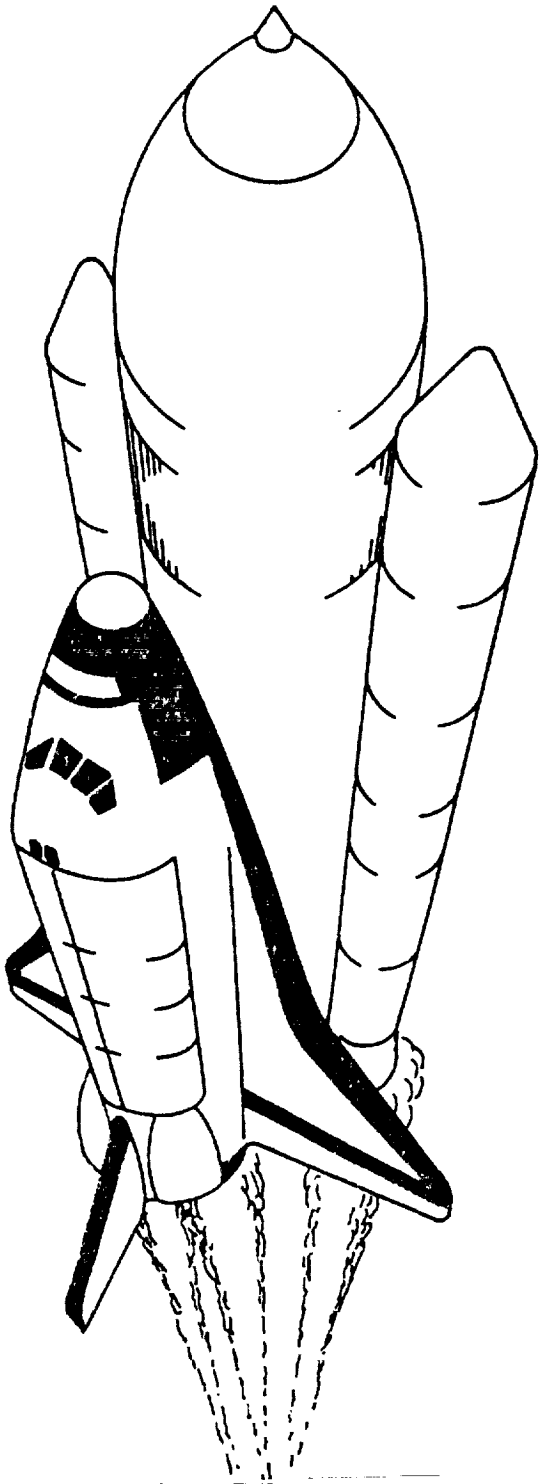
DEVELOPMENT OF A SHUTTLE RECOVERY COMMERCIAL MATERIALS PROCESSING IN SPACE (CMPS) PROGRAM



FINAL REPORT

Prepared for

NASA MARSHALL SPACE FLIGHT CENTER

Prepared by

WYLE LABORATORIES
7800 GOVERNORS DRIVE, WEST
HUNTSVILLE, ALABAMA 35807

WYLE LABORATORIES SCIENTIFIC SERVICES & SYSTEMS GROUP

FINAL REPORT

DEVELOPMENT OF A SHUTTLE RECOVERY COMMERCIAL MATERIALS PROCESSING IN SPACE (CMPS) PROGRAM

NASA CONTRACT NO. NAS8-36109

Prepared for

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

by

WYLE LABORATORIES
Space Engineering and Hardware Division
7800 Governors Drive, West
Huntsville, Alabama 35807

Program Manager:
C.L. Adams

Project Engineer:
T.M. Kozar

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1.0 INTRODUCTION

1.0 INTRODUCTION

The work performed under contract NAS8-36109, from October 1988 to May 1989 has covered five tasks as follows:

Task 1.0	Update Commercial Users Requirements
Task 2.0	Assess Availability of Carriers and Facilities
Task 3.0	Shuttle Availability Assessment
Task 4.0	Development of Optimum Accommodations Plan
Task 5.0	Payload Documentation Requirements Assessment

This report will cover the results from the first four tasks, Task 5 was completed by Center for Space and Advanced Technology (CSAT) and will be delivered under separate cover.

To update commercial user requirements, contacts were made with the JEA and CCDS partners to obtain copies of their most recent official flight requests (NASA form 1637 and 1628). From these requests the commercial partners' short and long range plans for flight dates, flight frequency, experiment hardware and carriers was determined. A 34" by 44" chart was completed to give a snapshot view of the progress of commercialization in space. Further, an assessment was made of the availability of carriers and facilities. Both existing carriers and those under development were identified for use by the commercial partners. A data base was compiled to show the capabilities of the carriers. A shuttle availability assessment was performed using the primary and secondary shuttle manifests released by NASA. Analysis of the manifest produced a flight-by-flight list of flight opportunities available to commercial users. Using inputs from the first three tasks, an Optimum Accommodations Plan was developed. The Accommodation Plan shows the commercial users manifested by flight, the experiment flown, the carrier used and complete list of commercial users that could not be manifested in each calendar year.

Contained herein is the documentation and results from the four tasks mentioned above.

2.0 UPDATE COMMERCIAL USER REQUIREMENTS

2.0 UPDATE COMMERCIAL USER REQUIREMENTS

The Commercialization of Space is a growing area of space activity. The number of commercial investigators continues to expand, broadening the many areas of research in the commercialization of space arena. NASA partnerships with universities and colleges, in the form of Centers for the Commercial Development of Space, currently number 16 covering 7 areas of space commercialization study. Private industry is also showing interest in the benefits of space research. Joint Endeavor Agreements (JEA) and Space Systems Development Agreements (SSDA) between NASA and private industry remain strong, with 6 active JEAs and 3 active SSDAs. To assess the status and needs of the commercial partners, information was gathered to update their requirements. Contacts were made to obtain current flight requests, annual reports and general information from the commercial partners. The information was organized into a 34" x 44" wall chart titled, "Commercial Development of Space as of January 1989". Included on the chart are the research areas, objectives, hardware requested and commercial applications of the CCDSs, JEAs, and SSDAs. Operational parameters and availability dates are shown for the hardware being developed, built and requested by commercial users. A pictorial representation of the above mentioned hardware, borders the chart. A viewgraph presentation was prepared from the wall chart and is included in this section, complete with facing page text.

The resumption of shuttle flights after the Challenger disaster, brought renewed enthusiasm to the commercialization of space community. New requirements for shuttle launch services and flight dates were requested by Code C of all the commercial users to plan for future activity. The commercial partners submitted, "Office of Commercial Programs (OCP) Flight Requests" (NASA Form 1637 and 1628) to NASA. Wyle received a copy of the flight requests submitted, and has updated the "Commercial Payloads Flight Requirements Database" (CPFRD). The CPFRD organizes the flight requests allowing easy access for data retrieval or analysis and lends itself to modification and future updates. Use of the CPFRD was essential in the completion of the "Commercial Flight Accommodation Plan" (CFAP).

2.1 SPACE COMMERCIALIZATION INFRASTRUCTURE

COMPARISON OF AGREEMENTS

Centers for the Commercial Development of Space (CCDS) are composed universities, industry, non-profit research organizations and government laboratories who are interested in space commercialization. Partial funding is provided by NASA for the first five years after which the CCDS must be self-supporting. Research and hardware development are conducted by the CCDS and industrial partners recruited by the CCDS. Launch services are provided by NASA to promote commercialization, and all proprietary data and patents remain the property of the CCDS and the industrial partner.

Joint Endeavor Agreements (JEA) are made between NASA and private industry for space flight projects on a "quid pro quo" basis. There is no exchange of funds, but the company will give NASA usage of their hardware or process (about 25%) to increase the NASA microgravity data base. NASA supplies the launch services, and all proprietary data and patents are retained by the company.

A Space System Development Agreement (SSDA) is also aimed at private industry interested in developing commercial ventures in space. However, the SSDA is more suited to companies interested in developing microgravity facilities and carriers. The venture is entirely self-supported, but the company is allowed to repay launch service costs to NASA on a deferred basis. The company is free to market users of it's hardware or carrier. All proprietary data and patents remain property of the company.

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COMPARISON OF AGREEMENTS

COMMERCIAL
FLIGHTS
ACCOMMODATION
PROGRAM
(CFAP)

AGREEMENT TYPE	MEMBERSHIP	FUNDING	FLIGHT COSTS	PROPRIETARY INFORMATION	PATENTS
CCDS	Academia with private industry partners	Joint NASA-industry for 5 years, self after	NASA	Protected	CCDS/ Industrial Partners
JEA	Private industry	Self	NASA	Protected	Company
SSDA	Private industry	Self	Self, in deferred payments	Protected	Company

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE (CCDS)

To facilitate and support the expanded commercial use of space, the NASA Office of Commercial Programs has created 16 Centers for the Commercial Development of Space. These CCDSs are not-for-profit cooperative partnerships of industry and universities that focus on specific technology areas identified as having potential for future space commercialization.

There are currently seven areas of investigation being developed by the CCDS partners. Life Sciences and Materials Processing are the most active areas.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE (CCDS)

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

AREAS OF INVESTIGATION

- AUTOMATION AND ROBOTICS
- LIFE SCIENCES
- MATERIALS PROCESSING IN SPACE
- REMOTE SENSING
- SPACE POWER
- SPACE PROPULSION
- SPACE STRUCTURES AND MATERIALS

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

TECHNICAL DISCIPLINE: AUTOMATION AND ROBOTICS

The two CCDSs involved in Automation and Robotics are the Wisconsin Center for Space Automation and Robotics (WCSAR) at the University of Wisconsin-Madison and the Center For Autonomous and Man-Controlled Robotic and Sensing Systems (CAMRSS) at the Environmental Research Institute of Michigan.

WCSAR is focusing on three specific areas of study and has acquired a trademark on the names: Astrobotics(TM), Astroculture(TM), and Astrofuel(TM). Astrobotics is defined as automation and robotic technologies for performing functional tasks required of man to live, travel and explore in space. Astroculture is developing agriculture technologies for the production of food supplies and waste recycling to support man's existence in space. Astrofuel is the acquisition of Helium-3 from lunar and planetary sources for supplying fusion energy for use on earth and in-space travel.

CAMRSS also has three major areas of study, Key Space Industrialization Enabling Technologies, Space Servicing, and Terrestrial Robotics and Automation Applications. Key Space Industrialization Enabling Technologies being studied are Machine Vision and Sensing Systems, Robotics and Automated Manufacturing Systems, and Biological Technology for Life Support Systems. Space servicing is the design of space systems for robotic servicing and tooling. Terrestrial Robotics and Automation applications include servicing industrial systems, operation in hazardous environments and use in bio-process, bioreactor, and screen automation.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TECHNICAL DISCIPLINE: AUTOMATION AND ROBOTICS

CCDSs

1. CENTER FOR SPACE AUTOMATION & ROBOTICS, UNIVERSITY OF WISCONSIN - MADISON
2. CENTER FOR AUTONOMOUS AND MAN-CONTROLLED ROBOTIC AND SENSING SYSTEM (CAMRSS), ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION \ CCDS	WISCONSIN	ERIM
Robotics for EVA	●	
Machine Vision and Sensing		●
Robotic & Automated Manufacturing Systems		●
Robotic Servicing and Tooling in Space		●
Robotics for Hazardous Environments		●
Controlled Ecological Life Support System	●	

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

TECHNICAL DISCIPLINE: LIFE SCIENCES

Two CCDSs are engaged in Life Sciences research, the University of Colorado-Boulder and Penn State University. Penn State and the University of Colorado-Boulder are doing research on the effects of space on mammalian cell function. The researchers hope to identify conditions in space that modify cells and tissue which cause disease and develop counter measures that could be used to fight these diseases on earth. Bone decalcification has been identified as a condition that is accelerated in space. Both CCDSs are involved in research to understand the cause of this anomaly and find a solution that will benefit astronauts and those afflicted with the same condition on earth.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TECHNICAL DISCIPLINE: LIFE SCIENCES

CCDSs

1. CENTER FOR BIOSERVE SPACE TECHNOLOGIES, UNIVERSITY OF COLORADO - BOULDER
2. CENTER FOR CELL RESEARCH, PENNSYLVANIA STATE UNIVERSITY

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION \ CCDS	U. OF COLORADO	PENN STATE
Artificial Membranes	●	
Disease Research and Prevention	●	●
Producing/Purifying Biological Molecules		●
New and Improved Pharmaceuticals		●
Water Reclamation	●	
Waste Management	●	
Advanced Design of Lighting Environments		●

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

TECHNICAL DISCIPLINE: MATERIALS PROCESSING IN SPACE (MPS)

Materials Processing is the most active area within the CCDSs. The six centers working in MPS are Battelle Columbus Laboratories, University of Alabama in Huntsville (UAH), Vanderbilt University, Clarkson University, The University of Houston, and The University of Alabama-Birmingham. Battelle and Clarkson are using the microgravity environment of space for the growth of very high quality inorganic crystals such as GaAs and CdTe. These crystals are used in the manufacture of electronic components such as semiconductors. By using the high quality crystals in the manufacturing process semiconductors with improved qualities are produced. An application of these advanced semiconductors are the next generation of high-speed computers.

Most of the commercial activities hope to benefit from the low gravity levels in space and the associated reduction in density driven convective flow, however the University of Houston is interested in the ultra-vacuum available on orbit. The University of Houston has requested space in the cargo bay to perform experiments using a wake shield facility. Using the vacuum swept out by the wake shield as the shuttle orbits the earth, chemical and molecular beam epitaxy experiments will be performed. Potential commercial applications in this area include advanced infrared detectors, superconducting materials, and magneto-optic recording.

Vanderbilt University is focusing its effort on the space processing of metals, alloys and ceramics. Advanced processing techniques to be used are directional solidification, containerless processing and vacuum solid state processing. Hardware identified to support Vanderbilt's research are the Advanced Automated Directional Solidification Furnace (AADSF), Metals and Alloys Solidification Apparatus (MASA), and High-Temperature Acoustic Levitator (HAL).

UAH is performing a wide variety of Materials Processing investigations. These investigations include, foam formation for advance space construction materials, electrodeposition for technologically important catalysts and dry lubrication, non-linear optical monomer thin films and non-linear optical organic crystal for improved optics and telecommunications, and organic separations for cancer and immunology research. UAH is pursuing an aggressive space flight program consisting of both sounding rocket and shuttle flights.

A large portion of UAB's research is dedicated to protein crystal growth in microgravity. Larger and higher quality crystals can be grown on orbit due to the reduction of the forces of gravity and convection. The crystals are studied with x-ray diffraction allowing researchers to ascertain the structure of the crystals. With the information gained by these processes, a better understanding of human diseases is acquired and the ability to engineer new and improved pharmaceuticals to combat diseases.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TECHNICAL DISCIPLINE: MATERIALS PROCESSING IN SPACE

CCDSs

1. CENTER FOR ADVANCED MATERIALS BATTELLE COLUMBUS LABORATORIES
2. CONSORTIUM FOR MATERIALS DEVELOPMENT IN SPACE, UNIVERSITY OF ALABAMA IN HUNTSVILLE
3. CENTER FOR SPACE PROCESSING OF ENGINEERING MATERIALS, VANDERBILT UNIVERSITY
4. CENTER FOR DEVELOPMENT OF COMMERCIAL CRYSTAL GROWTH IN SPACE, CLARKSON UNIVERSITY
5. CENTER FOR SPACE VACUUM EPITAXY, UNIVERSITY OF HOUSTON
6. CENTER FOR MACRO-MOLECULAR CRYSTALLOGRAPHY, UNIVERSITY OF ALABAMA-BIRMINGHAM

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION \ CCDS	BATTELLE	UAH	VANDERBILT	CLARKSON	HOUSTON	UAB
Advanced Coatings & Adhesives	●					
Technologically Important Catalysts	●	●				
Improved Semiconductors	●			●	●	
Processing Techniques for Glass	●					
Advanced Construction Materials		●				
Dry Lubricant		●				
Optics and Telecommunications		●		●	●	
Advanced Alloys		●	●			
Improved Magnets & Thermocouples			●			
High Temp. Composite Materials			●			
Aluminum Casting Technology			●			
Superconducting Materials		●			●	
Cancer and Immunology Research		●				
Disease Research and Prevention						●
New and Improved Pharmaceuticals						●
Research of Liposome Formation						●

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

TECHNICAL DISCIPLINE: REMOTE SENSING

Two CCDSs are working to expand remote sensing applications in the private sector. These CCDSs are The Space Remote Sensing Center at the Institute for Technology Development near Bay St. Louis, Mississippi and The Center for Real-Time Satellite Mapping at Ohio State University. Remote sensing of the earth will provide information on residential, industrial, commercial, and surburban growth and change. Ocean science research will allow a better understanding of tidal patterns and oceanic changes. Improvement in weather prediction capabilities and greater insight into the causes of weather changes are also potential applications of this research area.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TECHNICAL DISCIPLINE: REMOTE SENSING

CCDSs

1. SPACE REMOTE SENSING CENTER, INSTITUTE FOR TECHNOLOGY DEVELOPMENT
2. CENTER FOR REAL-TIME SATELLITE MAPPING, OHIO STATE UNIVERSITY

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION \ CCDS	ITD	OHIO STATE
Earth Science Research	●	●
Ocean Science Research	●	●
Weather Information Service	●	
Advanced Sensor Design	●	
Communications	●	

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

TECHNICAL DISCIPLINE: SPACE POWER

Texas A&M University is working on advanced commercial space power systems, three forms are envisioned: 1. Modular power systems integrated with the space shuttle, space stations or space platforms; 2. Power systems modules capable of docking with shuttles, space stations or space platforms to supply or re-charge on-board facilities. 3. Free flying space power platforms which transmit energy to consumer vehicles or satellites by microwave, laser or transmission line tether. Power generation sources being studied are photovoltaic, solar dynamics and nuclear. Technology development activities include power transmission, energy storage, thermal management and power related services such as electrolysis of water to produce hydrogen and oxygen.

