FINAL (1/07/92)

DAAC DESIGN DOCUMENT
OUTLINE

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1.0 **INTRODUCTION**

This document is intended to serve as a guide to the design of the proposed building addition required to house the personnel, activities, and functions of the EROS Data Center (EDC) in its role as a Distributed Active Archive Center (DAAC), a component of NASA's Earth Observing System (EOS) program.

EOS is a new NASA initiative that received new-start funding in October 1990. The program is evolving in terms of its scope, objectives and timelines in response to economic, political, and engineering realities.

As a consequence of the evolutionary development of systems requirements, the staffing and space allocation requirements for the EDC DAAC will change. To accommodate this, the building interior will be designed to remain flexible with regard to size and type of office and work space, both during the design period and after occupancy. Movable wall systems, open building design, core computer center placement, and archive expansion space all contribute to the flexibility necessary to accommodate the inevitable changes.

2.0 **BACKGROUND**

2.1 **THE EARTH OBSERVING SYSTEM (EOS) PROGRAM**

The Earth Observing System Program is a major new element of the developing U.S. Global Change Research Program (GCRP). The GCRP was established to define, measure, monitor, and predict physical characteristics of the Earth and its atmosphere. The EOS program will derive information that characterizes geophysical, chemical, and biological conditions of the Earth's land masses, oceans, and atmosphere. The EOS program will launch, over a period of 12 years, a series of polar-orbiting satellites, each carrying multiple remote sensing instruments that will collect data continuously during their daily passes over the entire globe.

During the 15-year data collection and analysis phase of the program, scientific researchers from U.S. and international academic institutions and governmental agencies will cooperate and collaborate extensively. New initiatives sponsored by international scientific research organizations, such as the International Geosphere-Biosphere Program and the World Climate Research Program, will help to coordinate the efforts of hundreds of scientists involved in the EOS program. Within the U.S., the National Aeronautics and Space Administration is the lead agency, but the National Oceanographic and Atmospheric Administration and the U.S. Geological Survey will contribute expertise and organizational resources. International partners, consisting primarily of the European Space Agency and the Japanese National Space Development Agency, will contribute additional science expertise and critically important instruments.

2.2   THE LAND PROCESSES DISTRIBUTED ACTIVE ARCHIVE CENTER (DAAC)

The EROS Data Center has been designated the Distributed Active Archive Center for land data. EDC is well prepared for its role, having served as a data manager, photographic and digital data processing center, film and tape archive, product distribution facility, and customer service center for Landsat data for the past 18 years. The EOS sensor instruments will be more complex than Landsat, the data volumes at least an order of magnitude higher, user products more diverse and more complex, production turnaround times more stringent, and the user community potentially far larger and broader in data application. However, the operational and scientific staff of the EDC has the expertise and motivation to accomplish the many tasks imposed by these new challenges.

The fundamental operational tasks, as currently envisioned by NASA, are described below.

- The Information Management System (IMS) will:

  ► Provide user access to the EOS Master Directory and the DAAC Directory of all available data sets; provide user search of DAAC catalog and inventory databases; switch to appropriate inventory data bases at other DAACs; accept requests for data sets, schedule acquisitions; provide quick-look browse or higher level products; provide order/acquisition status; provide access to EOSDIS literature and reference material; and maintain appropriate user billing and accounting files.

- The Product Generation System (PGS) will:

  ► Receive and archive incoming data; coordinate production; test, modify, and certify new data processing algorithms; produce Level-3 and -4 products; and, maintain both hardware/software and communications networks.

- The Data Archival and Distribution System (DADS) will:

  ► Receive data from the observatory (platform and instruments), from the Product Generation System, and from user scientists; index and archive data and documentation; extract entire or partial data sets; reformat data sets; and, distribute data to a variety of clients. These clients will include the PGS or the IMS within EDC, other DAACs, other data centers, or user scientists located around the world. Data will be distributed on a variety of magnetic and optical media or electronically over several high-speed nationwide data networks.

3.0   **LOCATION OF THE DAAC OPERATION**

The DAAC operation will be contained in a new facility joined to the extant EROS Data Center. It will be operationally self-contained, but will integrate and share support functions where mutually advantageous to the ongoing Data Center activities and the DAAC functions. The proposed location of the DAAC

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facility will be adjacent to the southeast wall of the existing EROS Data Center facility.

The existing facility has been referred to in previous architectural documents as the Data Handling Building (DHB); this practice will be followed herein. The planned addition will be referred to as the DAAC.

The impact of the DAAC on the current DHB will require certain modifications in the DHB to integrate the two facilities. The addition of 150-200 new staff members will require additional cafeteria space, a library, and general conference rooms. The DAAC will attract more visitors to EROS and, consequently, a larger visitor support center and an integrated lobby area will be required to provide a single point for public access to either facility.

To facilitate planning of shared space between the DAAC and the DHB, a conceptual design was commissioned with Spitznagel, Inc., a local architectural firm. They were contracted to develop a high-level design for the DAAC facility, leading to an approach to the integration of the existing and proposed structures.

The design study presumed that the DHB would supply the DAAC with fresh and waste water utilities, heating, electrical service, fire-suppression hydrants, warehousing facilities, hard-surface facility access, groundskeeping, security, visitor reception, postal service, voice communications, and document reproduction.

The report, titled "The EROS Building Addition Study" dated 5/08/91, recommended the integration of the DAAC with the DHB around a central lobby/atrium. Located immediately adjacent to the lobby/atrium is an auditorium, conference center, cafeteria, library, customer data service center, as well as wide corridors to computer centers, archives, and staff offices in the DHB and DAAC. The design permits the public to have unencumbered access to all appropriate areas, yet it maintains controlled access to production areas.

The study proposes approximately 6,300 sq. ft. of office, library, and customer service areas plus 4,300 sq. ft. of lobby in the DHB be repartitioned and remodeled to allow the DAAC to be optimally integrated with the DHB. The lower level of the DAAC will be constructed to allow loading dock access for supplies and materials for both buildings. A connecting ramp in the lower level will connect the structures.

Their recommendations have been accepted by the EDC as a plausible approach to developing an interface between the two structures. Alternative concepts could be explored during the design effort. The study is included as Attachment 1 to this document.

4.0 GENERAL REQUIREMENTS

The DAAC addition is to be functionally and operationally an extension of the existing DHB facility. However, it will be constructed as a separate structure for reasons of mission separation, fire safety, and security. The

DAAC addition shall be architecturally compatible and mechanically and electrically integrated with the existing facility and its systems. The building design shall conform to the applicable provisions of the "Performance Guide Specifications, Design/Build Office Buildings", General Services Administration, Public Buildings Service, 15 June 1990.

4.1 SITE DEVELOPMENT REQUIREMENTS

The existing Data Center is located on a 318 acre plot in a rural setting, with ample room for development. The building site is gently sloping. Necessary earthwork and contouring should be minimal. The need for additional employee and visitor parking must be assessed during the design, as should the need for access and service roads to the DAAC.

The landscaping philosophy for the EDC site is to preserve as much of the natural prairie as possible. While the DAAC will add a small amount to the groomed area, the landscaping required will be minimal.

4.2 EXTERIOR BUILDING REQUIREMENTS

Externally, the DAAC must be harmonious with the DHB. Exterior surfaces, lighting, shapes, and finishes will match as closely as possible. The intent is that the DAAC appear as a natural extension of the DHB.

Fenestration, designed with ease of maintenance and sound energy conservation practice in mind, will be provided at the building perimeter to allow natural lighting of most office areas.

The main entrance will be revised to provide access to both buildings and the lobby and atrium will serve as connections between buildings. Externally, the entrance will serve to unite the buildings, while the atrium will provide definition between them.

Walls will be reinforced concrete aggregate precast panels bolted in place and caulked between joints. Special emphasis is to be placed on durability of caulking material. Walls will have an R-value of 20.

The roof will be an EDPM rubber, rock-ballasted roof with insulation of R-40 sandwiched between the metal deck and rubber membrane. Lightning protection equipment and hardware will be provided and shall conform to NFPA 70 and 78 and UL 96.

4.3 INTERIOR BUILDING REQUIREMENTS

Within a gross footprint of 65,000 sq. ft., the building will provide 60,000 sq. ft. of finished, net usable floor space for the DAAC functions. The main floor will contain approximately 50,000 sq. ft. of the functional space, including mini-auditoriums and a cafeteria adjacent to a visitor-center lobby, computer facilities, laboratories and office for the supporting staff.

The DAAC shall have a fully excavated lower level to house mechanical, electrical, and communications equipment. It shall also provide for the

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balance of the required 60,000 sq. ft. of net usable space for a digital archive, product storage, and other DAAC support space.

The functional areas of the building are described in detail in Section 5 and the environmental characteristics of the spaces are described in Section 6.

The basic design of the interior spaces shall emphasize ease of alteration of configuration. There shall be no internal loadbearing walls. The finished areas will have lay-in, T-bar ceilings throughout, with plenums above, adequate to accommodate utilities delivery systems. A raised floor system, with 24-inch clearance beneath, will be used throughout the main floor of the structure except where such construction is not feasible or necessary. Floor loading capacity will be designed at 350 pounds per square foot throughout all working areas.

Vertical cable chases will provide connectivity between the main level and the lower level. Communications closets will be strategically located throughout the building and will be accessed and serviced from hallways wherever possible.

