities (linear version of the conical shaped charge). Transitioned into the Walleye and Condor weapons and is of current interest in an antiair role. This concept is commonly used by industry for many applications.

Variable Charge-to-Metal Ratio (VCMR). A concept that takes advantage of different metal case thicknesses to provide a range of initial fragment velocities that greatly improve focusing warhead fragments in the forward, or rearward, direction. This concept transitioned in the Shrike and HARM weapons.

Multi-Fragment Effects. The phenomena of many fragments impacting a target and the resulting additional target donated fragments was investigated to get a better handle on identifying actual target damage, especially air targets. Prior vulnerability only accounted for single fragments and their damage, but it was obvious that damage from a rifle bullet and a shotgun shell were different. This has transitioned to the air target vulnerability people investigating the phenomena and modifying their modeling.

Shear Fragmentation Control. A concept that brings together metallurgy and mechanics to provide a capability to control the size, shape, and number of fragments from a homogenous warhead case. This concept has transitioned into several warhead applications, mostly submunitions.

Continuous Rod. A concept where pairs of rod-shaped metal were welded at the ends to form a right circular cylinder bundle, which, when detonated from the inside, formed an expanding ring of metal. This concept was thought to be particularly effective against aircraft. This technology was

worked on by many facilities/investigators and was transitioned into several weapons—Sidewinder, Sparrow, Phoenix, ZUNI, Chaparral, etc.

Supersonic Penetrator. An investigation was made into the influence/effect of warhead shapes, sizes, weight, and length-to-diameter ratios on penetrating into earth-covered concrete structures at supersonic speeds in 1978-1979. This effort was expanded into looking at the damage that such a weapon and warhead would inflict to a ship target. This technology has not been transitioned as the Navy has not chosen to develop a weapon with this capability.

IM. An approach to solving fast cookoff of ordnance was investigated that involved implementing a stress riser in the warhead case to rupture it and allow the main explosive fill to burn, an out-gassing liner to pressurize the case to the rupture point, a fuze booster design that would vent the booster explosive pressures to allow it to burn, and a less sensitive main explosive fill. This approach was transitioned to the development of the Harpoon warhead and subsequently to the Penguin and Tomahawk warhead developments.

Explosive-Driven Generator. An explosive-driven helical generator was investigated to determine electric current and magnetic field amplification possibilities in 1964-1965. Further funding was not received and this effort was terminated. Los Alamos has an ongoing effort in this area for 20 to 30 years and we have maintained contact with them over the past 6 years. With the new interest in HPM and EMP payloads, this concept will probably be revived.

Explosive Response Modeling. Modeling of explosive detonations, including metal acceleration and explosive response to fragmentation impact shock were initiated in 1986. These investigations were in response to the IM issue and to provide a predictive capability before, and sometimes in lieu of, conducting testing. This technology is in use today to predict explosive response to unplanned stimuli and to evaluate configurations to mitigate the resulting shock levels to one which is tolerable to the warhead/weapon.

Incendiary Effects. Investigations into incendiary materials, how they might be used in warhead applications, and the effects/potential payoff from their use were initiated in 1968 and again in 1989-1993. The long-term effects on the targets (surface targets) from these materials is slowly being recognized. Early technology was transitioned in one of the ZUNI rocket warheads. Current efforts are oriented toward bimetallic systems for optimum synergism between materials.

Dual-Rotor Mechanical Arming. Developing the technology of dual-arming rotors, rather than one, made it possible to minimize the effects of lateral loading and greatly improving the performance of safe-arm mechanisms. This technology evolved in the 1960s and has transitioned into many weapons (Bullpup, Sidewinder, Shrike, Sparrow, HARM, etc.).

Balanced Rotor. This is a matched imbalance, dual-rotor arming mechanism investigated to eliminate the torque due to lateral acceleration. This technology improvement of the early 1970s is used today by most electro-mechanical safe-arm devices, and is found in HARM, AMRAAM, Sparrow, Standard , Sidewinder, Sparrow, etc.

Electronic Timer. This technology was investigated to replace the time-delay determination method for safe separation, generated previously by a mechanical escapement, with an accurate, flexible electronic circuit. This technology of the late 1970s was transitioned into FAE, Standard, bombs, and all new systems using electronic safe-arm systems.

Microprocessor/Microcomputer. This technology focused on using a microcomputer (also called a microcontroller) as the basic control unit in a safe-arm device. This early 1980s effort became the

basis for bomb fuzes and are being used in new electronic safe-arm device (ESAD) designs (e.g., AMRAAM, Patriot).

Clock Frequency Verification. This technology was developed to allow the digital circuitry to be checked against analog circuitry to ensure the digital system was operating with the right clock frequency. This 1970s technology was transitioned in the bomb fuze and into the WSESRB technical manual.

Micromachined Accelerometer. This effort investigated the feasibility of using micromachining technology to fabricate an accelerometer concept for safe-arm applications. This late 1980s technology was successfully developed (via Small Business Innovative Research) and is currently transitioned into various applications (several ESAD programs and automobile industry).

In-Line ESAD. This technology focused on the design and demonstration of a completely ESAD, with no mechanical parts and an in-line explosive train. The concept included electronic sensors, signal processing, high-voltage firing sets, and slapper detonators. This 1990s technology has transitioned to various contractors, and DOD and is under current development application for AMRAAM, JSOW, and a Navy directional ordnance system in advanced development.

Glide Weapon ESAD. This technology effort focused on demonstrating an ESAD concept which could perform its functions in the unique glide weapon environment. This late 1980s technology has transitioned into an application for JSOW.

Gate Array. This technology investigated the use of gate arrays for application in safe-arm devices in the late 1970s. This has transitioned into the bomb fuze and ESAD designs.

Mechanical Interrupter. This technology involved the adaptation of safe-arm technology used for warheads to arm-fire devices for propulsion use by providing a mechanical interruption of the motor squib and initiator. This 1980s technology resulted in the universal arm-fire device used by various weapons including Standard, Sidewinder, Sparrow, RAM, AMRAAM, and others.

In-Line Electronic Arm-Fire Device. This technology investigated the use of EASD technology for arm-fire application in early 1990s. Systems using both slapper detonators and laser initiation were investigated. Contractors are starting to propose this technology for new weapon systems.

Slapper Detonators. Slapper detonator technology was transitioned from the National Labs to address DOD weapon system requirements, such as producibility, cost, and improved performance, in the early 1990s. This technology is being used in all ESAD designs, such as AMRAAM, Patriot, Hellfire, etc., and in Navy advanced development projects. Micromachined technology is being applied to the design and fabrication of slappers to meet the DOD requirements.