Auburn University's research is directed toward power management, distribution, control and conditioning. Software is being developed to efficiently convert power from the source and time-line the available power to meet peak levels and durations required by commercial users. Research is also being pursued in power system reliability through development of advanced sensors and parallel processing techniques.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TECHNICAL DISCIPLINE: SPACE POWER

CCDSs

1. SPACE POWER INSTITUTE, AUBURN UNIVERSITY
2. CENTER FOR SPACE POWER, TEXAS A&M UNIVERSITY

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION / CCDS	AUBURN	TEXAS A&M
Autonomous Space Power	●	
Advanced Sensors for Power Systems	●	
Power Management System	●	●
Power Switches	●	
Power to Extend Life of Free-Flyers		●
High Power Systems		●
Power Conversion		●
Advanced Fuel Cells		●
Advanced Photovoltaic Power System		●
Heat Pipe Research		●

CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

TECHNICAL DISCIPLINE: 1. SPACE PROPULSION
2. SPACE STRUCTURES AND MATERIALS

The University of Tennessee Space Institute (UTSI) is developing propulsion and thruster technology for advanced space systems. The next generation of orbital vehicles and free flyers will require low-cost efficient propulsion systems. UTSI is studying advanced thrusters and nozzle design, and on-orbit refueling of liquid rocket motors. To monitor the large amount of hardware required for space propulsion, a system component tracking program is being developed.

Research in Space Structures and Materials is on-going at Case Western Rescue University. Materials that can be produced in space and withstand the harsh space environment are the focus of Case Western's effort. To better understand the long-term effects on space on materials, Case Western has submitted an official flight request to retrieve a lunar vehicle left on the moon during one of the Apollo flights, for analysis back on earth.

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CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TECHNICAL DISCIPLINES: 1. SPACE PROPULSION
2. SPACE STRUCTURES AND MATERIALS

CCDSs

1. CENTER FOR ADVANCED SPACE PROPULSION, UNIVERSITY OF TENNESSEE SPACE INSTITUTE
2. CENTER FOR MATERIALS FOR SPACE STRUCTURES, CASE WESTERN RESERVE UNIVERSITY

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION \ CCDS	U. OF TENN.	C W R U
Advanced Thrusters	●	
On-orbit Storage & Refueling Facilities	●	
Liquid Rocket Motor Design Software	●	
High-Area-Ratio Nozzle Design Software	●	
Fault Detection Expert System Software	●	
Propulsion System Component Tracking Software	●	
Improved Space Structures		●
Advanced Composite Materials		●

JOINT ENDEAVOR AGREEMENTS

The JEA is a cooperative agreement between U.S. industry and NASA to encourage private sector space research and commercialization. In most cases the company will provide the flight hardware and scientific expertise while NASA provides the launch services. In exchange for these launch services, NASA has the right to process samples in the industry partner's hardware and share in a portion of the experimental results. NASA agrees to protect the proprietary rights of their JEA partners. Through the JEA, NASA can reduce the cost and risk to industry of space product development until the viability of key technologies can be established.

This chart is a list of companies holding JEAs with NASA, and the commercial applications expected to result from these agreements. JEAs with flight experience are 3M, ITA, and Rockwell. ISC has submitted a formal flight request to fly initially in the fourth quarter of 1992 and Boeing is manifested to fly the Chemical Vapor Transport Experiment on STS 44 in January of 1991. Microgravity Research Associates is in the hardware development stage.

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JOINT ENDEAVOR AGREEMENTS

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

JEAs

1. 3M
2. BOEING
3. INTERNATIONAL SPACE CORPORATION (ISC)
4. INSTRUMENTATION TECHNOLOGY ASSOCIATES (ITA)
5. MICROGRAVITY RESEARCH ASSOCIATES (MRA)
6. ROCKWELL

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION \ JEA	3M	BOEING	ISC	ITA	MRA	ROCKWELL
Improved Electronics		●	●		●	●
Advanced Optics	●	●	●			
Low Cost Experiment Carrier				●		

SPACE SYSTEMS DEVELOPMENT AGREEMENTS (SSDA)

Three commercial partners have SSDAs with NASA; Geostar, Space Industries Inc., and Spacehab Inc. Geostar is planning to launch 3 satellites and 1 transmit/relay craft to provide positioning information to subscribers. The trucking industry is one of many potential users of the Geostar Service. The positioning data provided by Geostar will not only assist in vehicle scheduling but also the location of and assistance to disabled vehicles. Space Industries Inc. is developing the Industrial Space Facility (ISF), a man-tended free flyer for commercial users. The ISF will have shuttle revisits for retrieval of samples, experiment changeout and maintenance. ISF will have docking ports for expansion and possible docking to the Space Station, with an orbital life of approximately 30 years. Spacehab Inc. is developing a middeck augmentation module that will fly in the forward 1/4 of the cargo bay connected to the middeck via a tunnel adaptor. Spacehab will increase the shirt-sleeve middeck environment of the shuttle by 1000 ft^3. The initial flight of Spacehab is scheduled for November of 1991 on STS 51.

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SPACE SYSTEMS DEVELOPMENT AGREEMENTS (SSDA)

COMMERCIAL
FLIGHTS
ACCOMMODATION
PROGRAM
(CFAP)

SSDA

1. GEOSTAR
2. SPACE INDUSTRIES INC. (SII)
3. SPACEHAB INC.

COMMERCIAL APPLICATIONS

COMMERCIAL APPLICATION / CCDS	GEOSTAR	SII	SPACEHAB
Real-time Satellite Based Position Information	●		
Digital Messaging Services	●		
Long-Duration Commercial Payloads Facility		●	
Increase Pressurized Workspace for STS			●

CARRIERS AND FACILITIES

This chart is a pictorial representation of the carriers and facilities currently existing or being developed by commercial partners.

The Industrial Space Facility (ISF) is a man-tend free-flyer being design by Space Industries, Inc. Spacehab is a middeck augmentation model under construction by Spacehab, Inc., to expand the middeck environment by a volume of 1000 ft^3.

The ISEM-H is a GAS CAN-like carrier built by Instrumentation Technology Associates (ITA) that mounts to a Hitchhiker-M in the shuttle cargo bay. ISEM-H is a self-contained carrier, supplying the user power, heat rejection and other utilities. ITA is promoting the ISEM-H as a low-cost, "turn-key" experiment cannister.

The EOS carrier was originally developed by McDonnell-Douglas for their electrophoretic operations in space experiment, but is now being marketed as a general purpose cargo bay experiment carrier. The University of Houston is considering the EOS carrier as a potential platform for their wake shield facility.

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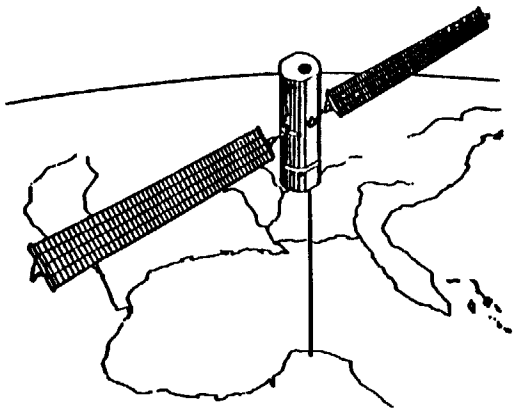
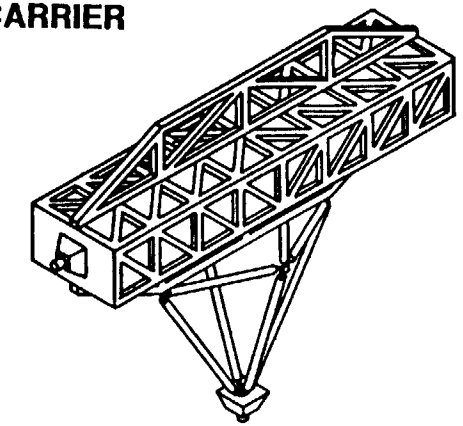
CARRIERS AND FACILITIES

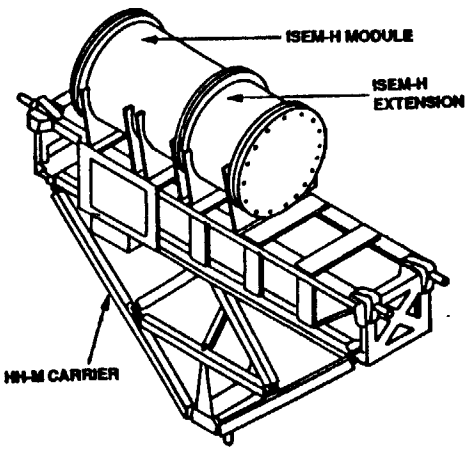
COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)



INDUSTRIAL SPACE FACILITY

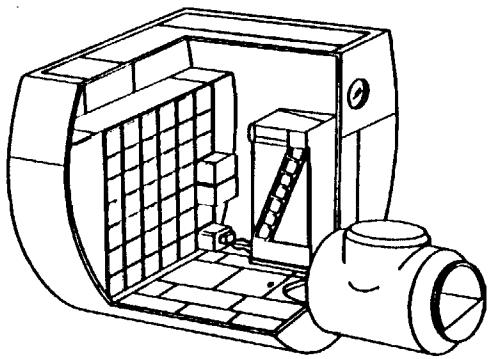
EOS CARRIER





ISEM-H

SPACEHAB



NAME	PAYLOAD WEIGHT (lbs.)	VOLUME (FT^3)	POWER (KW)	NUMBER OF RACKS	NUMBER OF LOCKERS
Industrial Space Facility	13,700	2,500	10.8	7 Double ISF Racks	24
ISEM-H	850	50	1.3	N/A	N/A
EOS Carrier	4,000	N/A	5.6	N/A	N/A
Spacehab	2,500	1,000	1.5	Up to 4 Double Racks	64

EXPERIMENT HARDWARE

ELECTRONIC MATERIALS

The microgravity environment of space holds unique opportunities for research in electronics and optics. Larger and more pure inorganic crystals can be grown in microgravity for improved, high-speed capacity semiconductors. Optical thin films processed in space possess outstanding electro-optical properties which will substantially advance technologies including electro-optical switching and optical amplification for communications. The hardware represented on this chart is being used or developed for research in electronics and optics.

The Crystal Growth Facility, being developed by NASA, has been requested by the Clarkson CCDS for use on their CdTe Crystal Growth Experiment.

Boeing is designing and building the Chemical Vapor Transport Furnace, which is scheduled to fly in a Middeck Accommodations Rack on STS 44.

A concept of the Battelle CCDS Float Zone Crystal Growth Facility is pictured, which will use an advanced version of the current fluids experiment apparatus.

Microgravity Research Associates is developing an Electroepitaxial Crystal Growth experiment for production of pure electroepitaxial crystals.

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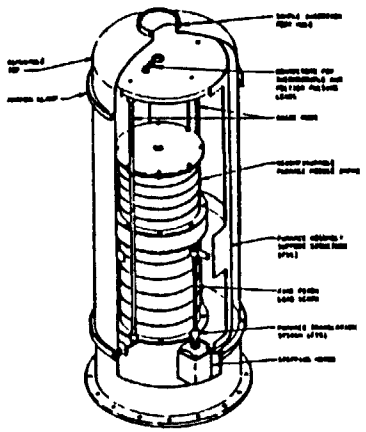
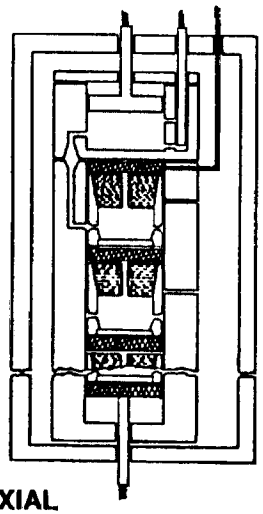
EXPERIMENT HARDWARE
ELECTRONIC MATERIALS

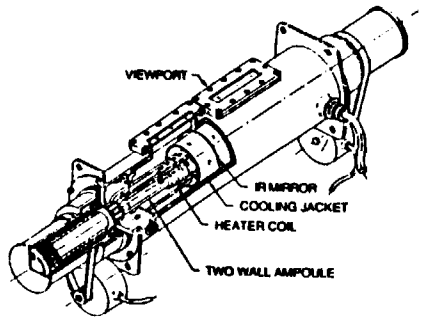
COMMERCIAL
FLIGHTS
ACCOMMODATION
PROGRAM
(CFAP)



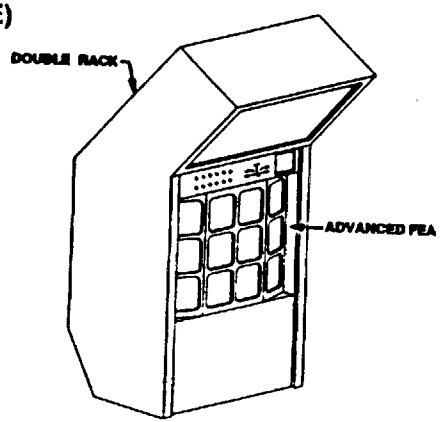
CRYSTAL GROWTH
FACILITY (CGF)



ELECTROEPITAXIAL
CRYSTAL GROWTH (ECG)



CHEMICAL VAPOR
TRANSPORT EXPERIMENT (CVTE)



FLOAT ZONE CRYSTAL
GROWTH FACILITY (FZCGF)

NAME	SPONSOR	PEAK POWER (W)	MASS (kg)	EXPERIMENT RUN DURATION	COOLING	TEMP. °C	CARRIER
CGF	MSFC CODE C	1430	273	276 hrs	Active	200-1600	SL RACK
CVTE	BOEING	1000	160	60 hrs	Active	600-1100	GALLEY (3 FURNACES)
FZCGF	BATTELLE	10000	134	7 hrs - 1 wk	Active	2200	SL RACK
ECG	MRA	20 - 30	1865	1 day - 10 days	Active		SL RACK

EXPERIMENT HARDWARE

ELECTRONIC MATERIALS

This chart is a continuation of the hardware used in electronic and optical investigations by commercial partners.

International Space Corporation's Normal Freezing Furnace (NFF) will fly in an experiment apparatus container on a Material Science Laboratory (MSL) in the cargo bay. NFF will use the directional solidification process to produce improved infrared and semiconductor crystals.

The University of Houston is planning to use a Space Ultra-Vacuum Research Facility, or wake shield for their chemical and molecular beam epitaxy experiments.

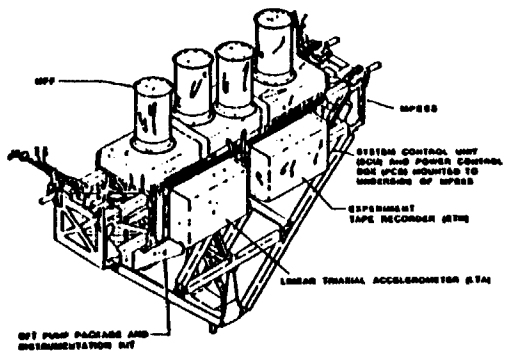
Vapor Crystal Growth System (VCGS) is a NASA owned facility that has been requested by the Clarkson CCDS. VCGS has previously flown on Spacelab-3.

The University of Alabama in Huntsville is using the Non-Linear Optical Organic Furnace (NLOOF) to produce optical crystals and thin films. The NLOOF recently flew on the CONSORT-1 sounding rocket and is scheduled to fly on Spacehab-1 and USML-1.

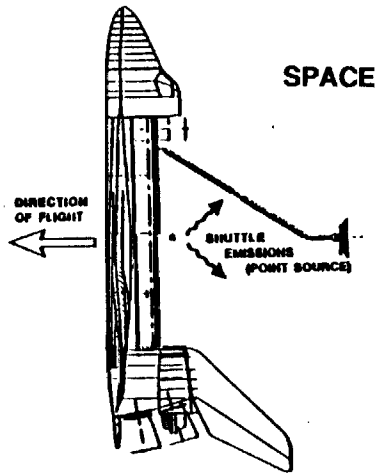
WYLE
LABORATORIES

EXPERIMENT HARDWARE ELECTRONIC MATERIALS

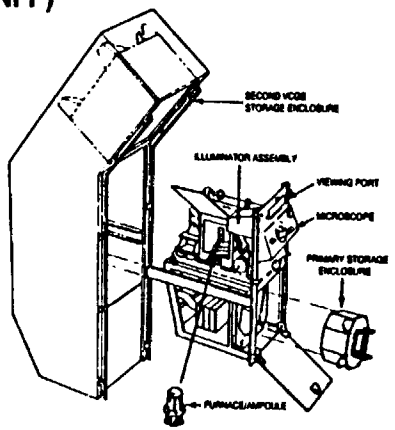
COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)



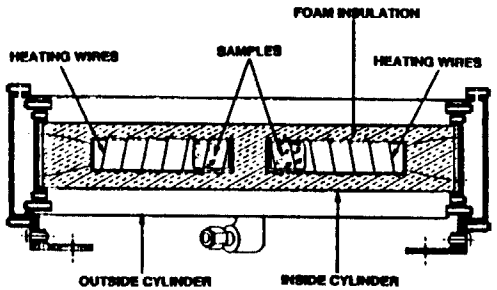
NORMAL FREEZING FURNACE (NFF)



SPACE ULTRA-VACUUM RESEARCH FACILITY (SURF)



VAPOR CRYSTAL GROWTH SYSTEM (VCGS)



NON-LINEAR OPTICAL ORGANIC CRYSTALS (NLOOC)

NAME	SPONSOR	PEAK POWER (W)	MASS (kg)	EXPERIMENT RUN DURATION	COOLING	TEMP. °C	CARRIER
NFF	ISC	1000	181.6	4 hrs	Active	1100	SL RACK
SURF	MSFC CODE C	1519	1247	40 hrs	Passive	Ambient	PALLET
VCGS	MSFC CODE EN			2 hrs - 4 wks	Active	120 - 180	SL SINGLE RACK
NLOOC/NLOMTF	UAH	96	40	120 hrs	Passive	150	GAS CANINSTER

EXPERIMENT HARDWARE

LIFE SCIENCES

Microgravity research activities in the Life Sciences are focused on cells and proteins. Microgravity enables researchers to grow larger and purer crystals that allow study of the crystal structure. Using X-ray diffraction, the structure of the crystal is ascertained so pharmaceuticals can be engineered instead of being developed on a trial and error basis.

The Continuous Flow Electrophoresis System (CFES) was produced by McDonnell-Douglas and purchased by NASA to purify cells and proteins used in pharmaceuticals. CFES was a pioneer for the commercialization of space on early shuttle flights.

The Monodisperse Latex Reactor (MLR) System is a NASA Code E payload that has been requested by the Battelle CCDS. The MLR produced the first commercial space product, latex spheres for precise measurement and calibration.

The University of Alabama - Birmingham has made extensive use of the Protein Crystal Growth 2/3 Hardware. Code E investigators also use PCG 2/3 which evolved from the early hand-held Protein Crystal Growth Unit.