Cable trays connecting the closets will be located under hallways for ease of access. Conduit will be run under the raised floor from the communications closet to each of the offices served by the closet.

A passenger elevator with 2,500-lb. minimum capacity and inside dimensions of at least 82-in. x 51-in. is required. Doors will be center-parting stainless steel. Car interior will be stainless steel with plastic panels.

A freight elevator with landings near the Computer Center will connect the main and lower level. The elevator will have a minimum loading capacity of 10,000 lbs. with a car size of 10 ft. by 10 ft. The elevator doors must permit the loading of pallet-sized freight. The doors will be designed to utilize secured access mechanisms if required, due to location or regulation.

4.4   SUPPORT FACILITIES REQUIREMENTS

Some utilities services from the DHB can be extended to and be shared by the DAAC, while others will add sufficient demand to require augmentation of existing service or complete stand-alone service. Hot and cold domestic water, sanitary sewer, steam and telephone services can be shared by the DHB and DAAC. The building automation system will require augmentation to service the combined buildings. Chilled water and electrical power systems may need to be independent from the DHB, depending on the outcome of demand studies for the DAAC. All utilities for the DAAC will be metered separately from the DHB.

4.4.1   Heating, Ventilating and Air Conditioning Systems

Heating, ventilation, and air conditioning equipment will be selected for the most cost-effective and energy-efficient operation. Preliminary planning suggests that office and support areas will be conditioned with central variable air volume systems with terminal hydronic heat. Steam will be used for heating and humidification in central air handlers and for producing hot water through heat exchangers for terminal and space heating. Air

conditioning of the building will be accomplished by circulation of air across chilled water cooling coils. Other systems or variations should be investigated by the architect and discussed during the design. A central utility control system will be provided to monitor and interface with the HVAC systems, and have the capability to communicate with the existing building control system.

4.4.2 Electrical Systems

The present load in the DHB is 1,200 KW on four 1,000 KVA transformers and 480 volt, 1600 amp buss ducts. Since the present primary electrical system is only 30% loaded, the service could be extended into the DAAC by the extension of the four 1,600 amp, 480 volt busses via the crawl space if the surplus capacity is adequate for the DAAC. In sizing the DAAC power demand, accommodating future growth in electrical power capacity is to be considered. The architect will analyze the option of redundant external source and discuss alternatives during the design.

Typically, CRAY-like supercomputers of the type anticipated for the DAAC come with their own motor generators to generate 400 cycle power and to give 500 cycle ride-through on power interruption. ADP-specific equipment voltages, uninterruptible power supply (UPS) requirements, and special power conditioning requirements will be accommodated by locally installed equipment.

The need for a UPS system to support building emergency systems and an orderly shut-down of ADP equipment is anticipated. Provision will be made for the space to house an ADP equipment UPS system. The actual computer equipment UPS must be tailored to ultimate system requirements and is expected to be purchased and installed as a part of the EOSDIS facility ADP equipment buy.

The architect must design space for back-up power generation. This equipment is expected to be purchased as part of the ADP equipment buys. Because of the number of unknowns and the recent advances in technology, the subject of UPS and back-up power is a primary consideration for a special study to determine suitable options and to define building specifications necessary to accept the expected equipment.

4.4.3 Fire Detection and Suppression

The facility will be fully sprinkler protected throughout. A low-voltage fire alarm system will include detectors, manual pull stations, air handling duct alarms and other appropriate alarm devices.

Fire detection and suppression for the Computer Center is unique and is described in Section 6.3.7 of this document.

4.4.4 Telephone Systems

The telephone system in the DAAC will be an upgrade and extension of the current system in the DHB. Future enhancements of the system may be integrated into the new Communications Room of the DAAC. Therefore, no immediate impact to floor space or DAAC design is envisioned beyond normal office and/or specialized support space wiring requirements.

4.4.5 Building Automation System

The building automation system will be computer based and will monitor and control the following systems: HVAC, fire alarm, lighting, physical access and energy conservation.

For ease of monitoring and control, the building automation system will be fully integrated with the existing control system within the DHB. The core of the integrated system will be upgraded to allow the monitoring and control features discussed below. The core computer shall have a minimum of an 80486 processor, 4 megabyte of RAM, 100 megabyte hard disk and be Ethernet compatible. A graphically addressed platform shall be used rather than one using a text based format. The operating system software shall use MS-DOS and allow on-site personnel to program and change all control sequences. The computer must be able to directly address, change and command all existing hardware and software points on the installed system.

A network of direct digital control (DDC) devices in the DAAC will provide local monitoring and control capabilities and will interconnect to the core system for centralized monitoring and control operations. The DDC's will have central down-loading and read-back capabilities. The DDC panels will be completely field programmable by the operating staff. The heating and cooling system shall be monitored and controlled by low-density DDC controllers, with a programmable sequence of control logic.

Strategically located doors throughout the DAAC will be controlled by a state-of-the-art access system. The access control system will communicate with the core system through the DDC network. The existing card access system in the DHB will be integrated into the core system.

A fire detection system will be installed throughout the DAAC, will be fully addressable and will use analog sensors to detect fire and smoke conditions. Alarms will be displayed on the core system display. Graphic representations of the indicating and initiating devices are to be programmed into the computer to aid in directly locating a problem when a fire condition exists. The fire alarm software shall be color sensitive so that as a sensor becomes dirty a change of color informs the staff that a problem is developing.

A lighting control package will be installed throughout the DAAC. This system will use state-of-the-art technology and be fully compatible with the building automation core computer. The system will use natural lighting levels as sensed by space sensors to adjust the illumination in the space by reducing the bulb wattage. The lighting panels shall communicate with the core computer so that all system functions can be controlled from a centralized location. Telephone interconnections will be incorporated into the system to allow adjustment of lighting through the phone system.

Remote standby power generation and power-peak shaving capabilities must be programmed into the core system so that the inherent energy saving possibilities can be used to reduce operating costs.

5.0   DETAILED FUNCTIONAL DESCRIPTION

A space allocation budget is summarized in <u>Table 1.</u>

5.1   PUBLIC SPACES

Public Spaces are defined as those areas open to the general public. These include the auditorium and cafeteria. These areas are expected to be adjacent to one another or connected by hallways with controlled access to working areas of either building.

5.1.1   Lobby

5.1.1.1   Description

The lobby area must accommodate up to 200 visitors at any one time. Visitors will sign-in at the security or reception desk. The lobby will be self-touring with an area set aside for a pamphlet rack and description board on how to tour the lobby. Visitors may view free-standing or wall mounted displays. Video stations may be used to allow remote viewing of the DAAC computer floor. Video stations and other displays will explain current EDC and EOS programs.

An executive waiting area, adjacent to the main lobby, will be provided. This area will be secured from operational areas of either building.

5.1.1.2   Environmental Requirements

Reference Section 6.8.

5.1.1.3   Functional Relationships

The Lobby must integrate the DHB and the DAAC to a cohesive single building. Visitors will be allowed unescorted access to the lobby, cafeteria, vending and auditorium areas.

5.1.2   Cafeteria

5.1.2.1   Description

A single cafeteria will service both the DHB and the DAAC, and will be open to the public. The cafeteria could expect to serve 150-250 breakfast meals and 250-350 lunches each day, not including the general public. Center employees will schedule their meal times to avoid congestion, therefore, the cafeteria will not have to accommodate the entire staff at one sitting. The cafeteria will include dishwashing equipment adjacent to the food preparation area to support use of china and flatware.

The dining area will incorporate natural lighting and have access to an outside patio area. A separate dining area adjacent to the main area with seating for up to 30 people is desirable. This room could include A/V and data communications hookups for conference activity.

MAIN FLOOR GROSS SPACE			LOWER LEVEL GROSS SPACE			
PUBLIC SPACE						
CAFETERIA	5500					
AUDITORIUM	4500					
SUBTOTAL		10000				
COMPUTER CENTER			COMPUTER CENTER			
SHIFT SUPERVISOR OFFICE	200		COMMUNICATIONS ROOM		3000	
COMPUTER ROOM	5400		COMMUNICATIONS MAINTENANCE ROOM		300	
ARCHIVE (ROBOT) ROOM	1700		EQUIPMENT STAGING/STORAGE ROOM		2000	
CONSOLE OPERATIONS ROOM	600		DIGITAL ARCHIVE		2000	
PRODUCTION SCHEDULING ROOM	500					
PERIPHERAL OPERATIONS ROOM	2000					
SUPPORT SERVICES ROOM	500					
SUPPLIES STORAGE ROOM	300					
HARDWARE MAINTENANCE WORK ROOM	500					
DAAC TESTING LABORATORY	1000					
DAAC APPLICATIONS LABORATORY	1000					
BREAK ROOM	200					
SUBTOTAL		13900		SUBTOTAL		7300
DAAC SUPPORT SPACE			DAAC SUPPORT SPACE			
TRAINING ROOM	1600		DISSEMINATION		600	
EXECUTIVE CONFERENCE ROOM	600		PRODUCT STORAGE ROOM		2000	
A/V SUPPORT	200					
TELECONFERENCING ROOM	400					
CONFERENCE ROOMS (3X250)	750					
DOC SCANNING/REPRODUCTION	200					
SUBTOTAL		3750		SUBTOTAL		2600
OFFICE SPACE						
DAAC MANAGEMENT STAFF	1800					
O&M CONTRACT MANAGMENT STAFF	536					
C/D CONTRACTOR STAFF	1340					
VENDOR ENGINEERING	402					
VISITING SCIENTISTS/ENGINEERS	2680					
COMPUTER OPERATIONS	134					
TECHNICAL SUPPORT	2412					
SOFTWARE DEVELOPMENT	2144					
NETWORK MANAGMENT	938					
DATA MANAGEMENT	536					
CUSTOMER SERVICES	134					
SCIENCE SUPPORT	3484					
SUBTOTAL		16540				
OPEN OFFICE/CLUSTER SPACE						
DAAC MANAGEMENT STAFF	536					
O&M CONTRACT MANAGMENT STAFF	268					
COMPUTER OPERATIONS	536					
TECHNICAL SUPPORT						
SOFTWARE DEVELOPMENT						
NETWORK MANAGMENT						
DATA MANAGEMENT	2000					
CUSTOMER SERVICES	2000					
SCIENCE SUPPORT	670					
SUBTOTAL		6010				
TOTAL DEDICATED SPACES		50200	TOTAL DEDICATED SPACES (FINISHED)			9900
CIRCULATION SPACE						
LOBBY	5000		MECHNICAL ROOM			12000
HALLS, LAVATORIES, ETC	9800					
SUBTOTAL		14800				
TOTAL MAIN FLOOR SPACE UTILIZED		65000	TOTAL LOWER LEVEL SPACE UTILIZED			21900