Laser Initiation. This 1990s technology is investigating the use of laser initiation to fire pyros and explosives for application to arm-fire and safe-arm devices. The technology for arm-fire devices has been demonstrated for propulsion, while the initiation of explosives for safe-arm application is still being worked on by DOD and DOE.

Explosive Logic and Hydras. This technology investigated the design and fabrication of explosive logic gates and explosive distribution systems for optimizing warhead performance. This 1970s technology was transitioned with the Sidewinder WDU-17 warhead development.

Inertia Switches. This 1960s technology uses a mass mounted to a spring that, upon deceleration of the weapon (target impact), causes the mass to overcome inertia and close an electrical contact. This was transitioned to over 12 Navy weapons.

Crush Switches. This technology investigated several configurations, but was basically a stiff rod located inside a coaxial, crushable sleeve that closed contacts when the sleeve was crushed (target impact). This 1960s technology was transitioned to several Navy weapons including Walleye, Harpoon, and Phoenix.

Piezo-Electric Switches. This technology investigated the phenomena of a piezo crystal putting out an electric charge when it was mechanically stressed. This 1960s technology was transitioned to several Navy weapons including Sparrow, Phoenix, and Standard.

Sensors. This technology investigated many sensor concepts and materials, such as single-disk, internal accelerometer, multiring stack, PVDF plastic film, micromachining including resistive and capacitive effects, and acoustic emission. This 1960-1990s technology has transitioned into several Navy weapons.

Signal Processing. This technology investigated several types of signal processing including external welded cordwood electronic firing switch, internal welded cordwood internal firing modules, hybrid discrete, hybrid integrated circuit, and ASIC. This 1960-1990s technology has transitioned into several Navy weapons, including Phoenix, Standard, and AMRAAM.

Dynamic Encounter Testing. This testing technology simulates air-air missile-to-target encounters (via dynamic track testing) to develop a contact fuzing database necessary to establish design parameters. This testing technology was developed in the 1970s and has been applied to several Navy weapon developments.

MAJOR PROTOTYPES/PRODUCTS/PROCESSES IN PRODUCTION OR TRANSFERRED TO INDUSTRY

Propulsions

Ordnance/Missile Systems

Vertical Launch ASROC (VLA) Missile. NAWCWPNS designed, developed, and released to production a new antisubmarine rocket capable of vertical launch from the Mk 41 vertical launcher. Includes the Mk 114 boost motor with modern hydroxyl-terminated polybutadiene (HTPB) propellant, new thrust cutoff ranging, and jet vane thrust vector control (TVC).

NWC TPs 7050, 6657, 6644; NWC TM 5721

Skipper AGM-123. A ZUNI motor, Paveway laser designation/seeker system, and aerodynamic surfaces were integrated and adapted to a 1,000-pound bomb to provide an accurate standoff weapon. The system was released to production.

NWC TM 4509

5-Inch/38 Rocket Assisted Projectile (RAP). Developed to extend range of 5-inch 38-caliber guns for use in SEA. Solid motor capable of withstanding gun launch-featured fluorocarbon propellant and Mk 279 igniter. Released to production in 1968.

5-Inch/54 Rocket-Assisted Projectile (RAP). Adaptation of 5-inch/38 design for 5-inch 54-caliber guns. Released in 1970.

Vertical-Launched Missile Prototypes/Demonstrations. A series of prototype tests demonstrated vertical launch capability for Chaparral, Sparrow, antisubmarine rocket (ASROC), and Harpoon missiles. All tests were successful and the various technologies transferred to Vertical Launch ASROC and industry.

Vertical-Seeking Ejection Seat. A gimbaled spherical solid motor, digital autopilot, and attitude reference were integrated to recover an escape seat ejected under adverse conditions, including inverted at 50 feet above ground level (AGL). The concept was flight demonstrated and transferred to industry.

NWC TMs 4008, 4426, 4693

Smokey SAM Simulator. A low-cost surface-to-air missile simulator with a dense smoky plume for realistic pilot training. All airframe/motor parts made of foam/paper to be ingestible by jet engines without causing stall. Released to production and transferred to industry.

NWC TM 4066

Bombardment Rocket (BOMROC). A 5-inch spin stabilized barrage rocket with increased range and lethality. Used fluorocarbon propellant with 19.6% aluminum and unique Mk 281 igniter. Mk 50 developed in 5 years and released to production in 1969.

Antisubmarine Rocket (ASROC). Second-generation longer-range replacement for Weapon A with thrust termination ranging and dual-grain extruded double base propellant. Six-month development included testing of 37 prototype motors. Released to Fleet in 1960 and still operational.

Rocket-Assisted Personnel Ejection Catapult. Escape system for high-performance aircraft at extreme ejections conditions using boost-sustain catapult propulsion. Mk 1 Mod 0 released for A4D; modified Mk 1 released for F111 interim used; Mk 2 Mod 0 released as replacement for M-B catapult gun.

SMARTROC. A surface-to-surface missile that flight demonstrated laser designation/seeker technology. Transferred to industry.

Laser-Guided Training Round. A low-cost training round that simulated Skipper performance for pilot delivery and tactics training.

TM 6388

Rocket Motors

High-Performance Test Track Booster. A high-performance booster for boosting track sleds to Mach 7. Developed and produced for Holloman AFB.

Tiger. A 110-inch-long, 16-inch-diameter track sled booster developed and produced for Holloman AFB.

Sidewinder (various Mk and Mod). Sidewinder 1A motor (Mk 17 Mod 0), based on NOTS HPAG motor (N-4 double-base propellant) released to production in 1956. Sidewinder 1C motor, incorporating aluminized cast composite propellant for improved kinematics, was released in 1964. NAWCWPNS has been design agent or Technical Direction Agent on all subsequent Sidewinder motors.

Chaparral. Sidewinder AIM-9D modified for Army ground-launched air defense. Mk 50 motor was adaptation of Sidewinder 1C motor.

Active Electronic Decoy. A propulsion/steering concept featuring four-axis control for a hovering decoy. Subscale prototypes were designed, fabricated, and static tested to verify proof-of-concept. Transferred to industry.

NWC TM 5429

HARM. A high-performance reduced-smoke motor for HARM. Developed and demonstrated, then transferred to industry for production.

SLUFAE. A 5-inch motor with HTPB propellant spun-cast onto the tube wall. The motor launched a FAE payload that cleared minefields. Released to production.