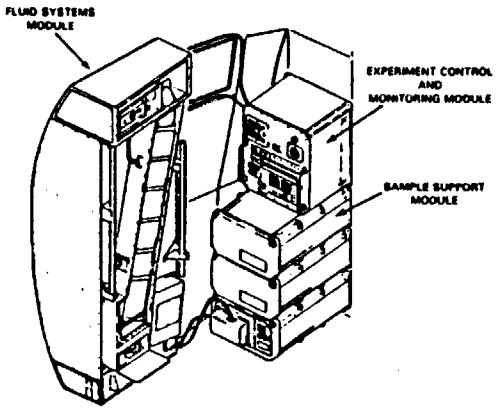
The PCG-IV hardware pictured below is a Phase A concept developed by MSFC. The hardware will be housed in a double rack, and feature a monitor for viewing the crystal growth process. An automated "carousel" will be used to process multiple samples.

Organic Separations is an UAH payload used to separate live cells for cancer and immunology research. The Organic Separations Experiment is planned to fly on Spacehab-1 and USML-1.

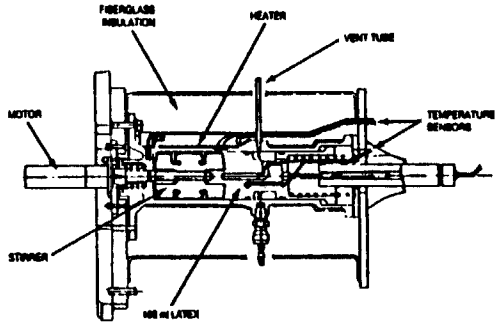
WYLE LABORATORIES

EXPERIMENT HARDWARE LIFE SCIENCES

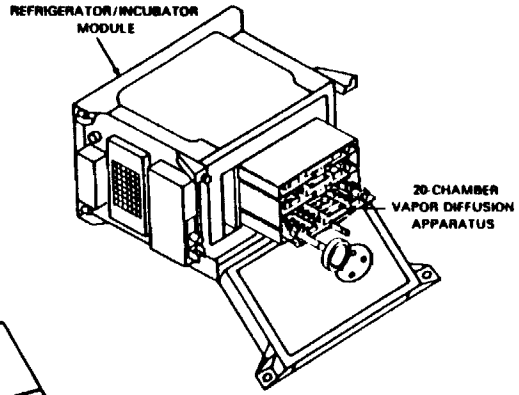
COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)



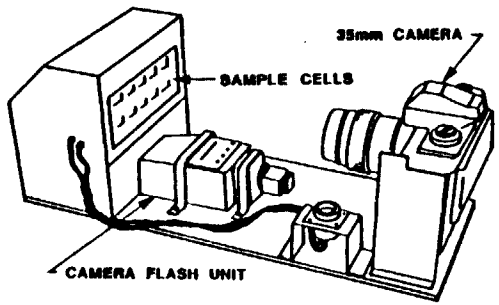
CONTINUOUS FLOW ELECTROPHORESIS SYSTEM (CFES)



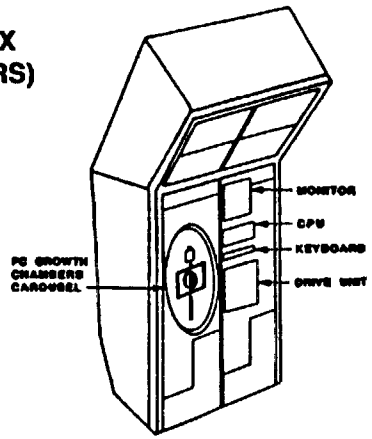
MONODISPERSE LATEX REACTOR SYSTEM (MLRS)



PROTEIN CRYSTAL GROWTH (PCG-2/3)



ORGANIC SEPARATIONS (OS)



PROTEIN CRYSTAL GROWTH-IV (PCG-IV)

NAME	SPONSOR	PEAK POWER (W)	MASS (kg)	EXPERIMENT RUN DURATION	COOLING	TEMP. °C	CARRIER
CFES	NASA	684	376	3.5 hrs - 20 hrs	Active	Ambient	GALLEY
MLRS	MSFC CODE E	382	79	20 - 80 hrs	Passive	70 - 90	LOCKER
PCG 2/3	CODE E/C	90	13.7	12 hrs - 10 wks	Passive	Ambient	LOCKER
PCG IV	CODE E/C			12 hrs - 10 wks	Active	Ambient	DOUBLE RACK
OS	UAH	100	100	10 hrs	Active	25	PORTION SL DBL RACK

EXPERIMENT HARDWARE

MATERIALS PROCESSING

Materials Processing is becoming a mature area of microgravity research, all seven pieces of hardware represented on the next two charts have previously flown on the shuttle or sounding rockets.

3M has built 3 experiment apparatus, Polymer Morphology, Physical Vapor Transport of Organic Solutions and Diffusive Mixing of Organic Solutions. These apparatus are used in organic and polymers science research. They are all middeck type payloads housed in a middeck experiment apparatus and require the space of 3.25 lockers. 3M is the most aggressive of the commercial partners in terms of shuttle flights. Starting in the 4th quarter of 1989 and extending to the year 2000, 3M has submitted 62 flight requests for its hardware.

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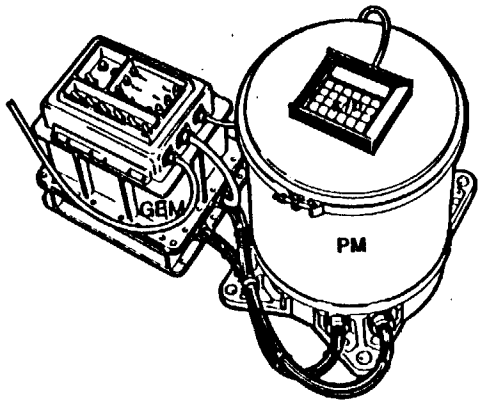
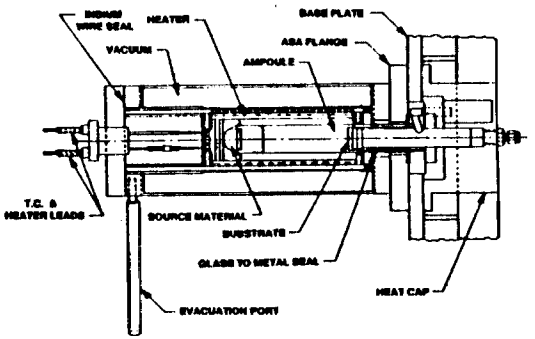
EXPERIMENT HARDWARE MATERIALS PROCESSING

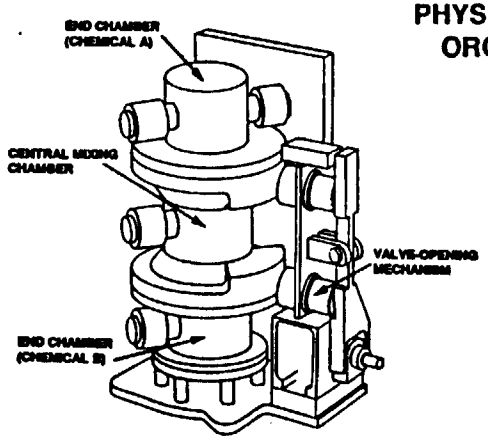
COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)



POLYMER MORPHOLOGY (PM)



PHYSICAL VAPOR TRANSPORT OF ORGANIC SOLUTIONS (PVTOS)



DIFFUSIVE MIXING OF ORGANIC SOLUTIONS (DMOS)

NAME	SPONSOR	PEAK POWER (W)	MASS (kg)	EXPERIMENT RUN DURATION	COOLING	TEMP. °C	CARRIER
PM	3M	150	135	125 hrs	Passive		SL RACK
PVTOS	3M	170	95	16 hrs - 96 hrs	Active	500	LOCKER
DMOS	3M	170	61	1 day - 7 days	Passive	Ambient	LOCKER

EXPERIMENT HARDWARE

MATERIALS PROCESSING

This chart is a continuation of hardware utilized by commercial users for Materials Processing in Space.

Electrodeposition (EDEP) was developed by UAH with support from McDonnell-Douglas for research in surface catalyst production. Commercial applications from the surface catalyst project are wear resistant coatings, dry lubrication and hardening of bearing surfaces.

Foam Formation (FF) is another UAH experiment, used to determine whether the properties of polymer gas foams are affected by preparation in microgravity. Results from the foam formation could lead to stronger, lighter construction materials in space. Both of the UAH payloads (EDEP, FF) flew on the CONSORT-1 sounding rocket flight and are scheduled to fly on Spacehab-1 and USML-1.

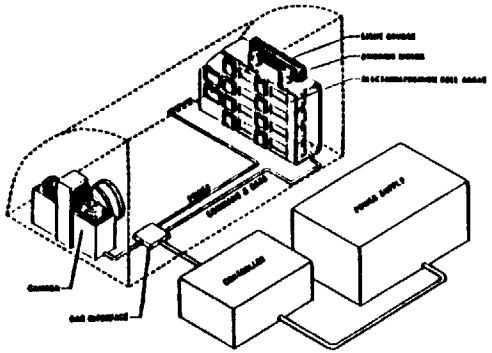
The Fluids Experiment Apparatus (FEA) was designed and built by Rockwell International. The FEA is a middeck payload for materials processing in crystal growth, general liquid chemistry, fluid physics and thermodynamics.

The Materials Dispersion Apparatus (MDA), developed by Instrumentation Technology Associates, is a compact semi-automated device that has the capability of mixing 100 to 200 samples of virtually any two fluids through liquid to liquid diffusion. Due to the versatility of the MDA, organic crystals can be grown for biomedical products and inorganic crystals can be grown for products such as advanced electronics. MDA recently flew on the CONSORT-1 sounding rocket.

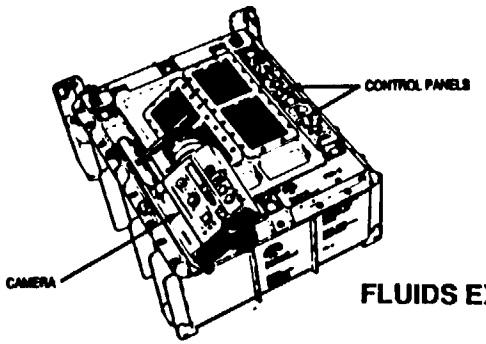
WYLE LABORATORIES

EXPERIMENT HARDWARE MATERIALS PROCESSING

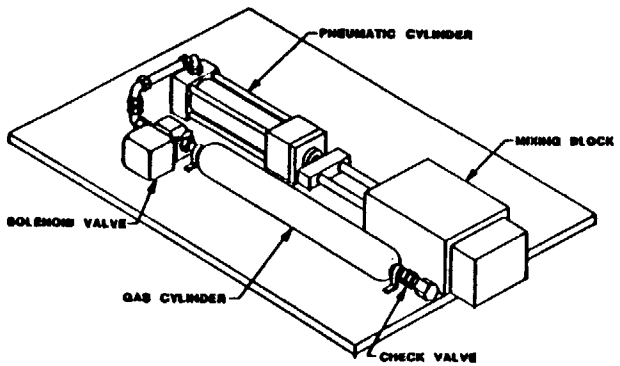
COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)



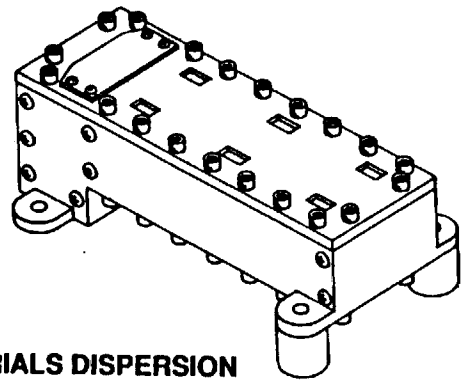
ELECTRODEPOSITION (EDEP)



FLUIDS EXPERIMENT APPARATUS (FEA)



FOAM FORMATION (FF)



MATERIALS DISPERSION APPARATUS (MDA)

NAME	SPONSOR	PEAK POWER (W)	MASS (kg)	EXPERIMENT RUN DURATION	COOLING	TEMP. °C	CARRIER
EDEP	UAH	20	8	32 - 160 hrs	Passive	Ambient	GAS CANNISTER
FEA	ROCKWELL	200	12	88 - 120 hrs	Passive	100	LOCKER
FF	UAH	20	16.1	1 hr	Passive	Ambient	LOCKER
MDA	ITA		2.3	Experiment dependent	Passive	Ambient	LOCKER, GAS CAN.

EXPERIMENT HARDWARE

METALS AND ALLOYS

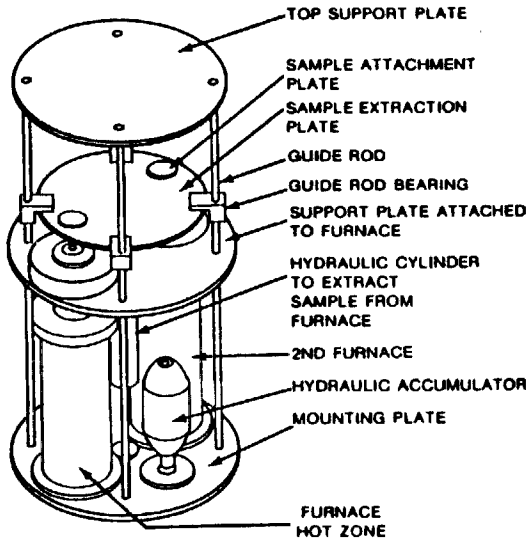
The production of advanced metals and alloys in space will expand knowledge on how gravity limits the melt growth of alloys. This knowledge can then be used to perfect the processing of alloys on earth and lead to commercial production of alloys in space.

The three pieces of hardware represented on this chart are all being developed by NASA and have been requested by the Vanderbilt CCDS for their experiments. Vanderbilt plans to use the Advanced Automated Directional Solidification Furnace for its Directional Solidification of Composite Materials and Aluminum Alloys experiments. The High Temperature Acoustic Levitator will be used in several containerless processing experiments, and the Metal and Alloys Solidification Apparatus will process samples for the Directional Solidification of Oxide Strengthened Materials and Immiscible Alloys experiments.

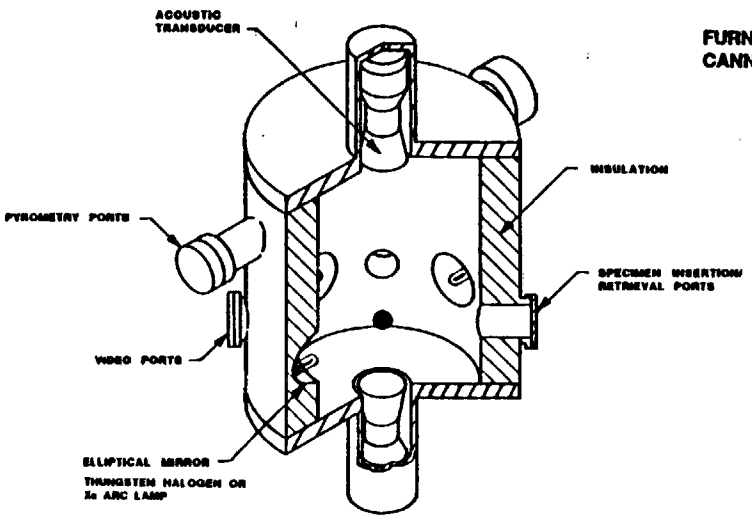
WYLE LABORATORIES

EXPERIMENT HARDWARE METALS AND ALLOYS

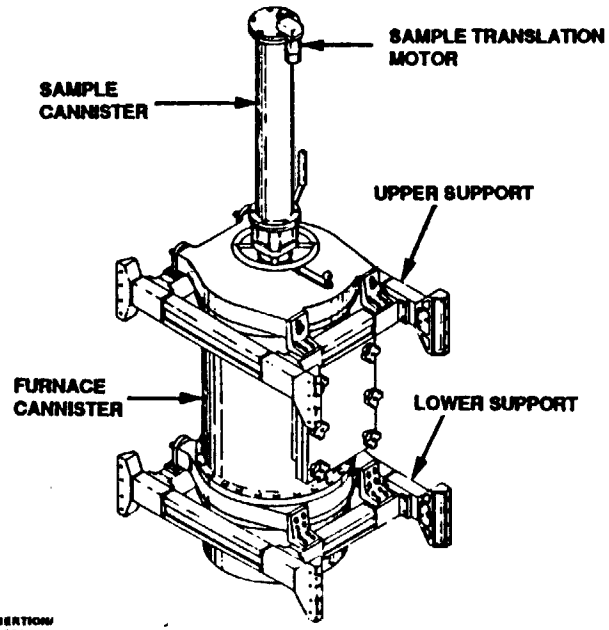
COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)



ADVANCED AUTOMATED DIRECTIONAL SOLIDIFICATION FURNACE (AADSF)



HIGH TEMPERATURE ACOUSTIC LEVITATOR (HAL)



METALS AND ALLOYS SOLIDIFICATION APPARATUS (MASA)

NAME	SPONSOR	PEAK POWER (W)	MASS (kg)	EXPERIMENT RUN DURATION	COOLING	TEMP. °C	CARRIER
AADSF	MSFC CODE EN	1000	90	48 hrs.	Active	1400	MSL
MASA	MSFC	1400	11	4 hrs. - 2 days	Active	1600	SL DBL RACK
HAL	MSFC	4380	220	Approx. 1.5 hr	Active	2200	MSL

2.2 COMMERCIAL PAYLOADS FLIGHT REQUIRMENTS DATABASE

COMMERCIAL PAYLOADS FLIGHT REQUIREMENTS DATABASE (CPFRD)

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: 3M EXPERIMENT: DIFFUSIVE MIXING OF ORGANIC SOLUTIONS (DMOS)

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: TO GROW FROM SOLUTION SINGLE CRYSTALS OF SELECTED ORGANIC MATERIALS OF INTEREST TO 3M'S SCIENCE RESEARCH LAB; TO IDENTIFY AND MODEL MASS TRANSPORT MECHANICS OF SOLUTIONS IN MICROGRAVITY; TO UNDERSTAND AND IMPROVE THE PROCESS OF SOLUTION CRYSTAL GROWTH IN SPACE.

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 10/01/89 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 42.0000 Y or length: 47.0000 Z: 0.00000 VOLUME (cm3): 163950.
MASS (kg, including stowage): 89.0000

REQUESTED CARRIER: 3.25 LOCKER VOLUME % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MAR, SPACELAB, SPACEHAB, CDSF, SPACE STATION

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	100.000	0.00000	
	PEAK:	100.000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 15.0000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	100.000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 2.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.1200
COMMENTS (crew): CREW ACTIVATION REQUIRED. PERIODIC MONITORING AND VOICE-DOWN OF STATUS INDICATORS BY CREW REQUIRED.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): Y VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 156.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NO STRINGENT ORBIT REQUIREMENTS IDENTIFIED.