Table 1 - ESTIMATED SPACE REQUIREMENTS

A vending area would be common to both dining areas and separate from the service lines. The vending area must be accessible 24 hours per day, 7 days a week, and must include space for employee-operated food cooling and heating equipment.

5.1.2.2 Environmental Requirements

Reference to Section 6.8.

5.1.2.3 Functional Relationships

The cafeteria and dining area will be integrated with the decor of the lobby and be adjacent to the auditoriums. Restrooms will be nearby and will also serve the public space. Since a single cafeteria will serve both buildings, its location must minimize inconvenience to staff and visitors.

5.1.3 **Auditorium**

5.1.3.1 Description

The auditorium must have an overall capacity for 300 people as a single auditorium. The auditorium area will have the flexibility to be divided into three mini-auditoriums; each would handle approximately 100 people. The auditorium floor would be sloped to optimize viewing. The interior walls will be moveable and soundproof. Each mini-auditorium will be wired for A/V and data communications. Auditorium seats will include flip-up desks for both right- and left-handed people. A landing area will also be available in each mini-auditorium to accommodate wheel chairs.

5.1.3.2 Environmental Requirements

Reference Section 6.7.

5.1.3.3 Functional Relationships

The auditorium will occasionally be configured as a single room. The rest of the time it is expected that one or more of the smaller auditoriums will be used daily to support walk-in visitors with a standard video presentation. The remaining portion of the auditorium may be used to conduct staff meetings and other informational activities. The auditorium must be located directly off the lobby with exits to the lobby and the cafeteria. Acoustical separation of the mini-auditoriums is critical.

5.2 **COMPUTER CENTER SPACES**

The computing equipment of the DAAC will consist of large mainframe supercomputers, associated support computers, robotic mass storage systems, and large-scale wide-area and local-area networking. The Computer Center will be centrally located. It will occupy space on both the main and lower level of the DAAC. The mechanical room, data communications hardware, digital

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archive, equipment staging areas, and equipment storage areas will be beneath the Computer Center in the lower level.

5.2.1 Shift Supervisor's Office

The Shift Supervisor's office will be located to allow ease of access to work areas within the Computer Center. The space must be appropriately sized to allow both an office and meeting area where the Supervisor and key technical staff plan daily IMS, PGS and DADS support tasks. Typically, this meeting would include computer operators, schedulers, engineers, and quality control personnel totaling eight people.

5.2.1.1 Environmental Requirements

Reference Section 6.1.

5.2.1.2 Functional Relationships

The room will be located near the Break and Peripheral Operations Rooms and will permit viewing of the Peripheral Operations, Console Operations, and Computer rooms.

5.2.2 Computer Room

5.2.2.1 Description

Approximately 5,400 sq. ft. of floor area will be required for computer equipment consisting of mainframe computers, front-end processors, disk storage subsystems, and other system components. The area was sized to accommodate three CRAY YMP class machines with all attendant components, excluding tape subsystems and hardcopy output devices which will be located in the peripheral operations room.

5.2.2.2 Environmental Requirements

Reference Section 6.3.

5.2.2.3 Functional Relationships

Consideration will be given to locating office space required for hardware engineers and Computer Operations Management Staff near the computer room.

5.2.3 Robotics Room

5.2.3.1 Description

The Robotics Room will occupy approximately 1,700 sq. ft. of floor area within the Computer Center. This space will house a state-of-the-art mass storage system consisting of tape recorders, robotics and tape storage shelving. The system was sized based upon emerging technologies such as that manufactured by E-Systems which uses D2 tape and aisle robotics. This sizing will permit the storage of all data for an

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estimated three years given the square-foot storage density of the
E-Systems design and an estimated archive growth rate of 250 gigabytes
per day.

5.2.3.2   Environmental Requirements

Reference Section 6.3.

5.2.3.3   Functional Relationships

The Robotics Room will be located adjacent to the Computer room. The
wall separating the Computer and Robotics Room is optional.

5.2.4 Digital Archive

5.2.4.1   Description

The Digital Archive will be initially sized at 2,000 sq. ft. and will be
situated in the lower level of the DAAC. It will be used to permanently
store data which has migrated from the robot(s) on the main floor. The
Digital Archive must be designed to allow a high degree of expandability
and flexibility. Using the emerging D2 magnetic tape technology as a
basis, it is envisioned that a 2,000 sq. ft. expansion of the Archive
will be required every 2-3 years throughout the projected 15 year life
of the EOS program. The Archive must be constructed to allow the
installation of tracked space-saver shelving systems. Consideration of
the placement of the space in relation to support columns is important
to overall space utilization. The Digital Archive design should also
permit the future installation of aisle robots similar to that installed
within the Robotics Room on the main floor.

The design of the Digital Archive must include work space for archive
management activities. This space will house mechanical equipment such
as tape cleaners, evaluators and degaussers. Additionally, this space
may house tape drives, becoming a remote tape mounting function to
support the Computer Center.

5.2.4.2   Environmental Requirements

Reference Section 6.2.

5.2.4.3   Functional Relationships

The Digital Archive should be located near the Freight Elevator to allow
movement of tape media between the main and lower levels of the Computer
Center.

5.2.5 Console Operations Room

5.2.5.1   Description

The Console Operations room, sized at approximately 600 sq. ft., will
house the master operator consoles of the supercomputers in the Computer

Room and be the work area for the computer operators for the systems. The space must include work areas for the generation of logs and reports and must contain shelving for technical manuals and application system documentation.

5.2.5.2   Environmental Requirements

Reference Section 6.3

5.2.5.3   Functional Relationships

This room should share a common wall with the Computer Room and the Production Scheduling Room.

5.2.6   Production Scheduling Room

5.2.6.1   Description

A 500 sq. ft. Production Scheduling Room is required. The Room will house workstations for up to four schedulers. Activities performed within this space will include DAAC-to-DAAC interfacing and coordination and inter-DAAC scheduling, prioritization and staging of work for the supercomputers and support systems of the IMS, PGS, and DADS.

5.2.6.2   Environmental Requirements

Reference Section 6.1.

5.2.6.3   Functional Relationships

The room should be located near the Support Services Room and the Console Operations Room.

5.2.7   Peripheral Operations Room

5.2.7.1   Description

The Peripheral Operations Room of 2,000 sq. ft. will house input and output devices. Within this space, product generation workstations comprised of computer consoles, output devices, label printers, hardcopy printers, flat work-space, raw stock and temporary shelving for product will be configured. Workstations are envisioned for hardcopy products such as black-and-white and color film, plots and printed reports; magnetic tape products such as 9-track, 3480, 8mm and 4mm tape, and optical disk products. Since the work performed in this area will be very labor intensive, the design of the space and the workstations within this space must promote efficient workflow from raw stock staging through product generation, quality inspection, and product delivery.

5.2.7.2   Environmental Requirements

Reference Section 6.3.

5.2.7.3   Functional Relationships

The room should be located near the Support Services Room and the Supplies Storage Room. Consideration will also be given to a location near the freight elevator. Additionally, a location adjacent to the Console Operations Room is desirable.

5.2.8   **Support Services Room**

5.2.8.1   Description

A Support Services Room of 500 sq. ft. is required. DAAC activities performed within this space include: Help Services, output distribution, and Computer Center access control. Because of the three differing services provided to the DAAC from this space, the Support Services Room may be divided into individual work areas. The help services area is envisioned to accommodate a workstation(s) manned by highly skilled technicians who provide user services for the DAAC's Computer Center. Likewise, the output distribution area will consist of pass-through bins where internal DAAC users may pick up hardcopy and digital products. Access control and Computer Center reception will also be performed from this space. Control logs, access control terminals, telephone and personnel paging services will be provide by the personnel assigned to this work space.

5.2.8.2   Environmental Requirements

Reference Section 6.1.