M-2 Flight Vehicle Glide Motor. A lightweight 5-inch motor developed for NASA and used to extend the glide ratio of the M-2 flight vehicle.

MICLIC. Another adaptation of the HPAG motor. This one towed a line of explosives across a minefield. The charges were then detonated to clear a path through the minefield. Adaptation still in production.

Missile A (Adapted for Lance Missile). A variable-thrust hybrid motor developed for the Army in 1961. The technology was demonstrated and then transferred to the Army where it was adapted to the Lance Missile.

NOTS Model 100A. A 17-inch spherical motor designed and produced for the Air Force Blue Scout Jr. Missile in 1960.

NOTS Model 100B. Modified Model 100A released to limited production in 1961 for use by NASA.

Rocket Motor Technology

Preferential Insulation Technique (PIT). A technique to reduce the violence of ordnance reaction to fuel-fire cookoff in which the item is partially insulated to achieve a low-order localized reaction. Released to industry and currently in operational use.

NWC TMs 5905, 6080, 6204; *Test Report for the HARM YSR113-TC-1 Rocket Motor Partial Insulation Technique (PIT) Qualification/Confirmation Program*, NWC TM 6730.

Thermally Initiated Venting System (TIVS). A technique to reduce the violence of ordnance reaction to fuel-fire cookoff in which a linear-shaped charge reduces case confinement when a sensor detects a temperature threat. Transferred to industry and currently in operation use on AMRAAM.

NWC TM 5537

Improved TIVS Sensor. A unique sensing device that will initiate a TIVS upon detecting either a fast or slow cookoff situation. Technology being transferred to industry.

NWC TP 8093, NWC TM 7038

Jet Vane TVC. A technology program to develop jet vane materials/designs that would operate in the highly erosive exhaust of modern high-temperature propellants. Incorporated in Vertical Launch ASROC (released to production) and transferred to industry.

Jet Tab TVC. A technology program to develop jet tab materials/designs for low-cost moderate performance TVC. Transferred to industry and released to production with the Tomahawk Mk 106 rocket motor.

Trapped Ball Movable Nozzle TVC. A series of technology programs investigating various types of ball and socket nozzles. Demonstrated and transferred to industry. Currently use on Tomahawk Mk 111 motor and Standard Missile Block IV booster.

Thrust Cutoff Range Control System. A technique to control range of ballistic trajectory tactical missiles by separating the motor from the payload before motor burnout. Required a novel technique for reversing the thrust while applying force to the payload to achieve safe separation. Incorporated into ASROC and released to production. Extensively modified for use with modern-cast composite propellants and released to production with VLA Mk 114 motor.

NWC TP 7050, NWC TM 5368

Igniters

Mk 281 (BOMROC). Developed for BOMROC. Initiated through ignition band on rocket. Used extruded cruciform grain of magnesium fluorocarbon and dual squibs with RF filters.

Mk 279 (RAP). Unique igniter for RAPs used a pyrotechnic time delay for increased projectile range and special gun-pressure-actuated spring disk that initiated a percussion primer to initiate the ignition process.

Mk 264 (Sidewinder). A pyrogen design that overcame low-temperature ignition problems of the previous pellet-tube igniter, the Mk 264 was released to production for use on the 1C motor. Also used in Chaparral Mk 50 motor.

Tomahawk Mk 305. A low-cost consummable pyrotechnic igniter designed and developed by NWC to replace the high-cost problem-plagued pyrogen igniter in the Tomahawk Mk 111 motor. Released to production.

NWC TPs 7049, 8143; NWC TM 5674

Plastic Igniter Processing. A unique process for injection molding and achieving the materials requirements for the plastic housing used in the Mk 305 igniter. Released to production and transferred to industry.

NWC TP 7049, NWC TM 5893

Arm-Fire Devices (AFDs)

Universal AFD. An AFD with superior safety characteristics and capable of being used in virtually all propulsion applications. Currently in production in a variety of Mk and Mods (Mk 31, Mk 33, Mk 35, and Mk 37) for several missiles, including Tomahawk and Standard Missile.

NWC TP 7089 (Mk 31), NWC TM 6074 (Mk 35)

Gas Generators

Mk 6 Mod 0 (Sidewinder). One of the first applications of ammonium nitrate propellant, which supplies clean gas at a relatively low flame temperature. The Mk 6 provides virtually all missile electrical and pneumatic actuator power. Released to production with the 1C motor and Chaparral.

Propellants/Processes

Mk 114 Booster Propellant. A state-of-the-art aluminized HTPB propellant (X-63) formulated for the Vertical Launch ASROC Mk 114 Booster.

NWC TP 7109

Fluorocarbon Propellants. A family high-density extruded propellants used in numerous igniters, motors, and flares. NWC PL 6670 formulation used by NASA on the Lunar Excursion Module and Viking Mars Lander.

Mk 111 Booster Propellant. When the contractor's propellant exhibited severe deficiencies, China Lake successfully reformulated the propellant and transferred the process back to industry. Currently in production.

Silver Iodate Propellant. Formulated to provide exhaust with silver iodide crystals for weather modification. Destroyed one-third of cloud wall (Hurricane Esther in 1963) and transferred to industry.

Tri-Phenyl Bismuth Delayed-Action Cure Catalyst. A China Lake-developed catalyst first used in the Trident first-stage motor. Transferred to industry and now the industry standard cure catalyst for HTPB propellants.

GAP-AN-AP-Nitroplasticizer Class 1.3 Minimum Smoke Propellant. A class of propellants first developed at China Lake. Transferred to industry and being used by most propulsion companies.

Liquid Fuels

JP-10 Fuel. A high-energy low-cost fuel with superior physical and chemical properties. New low-cost airbreathing missile fuel. Broadly used by nearly all airbreathing missiles—Talos/Vandal, SLAM/Harpoon, and Tomahawk, Air-Launched Cruise Missile (ALCM), and selected for Surface-Launched Air Targeted (SLAT) and AAAM.

Ramjet Fuel Studies Part 3. *Liquid Hydrocarbons*, by G. W. Burdette and J. T. Bryant, NWC TP 4810, January 1977.

Investigation of New Liquid Hydrocarbon Fuels for Ramjets and Liquid Propellant Guns, by G. W. Burdette, J. T. Bryant, and S. E. Wood, NWC TM 2887, August 1976.

RJ-4. Isomerized RJ-4 airbreathing missile fuel used by Tomahawk and Vandal.