CONTACT: DR. C.R. PODSIADLY PHONE: 612-733-7229
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 12/01/86
FLIGHTS FLOWN TO DATE: 2 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TBE

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: 3M EXPERIMENT: PHYSICAL VAPOR TRANSPORT OF ORGANIC SOLIDS(PVTOS)

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: GROW CRYSTALINE FILMS ON SELECTED SUBSTUTES OF ORGANIC SOLIDS USING THE PHYSICAL VAPOR TRANSPORT PROCESS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 08/01/88 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 42.0000 Y or length: 47.0000 Z: 0.00000 VOLUME (cm3): 163950.
MASS (kg, including stowage): 86.0000

REQUESTED CARRIER: 3.25 LOCKER VOLUME % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MAR, SPACELAB, SPACEHAB, CDSF, SPACE STATION

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	110.000	0.00000	
	PEAK:	170.000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 4.60000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	170.000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 2.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.1200
COMMENTS (crew): CREW ACTIVATION REQUIRED. PERIODIC MONITORING AND VOICE-DOWN OF STATUS INDICATORS BY CREW REQUIRED.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): Y VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 45.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NO STRINGENT ORBIT REQUIREMENTS IDENTIFIED.

CONTACT: DR. C.R. PODSIADLY PHONE: 612-733-7229
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 12/01/85
FLIGHTS FLOWN TO DATE: 1 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? FLT 25

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: 3M EXPERIMENT: POLYMER MORPHOLOGY (PM)

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: TO STUDY THE POLYMER SPECIFIC RESPONSE TO MICROGRAVITY BY EVALUATING A VARIETY OF POLYMER CHEMICAL STRUCTURES AND CORELATING THE POLYMER ENVIROMENT WITH THE POLYMER MICROSTRUCTURE AND MORPHOLOGY.

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 01/19/89 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 42.0000 Y or length: 47.0000 Z: 0.00000 VOLUME (cm3): 133560.
MASS (kg, including stowage): 82.2000

REQUESTED CARRIER: 3.25 LOCKER VOLUME % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MAR, SPACELAB, SPACEHAB, CDSF, SPACE STATION

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	170.000	0.00000	
	PEAK:	170.000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 18.0000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	170.000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 2.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.1100
COMMENTS (crew): CREW ACTIVATION REQUIRED. PERIODIC MONITORING AND VOICE DOWN OF STATUS INDICATORS REQUIRED.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 130.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NO STRINGENT ORBIT REQUIREMENTS IDENTIFIED.

CONTACT: DR. C.R. PODSIADLY PHONE: 612-733-7229
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 12/01/86
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? FLT 39

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BOEING AEROSPACE CORP. EXPERIMENT: CHEMICAL VAPOR TRANSPORT (CVT)

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: DEVELOP AND DEMONSTRATE THE TECHNOLOGY OF CRYSTAL GROWTH UTILIZYING THE CVT PROCESS. SPECIFICALLY, TO INVESTIGATE THE INFLUENCE OF MICROGRAVITY ON CRYSTAL MORPHOLOGY AND THE MEASUREMENT OF MASS TRANSPORT RATE IN THE ABSENCE OF CONVECTION.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 07/19/90 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): PROTOFLIGHT

DIMENSIONS (cm) X or diameter: 46.0000 Y or length: 203.000 Z: 51.0000 VOLUME (cm3): 434E00.
MASS (kg, including stowage): 259.000

REQUESTED CARRIER: MD ACCOM RACK (MAR) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACELAB, SPACEHAB, SPACE STATION

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	130.000	225.000	
	PEAK:	885.000	290.000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	0.00000	0.00000	AMOUNT (watts): 60.0000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 65.0000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	1125.00	91.0000
CABIN AIR	50.0000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): Y EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 10.000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 4.0000
COMMENTS (crew): EXPERIMENT CHECKOUT AND SAMPLE INSPECTION, MONITORING, SAMPLE CHANGEOUT, SHUTDOWN.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 54.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NONE

CONTACT: VIC SWEBERG PHONE: 206-773-6017
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 05/01/86
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TDB

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: INSTRUMENTATION TECH ASSOC, INC. EXPERIMENT: ITA STANDARDIZED EXPERIMENT MODULE (ISEM)

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: DESIGN, DEVELOP, AND MAKE AVAILABLE AN AFFORDABLE STANDARDIZED EXPERIMENT MODULE PAYLOAD CARRIER COMPATABLE WITH A HITCHHIKER-TYPE STRUCTURE FOR SHUTTLE FLIGHTS TO USERS THROUGH LEASE OR PURCHASE. PRESSURIZED CYLINDER FOR FOUR TO EIGHT SMALL PAYLOADS/ EXPERIMENTS.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 10/01/92 TURNAROUND (months): 18

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): PROTOFLIGHT

DIMENSIONS (cm) X or diameter: 101.600 Y or length: 215.900 Z: 0.00000 VOLUME (cm3): .1750E7
MASS (kg, including stowage): 556.800

REQUESTED CARRIER: HITCHHIKER (M) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS:

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1000.00	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 103.000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): Y DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): Y

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): GROUND CONTROLLED. CONTINGENCY FOR MANUAL STARTUP FROM AFT FLIGHT DECK.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 120.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NO STRINGENT ORBIT REQUIREMENTS IDENTIFIED.

CONTACT: JOHN CASSANTO PHONE: 215-524-1988
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 06/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TDB

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: INTERNATIONAL SPACE CORP. EXPERIMENT: DIRECTIONAL SOLIDIFICATION (PHASE 1)

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: TO PRODUCE SEVERAL INFRARED AND SEMICONDUCTOR CRYSTALS BY DIRECTIONAL SOLIDIFICATION USING THE NORMAL FREEZING FURNACE (NFF). EFFORTS WILL CONCENTRATE ON GALLIUM ARSENIDE, INDIUM PHOSPHIDE, AND CADMIUM TELLURIDE.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 06/01/88 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 102.000 Y or length: 152.000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 68.0000

REQUESTED CARRIER: HH-M USING EAC % USAGE (0-100): 0
OTHER COMPATIBLE CARRIERS: SL PALLET

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	450.000	0.00000	
	PEAK:	850.000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 55.0000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): NONE

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00100 TOTAL RUNTIME REQUIRED (hrs): 0.000

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NONE

CONTACT: JAMES A. RALPH PHONE: 305-254-4186
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 12/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TBD

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: INTERNATIONAL SPACE CORP. EXPERIMENT: DIRECTIONAL SOLIDIFICATION (PHASE 2)

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: TO PRODUCE SEVERAL INFRARED AND SEMICONDUCTOR CRYSTALS BY DIRECTIONAL SOLIDIFICATION USING THE NORMAL FREEZING FURNACE (NFF). EFFORTS WILL CONCENTRATE ON GALLIUM ARSENIDE, INDIUM PHOSPHIDE, AND CADMIUM TELLURIDE.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 10/01/88 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 102.000 Y or length: 152.000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: HH-M USING EAC % USAGE (0-100): 0
OTHER COMPATIBLE CARRIERS: SL PALLET

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	650.000	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied) -
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): NONE

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00100 TOTAL RUNTIME REQUIRED (hrs): 0.000

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NONE

CONTACT: JAMES A. RALPH PHONE: 305-254-4186
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 12/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TDB

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: INTERNATIONAL SPACE CORP. EXPERIMENT: DIRECTIONAL SOLIDIFICATION (PHASE 3)

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: TO PRODUCE SEVERAL INFRARED AND SEMICONDUCTOR CRYSTALS BY DIRECTIONAL SOLIDIFICATION USING THE NORMAL FREEZING FURNACE (NFF). EFFORTS WILL CONCENTRATE ON GALLIUM ARSENIDE, INDIUM PHOSPHIDE, AND CADMIUM TELLURIDE.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 04/01/90 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 102.000 Y or length: 152.000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: MSL % USAGE (0-100): 0
OTHER COMPATIBLE CARRIERS: SL PALLET

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	800.000	0.00000	
	PEAK:	1250.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): NONE

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00100 TOTAL RUNTIME REQUIRED (hrs): 0.000

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: NONE

CONTACT: JAMES A. RALPH PHONE: 305-254-4186
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 12/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TDB

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: MICROGRAVITY RESEARCH ASSOC. EXPERIMENT: ELECTROEPITAXIAL CRYSTAL GROWTH

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: TO DEMONSTRATE FEASIBILITY OF COMMERCIAL PRODUCTION OF ELECTROEPITAXIAL GROWN SEMICONDUCTOR CRYSTALS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 06/01/88 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 91.4000 Y or length: 91.4000 Z: 76.2000 VOLUME (cm3): 636573.
MASS (kg, including stowage): 363.000

REQUESTED CARRIER: MSL % USAGE (0-100): 33
OTHER COMPATIBLE CARRIERS: SPACELAB (USML1)

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1000.00	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 120.000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	1000.00	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): Y DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): Y

OPERATIONS
CREW TIME REQUIRED (hrs): 1.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): CREW REQUIREMENTS ARE TDB.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 120.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: PURGE GAS (HELIUM, HYDROGEN (90%/10%)). NO STRINGENT ORBIT REQUIREMENTS IDENTIFIED.

CONTACT: ROBERT PACE PHONE: 205-539-0781
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 03/01/83
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TDB

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: MICROGRAVITY RESEARCH ASSOC. EXPERIMENT: ELECTROEPITAXIAL CRYSTAL GROWTH

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: TO PERFORM FLIGHT RESEARCH NECESSARY TO PROVE THE CONCEPT AND TO VERIFY SCALEUP TECHNIQUES REQUIRED PRIOR TO THE SPACE COMMERCIALIZATION OF ELECTROEPITAXIAL GROWN SEMICONDUCTOR CRYSTALS.

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 12/01/89 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: MSL % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACE STATION

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	7000.00	0.00000	
	PEAK:	7000.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 840.000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	7000.00	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): CREW REQUIREMENTS ARE TDB.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 120.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: DIMENSIONS AND MASS PROPERTIES ARE TDB.

CONTACT: ROBERT PACE PHONE: 205-539-0781
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 03/01/83
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? TDB

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: ROCKWELL INTERNATIONAL CORP. EXPERIMENT: FLOATING ZONE CRYSTAL GROWTH

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: ADVANCEMENT OF FLOATING ZONE CRYSTAL GROWTH TECHNOLOGY AND PRODUCTION OF SCIENTIFICALLY VALUABLE SINGLE CRYSTAL SEMICONDUCTOR MATERIAL.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 08/04/88 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 37.0000 Y or length: 43.0000 Z: 19.0000 VOLUME (cm3): 30229.0
MASS (kg, including stowage): 36.0000

REQUESTED CARRIER: 1.5 MIDDECK LOCKERS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MAR, SPACELAB, SPACEHAB, CDSF, SPACE STATION

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	50.0000	
	PEAK:	0.00000	100.000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	
TOTAL ENERGY (kwh): 3.20000				

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	50.0000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 40.000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 2.0000
COMMENTS (crew): SETUP, INITIALIZATION, SAMPLE CHANGEOUT, SHUTDOWN.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00100 TOTAL RUNTIME REQUIRED (hrs): 64.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: 64 HOURS TOTAL EXPERIMENT DURATION. WOULD LIKE A RECORD OF ALL SHUTTLE MAJOR DISTURBANCE EVENTS (OMS FIRINGS, ETC.). EXPERIMENT REQUIREMENTS SHOULD NOT IMPOSE ANY CONSTRAINTS ON THE MISSION.

CONTACT: MIKE MARTIN PHONE: 213-922-4083
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? JEA
IF APPROVED, WHEN SIGNED? 03/01/87
FLIGHTS FLOWN TO DATE: 1 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? FLT 29

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE EXPERIMENT: HYDROTHERMAL INORGANIC CRYSTAL GROWTH

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: THIS EXPERIMENT WILL SYNTHESIZE ZEOLITE CRYSTALS IN A LOW TEMPERATURE FURNACE.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 91.0000

REQUESTED CARRIER: MIDDECK LOCKERS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MAR, SPACEHAB

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): Y DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 3.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): LOADING SAMPLES; TURN APPARATUS SWITHCHES ON/OFF, OBSERVE PERIODICALLY.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 144.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: HARDWARE WILL BE DESIGNED TO BE COMPATIBLE WITH SEVERAL POTENTIAL PAYLOAD CARRIER SYSTEMS, INCLUDING MIDDECK ACCOMMODATION RACK, SPACEHAB, OR MIDDECK LOCKERS.

CONTACT: FRANK JELINEK PHONE: 614-424-6375
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE EXPERIMENT: POLYMER COMPOSITES

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: THE OBJECTIVE OF THIS EXPERIMENT IS TO CATALYTICALLY CURE SEVERAL LIQUID POLYMER SYSTEMS UNDER MICROGRAVITY CONDITIONS.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 10/01/90 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 25.0000 VOLUME (cm3): 28600.0
MASS (kg, including stowage): 27.0000

REQUESTED CARRIER: MIDDECK LOCKER % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: GAS

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	150.000	0.00000	
	PEAK:	150.000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.15000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.2500 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): ACTIVATE AND DEACTIVATE EXPERIMENT.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 0.250

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: EXPERIMENT WILL ALSO FLY ON SOUNDING ROCKET IN FALL 1989. PAYLOAD COULD BE ACCOMMODATED IN MIDDECK OR GAS CAN.

CONTACT: FRANK JELINEK PHONE: 614-424-6376
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE EXPERIMENT: MEMBRANE FORMATION

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: TO PRODUCE CONTROLLED POROSITY POLYMER EMEBRANES BY DIFFUSION OF ORGANIC SOLVENTS FROM THIN FILM POLYMER MEMBRANES.

NUMBER OF LAUNCHES: 5 REQUESTED 1ST LAUNCH: 01/07/89 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 4.50000

REQUESTED CARRIER: MIDDECK LOCKER % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS:

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.2000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.2000
COMMENTS (crew): TURN A VALVE.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 0.000

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS:

CONTACT: FRANK JELINEK PHONE: 514-424-5376
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE EXPERIMENT: DOPED NON-LINEAR OPTIC SUBSTRATES

EXPERIMENT #: 4

EXPERIMENT OBJECTIVES: THIS EXPERIMENT WILL DETERMINE THE EFFECT OF MICROGRAVITY ON NON-LINEAR OPTIC PROPERTIES OF POLYMERIC MATERIALS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 01/01/90 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 53530.0
MASS (kg, including stowage): 10.0000

REQUESTED CARRIER: MIDDECK LOCKER % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: GAS CAN.

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): ACTIVATE/DEACTIVATE EXPERIMENT.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 1.250

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: EQUIPMENT WILL ALSO FLY ON A SOUNDING ROCKET IN FALL 1989. COULD BE ACCOMMODATED IN MIDDECK OR GAS CAN.

CONTACT: FRANK JELINEK PHONE: 614-424-6375
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE

EXPERIMENT: FLOAT ZONE CRYSTAL GROWTH OF CdTe

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: MICROGRAVITY MATERIALS PROCESSING EXPERIMENT TO DEMONSTRATE THE FEASIBILITY OF PRODUCING LARGE, HIGH-QUALITY, SINGLE-CRYSTAL SPECIMENS OF CADMIUM TELLURIDE (CdTe.. THESE SPECIMENS WILL BE USED IN SUBSEQUENT DEVICE-PERFORMANCE TESTS.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 07/01/93 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 91.0000

REQUESTED CARRIER: SPACELAB RACK % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS:

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 6.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): SAMPLE INSERTION/REMOVAL, MONITORING, MINOR SERVICING, ACTIVATE/DEACTIVATE.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 96.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: EACH SAMPLE WILL REQUIRE 8 HOURS TO PROCESS. A TOTAL OF SIX SAMPLES ARE SLATED TO BE PROCESSED. CREWTIME OF 1 HOUR PER SAMPLE IS ESTIMATED.

CONTACT: FRANK JELINEK PHONE: 614-424-6376
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE EXPERIMENT: POLYMER MEMBRANES

EXPERIMENT #: 6

EXPERIMENT OBJECTIVES: THE OBJECTIVE OF THIS EXPERIMENT IS TO FLASH EVAPORATE MIXED SOLVENT SYSTEMS IN THE ABSENCE OF CONVECTION TO CONTROLL THE POROSITY OF A POLYMER MEMBRANE.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 03/01/90 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 57000.0
MASS (kg, including stowage): 5.00000

REQUESTED CARRIER: MIDDECK LOCKER % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: YES

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.2000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.2000
COMMENTS (crew): TURN A VALVE.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 0.000

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: SAME EQUIPMENT DESIGN AS THE MEMBRANE FORMATION EXPERIMENT PROPOSED BY BATTELLE.

CONTACT: FRANK JELINEK PHONE: 614-424-6375
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: BATTELLE

EXPERIMENT: INORGANIC CRYSTAL GROWTH FROM SOLUTION

EXPERIMENT #: 7

EXPERIMENT OBJECTIVES: TO DEMONSTRATE THE FEASIBILITY OF PRODUCING INORGANIC CRYSTALS BY SOLUTION GROWTH UNDER MICROGRAVITY CONDITIONS USING THE CURRENT OR MODIFIED VERSION OF THE MONODISPERSE LATEX REACTOR (MLR).

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 01/07/89 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 73.0000

REQUESTED CARRIER: MIDDECK EAC % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: NONE

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	75.0000	0.00000	
	PEAK:	382.000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.2000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.2000
COMMENTS (crew): ACTIVATION AND DEACTIVATION OF EXPERIMENT.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 73.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: POWER IN PREPROCESS MODE IS 75 WATTS. EXPERIMENT WILL UTILIZE THE MLR HARDWARE.

CONTACT: FRANK JELINEK PHONE: 614-424-5375
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? 0

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: CASE WESTERN

EXPERIMENT: COMPOSITE MATERIALS FOR LUNAR STRUCTURES ENVIRONMENTAL TEST FIXTURE

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: SEMI-PERMANENT LUNAR ENVIRONMENTAL TEST FIXTURE, DESIGNED TO EVALUATE AND REPORT THE LONG TERM STABILITY OF COMPOSITE MATERIALS PLACED IN SERVICE ON THE LUNAR SURFACE.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 03/01/95 TURNAROUND (months):-0-

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): 909.000

REQUESTED CARRIER: TBD % USAGE (0-100):-0-
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1700.00	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	1700.00	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): Y DATA RECORDING (y/n): Y EXTERNAL CONTROL (y/n): Y DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): Y

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): CREW REQUIREMENTS ARE TO BE DETERMINED. SOME MINOR ASSEMBLY IS ANTICIPATED.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: THIS FLIGHT REQUEST WOULD BE OPTIMIZED BY THE RETURN OF A PREVIOUSLY DISCARDED SPACE VEHICLE OR STRUCTURAL SUBSYSTEM FROM THE LUNAR SURFACE. THE ASSUMPTION IS THAT THE DEPLOYMENT OF THE LUNAR MATERILAS TEST FIXTURE WOULD BE PERFORMED CONVENIENT WITH THE RECOVERY OF A LUNAR VEHICLE.

