NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 2000 ESTIMATES

SUMMARY

SCIENCE, AERONAUTICS AND TECHNOLOGY

	Amount (Dollars)	Page No
Space Science:		
Construct Interferometry Development Laboratory (JPL)	2,500,000	MS 4-16
Earth Science:		
Restore Meterological Development Laboratory (GSFC)	1,000,000	MS 4-19
Aeronautics:		
Replace Fan Blades, National Full-Scale Aerodynamic Complex (ARC)	3,400,000	MS 4-21
Replace Main Drive for 14x22-Foot Subsonic Tunnel (LaRC)	7,300,000	MS 4-23
Total Science, Aeronautics, and Technology	14,200,000	

CONSTRUCTION OF FACILITIES
FISCAL YEAR 2000 ESTIMATES

PROJECT TITLE: Construct Optical Interferometry Development Laboratory

INSTALLATION: Jet Propulsion Laboratory

FY 2000 CoF Estimate: $2,500,000

LOCATION OF PROJECT: La Canada - Flintridge, Los Angeles County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science

FY 1999 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project.

	Planning and Design	Construction	Total
Specific Construction Funding	$400,000	$2,500,000	$2,900,000
Capitalized Investment	---	---	0
Total	$400,000	$2,500,000	$2,900,000

SUMMARY PURPOSE AND SCOPE:
For the first increment of this project, $2,500,000 was identified, and was initiated via NASA's FY 1999 Initial Operating Plan. This second and final increment completes construction of the Interferometry Development Laboratory. The facility will include 1,330 square meters of laboratory areas plus additional space for restrooms, utility rooms, and an office. Laboratory areas include class 10,000 High Bay and Low Bay with adjacent non-clean support space for control electronics, computers, and equipment buildup. Highly sensitive instruments on optical tables require ground floor laboratories with vibration isolation pads in a clean environment. This facility will form the corner-piece of a three-building complex (two existing) which comprise the heart of optical interferometry at JPL.

PROJECT JUSTIFICATION:
The optical interferometry business base is growing rapidly, with a ground observatory project in development (Palomar), a second ground observatory and two major space missions just beginning (Keck, Deep Space 3, and Space Interferometry Mission) and a substantial supporting technology development program (Interferometry Technology Program). Other major projects are in the planning stage (e.g. Terrestrial Planet Finder). This building will provide urgently needed space to support projects from the ORIGINS, Advanced Technology and Mission Studies, and New Millennium programs.

Interferometry development laboratories and personnel are inefficiently scattered across JPL. Current accommodations can not meet the demands of the new flight programs that require significant new clean laboratory space by the end of 2001. The new space interferometer instruments will be large, typically tens of meters, or will have components distributed among multiple spacecraft, which must be demonstrated to work cooperatively as a single instrument. The new facility will be located near Buildings 171 and 306 to make available highly specialized Building 306 facilities such as supplementary clean and vibration-free space and for clustering purposes.

Vibration isolation pads (concrete blocks extending deep into the subsoil beneath the building) are needed to provide the base stability required for testing the interferometer systems to the required sub-nanometer pathlength and nanoradian pointing level. Building 306 is the only location with this capability and it is fully booked for many years with current flight projects, including the Thermal Emission Spectrometer and the Microwave Limb Sounder, as well as several smaller instrument tasks.

This project will allow the elimination of 26 trailers totaling 1209 square meters and the demolition of wood frame and stucco Building 11 (built in 1947) and Building 121 (built in 1952), totaling 900 square meters of antiquated, code deficient, maintenance intensive laboratory and office space.

IMPACT OF DELAY:
Delay in construction will cause cost increases due to inefficient use of people and testing work-around. The unavailability of suitable clean and vibration-free laboratory space will increase the flight performance risk and cause program schedule slips.

PROJECT DESCRIPTION:
This increment of work initiates construction of the Optical Interferometry Development Laboratory consisting of: one class 10,000 High Bay of approximately 458 square meter floor area and a height of 6 meters; one class 10,000 Low Bay of approximately 185 square meters; a ground (electronic) support area of approximately 134 square meters; and three class 100,000 development laboratories totaling approximately 219 square meters. The facility will also include a meeting room, office, and storage room totaling 52 square meters, and associated restrooms and circulation elements as required.

The facility will be located on Surveyor Road, across the street from Building 306. The site is currently occupied by a lot containing 26 wooden trailers, which will be demolished, making way for the modern, state of the art laboratory space.

The building will be a steel frame with concrete block and trusses, and a concrete base slab. Vibration isolation pads will be provided for optical tables in clean rooms. The exterior will be natural finish concrete block. Interior walls will be painted gypsum board, with epoxy paint on clean room walls. Ceilings will be grid supported faced tiles in the clean rooms. Heat, Ventilation and Air Conditioner (HVAC) systems will provide separate, zoned systems to the laboratories. High efficiency particular air (HEPA) filters and air showers will be provided in clean rooms. Utilities include clean instrument power; filtered nitrogen gas; and filtered, deionized, chilled cooling water.