Isomerized RJ-4 (RJ-4I), by G.W. Burdette, NWC TP 6300, May 1982.

Investigation of New Liquid Hydrocarbon Fuels for Ramjets and Liquid Propellant Guns, by G. W. Burdette, J. T. Bryant and S. E. Wood, NWC TM 2887, August 1976.

Fuel Bladder-Fuel Compatibility. Developed methodology and tools. These were used for Tomahawk fuel compatibility studies.

Liquid Ramjet Fuel Storage in Nitrile Rubber Bladders, by William R. Fuono, William Burdette, Gary W. Meyers, NWC TM 4209, April 1980.

Liquid Ramjet Fuel Storage in Nitrile Rubber Bladders, Extent of Plasticizer Leaching From Bladders By Various Fuels, by May L. Chan, William Burdette, Gary W. Meyers, NWC TM 3815, June 1979.

Expendable Turbine Engine Flight Demonstration. Turbo-condor flight test that laid the basis for expendable turbine engines for missiles, including Harpoon and Tomahawk.

Turbo-Condor Project Report (U), by J. L. Cook and R. D. Fulmer, NWC TM 4092 (publication CONFIDENTIAL), February 1974.

Turbo-Condor Thrust Requirements and Configuration Options (U), by J. L. Cook and G. R. Burgner, NWC TM 4092-6 (publication CONFIDENTIAL), March 1974.

Turbo-Condor Demonstration Missile Propulsion System Final Report, by Gary R. Burgner, Richard D. Fulmer, and William D. Sutherlen, NWC TM 451-014-74, August 1974.

Penguin, Mk 2 Mod 7. China Lake Ordnance Section modification to meet IM requirements. Currently in production in Norway and deployed on helicopter-equipped U.S. surface ships.

MK 44 Mod 1 Fuze Booster
Product Fabrication Spec: AS-3427
WDU-32/B Warhead
Product Fabrication Spec: NWC 2443
Development Report: NWC TM 6599

FMU-145/B Fuze
Product Fabrication Spec: NWC 2439
(Modified existing FMU-135/B Fuze)

Helicopter Trap Weapon (HTW). China Lake development with contractor fabrication support an air-delivered continuous rod warhead used to clear helicopter landing zones of vegetation and booby traps. Rapid-Action Development Program received approval for service use in 1970; 5,000-unit production.

Phoenix Ordnance Components. China Lake designed:

FSU-10/A Safe-Arm Device
Mk 60 Mod 0/2/3 Fuze Boosters
Mk 22 Mod 0 Explosive Lead
Mk 28 Mod 0 Explosive Lead
Mk 29 Mod 0 Explosive Lead
Mk 13 Mod 0 Fuze Trigger Device

Standard Missile Ordnance Components. China Lake designed:

Fuze Contact Device 3024251
Mk 5 Mod 0 Fuze Contact Device
Mk 71 Mod 1 Electric Detonator
Mk 73 Fuze Booster
Mk 51 Mod 0 S-A
Mk 54 Mod 0 S-A

Rolling Airframe Missile (RAM) Ordnance Components. China Lake designed:

Contact Fuze Triggering Device 5532116

Sparrow AIM-7 Ordnance Components. China Lake designed:

Mk 38 Mod 2 Fuze Booster
Mk 71 Mod 0 Warhead
Mk 26 Transfer Lead
Mk 17 Mod 0 Fuze Triggering Device
Mk 33 MOD 0 S-A

Sidewinder AIM-9 Ordnance Components. China Lake designed:

WDU-17/B Warhead
Mk 7 Mod 1 Explosive Lead
Mk 12 Mod 2 Explosive Lead
Mk 13 MOD 2 S-A

Safety-Arming Device Technology. China Lake-developed safety-arming devices are used in the great majority of Naval and Air Force air-launched weapons. These include

Sparrow
Sidewinder
Phoenix
AMRAAM
RAM
Tartar
Standard Missile
NATO Seasparrow
Tacit Rainbow
2.75-inch FFAR
ZUNI
Shrike
Maverick
Standard ARM
Harpoon
Sidearm
Penguin
Tomahawk
General purpose bombs
Advanced Bomb Family (ABF)
Advanced Interdiction Weapons System (AIWS)
Skipper

Arm-Firing Devices (AFD) Technology. China Lake-developed AFDs are used in the majority of Naval and Air Force air-launched missiles. These include

AMRAAM
RAM
Standard Missile
NATO Seasparrow
Harpoon
Penguin
Tomahawk
Vertical Launch ASROC

Warhead Technology. China Lake-developed warheads are used in the great majority of Naval and Air Force air-launched weapons. These include

Sidewinder
Sparrow
Sidearm
ZUNI
Shrike
Standard ARM
Tacit Rainbow
Walleye I and II
CATFAE
Harpoon
APAM
Rockeye

FAE
BLU-110
BLU-111
BGM-109

Source Compounds for Mercury Cadmium Telluride. China Lake-developed compounds that serve as improved source compounds for mercury cadmium telluride, allowing processing at dramatically lower temperatures. These compounds are being used in industry.

Second Navy IR/IED Symposium, CPIA Publ. 517, Vol. 1, p. 443, June 1989.

Electro-Mechanically Shuttered Video Camera. China Lake invented and patented shuttered video, which eliminates image smear and allows clear stop-action shots. This technology is used extensively on test ranges and is frequently seen in televised sporting events. This technology has been transferred to industry. Industrial uses include machine and bottling line analysis. Xybion Corporation developed a variation of the electro-mechanical shutter for multi-spectral imaging. NAC Corporation makes high-speed video cameras that use this technology.

Video Multiplexor. A video multiplexor, or video splitter, was developed and patented at China Lake in support of video-impact scoring systems. This system was also designed in the Weapons Impact Scoring System, which is widely used at Navy training ranges. The technology was transferred to industry who developed variations and improvements (color video version) over the years. Usage has mostly been for DOD support, but there is some use by industry for other purposes.

High-Speed Low-Light Level Camera. A special compound image intensifier was developed by China Lake in support of high-speed x-ray imaging analysis. This tube was intended to be mated to a Spin Physics, Company high-speed video camera system. Work was done with Spin Physics in early testing of the image intensifier tube. Spin Physics has since developed and marketed a commercial high-speed, low-light-level camera based on this design.

Human Factors. Research and exploratory development at China Lake in human factors and human engineering has lead to implementation in F/A-18 and A-6, specifically related to SLAM integration and operation.