CONTACT: JOHN WALLACE PHONE: 216-368-4222
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CASE WESTERN

EXPERIMENT: LONG DURATION EXPOSURE OF COMPOSITE MATERIALS FOR SPACE STRUCTURES

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: DETAILED PAYLOAD DESCRIPTION IS TBD. CURRENTLY THERE EXISTS A REQUIREMENT TO PERFORM REAL TIME MULTIPLE LONG DURATION COMPOSITE MATERIALS FOR SPACE STRUCTURES, ENVIRONMETAL DEGREDATION EXPERIMENTS AND VERIFICATIONS.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/94 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: SPACEHAB % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: LDEF

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): Y DATA RECORDING (y/n): Y EXTERNAL CONTROL (y/n): Y DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): Y

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): CREW REQUIREMENTS ARE TBD.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 8750.

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: RETURN OF LDEF-1 SPACECRAFT AND SUBSEQUENT SCIENTIFIC INVESTIGATION OF THE STRUCTURE AND EXPERIMENTS, SHALL BE THE MECHNISM FOR FINALIZATION OF THIS FLIGHT REQUEST.

CONTACT: JOHN WALLACE PHONE: 215-368-4222
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CASE WESTERN

EXPERIMENT: EXTENDED DURATION SPACE ENVIRONMENT COMPOSITE MATERIALS EXPOSURE (EDSEE)

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: EXTENDED DURATION COMPOSITES SPACE STRUCTURES MATERIALS EXPOSURE TO ATOMIC OXYGEN FLUX.

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 72.0000 Z:-0- VOLUME (cm3): 147000.
MASS (kg, including stowage): 77.0000

REQUESTED CARRIER: GAS (5 CU. FT.) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: HITCHHIKER-G

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 4.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): OPEN/CLOSE GAS CAN

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 504.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: BAY

REMARKS: THE ANTICIPATED BAY FORWARD FLIGHT ATTITUDES OF THE ASML-1,2,3,4 IS ESSENTIAL TO THE SCIENTIFIC WORTH OF THIS EXPERIMENT. HOWEVER DE-SCOPE OF THE EXPERIMENT TO HARD VACUUMS EXPOSURE IS FEASIBLE. THIS EXPERIMENT REQUIRES THE USE OF THE SPOC MOTORIZED DOOR CANISTER.

CONTACT: JOHN WALLACE PHONE: 216-358-4222
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CASE WESTERN

EXPERIMENT: LIMITED DURATION SPACE ENVIRONMENT COMPOSITE MATERIALS EXPOSURE.

EXPERIMENT #: 4

EXPERIMENT OBJECTIVES: EVALUATION OF CANDIDATE SPACE STRUCTURE COMPOSITE MATERIALS FOR DEGRADATION DUE TO EXPOSURE TO SPACE ENVIRONMENTS USING GET-AWAY-SPECIAL MOTORIZED DOOR CANISTERS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 03/01/90 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 72.0000 Z:-0- VOLUME (cm3): 147000.
MASS (kg, including stowage): 68.0000

REQUESTED CARRIER: GAS (5 CU. FT.) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: HITCHHIKER-G

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 3.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 3.0000
COMMENTS (crew): CLOSE MOTORIZED DOOR OF GAS CAN.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 168.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: SUN

REMARKS: 20 MINUTES OR MORE OF DIRECT EXPOSURE TO THE SUN FOLLOWED BY AN ORBITER ATTITUDE WHICH WOULD OFFER THE MAXIMUM AMOUNT OF ATOMIC OXYGEN FLUX INTO THE OPENED CANISTER FOR THE LONGEST DURATION POSSIBLE IS REQUIRED. THE USE OF HH-G PLATFORM WOULD INCREASE THE SCIENTIFIC WORTH OF THE EXPERIMENT.

CONTACT: JOHN WALLACE PHONE: 216-368-4222
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE: -0- IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CLARKSON

EXPERIMENT: NON-LINEAR OPTICAL AND TRIGLYCINE SULFATE CRYSTAL GROWTH (NLO-1)

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: A COMMERCIAL QUANTITY OF TGS AND A HIGHLY NON-LINEAR OPTICAL MATERIAL WILL BE GROWN FROM AN AQUEOUS SOLUTION AT 45 DEGREES C.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 10/01/92 TURNAROUND (months): 5

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 72.0000 Z:-0- VOLUME (cm3): 141500.
MASS (kg, including stowage): -0-

REQUESTED CARRIER: GAS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: NONE

CONTACT: WILLIAM WILCOX PHONE: 315-268-2326
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 09/01/86
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CLARKSON EXPERIMENT: ZEOLITE CRYSTAL GROWTH

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: A NUMBER OF 20ML VIALS OF VARIOUS ZEOLITES WILL BE PARTICIPATED ON ORBIT AT TEMPERATURES RANGING FROM 100 DEGREES C TO 170 DEGREES C.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 50.0000 VOLUME (cm3): 114400.
MASS (kg, including stowage): -0-

REQUESTED CARRIER: MIDDECK LOCKER (2) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: NONE

CONTACT: WILLIAM WILCOX PHONE: 315-253-2336
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 09/01/85
FLIGHTS FLOWN TO DATE:-0- , IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CLARKSON EXPERIMENT: LIQUID ENCAPSULATED MELT ZONE OF INDIUM (LEMZ-1)

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: THE PROCESS FEASIBILITY OF THE LIQUID ENCAPSULATED MELT ZONE TECHNIQUE WILL BE INVESTIGATED IN SPACE AT RELATIVELY LOW MELT TEMPERATURES (150 DEGREES C).

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 25.0000 Z: 44.0000 VOLUME (cm3): 57000.0
MASS (kg, including stowage): -0-

REQUESTED CARRIER: MIDDECK LOCKER % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: NONE

CONTACT: WILLIAM WILCOX PHONE: 315-268-3336
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 09/01/86
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CLARKSON EXPERIMENT: CHEMICAL VAPOR TRANSPORT OF CADMIUM TELLURIDE (CVTE)

EXPERIMENT #: 4

EXPERIMENT OBJECTIVES: THE BEHAVIOR OF VAPOR TRANSPORT IN SPACE ALONG WITH THE QUALITY OF THE RESULTING CDTE CRYSTAL WILL BE INVESTIGATED.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): PROTOFLIGHT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: MAR % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: NONE

CONTACT: WILLIAM WILCOX PHONE: 315-353-3335
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 09/01/65
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: CLARKSON EXPERIMENT: DIRECTIONAL SOLIDIFICATION OF CADMIUM TELLURIDE (DSCT)

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: A COMMERCIAL QUANTITY OF CADMIUM TELLURIDE WILL BE GROWN IN SPACE IN A TWO ZONE MELT FURNACE AT 1050 DEGREES C.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 02/01/93 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: GAS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MSL

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: NONE

CONTACT: WILLIAM WILCOX PHONE: 315-268-2336
HAS JEA (MOU OR OTHER PROGRAM) SEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 09/01/86
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: PENN STATE EXPERIMENT: PHYSIOLOGICAL SYSTEMS EXPERIMENT (PSE)

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: THE PURPOSE OF THE PHYSIOLOGICAL SYSTEMS EXPERIMENT IS TO EXAMINE THE EFFECTS OF HORMONE THERAPY ON CHANGES IN ORGANIC SYSTEMS KNOWN TO OCCUR DURING SPACEFLIGHT.

NUMBER OF LAUNCHES: 5 REQUESTED 1ST LAUNCH: 03/01/90 TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 50.0000 VOLUME (cm3): 114000.
MASS (kg, including stowage): 27.0000

REQUESTED CARRIER: MIDDECK LOCKERS (2) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	36.0000	-0-	
	PEAK:	47.0000	-0-	
ASCENT/DESCENT	NORMAL:	36.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	47.0000	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	36.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	47.0000	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 336.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: THE PSE WILL UTILIZE 2 ANIMAL ENCLOSURE MODULES (AEM), EACH HOUSING 6 RATS. THE RESULTS OF THIS EXPERIMENT ARE DIRECTLY APPLICABLE TO DISEASES ON EARTH, CAUSED BY HORMONE DEFECTS, WHICH AFFECT SYSTEMS SUCH AS MUSCLE, BONE AND IMMUNE SYSTEMS. LATE LOADING AND EARLY ACCESS IS REQUIRED.

CONTACT: WESLEY HYMER PHONE: 814-865-5132
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: PENN STATE EXPERIMENT: BONE #1 AND #2

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: GROWTH HORMONE AND OSTEOPOROSIS

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 11/01/89 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or Diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 87300.0
MASS (kg, including stowage): 18.0000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	20.0000	-0-	
	PEAK:	-0-		
ASCENT/DESCENT	NORMAL:	20.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	20.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 336.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: LATE PAYLOAD INSTALLATION AND EARLY ACCESS IS DESIRED. THIS EXPERIMENT WILL UTILIZE AN ANIMAL ENCLOSURE MODULE (AEM).

CONTACT: WESLEY HYMER PHONE: 814-865-9182
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: PENN STATE EXPERIMENT: GRANULES

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: CONTINUOUS FLOW ELECTROPHORESIS SYSTEM TO SEPARATE PITUITARY GLAND GRANULES.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/91 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): 277.000

REQUESTED CARRIER: CFES (GALLEY REPLACE % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACELAB

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	360.000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 6.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 2.0000
COMMENTS (crew): RUN CFES A TOTAL OF 3 RUNS, EACH RUN WILL LAST APPROXIMATELY 1 DAY.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 55.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: LATE LOADING OF SAMPLES PRIOR TO LAUNCH (6 HRS.) AND EARLY RETRIEVAL IS REQUIRED.

CONTACT: WESLEY HYMER PHONE: 814-865-9182
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: PENN STATE

EXPERIMENT: NON-INVASIVE DUAL PHOTON BONE DENSITOMETER MINIATURIZATION (DPA)

EXPERIMENT #: 4

EXPERIMENT OBJECTIVES: INSTRUMENT TO MEASURE BONE MINERAL DENSITY.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/91 TURNAROUND (months): 15

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): 51.0000

REQUESTED CARRIER: SPACEHAB X USAGE (0-100):-0-
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	550.000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 3.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): 30 MINUTES EVERY THIRD DAY.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 534.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: WESLEY HYMER PHONE: 814-865-9182
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: PENN STATE EXPERIMENT: DRUG DELIVERY

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: ESTROGEN AND OSTEOPOROSIS

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 09/01/90 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 57200.0
MASS (kg, including stowage): 18.0000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	20.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	20.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	20.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 335.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: THIS EXPERIMENT REQUIRES THE USE OF A ANIMAL ENCLOSURE MODULE. LATE INSTALLATION PRIOR TO LAUNCH AND EARLY RETRIEVAL IS REQUIRED.

CONTACT: WESLEY HYMER PHONE: 814-865-9132
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/DODS/SPONSOR: TEXAS A&M EXPERIMENT: MICRO HEAT PIPE EVALUATION

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: COMBINATION OF SEVERAL CHARGED AND UNCHARGED MICRO HEAT PIPES. THE OBJECTIVE IS TO DETERMINE EFFECT OF LOW GRAVITY ON THE OPERATION OF PHASE CHANGE HEAT TRANSFER IN SMALL CAPILLARY CHANNELS.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 01/01/91 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 72.0000 Z:-0- VOLUME (cm3): 147000.
MASS (kg, including stowage): 11.0000

REQUESTED CARRIER: SAS (5 CU. FT.) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	5.00000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: ALTON PATTON PHONE: 409-845-7441
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? DODS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: TEXAS A&M EXPERIMENT: MICROWAVE POWER TRANSMISSION DEMONSTRATION/ PHASE I

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: MICROWAVE TRANSMITTER, ANTENNA, RECTENNA, CONTROL METERS AND ELECTRONICS USED FOR IN-SPACE DEMONSTRATION OF POWER TRANSMISSION AT 2.45 GHZ.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months):-0-

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): 227.000

REQUESTED CARRIER: HITCHHIKER-M % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1300.00	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 43.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: ALTON PATTON PHONE: 409-845-7441
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: TEXAS A&M EXPERIMENT: MICROWAVE POWER TRANSMISSION DEMONSTRATION/ PHASE II

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: MICROWAVE TRANSMITTER, ANTENNA, RECTENNA, CONTROL METERS AND ELECTRONICS USED FOR IN-SPACE POWER TRANSMISSION AT 35 GHZ.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 03/01/94 TURNAROUND (months):-0-

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): 227.000

REQUESTED CARRIER: HITCHHIKER-M % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1300.00	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 72.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: ALTON PATTON PHONE: 409-845-7441
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: UAH EXPERIMENT: GETAWAY SPECIAL #105

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: TO GROW NON-LINEAR OPTICAL ORGANIC CRYSTALS AND THIN FILMS, INVESTIGATE POLYMER DEMIXING, PRODUCE NEW SURFACES WITH ELECTRODEPOSITION AND CODEPOSITION AND TO DEVELOP AND DEMONSTRATEGEMMIC RAY SENSOR MATERIAL.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 06/01/90 TURNAROUND (months): 0

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 71.0000 Z: 0.00000 VOLUME (cm3): 141920.
MASS (kg, including stowage): 91.0000

REQUESTED CARRIER: GAS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: NONE IDENTIFIED

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): EXPERIMENTS ARE PLANNED TO BE SELF CONTAINED. A SIGNAL MUST BE GIVEN TO TURN OFF PRIOR TO RE-ENTRY.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 96.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: THE EXPERIMENTS ARE PLANNED TO BE SELF-CONTAINED, INCLUDING THE OPTIMAL USE OF NASA'S BAROMETRIC SWITCH. ALTERNATIVELY, AN ON-SIGNAL BY ASTRONAUT MIGHT BE USED.PAYLOAD REQUIREMENTS AND SAFETY DOC. SUBMITTED TO GSFC. FLIGHT ON A MISSION HAVING AN ACCELEROMETER (SUCH AS SAMS) IS DESIRED.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-6530
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

ORIGINAL PAGE IS OF POOR QUALITY

JSA/CCDS/SPONSOR: UAH EXPERIMENT: GETAWAY SPECIAL #027

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: TO GROW NON-LINEAR OPTICAL ORGANIC CRYSTALS AND THIN FILMS, TO INVESTIGATE POLYMER DEMIXING PROCESS, TO PRODUCE NEW SURFACES WITH ELECTRODEPOSITION AND CODEPOSITION, AND TO DEVELOP AND DEMONSTRATE SOLVID RAY SENSOR MATERIALS.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 09/01/91 TURNAROUND (months): 0

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 71.0000 Z: 0.00000 VOLUME (cm3): 141300.
MASS (kg, including stowage): 91.0000

REQUESTED CARRIER: GAS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: NONE IDENTIFIED

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): A SIGNAL MUST BE GIVEN TO TURN OFF THE EXPERIMENTS BEFORE RE-ENTRY.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 96.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: EXPERIMENT ARE SELF-CONTAINED, INCLUDING USE OF BAROMETRIC SWITCH. ON-SIGNAL BY ASTRONAUT MAY BE REQUIRED. REQUIRE OF SIGNAL PRIOR TO REENTRY. DESIRE A FLIGHT HAVING AN ACCELEROMETER (SUCH AS SAMS). REFLIGHT OF SAS #105.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-6530
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE: -0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: USA EXPERIMENT: GET AWAY SPECIAL #005

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: TO GROW OPTICAL ORGANIC CRYSTALS AND THIN FILMS, INVESTIGATE POLYMER BLENDS, TO PRODUCE NEW SURFACES WITH ELECTRODEPOSITION AND CODEPOSITION AND TO INVESTIGATE FOAMS.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 03/01/91 TURNAROUND (months): 0

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 71.0000 Z: 0.00000 VOLUME (cm3): 141220.
MASS (kg, including stowage): 91.0000

REQUESTED CARRIER: GAS X USAGE (0-120): 100
OTHER COMPATIBLE CARRIERS: NONE IDENTIFIED

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): A SIGNAL MUST BE GIVEN TO TURN OFF THE EXPERIMENT BEFORE RE-ENTRY.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00100 TOTAL RUNTIME REQUIRED (hrs): 95.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: 0

REMARKS: EXPERIMENTS ARE SELF-CONTAINED, INCLUDING USE OF BAROMETRIC SWITCH. ON-SIGNAL BY AN ASTRONAUT MIGHT BE REQUIRED. OFF SIGNAL TO EXPERIMENT PRIOR TO REENTRY IS REQUIRED. FLIGHT WITH AN ACCELEROMETER IS DESIRED. THIS FLIGHT MAY CONSOLIDATE ANY NEEDED REFLIGHTS FROM GAS #10E,637 AND CONSORT 1,2.

CONTACT: CHARLES A. LUNDQUIST PHONE: 305-895-8520
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: UAH EXPERIMENT: CONCEP-1

EXPERIMENT #: 4

EXPERIMENT OBJECTIVES: TO GROW NON-LINEAR OPTICAL ORGANIC CRYSTALS AND THIN FILMS, TO INVESTIGATE POLYM

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 05/01/89 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 71.0000 Z: 0.00000 VOLUME (cm3): 141300.
MASS (kg, including stowage): 91.0000

REQUESTED CARRIER: GAS % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: NONE IDENTIFIED

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): ON/OFF SIGNAL TO THE GAS.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 55.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: N

REMARKS: SELF-CONTAINED EXPERIMENTS, INCLUDING USE OF THE BAROMETRIC SWITCH, ON-BOARD BY

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-6520
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? 0

EXPERIMENT REQUIREMENTS

JSA/DODS/SPONSOR: UAH

EXPERIMENT: MATERIALS PREPARATION AND LONGEVITY IN HYPERTHERMAL ATOMIC OXYGEN.