5.2.8.3   Functional Relationships

The Support Services Room will be located along a perimeter wall of the Computer Center. Close proximity to the DAAC Testing Laboratory is important.

5.2.9   **Supplies Storage Room**

5.2.9.1   Description

A Supplies Storage Room, sized at approximately 300 sq. ft., is required. The room will house shelving for the various magnetic tapes, papers, films, and disks used for production generation.

5.2.9.2   Environmental Requirements

Reference Section 6.3.

5.2.9.3   Functional Relationships

The Supplies Storage Room should be located adjacent to the Peripheral Operations Room. Additionally, consideration will be given to locating the room next to either the freight elevator or to a main corridor.

5.2.10 Hardware Maintenance Work Room

5.2.10.1 Description

A Hardware Maintenance Work Room of 500 sq. ft. is required. The room must be plumbed with hot and cold water, and have a sink suitable for cleaning plotter and other peripheral components. The room must have ample outlets for test equipment and peripheral device servicing. It shall be configured with a large work bench and ample documentation shelving.

5.2.10.2 Environmental Requirements

Refer to Section 6.3.

5.2.10.3 Functional Relationships

The Hardware Maintenance Work Room should be located next to the Peripheral Operations Room. This room shall not have an external Computer Center entrance.

5.2.11 DAAC Testing Laboratory

5.2.11.1 Description

The 1,000 sq. ft. DAAC Testing Laboratory is a multi-purpose room supporting end-user graphics output. The room shall be capable of being divided into three separate rooms via collapsible walls; each subdivision will have separate entries. Lighting shall be independently adjustable within each subdivided space. The DAAC Testing Laboratory will not have direct access to the restricted areas of the Computer Center.

5.2.11.2 Environmental Requirements

Refer to Section 6.1.

5.2.11.3 Functional Relationships

It is desirable to have the Laboratory located next to the Support Services Room with a common glass wall.

5.2.12 DAAC Applications Laboratory

5.2.12.1 Description

The DAAC Applications Laboratory of approximately 1,000 sq. ft. is an open laboratory providing unrestricted access for user groups. The Laboratory will not have any direct access to the restricted areas of the Computer Center. The room shall be capable of being divided into three separate rooms with separate entries. Independent adjustable lighting is required within each subdivided room.

5.2.12.2 Environmental Requirements

Refer to Section 6.1.

5.2.12.3 Functional Relationships

The Laboratory will provide easy access to the in-house and visiting scientist office areas.

5.2.13 Break Room

5.2.13.1 Description

A break room of 200 sq. ft. shall be constructed within the Computer Center. The room will be configured with a table, chairs, small refrigerator, microwave oven, and hot and cold running water. The room shall be a designated smoking area and must have separate ventilation.

5.2.13.2 Environmental Requirements

Refer to Section 6.1.

5.2.13.3 Functional Relationships

The Break Room should be located near the Console Operations Room, Peripheral Operations Room, and Shift Supervisor office.

5.3 FACILITY SUPPORT SPACES

5.3.1 Communications Room

5.3.1.1 Description

A Communications Room, requiring 3,000 sq. ft., will house communications equipment. The room will be constructed with a raised floor with 12-inch subfloor clearance and an unobstructed ceiling height of at least 7 ft.

5.3.1.2 Environmental Requirements

Refer to Section 6.3.

5.3.1.3 Functional Relationships

The Communications Room will be located on the lower level directly under the Computer Room with connections through common vertical cable chases.

5.3.2 Communications Maintenance Work Room

5.3.2.1 Description

A Communications Maintenance Room of approximately 300 sq. ft. is required. The room will have ample outlets for test equipment and equipment servicing. It shall be configured with a large work bench and ample documentation shelving.

5.3.2.2 Environmental Requirements

Reference Section 6.3.

5.3.2.3 Functional Relationships

The room should be located next to the Communications Room on the lower level.

5.3.3 Equipment Staging/Storage Room

5.3.3.1 Description

The Equipment Staging/Storage Room, sized at approximately 2,000 sq. ft., will be used as a work area to pack, unpack, assemble, and store computer equipment.

5.3.3.2 Environmental Requirements

Reference Section 6.3.

5.3.3.3 Functional Relationships

The Equipment Staging/Storage Room will be located on the lower level and must be in a location which provides easy access to both the drive-in freight unloading area and freight elevator.

5.3.4 Mechanical Room

5.3.4.1 Description

The Mechanical Room of 12,000 sq. ft. will house power conditioners, power supplies, Uninterruptible Power Supplies, chillers and other equipment necessary to support environments within the DAAC. A 15 ft. minimum ceiling height is required to accommodate the mechanical support systems of supercomputer class machines.

5.3.4.2 Environmental Requirements

Reference Section 6.6.

5.3.4.3 Functional Relationships

The Mechanical Room must have ready access to the freight unloading area.

5.4 DAAC SUPPORT SPACES

5.4.1 Training Room

5.4.1.1 Description

One 1,600 sq. ft. Training Room will be required. The Training Room will be divisible into two independent training bays of 800 sq. ft. each. Close proximity to the Auditorium and Cafeteria is desirable.

5.4.1.2 Environmental Requirements

General environmental requirements are described in Section 6.5 of this document. Additional environmental requirements may include activity-specific lighting, storage/shelf space for training materials, audio-visual equipment, wall display surfaces, demonstration systems for instructors, and appropriate wiring/communication lines for PC/Workstation-based instruction.

5.4.1.3 Functional Relationships

The Training Room must provide ready accessibility for permanent and visiting staff.

5.4.2 Executive Conference Room

5.4.2.1 Description

The executive conference room will include a drop-down screen and video projection unit, a small projection room for slide presentations, and access to the local area network for computer demonstrations. Estimated at 600 sq. ft., the room will include conference tables and executive chairs to seat at least 50 people.

5.4.2.2 Environmental Requirements

Refer to Section 6.5.

5.4.2.3 Functional Relationships

The Executive Conference Room should be close to the computer floor and could include a viewing window to see the computer equipment. It should be close to the lobby but secured from the general public.

5.4.3 Audio/Visual and Teleconferencing Room

5.4.3.1 Description

This conference room will be furnished to handle 30 people, is estimated at 400 sq. ft., and is equipped with complete audio/visual and teleconferencing capabilities. The design should consider shared access of a 200 square audio/visual support room. This room would be located between th Executive Conference Room and the Teleconferencing Room to support both rooms in the storage and operation of sound, video and communications equipment.

5.4.3.2 Environmental Requirements

Refer to Section 6.5.

5.4.3.3 Functional Relationships

The Audio/Visual equipment will conform to industry standards and be compatible with equipment currently in use in the DHB. A common room for this equipment could be used to support both A/V conference rooms. The room will be soundproof and equipped to allow easy use by non-technical staff members or guests.

5.4.4 General Purpose Conference Rooms

5.4.4.1 Description

Three conference rooms of 250 sq. ft. each will be used to hold routine staff meetings of section personnel. The rooms may also be used to support visiting scientists and to take on limited additional training and briefing activities associated with the DAAC.

5.4.4.2 Environmental Requirements

Refer to Section 6.5.

5.4.4.3 Functional Relationships

The three 250 sq. ft. conference rooms will be separate from one another and evenly distributed in the DAAC.

5.4.5 Document Scanning and Reproduction

5.4.5.1 Description

Sized at 200 sq. ft, the scanning room will contain electronic equipment needed to convert analog text and image data into computer readable formats. Equipment in this room will also serve to reproduce hardcopy material (i.e., xerox requirements) for the DAAC staff. The room will be open to both DAAC staff and visiting scientists.

5.4.5.2   Environmental Requirements

Refer to Section 6.1.

5.4.5.3   Functional Relationships

This room will be located near the Data Management office space.

5.4.6   Dissemination

5.4.6.1   Description

The Dissemination Room of 600 sq. ft. is the area where data products are prepared for shipment. Preparation work may include packaging computer tapes, cartridges, floppy disks, CD's or hardcopy products. The Dissemination Room will contain packaging equipment and supplies. The area will also include a product staging area as material may have to be stored awaiting completion of other products prior to data shipment.

5.4.6.2   Environmental Requirements

Refer to Section 6.4.

5.4.6.3   Functional Relationships

The Dissemination Room will be located in the lower level near the product storage room and the loading/unloading area and close to the freight elevator.

5.4.7   Product Storage Room

5.4.7.1   Description

The Product Storage Room, occupying 2,000 sq. ft., will be used to temporarily store products such as film, CD-ROMs, plots, and magnetic tape in anticipation of future distribution. Additionally, products generated in hardcopy form from other DAACs or other government organizations (such as maps produced by the USGS/National Mapping Division) will be stored and sent to customers. The room shall be equipped with shelving appropriate for the storage of tape, CD-ROM, reports, plots, film, and maps.

5.4.7.2   Environmental Requirements

Refer to Section 6.2.

5.4.7.3   Functional Relationships

The Product Storage Room will be located in the lower level next to the Dissemination Room.

5.5   OFFICE SPACES

A total of 16,540 sq. ft. of fixed office space and 6,010 sq. ft. of open work space will be required. Fixed office space will be located on the main floor and will be distributed among single- and double-occupant offices.

Table 2 provides a listing of offices and open office space requirements.