Propulsion Research. Diagnostic capabilities have lead to establishment of solid-propulsion industry standards, used on the space shuttle solid rocket booster, as well as on Trident and Standard Missile motors.

Materials. China Lake research and exploratory development have resulted in military products including weather modification devices, FLIR windows for S-3 and P-3, chemical light sticks, soil stabilization for helicopter landing pads, and smokes for marking and decoying. Industry products include chemical light sticks and dye lasers.

Optical Devices and Processes. Bowl-feed polishing and single-point diamond turning are China Lake developments that have become used routinely in the private sector. The Boeing 767 has optical components manufactured with these processes. The Sidewinder AIM-9M takes advantage of the single-point diamond turning for its optics. Scattering technology has been utilized in laser designators.

Fuze Technology. China Lake developed the first active-optical fuzes using solid-state lasers—the DSU-10 for the Standard ARM (developed in 90 days during 1968 to meet a Vietnam conflict requirement), the DSU-15 for Sidewinder, and the DSU-19 for HARM. The active-optical fuze

provides a proximity sensor that is immune to electronic countermeasures. Short-pulse radar fuzes have been developed for all-weather functioning, using the China Lake-developed fore and aft technique for better burst control. These are used on

AIM-54A Phoenix
Tartar
Terrier
Standard Missile

This technology has been exploited in over 30 years of Fleet use. China Lake RF fuze technology has also been used in earlier missiles such as

Sidewinders
Sparrow
AMRAAM

China Lake has exploited pseudonoise modulation for CW radar fuzes for

Phoenix AIM-54C
Sparrow AIM/RIM-7

China Lake developed the Universal Rocket Motor AFD to prevent tragic accidents such as the 1967 disaster aboard the U.S.S. *Forrestal*. The Universal AFD has been applied to many missiles, including

Seasparrow
Harpoon
Tomahawk
Standard Missile
RAM

This single device replaces a vast proliferation of rocket motor AFDs that were in the Fleet until the 1970s and offers significant improvements in safety and reliability.

RAM Active Optical Target Detector (AOTD). The RAM AOTD is a modification of an existing Sidewinder target detector. The modifications and initial testing was performed by NAWCWPNS China Lake personnel. The resulting design was released for limited/pilot production in 1988 and full production in 1993. Supporting documents include WS-20333A SCN-4 June 1990 and Drawing 5531710 Detector, Target Mk 20 Mod 1.

Improved Sparrow Fuze. The improved Sparrow (AIM/RIM-7P) Fuze, the DSU-34B TDD was developed at China Lake and went into full production in 1990.

Critical Item Production Specification for Fuze, Radar (Unit 7), NWC 2564; and Drawing Package NWC DWG 917AS20603.

Standard Missile 2, BLOCK IIIA Fuze. China Lake designed over 60% of the Standard Missile 2, Block IIIA Fuze (Mk-45 Mod 9 TDD), including the TDD Computer and Beam Steering Logic ASICs and associated software. The design was transitioned to the contractor and production begun in 1991.

Warhead Section Specification, WS-32083-EX 132 Mod 0 and EX 133 Mod 0; *Critical Item Development Specification for TDD Mk-45 Mod 9 and 10*, WS-26720-PT. 1; *Critical Item Production Fabrication Specification for Target Detecting Devices Mk-45 Mod 9 and 10*, WS-26720A-PT 2; *Standard Missile Type 2 Block II, Block III Parameters Test Document*, MD-55261.

Low-Altitude Guidance Algorithm. China Lake incorporated algorithms into the DSU-34 TDD, used in AIM/RIM-7P, for engagement of very low-flying antiship cruise missiles.

Millimeter-Wave Solid-State Technology. Technology, methodology, and architecture for design and implementation of high-power millimeter-wave solid-state transmitters at microwave and millimeter-wave frequencies were developed at China Lake. The technology is being used by the Army in the implementation of solid-state millimeter-wave power sources in the ERINT missile, and by the Navy in the Phoenix missile.

IEEE Transaction on Microwave Theory and Techniques, March 1982, Vol. MTT-30, Number 23, pp. 268-277.

Heterojunction Bipolar Transistor Technology. China Lake has developed AlGaAs/GaAs heterojunction bipolar transistor technology for active phased array radar systems in Ka-band. The technology has also transitioned for applications in cellular phone systems by ATT and Motorola at less than 1-GHz frequencies.

JDL Reliance Technology Panel for Electronic Devices Document for 1993, ONR, Arlington, Virginia.

LASINT. China Lake designed CLUSTER DARTH and CLUSTER HALT laser signal intelligence systems, which are currently deployed.

Network Analyzer. Developed and fabricated Ka-band network analyzer for characterization of millimeter-wave circuits. The analyzer has been used by Litton Industries in the design and development of high-power Ka-band magnetrons for the Navy.

HARM Guidance and Control ICs. Three ICs were designed, fabricated, and tested by China Lake and transitioned to production by Texas Instruments (TI). These circuits are part of the effort that saved $37.7M in production costs, leading to the Presidential Quality and Management Improvement Award, signed by President Bush (July 1990).

Semi-Custom Integrated Circuit Capability Developed In-House. China Lake is the only lab in DOD (1 of 17) to have this in-house capability. Processes developed at China Lake are being used by the David Sarnoff Research Center (Princeton, N.J.) and the Stanford Research Institute (Menlo Park, California).

Solid-State Accelerometers. China Lake developed one of the first solid-state accelerometers in the country. Our engineers worked with a commercial vendor to develop the process that is currently commercially available (Silicon Designs, Seattle, Washington).

IR Video Amplifier. China Lake personnel collaborated with Hughes (Tucson, Arizona) to develop a new IR video amplifier circuit and package for the MHIP (Sparrow) Missile.

A-6 Back-up Computer Battery Pack. China Lake developed and produced a battery pack for the A-6 aircraft, which replaces a battery pack not suited for the cockpit environment.

F-18 MODSUM Battery Pack. China Lake developed and produced a battery pack for the F/A-18 aircraft, which replaces a battery pack not suited for the cockpit environment.

ECU-112/A. The ECU-112/A is a power converter/interface unit for the LAU-7/A launcher. It is a replacement for the PP-2581/A, which was introduced into the Fleet in the early 1970s. The ECU-112/A provides substantially more regulated power, better efficiency, and higher reliability than the PP-2581/A. The design and development, analysis, prototype fabrication, and testing was done at China Lake in the mid-1980s.