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: MEASURE OF REACTIONS OF EEV ATOMIC OXYGEN WITH MATERIALS SURFACES AS A FUNCTION OF TEMPERATURES, FLUX AND ANGLE OF INCIDENCE. THESE DATA WILL ALLOW ESTIMATION OF LONG TERM MATERIALS EFFECTS AND ALLOW DEVELOPMENT OF SURFACE PREPARATION.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: 05/01/91 TURNAROUND (months): 0

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: HITCHHIKER-G % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: MPESS

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	0.00000	0.00000	
	PEAK:	0.00000	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN: 0 MAX TIME/OPERATION (hrs): 0.0000
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 168.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: N

REMARKS: EXPERIMENT WAS ORIGINALLY PLANNED AS PART OF THE EOIM-3 MISSION. THE INDUSTRIAL PARTICIPANT IN THIS PROJECT WAS MARTIN MARIETTA UNTIL OCTOBER 1988. A REPLACEMENT IS BEING NEGOTIATED.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-5320
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? DODS
IF APPROVED, WHEN SIGNED? 10/31/85
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT ?

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: LAH EXPERIMENT: PHYSICAL VAPOR TRANSPORT CRYSTAL GROWTH

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: GROWTH OF ZINC SELENIDE CRYSTALS. THE CONSORTIUM WOULD PREPARE AMPOULES FOR THE ZINC SELENIDE PROCESSES. THESE COULD BE STOWED WITH THE AMPOULES FOR OTHER USERS OF THIS APPARATUS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 11/01/91 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: SPACEHAB % USAGE (0-100): 0
OTHER COMPATIBLE CARRIERS: MAR

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1000.00	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	0.00000	0.00000	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	0.00000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	0.00000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	0.00000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 5.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 5.0000
COMMENTS (crew): SWITCHING AND CONFIRMING OPERATION.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 240.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: N

REMARKS: BOEING WILL ASSEMBLE A SECOND FLIGHT FURNACE FOR USE BY THE CCDSs. THE CONSORTIUM WILL BE ONE OF THE USERS OF THE FURNACE IN MULTIOBJECTIVE FLIGHTS OF IT. ACCOMMODATION REQUIREMENTS HAVE BEEN SUBMITTED TO MSFC BY BOEING.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-6520
HAS JEA (MCU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? N

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: CAR EXPERIMENT: CONSORTIUM SPACEHAB FACILITY

EXPERIMENT #: 7

EXPERIMENT OBJECTIVES: GROWTH OF NON-LINEAR OPTICAL CRYSTALS AND THIN FILMS, POLYMER INVESTIGATIONS AND ELECTRODEPOSITION INVESTIGATIONS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 11/01/91 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: SPACEHAB % USAGE (0-100): 0
OTHER COMPATIBLE CARRIERS: NONE

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1000.00	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	200.000	0.00000	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	200.000	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	200.000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	200.000	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 1.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.EE00
COMMENTS (crew): MOVE SAMPLES FROM MIDDECK TO SPACEHAB, START PROCESS.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 133.3

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: N

REMARKS: THIS ENSEMBLE OF INSTRUMENTATION IS ALREADY IN PREPARATION FOR USML-1. MANY DETAILS HAVE BEEN SUBMITTED TO USML-1 MISSION MANAGEMENT TEAM. THE HARDWARE WILL REQUIRE THE EQUIVALENT OF FOUR DOUBLE MIDDECK LOCKERS AS WELL AS SENSITIVE MATERIALS STOWAGE IN THE MIDDECK.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-6520
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? 0

EXPERIMENT REQUIREMENTS

JSA/DODS/SPONSOR: UAH EXPERIMENT: CONSORTIUM FOR MATERIALS DEVELOPMENT IN SPACE FACILITY (CMDSF)

EXPERIMENT #: 8

EXPERIMENT OBJECTIVES: NON-LINEAR OPTICAL CRYSTALS AND THIN FILM GROWTH, ELECTRODEPOSITION, ORGANIC SEPARATION.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 0.00000 Y or length: 0.00000 Z: 0.00000 VOLUME (cm3): 0.00000
MASS (kg, including stowage): 0.00000

REQUESTED CARRIER: SPACELAB RACK % USAGE (0-100): 75
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	1000.00	0.00000	
	PEAK:	1000.00	0.00000	
ASCENT/DESCENT	NORMAL:	200.000	0.00000	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	200.200	0.00000	AMOUNT (watts): 0.00000
PRELAUNCH	NORMAL:	200.000	0.00000	ESSENTIAL ENERGY (kwh): 0.00000
	PEAK:	200.200	0.00000	

TOTAL ENERGY (kwh): 0.00000

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	0.00000	0.00000
MPE FLUID LOOP	0.00000	0.00000
CABIN AIR	0.00000	0.00000

VENTING
VACUUM (mbar): 0.00000 FLOW (gm/s): 0.00000 QUANTITY (grams): 0.00000

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 0.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): MAVE SAMPLES FROM MIDDECK TO SPACELAB, START PROCESS.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 153.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): 0 INCLINATION (degrees): 0.000 ATTITUDE: N

REMARKS: MANY DETAILS BEYOND THOSE ON THIS SHEET HAVE BEEN PROVIDED TO THE USML-1 MISSION MANAGEMENT TEAM AT MSFC. THIS EXPERIMENT WILL REQUIRE IN ADDITION TO THE LOWER PORTION OF A SPACELAB DOUBLE RACK, 2 MIDDECK LOCKERS AND THE MIDDECK REFRIGERATOR.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-355-6330
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE: 0 . IF CURRENTLY MANIFESTED, WHICH FLIGHT? 3

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: UAH EXPERIMENT: LONG DURATION EXPOSURE FACILITY RETRIEVAL (LDEF)

EXPERIMENT #: 9

EXPERIMENT OBJECTIVES: ENERGETIC OXYGEN EFFECT TESTING.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: -0- TURNAROUND (months):-0-

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: CARGO BAY % USAGE (0-100):-0-
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kWh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs):-0-

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: THE UAH EXPERIMENTS ON LDEF THAT PREDATED OUR CMDS FORMATION WILL BE ANALYZED TO MEET CMDS PROJECT OBJECTIVES. THIS IS AN INFORMATION SUBMITTAL TO NOTE THE COMMERCIAL PROGRAM INTEREST IN THE LDEF RETRIEVAL AND TO SUPPORT ITS TIMELY ACCOMPLISHMENT.

CONTACT: CHARLES A. LUNDQUIST PHONE: 205-895-6520
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO EXPERIMENT: BIOSERVE MATERIALS DISPERSION APPARATUS

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: PERFORM BIOPROCESSING ACTIVITIES IN MICROGRAVITY, INCLUDING PROCESSING OF FLUIDS THROUGH LIQUID TO LIQUID DIFFUSION USING THE MATERIALS DISPERSION APPARATUS (MIA), FOR APPLICATIONS IN SEVERAL BIOMEDICAL AREAS (E.G. PROTEIN CRYSTAL GROWTH).

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 02/01/90 TURNAROUND (months): 5

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 57000.0
MASS (kg, including stowage): 32.0000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 130.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: PAYLOAD USES REFRIGERATOR/INCUBATOR MODULE (R/IM) LOCATED AT JSC. LATE LOADING AND EARLY ACCESS IS REQUIRED.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7613
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO EXPERIMENT: MICRO-ORGANISMIC REACTOR

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: EXAMINATION OF THE BIOSYNTHESIS OF PLANTS, BACTERIA AND PLANT EMBERANES WHICH HARVEST CO2, N2 AND LIGHT ENERGY IN CHEMICAL FORMS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 06/01/92 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3): 57000.0
MASS (kg, including stowage): 13.6000

REQUESTED CARRIER: MIDDECK LOCKER % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: GAS (5 CU. FT)

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	65.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 4.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 4.0000
COMMENTS (crew): SAMPLES CHANGES AND STABILIZATION.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 254.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: INITIAL VERSIONS OF THIS EXPERIMENTAL WORK MAY BE SUITABLE FOR FLIGHT IN EXISTING FEA OR MRA HARDWARE. FOLLOW-ON STUDIES ARE LIKELY TO REQUIRE SPECIALIZED HARDWARE CURRENTLY UNDER DEVELOPMENT. THIS EQUIPMENT MAY BE SUITABLE FOR AUTOMATION. FOLLOW-ON WORK MAY BE ABLE TO UTILIZE LIFESAT OR A C-GAS.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO EXPERIMENT: CENTRIFUGAL FLUIDS MANAGEMENT

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: USE OF THE CENTRIFUGAL FORCES TO PUMP AND MIX FLUIDS OR PERFORM PHASE SEPARATIONS IN ZERO GRAVITY

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3): 57000.0
MASS (kg, including stowage): 15.2000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	50.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs): 5.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5200
COMMENTS (crew): LOAD SAMPLES AND REAL TIME PHOTOGRAPHY

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 334.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: THIS HARDWARE IS UNDER DEVELOPMENT. POWER REQUIREMENTS, ETC. MAY CHANGE WITH TIME.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
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FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO EXPERIMENT: BLOOD RHEOLOGY EXPERIMENT/LYMPHATICS/BONE DYNAMICS

EXPERIMENT #: 4

EXPERIMENT OBJECTIVES: STUDY OF BIOMEDICAL ISOMORPHISM IN RODENTS IN MICROGRAVITY FOR EVALUATING "MODEL" DISEASE STATES AND AGING SECRETS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (mo/hs): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 24.9000 Y or length: 43.7300 Z: 51.0000 VOLUME (cm3): 55100.0
MASS (kg, including stowage): 27.0000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACELAB

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	50.0200	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	50.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	50.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 5.5000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): ACQUIRE BLOOD SAMPLES

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 354.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: KANSAS STATE UNIV. AND UNIV. OF COLORADO HAVE PROPOSED TO EXAMINE THE EFFECTS OF BLOOD RHEOLOGY IN RHESUS MONKEYS. THIS EXPERIMENT WILL FORM AN IMPORTANT LEAD-IN TO THIS WORK. THIS EXPERIMENT WILL UTILIZED THE ANIMAL ENCLOSURE MODULE (AEM).

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
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FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO EXPERIMENT: BIOPROCESSING FLUIDS EXPERIMENT APPARATUS II (BFEA-II)

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: SYNTHESIS OF ARTIFICIAL BIOMATERIALS

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 07/01/90 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 50.0000 VOLUME (cm3): 114030.
MASS (kg, including stowage): 18.0000

REQUESTED CARRIER: MIDDECK LOCKERS (2) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	50.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 3.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): CHANGE SAMPLE CASSETTE

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 264.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: LATE LOADING OF 12 HOURS BEFORE LAUNCH AND EARLY ACCESS OF 5 HOURS AFTER LANDING IS DESIRED. IF THIS IS NOT POSSIBLE, ALTERNATE SAMPLES WILL BE PROCESSED. THIS EXPERIMENT REQUIRES USE OF THE REFRIGERATOR/INCUBATOR MODULE (R/IM) OR SHARED USE OF THE REFRIGERATOR/FREEZER.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
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FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: COLORADO EXPERIMENT: BIOPROCESSING FLUIDS EXPERIMENT APPARATUS (B-FEA)

EXPERIMENT #: 5

EXPERIMENT OBJECTIVES: FEA EQUIPPED WITH ISOTHERMAL HEATER TO ALLOW THE STUDY OF SELF ASSEMBLY AND DIRECTED ASSEMBLY OF MACROMOLECULES.

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 07/01/90 TURNAROUND (months): 8

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 50.2000 VOLUME (cm3): 114000.
MASS (kg, including stowage): 18.0000

REQUESTED CARRIER: MIDDECK LOCKERS (2) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	50.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	50.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	50.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 3.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 3.0000
COMMENTS (crew): CHANGE SAMPLE CASSETTE

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 264.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: LATE PAYLOAD INSTALLATION OF 12 HOURS BEFORE LAUNCH AND EARLY ACCESS OF 6 HOURS REFLECT DESIRABLE LIMITS. IF THIS IS NOT POSSIBLE, ALTERNATE SAMPLES WILL BE FLOWN. THIS EXPERIMENT WILL REQUIRE USE OF THE R/IM OR SHARED USE OF A REFRIGERATOR FREEZER.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: COLORADO EXPERIMENT: HIGHER PLANT GROWTH IN MICROGRAVITY

EXPERIMENT #: 7

EXPERIMENT OBJECTIVES: THE GROWTH OF HIGHER PLANTS, ESPECIALLY FOOD PLANTS, IN MICROGRAVITY WILL BE INVESTIGATED.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 07/01/89 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 72.4000 Z:-0- VOLUME (cm3): 145743.
MASS (kg, including stowage): 45.5000

REQUESTED CARRIER: GAS (5 CU. FT.) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	15.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 0.0000 NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL SUNTIME REQUIRED (hrs): 184.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: COLORADO EXPERIMENT: GENERIC BIOPROCESSING APPARATUS (GBA)

EXPERIMENT #: 8

EXPERIMENT OBJECTIVES: VIRUS BIOLOGICS: THE ISOLATION, IDENTIFICATION, CHARACTERIZATION OF CELL RECEPTORS THAT ALLOW VIRUSES TO ENTER CELLS.

NUMBER OF LAUNCHES: 3 REQUESTED 1ST LAUNCH: 05/01/92 TURNAROUND (months): 5

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 57000.0
MASS (kg, including stowage): 14.0000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACELAB RACK, SPACEHAB

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	100.000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	100.000	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	100.000	-0-	ESSENTIAL ENEREY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 3.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 3.0000
COMMENTS (crew): SAMPLE CHANGES

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 240.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: THE LATE ACCESS OF 12 HOURS BEFORE LAUNCH AND EARLY ACCESS OF 6 HOURS AFTER LANDING IS DESIRED. THIS EXPERIMENT REQUIRES THE US OF THE R/IM OR SHARED USE OF A REFRIGERATOR/FREEZER.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO EXPERIMENT: LOSS OF MICROGRAVITY

EXPERIMENT #: 9

EXPERIMENT OBJECTIVES: USE OF PULSED EM FIELDS TO REDUCE BONE MASS LOSS IN EXPERIMENTAL ANIMALS.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 01/01/90 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0000 Y or length: 72.0000 Z:-0- VOLUME (cm3): 147330.
MASS (kg, including stowage): 23.0000

REQUESTED CARRIER: GAS CAN (5 CU. FT.) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 384.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: EARLY PAYLOAD REMOVAL IS MORE CRITICAL THAT LATE PAYLOAD INSTALLATION. IF REMOVAL IS DELAYED, IT WILL BE DIFFICULT TO DETERMINE IF PEMF'S HAVE AMEORATED BONE MASS LOSS, OR IF ANIMALS HAVE RE-CALCIFIED UPON RE-EXPOSURE TO GRAVITY FIELD.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JEA (YOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: COLORADO

EXPERIMENT: BIOPROCESSING WITH THE MATERIALS DISPERSION APPARATUS

EXPERIMENT #: 10

EXPERIMENT OBJECTIVES: FLUID MIXING DEVICE THAT CAN MIX 140 SAMPLES OF ANY 2-3 FLUIDS. USES: PROTEIN CRYSTAL GROWTH, BIOPROCESSING AND BIOSCIENCE.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 11/01/89 TURNAROUND (months): 9

CURRENT STATUS OF HARDWARE (concept, mockup, prototype unit, flight unit): FLIGHT UNIT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 57000.0
MASS (kg, including stowage): 34.0000

REQUESTED CARRIER: MIDDECK LOCKER (1) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	75.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	75.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	75.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 1.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.5000
COMMENTS (crew): SEQUENCE AT START OF MICROGRAVITY AND STOP 8 HOURS PRIOR TO RE-ENTRY.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 240.0

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: 12 HOUR LATE LOADING AND 5 HOUR EARLY ACCESS REFLECT DESIRED LIMITS. PAYLOAD WEIGHT INCLUDES THE WEIGHT OF A R/IV, MEA, CONTROL BOX AND BATTERIES.

CONTACT: MARVIN LUTTGES PHONE: 303-492-7513
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

C-2

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: HOUSTON

EXPERIMENT: WAKE SHIELD FACILITY

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: MOLECULAR AND CHEMICAL BEAM EPITAXY GROWTH OF COMPOUND SEMICONDUCTORS, AND OTHER TECHNICALLY IMPORTANT MATERIALS USING TECHNIQUES REQUIRING ULTRA-HIGH VACUUM, HIGH PUMPING SPEEDS, AND RELATIVELY LARGE WORKING VOLUMES.

NUMBER OF LAUNCHES: 4 REQUESTED 1ST LAUNCH: 09/01/91 TURNAROUND (months): 5

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 327.000 Y or length: 305.000 Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): 1125.00

REQUESTED CARRIER: ECS CARRIER X USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: CARGO BAY PALLET

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): Y UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 40.000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 40.000
COMMENTS (crew): PAYLOAD OPERATIONS IDENTIFIED AS ABOUT 40 CONTINUOUS HOURS USING A TWO SHIFT OPERATION.

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): Y VERNIER THRUSTERS (y/n): Y CREW MOTION (y/n): N VENTING (y/n): Y

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00100 TOTAL RUNTIME REQUIRED (hrs): 40.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: Y

REMARKS: USE OF RMS TO REMOVE WAKE SHIELD PAYLOAD FROM CARRIER AND POSITION IT WITH RELATION TO ORBITER, VELOCITY VECTOR, AND SUN, AS REQUIRED, TO ACCOMPLISH OPERATIONS. PAYLOAD POWER REQUIREMENTS ARE SELF-CONTAINED; DATA LINK THROUGH RMS IS REQUIRED.

CONTACT: ALEX IGNATIEV PHONE: 713-749-3781
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 89/01/36
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CODS/SPONSOR: UTSI

EXPERIMENT: S.P.E., FUEL CELL THERMAL AND WATER MANAGEMENT TESTING IN SPACE

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: AN AUTONOMOUS S.P.E. FUEL CELL OPERATING TO TEST THERMAL AND WATER MANAGEMENT SYSTEMS IN A WEIGHTLESS ENVIRONMENT.

NUMBER OF LAUNCHES: 1 REQUESTED 1ST LAUNCH: -0- TURNAROUND (months):-0-

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 51.0300 Y or length: 33.0000 Z:-0- VOLUME (cm3): 72000.0
MASS (kg, including stowage): -0-

REQUESTED CARRIER: GAS (2.5 CU. FT.) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	100.000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	10.0000	-0-	ESSENTIAL POWER REQUIRED (y/n): Y
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	10.0000	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 2.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 2.0000
COMMENTS (crew): PERIODIC MONITORING

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED:-0- TOTAL RUNTIME REQUIRED (hrs): 24.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: OPENING LID ON GAS CANISTER TO FACILITATE RADIATION HEAT EXCHANGE, AS WELL AS A HYDROGEN AND OXYGEN SUPPLY IS REQUIRED.