Table 3 provides an anticipated breakout of staff by EOSDIS specified functionality:

IMS - Information Management System
PGS - Product Generation System
DADS - Data Archive and Distribution System

Environmental considerations are common throughout all office or open spaces described in Section 5.5.1 through 5.5.12. The description of this environment is found in Section 6.1 of this document.

5.5.1   DAAC Management Staff

5.5.1.1   Description

DAAC Management staff (10) will consist of a Chief, DAAC Operations and Sciences, three DAAC Program Managers, a Senior Scientist, a Senior Engineer, and four Secretaries.

5.5.1.2   Offices

Six spatially related offices (totaling 1,800 sq. ft.) will be required by DAAC Management staff: one single-occupant office for the Chief, DAAC Operations and Sciences, three single-occupant offices for Program Managers, and two single-occupant offices for the Senior Scientist and Senior Engineer.

5.5.1.3   Open space

536 sq. ft. of open space adjacent to DAAC Management offices will be required to accommodate secretarial support.

5.5.1.4   Functional Relationships

DAAC Management will provide general management and oversight to operations in the Land Processes DAAC. The Chief, DAAC Operations and Sciences, will report directly to and receive direction from the Chief, EROS Data Center. DAAC Management staff will work closely with O&M Contractor Management staff.

DAAC OPERATIONS AND SCIENCES	STAFFING PROFILE						
	MGMT	DAAC	PRS	TRG	VISITING	OTHER	TOTAL
DAAC MANAGEMENT STAFF							
CHIEF, DAAC OPERATION AND SCIENCES	1						1
DACC PROGRAM MANAGERS	3						3
SENIOR SCIENTIST	1						1
SENIOR ENGINEER	1						1
SECRETARIAL SUPPORT	4						4
SUBTOTAL	10	0	0	0			10
DAAC OPERATIONS BRANCH							
SUPERVISOR , COMPUTER OPERATIONS	1						1
SHIFT SUPERVISORS		1	1	1			3
SECRETARY	1						1
COMPUTER OPERATORS		7	10	3			20
COMPUTER SCHEDULERS		2	8				10
SUBTOTAL	2	10	18	4			35
SUPERVSIOR, TECHNICAL SUPPORT	1						1
SECRETARY	1						1
SYSTEMS MANAGERS		1	4	1			6
PERFORMANCE SPECIALISTS		2	2				4
HARDWARE ENGINEERING			5				5
HELP SERVICES			3				3
DOCUMENTATION SPECIALISTS		1	2				3
SUBTOTAL							23
SUPERVISOR, SOFTWARE DEVELOPMENT	1						1
SECRETARY	1						1
TEST ANALYSTS		2	4				6
PROGRAMMERS		5	5				10
SUBTOTAL							18
SUPERVISOR, NETWORK MANGAGEMENT	1						1
SECRETARY	1						1
HARDWARE COMM ENGINEERS		2	2	1			5
SOFTWARE COMM ENGINEERS		1	1	1			3
SUBTOTAL							10
SUPERVISOR, DATA MANAGEMENT	1						1
SECRETARY	1						1
DIGITAL QUALITY CONTROL			5				5
DIGITAL ARCHIVE TECHNICIAN		2					2
INVENTORY SPECIALISTS		8					8
SUBTOTAL							17
SUPERVISOR, CUSTOMER SERVICES	1						1
SECRETARY	1						1
CUSTOMER SERVICES SPECIALISTS				9			9
DISSEMINATION SERVICES			3				3
SUBTOTAL							14
DAAC SCIENCES BRANCH							
SUPERVISOR, SCIENCE SUPPORT	1						1
SECRETARIES	5						5
SCIENTISTS			10				10
SCIENCE SUPPORT PROGRAMMERS			15				15
SUBTOTAL							
VISITING /OTHER STAFF							
SCIENTISTS/ENGINEERS					20		20
C/D CONTRACTORS						10	10
VENDOR ENGINEERING						4	4
O&M CONTACT MANAGEMENT						6	6
FACILITIES MANAGEMENT						0	0

Table 2

DAAC OPERATIONS AND SCIENCES	SPACE REQUIRED		
	OFFICE	OPEN	TOTAL
	NO. SQ. FT.	SQ. FT.	SQ. FT.
DAAC MANAGEMENT STAFF			
CHIEF, DAAC OPERATION AND SCIENCES	1	500	0	500
DACC PROGRAM MANAGERS	3	900	0	900
SENIOR SCIENTIST	1	200	0	200
SENIOR ENGINEER	1	200	0	200
SECRETARIAL SUPPORT	0	536	536
SUBTOTAL	6	1800	536	2336
DAAC OPERATIONS BRANCH			
SUPERVISOR , COMPUTER OPERATIONS	1	134	0	134
SHIFT SUPERVISORS	0	0	0
SECRETARY	0	134	134
COMPUTER OPERATORS	0	0	0
COMPUTER SCHEDULERS	0	0	0
SUBTOTAL	1	134	134	268
SUPERVSIOR, TECHNICAL SUPPORT	1	134	0	134
SECRETARY	0	134	134
SYSTEMS MANAGERS	5	670	0	670
PERFORMANCE SPECIALISTS	4	536	0	536
HARDWARE ENGINEERING	5	670	0	670
HELP SERVICES	0	0	0
DOCUMENTATION SPECIALISTS	3	402	0	402
SUBTOTAL	18	2412	134	2546
SUPERVISOR, SOFTWARE DEVELOPMENT	1	134	0	134
SECRETARY	0	134	134
TEST ANALYSTS	5	670	0	670
PROGRAMMERS	10	1340	0	1340
SUBTOTAL	16	2144	134	2278
SUPERVISOR, NETWORK MANGAGEMENT	1	134	0	134
SECRETARY	0	134	134
HARDWARE COMM ENGINEERS	4	536	0	536
SOFTWARE COMM ENGINEERS	2	268	0	268
SUBTOTAL	7	938	134	1072
SUPERVISOR, DATA MANAGEMENT	1	134	0	134
SECRETARY	0	134	134
DIGITAL QUALITY CONTROL	3	402	0	402
DIGITAL ARCHIVE, INVENTORY	0	1866	1866
SUBTOTAL			
SUPERVISOR, CUSTOMER SERVICES	1	134	0	134
SECRETARY	0	134	134
CUSTOMER SERVICES, DISSEMINATION	0	1866	1866
DAAC SCIENCES BRANCH			
SUPERVISOR, SCIENCE SUPPORT	1	134	0	134
SECRETARY	0	670	670
SCIENTISTS	10	1340	0	1340
SCIENCE SUPPORT PROGRAMMERS	15	2010	0	2010
VISITING /OTHER STAFF			
SCIENTISTS/ENGINEERS	20	2680	0	2680
C/D CONTRACTORS	10	1340	0	1340
VENDOR ENGINEERING	3	402	0	402
O&M CONTACT MANAGEMENT	4	536	268	804
FACILITIES MANAGEMENT	0	0	0

Table 3

5.5.2   O&M Contractor Management Staff

5.5.2.1   Description

Operations and Maintenance (O&M) Contractor Management staff (6) will consist of a General Manager, a Deputy Project Manager, a Contract Administrator, a Personnel Officer, and two Secretaries.

5.5.2.2   Offices

Four spatially associated single-occupant offices (totaling 536 sq. ft.) will be required by O&M Contractor Management staff.

5.5.2.3   Open space

268 sq. ft. of open space adjacent to O&M Contractor Management offices will be required to accommodate secretarial support and peripheral work space.

5.5.2.4   Functional Relationships

O&M Contractor Management will provide general management and oversight to O&M contract operations in the DAAC. The General Manager will report directly to the Chief, DAAC Operations and Sciences.

5.5.3   C/D Contractor Staff

5.5.3.1   Description

EOS Phase C/D Contractor staff will consist of up to ten software engineers representing the principal contractors to NASA for the development of EOS data processing software.

5.5.3.2   Offices

Ten spatially associated single-occupant offices (totaling 1,340 sq. ft.) will be required by C/D Contractor staff.

5.5.3.3   Open space

No open space will be required to support C/D Contractor staff.

5.5.3.4   Functional Relationships

C/D Contractor staff will work closely with O&M contractor staff and will need access to the DAAC Testing Laboratory.

5.5.4   Vendor Engineering Staff

5.5.4.1   Description

Vendor Engineering staff will consist of up to four system engineers.

5.5.4.2 Offices

Three spatially associated single- or double-occupant offices (totaling 402 sq. ft.) will be required by Vendor Engineering staff.

5.5.4.3 Open space

No open space will be required to support Vendor Engineering staff.

5.5.4.4 Functional Relationships

Vendor Engineering staff will work closely with O&M contractor staff. They will need to be located in close proximity to vendor-supplied systems and peripheral devices in the computer center and have access to the Equipment Staging/Storage Room (lower level) and Hardware Maintenance Work Room.

5.5.5 Visiting Scientists/Engineers Staff

5.5.5.1 Description

Visiting staff will consist of up to 20 scientists and engineers.

5.5.5.2 Offices

Twenty spatially associated single-occupant offices (totaling 2,680 sq. ft.) will be required.

5.5.5.3 Open space

Open space requirements are combined with that provided for the Science Support Staff, Section 5.5.12.3.