FY 2000 PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
Architectural/Structural/Sitework	LS	---	---	$1,570,000
Mechanical.	LS	---	---	570,000
Electrical	LS	---	---	360,000
Total				$2,500,000

OTHER EQUIPMENT SUMMARY: None

FUTURE ESTIMATED CONSTRUCTION FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

PROJECT TITLE: Restore Meteorological Systems Development Laboratory

INSTALLATION: Goddard Space Flight Center

FY 2000 ESTIMATE: $1,000,000

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Earth Science

FY 1999 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning And Design	Construction	Total
Specific Construction Funding	$485,000	$4,000,000	$4,485,000
Capitalized Investment	---	4,947,107	4,947,107
Total	$485,000	$8,947,107	$9,432,107

SUMMARY PURPOSE AND SCOPE:
This project is the second and final increment to restore and upgrade various components of the Meteorological Systems Development Laboratory, Building 21. Areas affected include stairwells, egress paths, fire rating around laboratories, restrooms, mechanical systems, and electrical systems. The work will bring Building 21 into compliance with the Life Safety Code (1997), the Uniform Federal Accessibility Standards (1998), and the National Electrical Code (1996). Mechanical work will include asbestos removal. The first increment of this project was identified in the Agency's FY 1999 Initial Operating Plan in the amount of $4,000,000.

PROJECT JUSTIFICATION:
The building has been in service for 30 years. The existing systems have deteriorated and are beyond their useful life. It is essential to restore those components likely to fail to maintain reliable support of the Center's mission. The building is out of compliance with a variety of building, life safety, and accessibility codes; putting people, projects and equipment at risk. Operational requirements and budget constraints have severely strained system capabilities, increasing the risk of failure. This project corrects building problems that pose the greatest risk to safety, systems capacities, and reliable facility service.

IMPACT OF DELAY:

System breakdown could occur at any time, resulting in an emergency repair/replacement situation. The delay will increase operations and maintenance costs. Research critical to the GSFC mission is conducted in this building. Any unanticipated outage in the facility would seriously impact research operations.

PROJECT DESCRIPTION:
This project provides replacement of the existing variable air volume boxes, duct work, piping, diffusers and grilles, air-handling unit #4, electrical and controls upgrades, and some asbestos removal.

FY 2000 PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
General Requirements.	LS	---	---	$ 35,000
Architectural/Structural.	LS	---	---	150,000
Mechanical	LS	---	---	800,000
Electrical.	LS	---	---	15,000
Total				$1,000,000

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

CONSTRUCTION OF FACILITIES
FISCAL YEAR 2000 ESTIMATES

PROJECT TITLE: Replace Fan Blades, National Full-Scale Aerodynamic Complex

INSTALLATION: Ames Research Center

FY 2000 Estimate: $3,400,000

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aero-Space Technology

FY 1999 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific Construction Funding	$810,000	$2,000,000	$2,810,000
Capitalized Investment	---	---	---
Total	$810,000	$2,000,000	$2,810,000

SUMMARY PURPOSE AND SCOPE:
The scope of this project is to design, manufacture, and install new fan blades in the National Full-Scale Aerodynamic Complex (NFAC) at Ames Research Center. The NFAC is comprised of two large-scale wind tunnels that share a common fan drive system. The fan blades have developed significant cracking. An interim repair has been implemented until new blades can be procured.

PROJECT JUSTIFICATION:
The NFAC is a vital National facility that supports aerodynamic and aeroacoustic testing for research and development of fixed and rotary winged aircraft. The NFAC fan drive system was modified when the 80 X 120 wind tunnel leg was added in the late 1970's. Each of six fans was upgraded and the blades (15 per fan) were replace. The new blades were made from a laminated wood product called "Hydulignum". This material was used as the main structural component of the blades, while the leading and trailing edges and the outer tip region were made of spruce. The attachment of the blades to the fan drive was accomplished via a metal cuff that was threaded onto the root end of the blade. These blades continued in operation until 1996 when numerous cracks were discovered in the "Hydulignum" emanating from the root attachment area. An investigation revealed a higher dynamic loading on the blades than considered in the design. This caused the blades to vibrate at a rate 4 times greater than expected. The blades effectively reached their 40-year "fatigue life" after only 10 years of actual operation.

Temporary repairs consisting of injecting the cracks with high strength epoxy adhesive and wrapping the lower portion of the blade and steel cuff with a carbon composite material are complete. Based on fatigue tests, the temporary repairs will last for a maximum of 5-6 years. Permanent repairs must be accomplished to avoid shutdown of the facility.

IMPACT OF DELAY:
Temporary repairs have extended the safe operating life of the existing fan blades 5 years. Failure to replace these fan blades will result in increased cost, disruption, and delay to commercial and military aviation programs when the temporary repaired blades exceed their safe operating life. As currently planned, the project will have the new blades installed slightly before this time, ensuring minimum disruption of NFAC operations.