CONTACT: PHONE: -0-
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? -0-
IF APPROVED, WHEN SIGNED? 11/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JSA/CCDS/SPONSOR: WISCONSIN

EXPERIMENT: (BIOSCULTURE-1) WATER MOVEMENT IN A NON-SATURATED MATRIX IN A MICROGRAVITY ENVIRONMENT

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: A TEST UNIT TO EVALUATE CAPILLARY MOVEMENT INTO AND OUT OF A MATRIX USING A POROS-TUBE BASED WATER DELIVERY SYSTEM AND TO DETERMINE THE CAPABILITY OF MAINTAINING THE MATRIX IN A NON-SATURATED CONDITION UNDER MICORGRAVITY.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/31/92 TURNAROUND (months): 3

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter: 52.0000 Y or length: 44.0000 Z: 35.0000 VOLUME (cm3): 57000.0
MASS (kg, including stowage): 13.6000

REQUESTED CARRIER: MIDDECK LOCKER % LEASE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACEX

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	50.0000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 1.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs): 0.1500
COMMENTS (crew): MONITOR STATUS OF EXPERIMENT, CHANGING OF EXPERIMENTAL PARAMETERS.

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 35.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: SPACE QUALIFIED EXPERIMENT CONTAINER FOR MIDDECK LOCKER SUCH AS THE PLANT GROWTH

CONTACT: JOHN BOLLINGER PHONE: 608-262-3432
HAS JSA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 09/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: VANDERBILT EXPERIMENT: FLOATING ZONE PROCESSING OF SEMICONDUCTOR-METAL EUTECTICS

EXPERIMENT #: 1

EXPERIMENT OBJECTIVES: CRYSTAL GROWTH OF SILICON BASED SEMICONDUCTOR-METAL EUTECTICS

NUMBER OF LAUNCHES: 5 REQUESTED 1ST LAUNCH: -0- TURNAROUND (months): 6

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: BOEING CVT (MAR) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	600.000	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): N
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): Y

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): -0-

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 50.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: CURRENTLY EVALUATING THE FEASIBILITY OF MODIFYING PART OF THE BOEING CVTE HARDWARE TO ENABLE THESE FLOATING ZONE EXPERIMENTS. PRELIMINARY CALCULATIONS INDICATE THAT THIS CONCEPT IS INDEED FEASIBLE.

CONTACT: ROBERT BAYUZICK PHONE: 615-322-7047
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: VANDERBILT EXPERIMENT: DIRECTIONAL SOLIDIFICATION OF CU-PB ALLOY (DSCUPB)

EXPERIMENT #: 2

EXPERIMENT OBJECTIVES: LEAD-13% COPPER ALLOYS WILL BE DIRECTIONALLY SOLIDIFIED IN THE MSFC FACILITY WHILE IN A MICROGRAVITY ENVIRONMENT.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 5

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: MSFC (SPACELAB) % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: -0-

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPS FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): - DATA RECORDING (y/n): - EXTERNAL CONTROL (y/n): - DOWNLINK DATA (y/n): - UPLINK CONTROL (y/n): -

OPERATIONS
CREW TIME REQUIRED (hrs): 8.0000 NO. OF CREWMEN: 1 MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): INITIATE EXPERIMENT, MONITORING, POSSIBLE SAMPLE CHANGE OUT

CONSTRAINTS
LIGHTING (y/n): - WATER DUMPS (y/n): - VERNIER THRUSTERS (y/n): - CREW MOTION (y/n): - VENTING (y/n): -

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): - G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 55.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: ROBERT BAYUZICK PHONE: 615-322-7347
HAS JEA (YOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 10/01/85
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

EXPERIMENT REQUIREMENTS

JEA/CCDS/SPONSOR: VANDERBILT EXPERIMENT: OXIDE STRENGTHENED HIGH TEMPERATURE ALLOYS

EXPERIMENT #: 3

EXPERIMENT OBJECTIVES: SAMPLES WILL BE FLOWN ON THE MASA FURNACE. BEHAVIOR OF OXIDE PARTICLES AT THE SOLID/LIQUID INTERFACE WILL BE STUDIED.

NUMBER OF LAUNCHES: 2 REQUESTED 1ST LAUNCH: 03/01/92 TURNAROUND (months): 12

CURRENT STATUS OF HARDWARE (concept, mockup, protoflight unit, flight unit): CONCEPT

DIMENSIONS (cm) X or diameter:-0- Y or length:-0- Z:-0- VOLUME (cm3):-0-
MASS (kg, including stowage): -0-

REQUESTED CARRIER: MSL % USAGE (0-100): 100
OTHER COMPATIBLE CARRIERS: SPACELAB RACK

POWER		DC (watts)	AC (watts)	
ON-ORBIT	NORMAL:	-0-	-0-	
	PEAK:	-0-	-0-	
ASCENT/DESCENT	NORMAL:	-0-	-0-	ESSENTIAL POWER REQUIRED (y/n): -
	PEAK:	-0-	-0-	AMOUNT (watts): -0-
PRELAUNCH	NORMAL:	-0-	-0-	ESSENTIAL ENERGY (kwh): -0-
	PEAK:	-0-	-0-	

TOTAL ENERGY (kwh): -0-

THERMAL/FLUID ACCOMMODATIONS

	COOLING (watts)	FLOWRATE (kg/hr)
AVIONICS AIR LOOP	-0-	-0-
MPE FLUID LOOP	-0-	-0-
CABIN AIR	-0-	-0-

VENTING
VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

COMMAND/CONTROL (externally supplied)
TELEMETRY (y/n): N DATA RECORDING (y/n): N EXTERNAL CONTROL (y/n): N DOWNLINK DATA (y/n): N UPLINK CONTROL (y/n): N

OPERATIONS
CREW TIME REQUIRED (hrs):-0- NO. OF CREWMEN:-0- MAX TIME/OPERATION (hrs):-0-
COMMENTS (crew): CHANGE SAMPLES

CONSTRAINTS
LIGHTING (y/n): N WATER DUMPS (y/n): N VERNIER THRUSTERS (y/n): N CREW MOTION (y/n): N VENTING (y/n): N

POINTING/STABILIZATION
TARGETS REQUIRED (y/n): N G-LEVEL REQUIRED: 0.00010 TOTAL RUNTIME REQUIRED (hrs): 10.00

ORBIT PARAMETERS
ALTITUDE REQUIRED (nmi): -0- INCLINATION (degrees): -0- ATTITUDE: -0-

REMARKS: -0-

CONTACT: ROBERT BAYUZICK PHONE: 615-322-7047
HAS JEA (MOU OR OTHER PROGRAM) BEEN APPROVED? Y
WHICH PROGRAM AND APPLICATION DATE? CCDS
IF APPROVED, WHEN SIGNED? 12/01/87
FLIGHTS FLOWN TO DATE:-0- . IF CURRENTLY MANIFESTED, WHICH FLIGHT? -0-

3.0 CARRIERS AND FACILITIES DATABASE

3.0 CARRIERS AND FACILITIES DATABASE

The space flight accommodation hardware available to commercial users varies widely from middeck carriers to free-flyers. To efficiently match the requirements of experiment hardware to the resources of a carrier, information on the carrier's capabilities are required. The carriers and facilities database contains all types of space flight accommodation hardware covering the spectrum from middeck lockers to the Space Station. A total of 42 carriers and facilities are contained in the database. Data inputs for each entry are: company/sponsor, mission length, flight experiment opportunity value, parent, and status of hardware. Operational parameters for each entry include interior and exterior dimensions, volume, mass, power, cooling, command/control, venting, exposure and video. The "remarks" entry for each carrier gives information on past or future flights, safety and integration concerns or other general information relevant to the carrier. The database is an evolving entity, which will be updated and expanded as new data is received and analyzed. Use of the information in the carriers and facilities database can give a better understanding of the capabilities and function of space flight accommodation hardware.

Information from the database was used extensively on the Commercial User Flight Accommodation Plan.

CARRIERS AND FACILITIES DATABASE INDEX

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CARRIER: DOUBLE ADAPTER PLATE	CONFIGURATION: STANDARD	ACRONYM: DAP
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: N/A

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	1.8235	width:	1.427	length:	0.0729	diameter: -0-
(internal,ft)	height:	-0-	width:	0.	length:	-0-	diameter: -0-

VOLUME (ft3)

total: 4. experiment: 4. stowage: 0. pressurized: 4.
mounting area (ft2): 2.48

MASS (lbs)

total: 120. experiment: 100.5 carrier: 12.5

POWER

	Total to Carrier	Available to User
NORMAL (watts)	180.	180.
PEAK (watts)	180.	180.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 180. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 180.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Single adapter plates must be installed one above the other to the locker interface, the double adapter plate is then secured to the single plates covering the area of two middeck lockers. Experiment apparatus may then be bolted to the double adapter plate. Weight of all plates must be considered when figuring weight limits and center of gravity.

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CARRIER: EOS CARRIER	CONFIGURATION: CROSS-BAY	ACRONYM: EOS CARR
COMPANY/SPONSOR: McDONNELL-DOUGLAS ASTRONAUTICS CO.	MISSION LENGTH (DAYS): 7.	FED'S: 1.5

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 12.2 width: 3.5 length: 14. diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 60. experiment: 60. stowage: 0. pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 5424. experiment: 4000. carrier: 680.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	5600.	5600.
PEAK (watts)	5600.	5600.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 5600. AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): TBD COMMAND (y/n): Y COMMAND LINK (kbps): TBD

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): NONE

REMARKS: The EOS carrier is a proposed carrier following the same general configuration as the Multi-Purpose Experiment Support Structure. It is a cross bay bridge type structure approximately 3 feet wide in the payload fore-aft direction. Power values are mission dependent.

CARRIER: EUROPEAN RETRIEVABLE CARRIER	CONFIGURATION: FACILITY MODULE	ACRONYM: EURECA
COMPANY/SPONSOR: EUROPEAN SPACE AGENCY	MISSION LENGTH (DAYS): 180.	FEO'S: -0-

PARENT: NONE

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external, ft) height: -0- width: -0- length: 8.2 diameter: -0-
(internal, ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: -0- experiment: -0- stowage: -0- pressurized: -0-
mounting area (ft2): -0-

MASS (lbs)

total: 7750. experiment: 2650. carrier: 5100.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	5900.	1700.
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 3800. AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): TBD COMMAND (y/n): Y COMMAND LINK (kbps): 2.5

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): - VIDEO (i.e. CCTV, NONE): -0-

REMARKS: The EURECA concept is a free-flying retrievable carrier of experiments, which is launched and recovered by the shuttle. Removal of the EURECA platform from the cargo bay will be by the remote manipulator system and the platform will have an in-orbit stay of approximately six months. The return to earth will take place as soon as possible after completion of the experiments, but waiting ("dormant") periods of several weeks or even months may occur depending on the shuttle's flight schedule. A wide variety of experiments are planned for EURECA including, protein crystallization, processing of metallurgical samples and Earth observation.

CARRIER: EXPERIMENT APPARATUS CONTAINER	CONFIGURATION: MSL	ACRONYM: MSL EAC
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: 1.

PARENT: MSL

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height: -0-	width: -0-	length:	3.34	diameter:	1.417
(internal,ft)	height: -0-	width: -0-	length:	2.68	diameter:	1.4

VOLUME (ft3)

total: 5.3 experiment: 4.2 stowage: 0. pressurized: 5.3
mounting area (ft2): 9.24

MASS (lbs)

total: 350. experiment: 275. carrier: 75.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	583.	470.
PEAK (watts)	1000.	865.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	74.16	34.1

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 800. AVAILABLE TO EXPERIMENTS LIQUID: 800. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 1400 COMMAND (y/n): Y COMMAND LINK (kbps): 8

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: The MSL EAC houses experiment apparatus with greater weight and power requirements than can be accommodated by the middeck EACs. No instrumentation is provided by the MSL EAC, it uses the MSL electrical and signal equipment. Feed-throughs for electrical power, signal and fluid interfaces are located in the lower part of the EAC.

CARRIER: GET-AWAY SPECIAL BRIDGE	CONFIGURATION: CROSS-BAY	ACRONYM: GAS BRIDGE
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: 1.5

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 9.38 width: 2.79 length: 14.24 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 60. experiment: -0- stowage: -0- pressurized: -0-
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 4800. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	0.	0.
PEAK (watts)	0.	0.
PEAK LENGTH (hours)	0.	0.
ENERGY (kwh)	0.	0.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 0. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): TBD COMMAND (y/n): Y COMMAND LINK (kbps): TBD

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): NONE

REMARKS: The GAS Bridge is an adaptation of the Multi-Purpose Experiment Support Structure (MPESS) cross-bay carrier. A maximum of 12 GAS CANs can be mounted per mission. All power, cooling/heating and data acquisition is the responsibility of the individual experimenters.

CARRIER: GET-AWAY-SPECIAL CANNISTER	CONFIGURATION: SMALL	ACRONYM: GAS CAN SM
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: .25

PARENT: HITCHHIKER

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: -0- width: -0- length: -0- diameter: -0-
(internal,ft) height: -0- width: -0- length: 1.183 diameter: 1.666

VOLUME (ft3)

total: 2.5 experiment: 2.5 stowage: 0. pressurized: 2.5
mounting area (ft2): -0-

MASS (lbs)

total: 150. experiment: 100. carrier: 50.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	0.	0.
PEAK (watts)	0.	0.
PEAK LENGTH (hours)	0.	0.
ENERGY (kwh)	0.	0.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 0. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): N

REMARKS: The Get-Away-Special is a standard, cylindrical aluminum container offering short turn-around time for experimenters. It can be evacuated and/or pressurized and includes an insulated exterior on the bottom and sides for thermal control, an insulated end cap is available. GAS CANs can fly on HH-G, HH-M, and the GAS Bridge. The user must provide power, heating/cooling and data acquisition. A GAS CAN is the easiest, most economical means of flying experiment equipment in the orbiter cargo bay.

CARRIER: GET-AWAY-SPECIAL CANNISTER	CONFIGURATION: STANDARD	ACRONYM: GAS CAN
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 0.5

PARENT: HITCHHIKER

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 0. width: 0. length: -0- diameter: -0-
(internal,ft) height: -0- width: 0. length: 2.375 diameter: 1.666

VOLUME (ft3)

total: 5. experiment: 5. stowage: 0. pressurized: 5.
mounting area (ft2): -0-

MASS (lbs)

total: 300. experiment: 200. carrier: 100.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	0.	0.
PEAK (watts)	0.	0.
PEAK LENGTH (hours)	0.	0.
ENERGY (kwh)	0.	0.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 0. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0. COMMAND (y/n): N COMMAND LINK (kbps): 0.

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): NONE

REMARKS: The Get-Away-Special is a standard, cylindrical aluminum container offering short turn-around time for experimenters. It can be evacuated and/or pressurized and includes an insulated exterior on the bottom and sides for thermal control, an insulated end cap is available. GAS CANs can fly on HH-G, HH-M, and the GAS Bridge. The user must provide power, heating/cooling and data acquisition. A GAS CAN is the easiest, most economical means of flying experiment equipment in the orbiter cargo bay.

CARRIER: HITCHHIKER	CONFIGURATION: HITCHHIKER-G	ACRONYM: HH-G
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 1.5

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 5. width: 10. length: -0- diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 10. experiment: 10. stowage: 0. pressurized: 10.
mounting area (ft2): 21

MASS (lbs)

total: -0- experiment: 750. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	1300.	1300.
PEAK (watts)	1400.	1400.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	60.	60.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 0. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 1300 COMMAND (y/n): Y COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Can accommodate up to six payloads. HH-G is side mounted in the cargo-bay on starboard side to avoid interference with the remote manipulator system (RMS). Experiments can be located in GAS CANS or the Shuttle Payload of Opportunity Carrier (SPOC), a standard HH-G avionics package is supplied. Exposure to space environment can be accommodated with an opening motorized lid on a GAS CAN. Heat rejection must be supplied by the customer. Power available is mission dependent.

CARRIER: HITCHHIKER	CONFIGURATION: HITCHHIKER-M	ACRONYM: HH-M
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: 1.5

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 9.38 width: 2.79 length: 14.24 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: -0- experiment: -0- stowage: 0. pressurized: 0.
mounting area (ft2): 28

MASS (lbs)

total: 3000. experiment: 1170. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	1300.	1300.
PEAK (watts)	1400.	1400.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	103.	103.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 0. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 1300 COMMAND (y/n): Y COMMAND LINK (kbps): 8.064

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Designed as a carrier for payloads of opportunity whose requirements fall between a GAS CAN and a Spacelab pallet. HH-M uses a Multi-Purpose Experiment Support Structure (MPESS) to mount experiments. HH-M is considered a secondary payload and cannot interfere with primary payloads. Mounting area consists of 3 plates 2.8 X 3.33ft. and 3 plates 2.4 X 3.33ft., a maximum of 3 plates may be used per mission. HH-M occupies 1/4 of payload bay. Power available is mission dependent.

CARRIER: INDUSTRIAL SPACE FACILITY	CONFIGURATION: FACILITY MODULE	ACRONYM: ISF
COMPANY/SPONSOR: SPACE INSDUSTRIES, INC.	MISSION LENGTH (DAYS): 180.	FED'S: 34.

PARENT: NONE

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external,ft) height: -0- width: -0- length: 35. diameter: 14.5
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 2500. experiment: 332. stowage: 22. pressurized: 2500.
mounting area (ft2): 0

MASS (lbs)

total: 32697. experiment: 12000. carrier: 20697.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	12800.	10800.
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 16000. AVAILABLE TO EXPERIMENTS LIQUID: 11000. AIR: 5000.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 16 COMMAND (y/n): Y COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Fully operational after one launch, designed for 30-year orbital life, maintains LEO 3 years without resupply. Can be man-tended or serve as a free-flyer. Contains 7 double racks and 6 modular containers.

CARRIER: ISF MODULAR CONTAINER	CONFIGURATION: STANDARD	ACRONYM: ISF MC
COMPANY/SPONSOR: SPACE INDUSTRIES, INC.	MISSION LENGTH (DAYS): 180.	FED'S: -0-

PARENT: ISF

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external,ft)	height:	2.	width:	3.	length:	1.67	diameter: -0-
(internal,ft)	height: -0-		width: -0-		length: -0-		diameter: -0-

VOLUME (ft3)

total: 14. experiment: 14. stowage: -0- pressurized: 14.
mounting area (ft2): 0

MASS (lbs)

total: 450. experiment: -0- carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	800.	800.
PEAK (watts)	800.	800.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 800. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 800.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 16 COMMAND (y/n): Y COMMAND LINK (kbps): 1

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Video and voice communications capability in man-tended mode only. The ISF modular container will hold up to four shuttle middeck locker equivalent volumes.