5.5.5.4 Functional Relationships

Visiting scientists and engineers will work closely with DAAC Science Support staff and should be located in close proximity to them to accommodate this interaction. They will require direct access to DAAC Applications and Testing Laboratories and will be supported by secretarial staff within the DAAC Science Support group.

5.5.6 Computer Operations Staff

5.5.6.1 Description

Computer Operations staff will consist of an Operations Supervisor, three Shift Supervisors, one Secretary, 20 Computer Operators, and 10 Computer Schedulers.

5.5.6.2 Offices

One single-occupant office of 134 sq. ft. will be required to accommodate the Operations Supervisor.

5.5.6.3   Open space

536 sq. ft. of open space adjacent to the Operations Supervisor's office will be required to accommodate secretarial support for the Computer Operations, Technical Support, Software Development and Network Management staff. Other Computer Operations staff will be distributed at stations within the Computer Room, Console Operations Room, Peripheral Operations Room, Production Scheduling Room, and Shift Supervisors Office of the Computer Center.

5.5.6.4   Functional Relationships

Computer Operations staff will work closely with Data Management and Customer Services staff and will require direct access to the Computer Room, Production Scheduling Room, and Console and Peripheral Operations Rooms of the Computer Center.

5.5.7   Technical Support Staff

5.5.7.1   Description

Technical Support staff (23) will consist of a Supervisor, one Secretary, six Systems Managers, four Performance Specialists, five Hardware Engineers, three Help Services Specialists, and three Documentation Specialists.

5.5.7.2   Offices

Seventeen spatially associated single- and double-occupant offices, totaling 2,278 sq. ft., will be required to accommodate Technical Support staff. In addition to these offices, one single-occupant office of 134 sq. ft., to accommodate the Supervisor of Technical Support, will be located adjacent to the Computer Operations Supervisor's office described in Section 5.5.6.2.

5.5.7.3   Open space

Secretarial support will share the open space adjacent to the Supervisor's office as described in Section 5.5.6.3. Help Services Specialists will be located at stations within the Support Services Room of the Computer Center.

5.5.7.4   Functional Relationships

Technical Support staff will work closely with the DAAC Computer Operations, Software Development, and Network Management staff as well as with Vendor Engineering and C/D Contractor staff and will require direct access to the Computer and Robotics Rooms, Hardware Maintenance Work Room, DAAC Testing Laboratory, and Equipment Staging/Storage Room (lower level) of the Computer Center.

5.5.8 Software Development Staff

5.5.8.1 Description

Software Development staff (18) will consist of a Supervisor, one Secretary, six Test Analysts, and ten Programmers.

5.5.8.2 Offices

Fifteen spatially associated single- and double-occupant offices totaling 2,010 sq. ft. will be required to accommodate Software Development staff. In addition to these offices, one single-occupant office of 134 sq. ft., to accommodate the Supervisor of Software Development, will be located adjacent to the Computer Operations Supervisor's office described in Section 5.5.6.2.

5.5.8.3 Open space

Secretarial support will share the open space adjacent to the Supervisor's office as described in Section 5.5.6.3.

5.5.8.4 Functional Relationships

Software Development staff will work closely with DAAC Technical Support and Science Support staff, C/D Contractor and Vendor Engineering staff, and Visiting Scientists/Engineers and will require direct access to the DAAC Testing Laboratory of the Computer Center.

5.5.9 Network Management Staff

5.5.9.1 Description

Network Management staff will consist of a Supervisor, one Secretary, five Communications Hardware Engineers, and three Communications Software Engineers.

5.5.9.2 Offices

Six spatially associated single- and double-occupant offices totaling 804 sq. ft. will be required to accommodate Network Management staff. In addition to these offices, one single-occupant office of 134 sq. ft., to accommodate the Supervisor, Network Management, will be located in close proximity to the Computer Operations Supervisor's office described in Section 5.5.6.2.

5.5.9.3 Open space

Secretarial support will share the open space adjacent to the Supervisor's office as described in Section 5.5.6.3.

5.5.9.4   Functional Relationships

Network Management staff will work closely with all organizational
elements of the DAAC and will require direct access to all areas within
the Computer Center (main floor and lower level) as well as peripheral
areas in which integrated telecommunications and computer systems are
located.

5.5.10   Data Management Staff

5.5.10.1   Description

Data Management staff will consist of a Supervisor, one Secretary, five
Digital Quality Control Specialists, two digital archive Technicians,
and eight Inventory Specialists. They will be responsible for data
quality and data entry coordination activity associated with the DAAC.
Section personnel will monitor data entry activity, perform data base
corrections, implement archive enhancements and report data base
holdings. Such reports will include published documents and graphic
plots of data coverage.

5.5.10.2   Offices

Four spatially associated single- and double-occupant offices totaling
536 sq. ft. will be required to accommodate the Supervisor of Data
Management and Digital Quality Control Specialists.

5.5.10.3   Open space

2,000 sq. ft. of open space adjacent to Data Management staff offices
will be required to accommodate Digital Archive Technicians and
Inventory Specialists, secretarial support, and peripheral work space.

5.5.10.4   Functional Relationships

Data Management staff will work closely with DAAC Computer Operations,
Technical Support, and Customer Services staff. They will also work
closely with C/D Contractor and Vendor Engineering staff associated with
the archive's robotic system.

5.5.11   Customer Services Staff

5.5.11.1   Description

The Customer Services staff will consist of a Supervisor, one Secretary,
nine Customer Services Specialists, and three Dissemination Services
Specialists. They will be responsible for supporting data requests for
Land DAAC products. Activities will include general phone support,
walk-in visitors and scheduled visitor support. Customer Service
personnel will perform product inquiry, ordering, billing and accounting
functions required by the DAAC. The Customer Service and Dissemination
Service Specialists will also coordinate information mailings and answer
general information requests.

5.5.11.2 Offices

One single-occupant office of 134 sq. ft. will be required to accommodate the Supervisor, Customer Services.

5.5.11.3 Open space

2,000 sq. ft. of open space adjacent to the Supervisor's office will be required to accommodate Customer and Dissemination Services Specialists, secretarial support, and peripheral work space.

5.5.11.4 Functional Relationships

Customer Services staff will work closely with DAAC Computer Operations, Technical Support, and Data Management staff.

5.5.12 Science Support Staff

5.5.12.1 Description

Science Support staff will consist of a Supervisor, five Secretaries, ten Scientists, and fifteen Science Support Programmers.

5.5.12.2 Offices

Twenty-six spatially associated single-occupant offices (totaling 3,484 sq. ft.) will be required to accommodate the Supervisor, Scientists and Science Support Programmers.

5.5.12.3 Open space

670 sq. ft. of open space adjacent to Science Support staff offices will be required to accommodate secretarial support and peripheral work space for Science Support staff and visiting scientists/engineers.

5.5.12.4 Functional Relationships

Science Support staff will work closely with DAAC Technical Support, Software Development, and Customer Services staff and with visiting scientists/engineers and will require direct access to DAAC Applications and Testing Laboratories.

6.0 DESCRIPTION OF ENVIRONMENTS

6.1 OFFICE/OPEN SPACE/LABORATORIES

6.1.1 Character

These spaces will house civil service and contract personnel who manage and operate the DAAC facility and contractor and visiting scientist personnel who provide technical support to the DAAC. Also included are several laboratories associated with the computer center.

6.1.2 Materials

Ceilings will be of the lay-in, acoustic panel type. Walls will be demountable systems of glass and anodized aluminum mullion or painted gypsum board over metal stud partitioning, pending the outcome of studies of cost versus efficiency.

6.1.3 HVAC

These spaces are to be maintained at 75° F. (± 5° F.), and 50% relative humidity (± 10%).

6.1.4 Lighting

The ambient light level shall be 50 foot-candles throughout the area with 100 foot-candles in precision work areas. An emergency egress lighting system shall be provided for all office areas.

6.1.5 Utilities

Power/communications workstation modules, supplying combinations of 110 volt power, telephone, data network communications, and local printer hook-ups will be provided at strategic locations in all rooms.

6.2 DIGITAL ARCHIVE (Lower Level)

6.2.1 Character

The Digital Archive (lower level) will be used to store digital storage media after their removal from the robotic storage.

6.2.2 Materials

Ceiling will be of the lay-in acoustical panel type. Walls will be constructed of painted gypsum board on metal studding. The floors will be vinyl tile over sealed concrete slab. An appropriate vapor barrier will be installed in or on all floors, walls, and ceilings.

6.2.3 HVAC

The design of the HVAC for the Digital Archive is critical to the long-term preservation of the digital data stored. Temperature and humidity aim points and tolerances and air filtration standards must be matched to the stability and durability of the digital medium. Understanding of the interactions of the various media with variations in environmental parameters is a constantly evolving technology. Furthermore, new media with less stringent environmental requirements are under development and may be the media of choice in the era of the DAAC operation. For these reasons, it will be necessary for the designers to undertake a study to assess the state-of-the-science at the latest date possible and use the most current information to establish the environmental requirements. See Section 7.6.

6.2.4 Lighting

The ambient light level will be 50 foot-candles overall with 100 foot-candles in precision work areas. Lay-in fluorescent light fixtures with dual light level capability are preferred. An emergency egress lighting system will be provided.

6.2.5 Utilities

Electrical service will be provided at required locations with 120 volt, 60 Hz double duplex outlets.