DESCRIPTION:
The scope of the total project is to design, manufacture, and install new composite fan blades in the National Full-Scale Aerodynamic Complex (NFAC) at Ames Research Center. New blades made from composite materials are the most viable method of replacing the temporary repaired blades. Composite blades will be substantially lighter than the current wood blades and have better damage tolerance characteristics. Design concepts for these new blades range from a traditional spar, rib, skin construction used in many of today's helicopter blades to a stiffened skin panel approach where stiffening elements are directly integrated into the outer skin assembly at the time of manufacture. The superior performance and increased durability of the new composite fan blades will ensure the operation of the National Full Scale Aerodynamic Complex for years to come.

Because of the wide variety of potential design solutions and manufacturers, prior year design funding was used for development of three conceptual designs. The FY 1999 funding increment is being used to complete the engineering after a concept is selected, develop structural prototypes, and initiate prototype testing and production. Follow-on funding in later fiscal years will complete the blade manufacture, delivery, and installation.

FY 2000 PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
Manufacture New Blades	LS	---	---	$3,400,000
Total				$3,400,000

OTHER EQUIPMENT SUMMARY: None

FUTURE ESTIMATED CONSTRUCTION FUNDING REQUIRED TO COMPLETE THIS PROJECT: Future funding is needed in the amount of approximately $10,000,000 in order to complete this project. Without this funding, the blade replacement cannot be completed, risking facility shutdown if the temporary repair life is exceeded. When combined with FY 99 funding of $2,000,000, the total cost will be approximately $15,400,000.

PROJECT TITLE: Replace Main Drive for 14x22-Foot Subsonic Tunnel

INSTALLATION: Langley Research Center

FY 2000 Estimate: $7,300,000

LOCATION OF PROJECT: Langley Research Center

COGNIZANT HEADQUARTERS OFFICE: Office of Aero-Space Technology

FY 1999 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific Construction Funding	$175,000	$500,000	$675,000
Capitalized Investment	---	17,441,231	17,441,231
Total	$175,000	$17,941,231	$18,116,231

SUMMARY PURPOSE AND SCOPE:
This project is the second and final increment to upgrade of the 14x22-Foot Subsonic Tunnel in Building 1212C. It provides a new main drive system, a set of fan blades, and modifications to the model preparation area. The project will provide improvements in drive performance, operational efficiencies, utility usage, operation and maintenance personnel requirements, and reduce life cycle costs. The first increment of this project, identified in the Agency's FY 1999 Initial Operating Plan in the amount of $500,000, provides for design of this design-build procurement.

PROJECT JUSTIFICATION:
The 14x22-Foot Subsonic Tunnel is used for low speed testing of powered and unpowered models of various fixed and rotary wing, civil and military aircraft. The tunnel became operational in 1970. The original drive system, with 1960's vintage drive technology, is still in place and utilizes custom control components that are no longer available. Spare parts have to be custom manufactured. The 14x22 Tunnel is heavily utilized. Closure of the LaRC 30x60-Foot Wind Tunnel has shifted additional experimental programs to the 14x22 Tunnel and requires accommodating added test hardware and increased operational efficiency. Its efficient operation is critical to the current Programs and will continue to be critical and heavily utilized for low speed requirements of future programs. This facility is sought and required by major customers such as Boeing North America, Lockheed Martin, Bell, Sikorsky, and the DOD.

IMPACT OF DELAY:
The frequency and severity of failures will increase due to significantly increased operational demands. A major failure of the drive system would cause an unplanned, two-year downtime and the consequences would be catastrophic to NASA's Program and commitments. The existing level of risk is unacceptable.

PROJECT DESCRIPTION:
The existing 6,650 horsepower (hp), three phase alternating current (ac) induction motor mounted in tandem with a 1,350 hp direct current motor will be replaced with an ac synchronous motor and controls having a maximum capability of 12,000 hp. This matches the existing drive capability at rated overload conditions. The existing motor-generator set, liquid rheostat, and associated controls will be removed. A set of nine fan blades plus one spare blade will be provided. Also included is a portable lift for model cart access, vacuum equipment to mitigate contamination of the models during air bearing operation, and modification of a structural support to facilitate cart movements.

FY 2000 PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
Main Drive Equipment	LS	---	---	$4,800,000
Architectural/Civil/Structural	LS	---	---	400,000
Mechanical	LS	---	---	450,000
Electrical	LS	---	---	1,050,000
Fan Blades	LS	---	---	400,000
Model Prep Area Mods	LS	---	---	200,000
Total				$7,300,000

OTHER EQUIPMENT SUMMARY: None

FUTURE ESTIMATED CONSTRUCTION FUNDING REQUIRED TO COMPLETE THIS PROJECT: None.