Countermeasures Simulator. The countermeasures simulator was designed and fabricated in support of the Sidewinder AIM-9M-8/9 project. It can be used, in conjunction with a rate table, to simulate various countermeasures characteristics such as number per second, burst rate, and intensity. A development data package was created and the technology was transferred to Entron Electronics for low rate production in 1993.

Single-Chamber Recharger (SCR). The GCU-30/E Guided Missile Coolant Recharging Unit, or SCR, was designed at China Lake in the mid-1980s as the replacement for the GCU-26. The SCR was designed to be portable and pneumatically driven with no input electricity required, and to replenish the Air Force missile coolant tanks with high-purity argon or nitrogen at a much higher rate than the GCU-26. Engineering development units were fabricated and tested and two Level 3 production data packages ("build-to-print") were created at China Lake (the second data package is for the GCU-31, which is used to charge Army Stingers). The GCU-30 and the GCU-31 were transitioned to production in the late 1980s.

PROCESSES AND PRODUCTS UTILIZED BY INDUSTRY AND MILITARY SERVICES THAT HAVE BEEN DEVELOPED BY NAWCWPNS CHINA LAKE MATERIALS ENGINEERING PERSONNEL

Design, development, and qualification of Sidewinder Forward Hanger Fairing, to reduce parasitic drag of the forward hanger.

Design, development, and qualification of Sidewinder Rocket Motor Safe and Arm Inspection Gage, SA639AS1059.

Design, development, and qualification of Sidewinder Coupling Ring Screw process modifications to eliminate field failures, many of which are due to stress corrosion cracking. Modified screws are in the Fleet.

Design, development, and qualification of Sidewinder Mk 1 Mod 4, one-piece rapidly solidified technology aluminum (AA8009) skin, high-performance, low-drag, low-maintenance wing.

Development of Sidewinder wing thermal recoating 639AS4896. Wings with previously damaged thermal coating were scrapped. The new repair procedure allows the damaged wings to be repaired and returned to the Fleet. Used by Navy and Air Force.

Sea Sparrow folding wing pin stress corrosion cracking failures led to new design of pin with different geometry and material. The new pin is in the Fleet including North Atlantic Treaty Organization (NATO) units.

Developed an eddy current inspection technique capable of detecting fatigue cracks on QF-4 engine turbine blades. The technique reliably detects existing cracked turbine blades without disassembly of the turbine. Procedure used by Air Force and Navy for engine turbine blade inspection.

Development of a replacement oxidant injector for the Mk 50 torpedo boiler. The new injector is successful in withstanding worst-case run profiles where the existing design resulted in failure at 60 to 80% utilization. The new design implemented a chemical vapor deposition manufactured tungsten insert brazed into a Hastelloy "S" housing. Insert manufacture and brazing procedures were unique. System is deployed in the Fleet.

Development of a modified heat-treatment procedure for existing military standard retainer rings (MS16625) that significantly reduces risk of service induced failures. Numerous "stock" retainer rings fractured in service due to hydrogen embrittlement, causing hardware damage and personnel injury. The modified heat treatment significantly increased resistance to hydrogen embrittlement without lowering strength below design allowable limits.

Redesign, development, and qualification of retrofittable Sidewinder forward hanger bolt to solve hanger bolt failures resulting in loss of missiles from aircraft in flight and on carrier landings. In current use for all Navy and Air Force Sidewinder missiles.

Redesign, development, and qualification of retrofittable Sidewinder launch rail aft snubber to solve launch-rail aft snubber missile-aft hanger lug-interface wear problem resulting in discard of otherwise serviceable Sidewinder motors. Retrofit kits scheduled for deployment to Navy and Air Force.

Redesign, development, and qualification of HARM all-up-round container to improve producibility and expedite production. This eliminated long-standing handling damage problems requiring depot repair of approximately one-third of containers returned to depot for reutilization. HARM container is under Air Force cognizance. Work was done at China Lake due to urgent need for containers to avoid shutdown of missile production line.

Development of Stealth technology and manufacturing processes used in several Navy and Air Force missile systems (details are classified).

Redesign, development, and qualification of Mk 43 TDD for use in the Navy and Air Force JDAM program. Deployed and used during Desert Storm.

Redesign, development, and qualification of high-voltage current source drives for A-6E aircraft. Part number is U5, UDS2981-H-883.

Redesign, development, and qualification of extended delay time fuze with Global Positioning System (GPS) add-on. Fuze is used on Navy and Air Force Cruise/Tomahawk missiles. Deployed and used in Desert Storm.

Development of non-ozone depleting chemical soldering and electronics fabrication technology. This includes advanced development of water-based fluxes and no-clean soldering technology. Technology and processes have been adopted by several Army, Navy, and Air Force programs in contractor manufacturing processes. Technology and processes are being implemented in NAVAIR Repair and Maintenance Depots (NADEPs).

Development of bench scale cleaning apparatus for electronics assemblies. Several small contractors have built units based on the China Lake design.

Aerodynamics and TVC. TVC technology for tactical weapons developed at China Lake more than 20 years ago is now enjoying a wave of applications for the new family of vertically launched shipboard missiles: Tomahawk, Standard Missile, and Vertical Launch ASROC.

Soldering Technology. Soldering technology rose out of an environment at the Center that included testing and evaluation of contractor-developed hardware. The need for excellence in soldering of increasingly complicated weapons grew as the focus shifted from developing new systems to increasing the reliability and performance of existing designs. Formal soldering technology activity began in 1966. The military specification (WS-6536) that evolved from this was subsequently applied throughout the DOD. It has been said that this specification was responsible for saving DOD countless millions of dollars by forcing discipline into soldering programs. It was because of that specification that the Soldering Technology School was established in 1977 to train contractor and government personnel in the requirements of weapon specifications and techniques. With the advent of MIL-STD-2000, the school was in the forefront, developing the curriculum used throughout the Defense Department for training and certification meeting the requirements of the new standard. The school has been expanded under contract operation and currently trains hundreds of personnel, offering an 80-hour initial certification course, as well as a 24-hour MIL-STD-2000 conversion course for those who have previously been certified and who meet other eligibility requirements. The training stresses "hands-on" approaches to the soldering process (both hand and machine), solderability testing, cleanliness testing, electrostatic discharge control, inspection and defect detection, and process controls that lower defect rates and increase production. The operation of the school has recently been transferred to private industry via a CRADA.