6.3 COMPUTER SPACES

6.3.1 Character

It is currently anticipated that these spaces will house two types of computers. Three CRAY-like supercomputers are anticipated to require cryogenic cooling, and two super-mini computers will require underfloor/ ambient air cooling. The CRAY-like computers must be located within approximately 100 ft. of each other and their respective peripheral support equipment rooms. These peripheral support rooms will accommodate printers, tape drives, and other associated peripherals which will require underfloor/ambient air cooling.

6.3.2 Materials

Ceiling will be of the lay-in acoustical panel type. Walls will be constructed of painted gypsum board on metal studding. All inner walls will be acoustic-surfaced to minimize the noise generated by the resident systems. The raised floor systems use melamine phenolic plastic laminate and/or carpeted access floor panels. If carpeted floor tile is used, the carpet selected must be specifically designed for computer rooms. An appropriate vapor barrier will be installed in or on all floors, walls, and ceilings. Control of dust will be a consideration in the selection of wall, floor and ceiling materials.

6.3.3 HVAC

Computer room environmental conditions will be maintained at 72° F. (± 2° F.), with 50% relative humidity (± 5%). Underfloor plenum supply air will be provided at temperature and humidity levels necessary to meet ADP equipment manufacturer requirements. If such requirements are not known, however, an underfloor temperature of 58-60° F., with a maximum relative humidity of 80%, and an underfloor static pressure of 0.1 inches of water will be assumed for load calculation purposes.

6.3.4 Lighting

Generally, all computer spaces require 50 foot-candles of ambient light; however, 100 foot-candles are required in precision work areas. Lay-in fluorescent light fixtures are required to provide dual light level capability. All computer spaces must be equipped with emergency lighting.

6.3.5 Utilities

Power requirements within all computer spaces include: 120 volt, 60 Hz double duplex outlets at required locations; 120/208 volt, 60 Hz "ordinary" computer power distributed to power panels at the periphery of the computer rooms; 208 volt, 400 Hz "super" computer power from manufacturer supplied motor-generator sets supplying power through power distribution centers within the computer rooms.

6.3.6 Security requirements

All areas within the Computer Center except the Test and Visualization Laboratories will be under access restrictions. The number of doors to the Computer Center shall be limited to those necessary to meet fire code regulations and to conduct normal business operations. All main-floor areas considered as restricted access areas shall be entered through a primary access control point located near the Support Services room.

The perimeter walls of the Computer Center will be free of glass except as required for safety purposes at entrances and exits. A large corridor window allowing viewing of the computer room will be considered during the design effort.

The internal walls separating the work areas within the Computer Center will be constructed such that the upper half of the walls are glass. Windows will be fixed with embedded metal mesh or other breakage resistant glass and all fastening devices will be located to the inside of the computer room. Barriers will be installed beneath the raised floor separating areas designated as restricted and non-restricted access.

6.3.7 Special Fire Detection and Suppression

All rooms within the Computer Center will be provided with a fire detection and suppression system. The fire detection system recommended for consideration is a sniffer pipe system that continuously draws in air from select areas in the Computer Center and uses particle detection devices to detect unsafe conditions. Pre-action water sprinkler fire extinguishing systems should be utilized to prevent the accidental release of water if a sprinkler system leak occurs.

6.3.8 Computer Grounding

The high operating frequency of computers requires a safety grounding system ("green wire") plus an additional system called the Signal Reference Grid (SRG). In addition to the SRG, a low resistance 60 Hz ground must be provided to prevent unsafe voltages from lightning strikes or faulty currents. The Signal Reference Grid (SRG) is a low impedance network of conductors which establishes an equipotential surface for high frequency, low current digital signals.

6.4   LOGISTICS SPACE

6.4.1   Character

This area accommodates shipping, receiving and storage of freight, parts and supply shipments, and interim storage, packaging and shipment preparation for output products to the user community. Logistics space will have access to an 8-ft. roll-up door, drive-in access ramp, and freight elevator.

6.4.2   Materials

Walls will be painted cinder block construction. Sealed concrete floors will be finished with vinyl tile. Ceilings will be T-bar, lay-in acoustical panel construction.

6.4.3   HVAC

Environmental conditions must be maintained at 75° F. (± 5° F.), and 50% relative humidity (± 10%). Ventilation air will be provided at the rate of 20 CFM per person.

6.4.4   Lighting

The maximum ambient light level required is 30 foot-candles, which can be supplied by industrial type two-tube pendant fluorescent light fixtures. Emergency lighting is required for all logistics spaces.

6.4.5   Utilities

120 volt duplex outlets on inner wall will be installed at required locations.

6.5   CONFERENCE/TRAINING SPACE

6.5.1   Character

This space will provide conferencing and training areas for operational personnel and visiting scientists of the DAAC.

6.5.2   Materials

Walls will be two layers of 5/8-in. sheetrock filled with insulation for soundproofing. Floors will be carpeted.

6.5.3   HVAC

Environmental conditions of the spaces must be maintained at 75° F. (± 5° F.), and 50% relative humidity (± 10%). Ventilation air must be provided at the rate of 20-35 CFM per person.

6.5.4   Lighting

Four types of lighting must be provided. Lay-in fluorescent lighting will be provided for ambient light level of 50 foot-candles. Localized work ares will

require dimmer-controlled incandescent lighting fixtures with 100 foot-candles. Grease boards, blackboards, and bulletin boards need direct lighting. Areas that support slide and video presentations will require alternate incandescent general lighting with dimmer controls.

6.5.5 Utilities

Power/communications workstation modules, supplying combinations of 110 volt power, telephone, data network communications, and local printer hook-ups will be provided at strategic locations in all rooms.

6.6 MECHANICAL SUPPORT SPACES

6.6.1 Character

The support spaces within the mechanical room will house the electrical, building mechanical, and computer support equipments. The electrical equipment will include transformers, switch gear, primary communications and power distribution systems for the entire building. The building support equipment will include mechanical system equipment for building comfort and ventilation systems. The computer support equipment includes manufacturer-supplied cryogenic cooling equipment and motor-generator sets required to operate the supercomputers.

6.6.2 Materials

Unpainted cinder block walls may be used. Floors will be sealed concrete. In-floor drainage will be provided. Ceilings may be exposed concrete with a minimum ceiling height of 14 feet.

6.6.3 HVAC

Sufficient ventilation to maintain interior space temperatures below 85° F. will be required.

6.6.4 Lighting

General lighting will be 30 foot-candles minimum. Industrial two-tube pendant fluorescent light fixtures may be used. An emergency lighting system is required.

6.6.5 Utilities

120 volt, 60 Hz, duplex outlets are required at regular intervals around the room perimeter.

6.7 AUDITORIUM

6.7.1 Character

The Auditorium will accommodate seminars, audio/visual presentations and general lectures. As a single unit it will accommodate seating of 300 occupants. It will be divisible into three, equal size mini-auditoriums.

6.7.2 Materials

Lay-in acoustical ceilings will have a minimum height of 10 feet. Walls will be constructed of glass and anodized aluminum mullion or painted gypsum board on metal stud. A track mounted collapsible wall system will be used for room division. Floors will be carpeted.

6.7.3 HVAC

Environmental conditions are to be maintained at 75° F. (± 5 F.), and 50% relative humidity (± 10%).

Air exchange flow rate will be 20-35 CFM per room occupant.

6.7.4 Lighting

Lay-in fluorescent light fixtures with dimmable light level capability will provide ambient lighting at a minimum of 50 foot-candles. An emergency lighting system will be provided.

6.7.5 Utilities

120 volt, 60 Hz double duplex outlets are required at regular intervals.

6.8 MISCELLANEOUS SPACES

6.8.1 Character

Miscellaneous spaces include a lobby, atrium, corridors, toilet facilities, vending/food service and break areas, and other similar spaces.

6.8.2 Materials

Quality of finish will be appropriate to the function of the space. Ceramic tile will be used on walls and floors in toilet facilities; vinyl wall covering, plaster, brick, or stone will be used on walls at building main entry, vinyl wall covering, glass and anodized aluminum and/or painted gypsum board partitioning will be used along corridors. Stone or terrazzo flooring could be used at building main entry and in high traffic lobby spaces. Lay-in acoustic ceiling will be used throughout these spaces except in lobbies and other "image projecting" spaces where other durable, easily maintained, and cost effective materials may be appropriate.

6.8.3 HVAC

Environmental conditions will be maintained at 75° F. (± 5° F.), and 50% relative humidity (± 10%). Ventilation air will be provided at the rate of 20 CFM per person.

6.8.4 Lighting

Ambient light levels of 30 foot-candles are required throughout from lay-in fluorescent light fixtures. High Intensity Discharge accent lighting as may

be required in entry and lobby areas. An emergency lighting system is required.

6.8.5 Utilities

120 volt double duplex outlets at regular intervals are required with 120 volt electrical power strips in vending areas.

7.0   **TOPICS FOR FURTHER STUDY**

There are a number of issues bearing on the design of the DAAC that are not adequately understood or clearly resolved at this time. These items are identified for specific study by the Architect/Engineer team. Each subject should be thoroughly researched and a report prepared in which the technical issues are identified and discussed, the alternatives enumerated and the cost trade-offs evaluated. These reports will be submitted to the government representative for approval and selection of the preferred approach.