Technology Transfer. China Lake has been a leader among federal laboratories in stimulating the application of defense and space R&D products to civilian problems and in catalyzing the formation of the Federal Laboratory Consortium for Technology Transfer. By 1970 a basis had been established for a technology transfer program at China Lake that provided technology transfer initiatives in four areas: (1) telecommunications on radar systems, video frequency data conversion, data displays, test facilities, and a design for an airport firefighting system for short take-off and landing airports for the Federal Aviation Administration; (2) low-light-level television, voice scramblers, patrol car tracking, and personnel communication links for the Law Enforcement Assistance Administration; (3) biomedical ideas for the National Institute of Health; and (4) an air quality control monitoring program to conduct mapping of aerosols for the State of California. Other contributions resulted from investigations into wind, solar, and geothermal energy; solid waste conversion to clean burning fuel; and aircraft survivability. An explosive device was developed to clear fire lines for the Forest Service.

From this effort developed a consortium of DOD laboratories in 1971, devoted to technology transfer and technology utilization. With NWC leadership and assistance, the Federal Laboratory Consortium was institutionalized in 1974 with the support of the National Science Foundation, which included 70 federal laboratories from all major R&D-intensive federal agencies. Subsequent years have witnessed a burgeoning of technology transfer activities in the remainder of the Federal Government. The Stevenson-Wydler Act, PL 96-480, of 1980 now requires federal agencies with an R&D effort to have offices of research and technology application to spearhead the transfer of promising scientific and technical ideas to the non-federal sector.

China Lake technology that has been transferred to industry via CRADAs and Patent License Agreements includes chemiluminescence, method of making near-IR polarizers, tablet to prevent

calcification of pipes, theory and software for nondestructive analysis of roughness correlation for multi-layer optical components, chemical investigations toward detector materials, software applications for computer networking, Markov Process literature, phased-array covert altimeter, injection loading technology, fiber-optic gyro technology, high-temperature semiconductors, electronics manufacturing technology, IR flare countermeasure simulator technology, conductive transparent polymers, and embedded computing technology.

DATA CALL #12
8 Aug 94 Submission
CHINA LAKE

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

W. E. NEWMAN, RADM, USN	W E Newman
NAME (Please type or print)	Signature
Commander	8/22/94
Title	Date
Naval Air Warfare Center	
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)

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.

MAJOR CLAIMANT LEVEL

DONALD V. BOECKER, RADM USN ~~WXXXXXXBXXWXSXXXXXADMXXXUSN~~	Donald V. Boecker
NAME (Please type or print)	Signature
Commander (Acting)	8/22/94
Title	Date
Naval Air Systems Command	
Activity	

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER	W A Earner
NAME (Please type or print)	Signature
	8/26/94
Title	Date

BRAC-95 CERTIFICATION

Reference: SECNAV NOTE 11000 dtd 8 Dec 93

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.

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We have responded to the BRAC 95 Data Call #12 for China Lake per the instructions. However, it is essential to understand that the Naval Air Warfare Center Weapons Division (NAWCWPNS) is a full-spectrum research, development, test, evaluation, and in-service engineering center for weapon systems associated with air warfare; missiles and missile subsystems, aircraft weapons integration, and assigned airborne electronic warfare systems. Naval Air Warfare Center Weapons Division as a total entity represents the work of more than 8,000 civilian employees and 1,300 military personnel. It is the Navy's complete repository of scientific and technical knowledge for air warfare systems, guided missiles, and aircraft/weapon integration and it is the host for the Navy's Air Weapons Operational Testing Squadrons. Naval Air Warfare Center Weapons Division constitutes the Department of Defense's largest weapons research and development laboratory and air, land and sea test range capability.

The primary sites of NAWCWPNS are at China Lake and Point Mugu, California. A major detachment is operated as a tenant at the White Sands Missile Range. These sites operate with a truly integrated structure. Many organizational entities are spread across both sites. This organizational integration across sites and functional areas recognizes that research, development, test,

evaluation, and in-service engineering of weapon systems, is a critical mass of technical talent focused on all life cycle phases of this mission. A single support organization serves both sites, resulting in the most cost effective infrastructure. Although BRAC '95 Data Call #12 is provided separately for China Lake and Point Mugu as requested, the capabilities of both NAWCWPNS sites must be considered as an integrated whole; and the commonalty and synergy of the research and development with test and evaluation facilities and people had to be artificially split in order to respond to the separate data calls.

I certify the information contained herein is accurate and complete to the best of my knowledge and belief. This revision represents a complete rewrite of NAWCWPNS, China Lake BRAC '95 Data Call #12 which was submitted June 15, 1994 and should replace that document in its entirety.

ACTIVITY COMMANDER

D. B. McKinney, RADM, USN	
Name (Please type or print)	Signature
Commander	8/8/94
Title	Date

Naval Air Warfare Center Weapons Division China Lake
Activity

DATA CALL #12 Change Pages 8-14-94
~~15 Aug 94~~
CHINA LAKE

167

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

W. E. NEWMAN, RADM, USN
NAME (Please type or print)

Signature

Commander
Title

8/22/94
Date

Naval Air Warfare Center
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)

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.

MAJOR CLAIMANT LEVEL

DONALD V. BOECKER, RADM USN
~~XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX~~
NAME (Please type or print)

Signature

Commander (Acting)
Title

8/22/94
Date

Naval Air Systems Command
Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type or print)

Signature

Title

8/26/94
Date

REVISIONS DATED 8-14-94

BRAC-95 CERTIFICATION

Reference: SECNAV NOTE 11000 dtd 8 Dec 93

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ACTIVITY COMMANDER

D. B. McKinney, RADM, USN
Name (Please type or print)

Signature

Commander
Title

8/15/94
Date

Naval Air Warfare Center Weapons Division China Lake Site
Activity

Data Call #12 Revision of 14 August 1994

DATA CALL #12
Revision of 21 Aug 94
China Lake

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

W. E. NEWMAN, RADM, USN
NAME (Please type or print)

Signature

Commander
Title

8/26/94
Date

Naval Air Warfare Center
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)

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.

MAJOR CLAIMANT LEVEL

W. C. BOWES, VADM, USN
NAME (Please type or print)

Signature

Commander
Title

29 AUG 94
Date

Naval Air Systems Command
Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type or print)

Signature

Title

9/1/94
Date

REVISION DATED 8-21-94

BRAC-95 CERTIFICATION

Reference: SECNAV NOTE 11000 dtd 8 Dec 93

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ACTIVITY COMMANDER

D. B. McKinney, RADM, USN
Name (Please type or print)

Signature

Commander
Title

8/24/94
Date

Naval Air Warfare Center Weapons Division China Lake Site
Activity

Data Call #12 Revision of 21 August 1994

NAWCWD
CHINA LAKE
#12
9/12/94 REVISION

UIC 60530

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

L. L. LUNDBERG
NAME (Please type or print)

Signature

ACTING COMMANDER
Title

9/19/94
Date

NAVAL AIR WARFARE CENTER
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)

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.