7.1   **FIRE DETECTION AND SUPPRESSION SYSTEM**

The DAAC will house over 40 million dollars in computer and support equipment. Over the 15-year active life span of EOS, hundreds of millions of dollars will have been expended to collect, ingest, catalog and archive earth resources data in the DAAC. These large expenditures for hardware and data collection and storage require extraordinary planning with regard to fire detection and suppression systems.

For the past 20 years, Halon has been the fire extinguishing chemical of choice in data centers. Halon's popularity results from the fact that it is non-toxic, non-corrosive, and non-conductive. In 1987, a ruling was made to restrict the use of Halon, as it was determined to be harmful to the earth's rapidly diminishing ozone layer. Worldwide production is scheduled to be phased out by the year 2000. The ruling caused Data Center administrators to seek alternatives to guard their computer facilities against fire.

Research into development of Halon alternatives is underway and many promising chemicals are being tested. DuPont FE25, FE13, and FE232 are possible replacements for Halon 1301 and 1211. Great Lakes FM-100 is also a probable replacement for Halon 1301 and 1211. However, drawbacks such as cost, potency, toxicity and availability must be carefully considered when designing the fire suppression system. The study must examine the efficacy of these gases, along with other suppression agents including water, and determine which of these best meet the needs of the DAAC.

The study must also evaluate and propose which fire detection system most closely meets the DAAC's requirement. Combinations of detection devices may be appropriate. Advances such as "sniffer pipe" detection devices must also be investigated. These are ultra sensitive fire detectors which utilize cloud chamber particle detection technology and an air sampling network that is unaffected by high air velocities, dust and humidity.

The A&E must ensure that the Fire Detection and Suppression system implemented within the DAAC is designed and installed according to National Fire

Protection Association standards, U.L. guidelines, Federal regulations and local code.

7.2   POWER CONDITIONING AND BACKUP POWER

A study is necessary to determine the required Uninterruptible Power Supply (UPS) system to protect against loss of data resulting from an unscheduled power outage. The specific duration of UPS service to be delivered would have to be evaluated as a consequence of balancing incurred costs versus anticipated benefits. The objective is to: (1) minimize immediate lost productivity; (2) minimize induced lost productivity, primarily at the EDC DAAC but also at the GSFC or other DAACs, due to rescheduling and restarting of tasks or retransmission of data; (3) minimize adverse hardware effects resulting from cycling of computer power supplies and magnetic storage devices; and (4) minimize or eliminate the possibility for lost data or corrupted data bases and data files.

One approach is to install UPS-supported circuits in all offices and computer-equipped work areas in the DAAC, in addition to full UPS service to the computer and telecommunications areas. Three levels of controlled interruption could be provided: 5 minutes of UPS service to all offices to power down PC's; 15 minutes of power to production support areas that utilize computer workstations; and, 30 minutes of UPS service to telecommunications/networking equipment and to production computers, especially to the supercomputer(s) and/or mainframe computer(s).

Current supercomputer installations utilize a motor-generator to provide isolation from switching and lightning voltage transients as well as to provide a 30- to 60-cycle ridethrough for protection device switching. Full battery/inverter UPS systems normally are not used with supercomputers for at least two reasons: such a system would have to have a 1,000-KVA capacity or greater, which is expensive; and it would have to have 400-Hz output, which is non-standard. However, it is entirely conceivable that the computers to be installed at the DAAC will be fully compatible with UPS technology available at the time of installation.

The computationally intensive and delivery-imperative nature of the product generation supercomputers likely to be installed at the DAAC makes UPS support of the supercomputers essential. The study will also determine the most reliable and most cost-effective implementation of UPS service to the main computers, recognizing that motor-generators fail to provide the required duration of uninterrupted power.

In addition, the study will consider how to couple, most effectively, a diesel generator system to the UPS. The generator could be used not only to lengthen the outage duration that could be tolerated, but also to reduce peak KWH demand charges by supplying cogeneration. A third contribution of the generator could be to power HVAC critical to the computer area. Without power for the HVAC, systems in the computer area likely could not be operated for more than 15 minutes.

7.3   SIGNAL GROUND REFERENCE SYSTEM

A special study will be conducted to document the approach in the building
design to the creation of a signal ground reference system (SRGS) in the
Computer Center.

All national grounding codes, defined by the National Electrical Code (NFPA
publication 70), must be observed to ensure safety of personnel. In addition,
a separate ground system must be installed to ensure the proper functioning of
installed computer and peripheral equipment. The requirement for and design
of this separate ground system, which is critical to the reliable operation of
computers and peripherals, generally is not widely understood.

The safety grounding code is wholly inadequate to provide a reference ground
for equipment that is physically separated on a single floor or, worse yet,
between floors. To operate reliably and predictably, high-speed computers
require a low-impedance ground at signal frequencies much higher than the 60-
Hertz power frequency (400-Hertz for some supercomputers). A current design
objective for computer grounding systems is to have the reference system
appear to be a short-circuit (or very low impedance) for signal frequencies up
to 25 megaHertz. Such a ground reference system will ensure that everpresent
radio-frequency signals--noise--cannot be induced or injected to the computer
equipment.

There are several approaches to creating a SGRS, each with attendant costs and
efficacies. One of the most elaborate is constructed by laying a grid of low-
impedance conductors (two-inch-wide copper strips spaced at two-foot
intervals, for example) on the floor of all areas where computer equipment
will be located. The strips are bonded at all intersections. The copper grid
is physically bonded to metal components in the area. The grid is also bonded
to the pedestals which support raised floor panels; to building structural
steel members (vertical and horizontal); to electrical conduits; to HVAC
ductwork; to fire-detection/suppression plumbing; and, to all other conductors
that enter or exit the computer equipment area. The point of connection to
the grid is at the point of entry to the area. In addition, the grid is
bonded to the frames of all computer equipment.

When a SGRS is properly designed and installed, electrical ground loops, as
well as high-frequency noise induced into power and data cables, will be
eliminated.

Alternative SGRS solutions will be documented and costed in the report.
Several articles have been published that describe proper reference-grid
design details and construction procedures. FIPS publication 94, *Guidelines
on Electrical Power for ADP Installations*, also provides detailed information.

7.4   ARCHIVE ENVIRONMENT REQUIREMENTS

Iron oxide, cobalt modified iron oxide and chromium dioxide particulate media
have dominated magnetic tape recording applications for several decades.
These media cannot be used in high density recording for the DAAC, primarily
because of their limited coercivity. For these applications, the industry has
turned to metal particle (MP) tapes which offer higher coercivities and higher

magnetizations. Unfortunately, the iron particles employed in MP tapes are susceptible to corrosion which can compromise their integrity and reliability for archive data applications. Barium Ferrite (BaF) particulate media represent the latest development in high density data recording. Compared with MP tapes, BaF tapes could offer several important advantages: complete immunity from corrosion, superior recording performance, and extremely high recording densities.

The National Archive and Records Administration has documented the environmental requirement for traditional iron oxide tapes and is currently designing a facility for these media as well as MP.

National Media Labs is currently performing research related to durability and stability of both MP and BaF tape media and their environmental requirements. Initial findings from this research are expected to be available to the government in late FY 1992. The A&E must remain cognizant of this research and existing technology to design a Digital Archive which will provide the necessary degree of flexibility to meet the environmental requirements of the media. A decision document will be prepared just prior to the time that a final decision must be made.

7.5   EXECUTIVE ORDER 12758, ENERGY EFFICIENCY REQUIREMENTS

The United States has 5 percent of the world's population and yet consumes more than 20 percent of the world's fossil fuels. High rates of energy consumption in the United States contribute to global warming, urban smog, acid rain, oil spills, and other environmental pollution problems.

Executive Order 12759, Energy Efficiency Requirements for Newly Constructed Federal Buildings, 10 CFR 435, simply states that an energy audit of the proposed construction must show a reduction of 45 percent from the energy consumed per square foot in 1975 by the use of "energy conservation measures." An energy audit of the DHB was performed May 30, 1975, and will be made available.

"Energy conservation measure" means an installation or modification of an installation in a building which is primarily intended to either reduce energy consumption or allow the use of a renewable energy source and includes, but is not limited to: super insulation, automatic energy control systems, passive solar, load shedding/cogeneration, heat reflective coatings, air-to-air heat reclamation, energy efficient lighting, indirect lighting, variable frequency speed control on pumps and fans, free cooling and heat recovery of computer room air conditioning, variable volume air distribution, and weatherstripping.

An energy audit must draw conclusions on which energy conservation measures are compatible and can be utilized to effect a 45 percent reduction per square foot on energy conservation from the 1975 base.

7.6   SPECIAL SECURITY FACILITY

This DAAC Design Document does not specify the inclusion of a Sensitive Compartmentalized Information Facility (SCIF) in the construction requirements at this time. It is probable, however, that such a structure will be required

in the future and it may be cost beneficial to include elements of the SCIF construction in the original design. For example, walls, ceiling, and floor of the SCIF structure have unique construction characteristics and it may be appropriate to incorporate these features into a pre-designated lower level area for future development of the SCIF.

The SCIF must meet "Tempest" standards for shielding of radio frequency emissions as well as SCIF security requirements.

The study must identify the construction requirements inherent in providing a tempested SCIF environment in the building and examine alternatives for including provisions in the original design for future development of the SCIF.