MAJOR CLAIMANT LEVEL

W. C. BOWES, VADM, USN
NAME (Please type or print)

Signature

COMMANDER
Title

20 Sep 94
Date

NAVAL AIR SYSTEMS COMMAND
Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type or print)

Signature

Title

9/21/94
Date

Contained w/ 9-12-94 Revision

DEPARTMENT OF THE NAVY
NAVAL AIR WARFARE CENTER
NAVAL AIR WARFARE CENTER HEADQUARTERS
1421 JEFFERSON DAVIS HWY
ARLINGTON VA 22243

IN REPLY REFER TO
1000
Ser NAWC-21C/

SEP 16 1994

From: Commander, Naval Air Warfare Center
To: Distribution

Subj: RELEASE OF BASE REALIGNMENT AND CLOSURE DATA CALL IN THE ABSENCE OF THE COMMANDER

1. During the period 19-21 September I will be on travel.

2. Mr. Lewis L. Lundberg, Technical Director, Naval Air Warfare Center, is designated as acting as Acting Commander during this period. As such, he is authorized to release completed Base Realignment and Closure Data Calls and to provide certification for the data calls.

W E Newman
W. E. NEWMAN

Distribution:
COMNAVAIRWARCENWPNDIV
COMNAVAIRWARCENACDIV
NAVAIRWARTRASYSDIV

REVISIONS OF 9-12-94

BRAC-95 CERTIFICATION

Reference: SECNAV NOTE 11000 dtd 8 Dec 93

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I certify the information contained herein is accurate and complete to the best of my knowledge and belief.

ACTIVITY COMMANDER

Roger K. Hull, CAPT, USN
Name (Please type or print)

Signature

Acting Commander
Title

16 Sept 94
Date

Naval Air Warfare Center Weapons Division China Lake Site
Activity

Data Call #12 Revision of 12 September 1994

NAWCWD
CHINA LAKE
#12
9/13/94 REVISION

UIC 60530

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

L. L. LUNDBERG
NAME (Please type or print)

Signature

ACTING COMMANDER
Title

9/19/94
Date

NAVAL AIR WARFARE CENTER
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)

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.

MAJOR CLAIMANT LEVEL

W. C. BOWES, VADM, USN
NAME (Please type or print)

Signature

COMMANDER
Title

20 Sep 94
Date

NAVAL AIR SYSTEMS COMMAND
Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type or print)

Signature

Title

9/21/94
Date

CONTAINED W/ 9-13-94 REVISION

DEPARTMENT OF THE NAVY
NAVAL AIR WARFARE CENTER
NAVAL AIR WARFARE CENTER HEADQUARTERS
1421 JEFFERSON DAVIS HWY
ARLINGTON VA 22243

IN REPLY REFER TO
1000
Ser NAWC-21C/

SEP 16 1994

From: Commander, Naval Air Warfare Center
To: Distribution

Subj: RELEASE OF BASE REALIGNMENT AND CLOSURE DATA CALL IN THE ABSENCE OF THE COMMANDER

1. During the period 19-21 September I will be on travel.

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W. E. Newman

W. E. NEWMAN

Distribution:
COMNAVAIRWARCENWPNDIV
COMNAVAIRWARCENACDIV
NAVAIRWARTRASYSDIV

REVISIONS DATED 9-13-94

UIC 60530

BRAC-95 CERTIFICATION

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I certify the information contained herein is accurate and complete to the best of my knowledge and belief.

ACTIVITY COMMANDER

Roger K. Hull, CAPT, USN
Name (Please type or print)

Signature

Acting Commander
Title

16 Sept '94
Date

Naval Air Warfare Center Weapons Division China Lake Site
Activity

Data Call #12 Revision of 13 September 1994

NAWC WD
CHINA LAKE
DATA CALL #12
9/15/94 REVISION

UIC N60530

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

NEXT ECHELON LEVEL (if applicable)

L. L. LUNDBERG
NAME (Please type or print)

Signature

ACTING COMMANDER
Title

9/19/94
Date

NAVAL AIR WARFARE CENTER
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)

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.

MAJOR CLAIMANT LEVEL

W. C. BOWES, VADM, USN
NAME (Please type or print)

Signature

COMMANDER
Title

20 Sep 94
Date

NAVAL AIR SYSTEMS COMMAND
Activity

I certify that the information contained herein is accurate and complete to the best of my knowledge and belief.

DEPUTY CHIEF OF NAVAL OPERATIONS (LOGISTICS)
DEPUTY CHIEF OF STAFF (INSTALLATIONS & LOGISTICS)

W. A. EARNER
NAME (Please type or print)

Signature

Title

9/21/94
Date

Contained w/ 9-15-94 revisions

DEPARTMENT OF THE NAVY
NAVAL AIR WARFARE CENTER
NAVAL AIR WARFARE CENTER HEADQUARTERS
1421 JEFFERSON DAVIS HWY
ARLINGTON VA 22243

IN REPLY REFER TO
1000
Ser NAWC-21C/

SEP 16 1994

From: Commander, Naval Air Warfare Center
To: Distribution

Subj: RELEASE OF BASE REALIGNMENT AND CLOSURE DATA CALL IN THE ABSENCE OF THE COMMANDER

1. During the period 19-21 September I will be on travel.

2. Mr. Lewis L. Lundberg, Technical Director, Naval Air Warfare Center, is designated as acting as Acting Commander during this period. As such, he is authorized to release completed Base Realignment and Closure Data Calls and to provide certification for the data calls.

W. E. Newman

W. E. NEWMAN

Distribution:
COMNAVAIRWARCENWPNDIV
COMNAVAIRWARCENACDIV
NAVAIRWARTRASYSDIV

REVISIONS DATED 9-15-94

UIC 60530

BRAC-95 CERTIFICATION

Reference: SECNAV NOTE 11000 dtd 8 Dec 93

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ACTIVITY COMMANDER

Roger K. Hull, CAPT, USN
Name (Please type or print)

Signature

Acting Commander
Title

16 Sept '94
Date

Naval Air Warfare Center Weapons Division China Lake Site
Activity

Data Call #12 Revision as of 15 September 1994