CARRIER: ISF RACK	CONFIGURATION: DOUBLE	ACRONYM: ISFR
COMPANY/SPONSOR: SPACE INDUSTRIES, INC.	MISSION LENGTH (DAYS): 180.	FED'S: 3.3

PARENT: ISF

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external,ft) height: 6.21 width: 3.46 length: 3.29 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 54. experiment: 54. stowage: 0. pressurized: 54.
mounting area (ft2): 0

MASS (lbs)

total: 1600. experiment: 1475. carrier: 125.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	800.	800.
PEAK (watts)	4000.	4000.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 4000. AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 16 COMMAND (y/n): Y COMMAND LINK (kbps): 1

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Video and voice communications capability only in man-tended mode. The ISF can contain up to 8 double racks.

CARRIER: INDUSTRIAL SPACE FACILITY	CONFIGURATION: SUPPLY MODULE	ACRONYM: ISF SM
COMPANY/SPONSOR: SPACE INDUSTRIES, INC.	MISSION LENGTH (DAYS): 180.	FED'S: -0-

PARENT: NONE

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external,ft) height: -0- width: -0- length: 11. diameter: 14.5
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 450. experiment: -0- stowage: -0- pressurized: 450.
mounting area (ft2): 0

MASS (lbs)

total: -0- experiment: 20000. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	-0-
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): - TELEMETRY DOWNLINK (kbps): -0- COMMAND (y/n): - COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): B VIDEO (i.e. CCTV,NONE): -0-

REMARKS: Length may vary from 6 to 11 ft., vol from 5 to 5000cu. ft. Can be used as a logistics module for resupply of consumables and updating experiments or as a dedicated module for users to conduct special activities not compatible with other facility module users.

CARRIER: ITA STANDARDIZED EXPERIMENT MODULE CONFIGURATION: LARGE-G ACRONYM: ISEM-G LG

COMPANY/SPONSOR: INSTRUMENTATION TECH ASSOCIATES INC MISSION LENGTH (DAYS): 7. FED'S: 1.0

PARENT: GAS CAN

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: -0- width: -0- length: 2.354 diameter: 1.545
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 5. experiment: 3.5 stowage: 0. pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 200. experiment: 140. carrier: 60.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	-0-
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	1.2	1.2

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): - TELEMETRY DOWNLINK (kbps): -0- COMMAND (y/n): - COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): - VIDEO (i.e. CCTV,NONE): -0-

REMARKS: Designed to fit in a large (5.0cu.ft.) GAS CAN, the ISEM-G consists of an aluminum aerospace structure with support avionics and "housekeeping" equipment at the bottom of the module. The basic equipment package consists of a power supply, recorder, programmer-sequencer and instrumentation. The ISEM seperates the support equipment from the user area, leaving approximately 3.5 cu.ft. for experiment hardware. Current ISEM-Gs can be shared by multiple users and can accommodate from 3-10 experiments per mission. Power provided by lead acid batteries.

CARRIER: ITA STANDARDIZED EXPERIMENT MODULE CONFIGURATION: SMALL-G ACRONYM: ISEM-G SM

COMPANY/SPONSOR: INSTRUMENTATION TECH ASSOCIATES INC MISSION LENGTH (DAYS): 7. FED'S: .5

PARENT: GAS CAN

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: -0- width: -0- length: 1.177 diameter: 1.545
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 2.5 experiment: 1.3 stowage: 0. pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 100. experiment: 70. carrier: 30.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	-0-
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	1.2	1.2

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): - TELEMETRY DOWNLINK (kbps): -0- COMMAND (y/n): - COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): - VIDEO (i.e. CCTV,NONE): -0-

REMARKS: Designed to fit in a small (2.5cu.ft.) GAS CAN. The ISEM-G consists of an aluminum aerospace structure with support avionics and "housekeeping" equipment at the bottom of the module. The basic equipment package consists of a power supply, recorder, programmer-sequencer and instrumentation. The ISEM seperates the support equipment from the user area, leaving approximately 1.3cu.ft. for experiment hardware. Current ISEM-Gs can be shared by multiple users. Power provided by lead acid batteries.

CARRIER: ITA STANDARDIZED EXPERIMENT MODULE CONFIGURATION: ISEM-H ACRONYM: ISEM-H

COMPANY/SPONSOR: INSTRUMENTATION TECH ASSOCIATES INC MISSION LENGTH (DAYS): 7. FEO'S: 1.0

PARENT: HITCHHIKER-M

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: -0- width: -0- length: 5. diameter: 3.33
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 50. experiment: 50. stowage: 0. pressurized: 50.
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 850. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	1300.	1300.
PEAK (watts)	1300.	1300.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	13.5	13.5

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 900. AVAILABLE TO EXPERIMENTS LIQUID: 900. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 1400 COMMAND (y/n): Y COMMAND LINK (kbps): 8

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): N

REMARKS: ISEM-H will be positioned on top of Hitchhiker-M. It consist of three bacis elements: an outer shell pressure vessel, an interior shelf structure for mounting experiments and interface avionics which tap into the orbiter resources. One large or several small can be flown, an environment of one atmosphere can be maintained or can be vented to the vacuum of space. A 25-inch exstention is also available, increasing the length to over 7 feet. Power available is mission dependent. Heat rejection system is independent of shuttle.

CARRIER: LARGE TRAY	CONFIGURATION: STANDARD	ACRONYM: L TRAY
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: N/A

PARENT: STOWAGE LOCKER

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.8075	width:	1.4214	length:	1.67667	diameter:	-0-
(internal,ft)	height:	0.799	width:	1.4125	length:	1.667	diameter:	-0-

VOLUME (ft3)

total: 1.8 experiment: 1.8 stowage: 0. pressurized: 1.8
mounting area (ft2): -0-

MASS (lbs)

total: 60. experiment: 56.6 carrier: 3.4

POWER

	Total to Carrier	Available to User
NORMAL (watts)	90.	90.
PEAK (watts)	90.	90.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 90. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 90.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Used to support hardware inside middeck lockers, trays are pressure formed from plastic. Values for power and cooling are those allocated to a middeck locker.

CARRIER: MATERIAL SCIENCE LABORATORY	CONFIGURATION: STANDARD	ACRONYM: MSL
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: 3.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 9.19 width: 2.92 length: 14.47 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 0. experiment: 0. stowage: 0. pressurized: 0.
mounting area (ft2): 81

MASS (lbs)

total: -0- experiment: 2040. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	1410.	470.
PEAK (watts)	2595.	865.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	103.	34.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 2500. AVAILABLE TO EXPERIMENTS LIQUID: 2500. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 1400 COMMAND (y/n): Y COMMAND LINK (kbps): 8

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Mounting structure for the MSL is the Multi-Purpose Experiment Support Structure (MPESS). Experiments can be controlled by crew members using a control panel in the aft flight deck, by the investigator through command uplink from the ground, or by automatic programmed commands. A maximum of 3 experiments can fly on MSL per mission. MSL occupies 1/4 of the payload bay. Power values available to user are for a 1/3 MSL allocation to an individual user. Available power is mission dependent.

CARRIER: MIDDECK ACCOMODATIONS RACK	CONFIGURATION: SINGLE	ACRONYM: MAR
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 1.7

PARENT: SHUTTLE MIDDECK

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 6.58 width: 1.75 length: 1.83 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 15. experiment: 13. stowage: 0. pressurized: 15.
mounting area (ft2): -0-

MASS (lbs)

total: 550. experiment: 400. carrier: 150.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	1000.	1000.
PEAK (watts)	1000.	1000.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 1000. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 1000.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): TBD COMMAND (y/n): Y COMMAND LINK (kbps): TBD

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): -0-

REMARKS: MAR will increase the space avialable for small payloads and experiments in the middeck by supplementing the volume occupied by middeck stowage lockers. The MAR is designed as a versatile integration facility with the equivalent stowage volume of five middeck stowage lockers. Experiment Apparatus Containers, trays or payloads specially sized to the MAR's capacity can be integrated in the carrier. Power distribution and active thermal control options are available to investigators using the MAR. The MAR itself has no data acquisition capabilities. Data are acquired through instrumentation provided with the experiment apparatus contained in the MAR or by other supporting instrumentation

CARRIER: MIDDECK EXPERIMENT APPARATUS CONTAINER CONFIGURATION: DOME TOP CYLINDRICAL ACRONYM: DTC EAC

COMPANY/SPONSOR: NASA MISSION LENGTH (DAYS): 7. FED'S: 1.0

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height: -0-	width: -0-	length:	2.66	diameter:	1.47
(internal,ft)	height: -0-	width: -0-	length:	2.34	diameter:	1.41

VOLUME (ft3)

total: 4.51 experiment: 3.65 stowage: 0. pressurized: 3.65

mounting area (ft2): -0-

MASS (lbs)

total: 120. experiment: 90. carrier: 30.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	180.	180.
PEAK (watts)	180.	180.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 180. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 180.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Middeck EACs are convenient, economical devices that provide protective housing for experiment apparatus. Middeck EACs contain experiments that have reduced power and weight requirements than cargo bay EAC payloads. Because middeck EACs offer an enclosed and sealed environment, certain safety waivers may be granted to the materials of components enclosed. Only about 2/3 of dome volume is available due to shape. Perpendicular mounting of dome top EAC would necessitate approval from NASA/JSC. The dome top EAC requires a double adapter plate for mounting in the space of two middeck lockers.

CARRIER: MIDDECK EXPERIMENT APPARATUS CONTAINER CONFIGURATION: FLAT TOP CYLINDRICAL ACRONYM: FTC EAC

COMPANY/SPONSOR: NASA MISSION LENGTH (DAYS): 7. FED'S: .56

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height: -0-	width: -0-	length:	1.61	diameter:	1.46
(internal,ft)	height: -0-	width: -0-	length:	1.53	diameter:	1.35

VOLUME (ft3)

total: 2.69 experiment: 2.2 stowage: 0. pressurized: 2.2

mounting area (ft2): -0-

MASS (lbs)

total: 120. experiment: 93.1 carrier: 26.9

POWER

	Total to Carrier	Available to User
NORMAL (watts)	180.	180.
PEAK (watts)	180.	180.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 180. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 180.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): N

REMARKS: Middeck EACs are convenient, economical devices that provide housing for experiment apparatus. Middeck EACs contain experiments that have reduced power and weight requirements than cargo bay EAC payloads. Because middeck EACs offer an enclosed and sealed environment, certain safety waivers may be granted to the materials of components enclosed. All instrumentation and data acquisition are supplied by the experimenter. The flat top EAC requires a double adapter plate for mounting in the space of two middeck lockers.

CARRIER: MIDDECK EXPERIMENT APPARATUS CONTAINER CONFIGURATION: RECTANGULAR ACRONYM: REC EAC

COMPANY/SPONSOR: NASA MISSION LENGTH (DAYS): 7. FED'S: .33

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.92	width:	1.48	length:	1.63	diameter:	-0-
(internal,ft)	height:	0.86	width:	1.47	length:	1.46	diameter:	-0-

VOLUME (ft3)

total: 2.23 experiment: 1.84 stowage: 0. pressurized: 1.84
mounting area (ft2): -0-

MASS (lbs)

total: 120. experiment: 43. carrier: 17.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	90.	90.
PEAK (watts)	90.	90.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 90. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 90.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Middeck EACs are convenient, economical devices that provide protective housing for experiment apparatus. Middeck EACs contain experiments that have reduced power and weight requirements than cargo bay EAC payloads. Because middeck EACs offer an enclosed and sealed environment, certain safety waivers may be granted to the materials of the components enclosed. The two sides and top are a single unit. There is a hinged door on the front end of the container to permit access to the payload. The rectangular EAC provides a more rigid housing for experiment apparatus than either of the cylindrical EACs

CARRIER: MIDDECK LOCKER	CONFIGURATION: STANDARD	ACRONYM: LOCKER
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 0.3

PARENT: SHUTTLE MIDDECK

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 0.8964 width: 1.5104 length: 1.755167 diameter: -0-
(internal,ft) height: 0.829 width: 1.44267 length: 1.6933 diameter: -0-

VOLUME (ft3)

total: 2. experiment: 2. stowage: 0. pressurized: 2.
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 60. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	90.	90.
PEAK (watts)	90.	90.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 90. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 90.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Primary mission is to store crew necessities and support equipment. Lockers can also be used for small, low-power experiments on a mission-by-mission basis. The middeck contains a total of 42 lockers that may be operated or observed by crew members. Middeck lockers are compatible with the Spacehab module, SMIDEX rack in Spacelab, ISF and the Space Station.

CARRIER: MIDDECK VOLUME A	CONFIGURATION: STANDARD	ACRONYM: VOL A
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: N/A

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

	height:	width:	length:	diameter:
(external, ft)	-0-	-0-	-0-	-0-
(internal, ft)	0.432	4.335	1.6929	-0-

VOLUME (ft3)

total: 3.17 experiment: 3.17 stowage: 0. pressurized: 3.17
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 95. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	-0-
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV, NONE): NONE

REMARKS: Volume A is located above the forward middeck lockers. The volume will accommodate three single stowage trays with guides side-by-side. A door with three removable panels encloses the volume. Any of the panels can be removed without affecting its structural integrity.

CARRIER: MULTI-PURPOSE EXP. SUPPORT STRUCTURE	CONFIGURATION: CROSS-BAY	ACRONYM: MPESS
COMPANY/SPONSOR: MARSHALL SPACE FLIGHT CENTER	MISSION LENGTH (DAYS): 7.	FED'S: 1.5

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 9.39 width: 2.79 length: 15. diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: -0- experiment: -0- stowage: -0- pressurized: -0-
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 4200. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	-0-
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): -0- COMMAND (y/n): Y COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): -0-

REMARKS: MPESS is a versatile cross-bay carrier for the shuttle. The generic MPESS structure is used for the Material Science Laboratory, the Get-Away-Special Bridge, Spartan Flight Support Structure and the Hitchhiker-M carriers. Space allocation is 1/4 of the payload bay. MPESS has flown on several previous missions, a total of 5 carriers are available.

CARRIER: PAYLOAD MOUNTING PANEL	CONFIGURATION: STANDARD	ACRONYM: PMP
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: N/A

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.8964	width:	1.427	length:	0.04167	diameter: -0-
(internal,ft)	height:	-0-	width:	0.	length:	-0-	diameter: -0-

VOLUME (ft3)

total: 4. experiment: 4. stowage: 0. pressurized: 4.
mounting area (ft2): 2.48

MASS (lbs)

total: 120. experiment: 113. carrier: 7.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	180.	180.
PEAK (watts)	180.	180.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 180. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 180.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: The payload mounting panel (PMP) design allows a two-locker size payload to be directly mounted to the two PMPs, which mount to the wire trays in the middeck. Eliminating the need for a double adapter plate. Values for volume, power and cooling are those allocated for two middeck lockers.

CARRIER: SINGLE ADAPTER PLATE	CONFIGURATION: STANDARD	ACRONYM: SAP
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: N/A

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 0.8964 width: 1.427 length: 0.0625 diameter: -0-
(internal,ft) height: -0- width: 0. length: -0- diameter: -0-

VOLUME (ft3)

total: 2. experiment: 2. stowage: 0. pressurized: 2.
mounting area (ft2): 1.24

MASS (lbs)

total: 69. experiment: 62.8 carrier: 6.2

POWER

	Total to Carrier	Available to User
NORMAL (watts)	90.	90.
PEAK (watts)	90.	90.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 90. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 90.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Used in place of a standard middeck locker, the single adapter plate has a universal hole pattern for attaching experiment apparatus that are contained in the appropriate hardware such as a middeck EAC.

CARRIER: SMALL TRAY	CONFIGURATION: STANDARD	ACRONYM: S TRAY
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: N/A

PARENT: STOWAGE LOCKER

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.395	width:	1.4214	length:	1.67667	diameter: -0-
(internal,ft)	height:	0.38667	width:	1.4125	length:	1.667	diameter: -0-

VOLUME (ft3)

total: 0.85 experiment: 0.85 stowage: 0. pressurized: 0.85
mounting area (ft2): -0-

MASS (lbs)

total: 30. experiment: 27.55 carrier: 2.45

POWER

	Total to Carrier	Available to User
NORMAL (watts)	45.	45.
PEAK (watts)	45.	45.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 45. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 45.

COMMAND/CONTROL

TELEMETRY (y/n): N TELEMETRY DOWNLINK (kbps): 0 COMMAND (y/n): N COMMAND LINK (kbps): 0

VENTING

CAPABILITY (y/n): N VACUUM (mbar): 0. FLOW (gm/s): 0. QUANTITY (grams): 0.

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): NONE

REMARKS: Used to support hardware inside middeck lockers. Two small trays can be stowed in one locker. Separation of the small trays is accomplished by installing special guides, containing friction devices, on the locker sides. This feature allows each small tray to be removed individually, yet remain in place in a zero-g environment. Values for power and cooling are 1/2 those allocated to a middeck locker.

CARRIER: SPACE STATION-UNITED STATES LABORATORY CONFIGURATION: PHASE 1 ACRONYM: SS-USL

COMPANY/SPONSOR: NASA MISSION LENGTH (DAYS): 90. FED'S: 46

PARENT: NONE

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external,ft) height: -0- width: -0- length: 44.52 diameter: 14.6
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 7400. experiment: 539. stowage: -0- pressurized: 7400.
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 21510. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	50000.	45000.
PEAK (watts)	50000.	45000.
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 50000. AVAILABLE TO EXPERIMENTS LIQUID: 45000. AIR: 0.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 100000 COMMAND (y/n): Y COMMAND LINK (kbps): 10000

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: The space station will be a permenantly manned outpost with shuttle revisits to replenish supplies, equipment and relieve crew members. The space station will offer commercial users increased run-duration for performing experiments. The Phase 1 power source for the space station is still undecided between photovoltaic and solar dynamic power sources. The U.S. laboratory will have capacity for 29 double racks, 14 of them available to experimenters. Initial construction of the space station is scheduled for early in 1995, with completion scheduled for 1998 for Phase 1. The scheduled completion date for Phase 2 is the year 2000.

CARRIER: SPACEHAB	CONFIGURATION: MIDDECK AUGMENTATION	ACRONYM: SH MAM
COMPANY/SPONSOR: SPACEHAB, INC.	MISSION LENGTH (DAYS): 7.	FEO'S: 21.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): DESIGN

DIMENSIONS

(external,ft) height: -0- width: -0- length: -0- diameter: -0-
(internal,ft) height: -0- width: -0- length: 10. diameter: 12.1

VOLUME (ft3)

total: 1000. experiment: 129. stowage: -0- pressurized: 1000.
mounting area (ft2): 0

MASS (lbs)

total: 10000. experiment: 3000. carrier: 7000.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	1750.	1450.
PEAK (watts)	3500.	3200.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 6500. AVAILABLE TO EXPERIMENTS LIQUID: 4500. AIR: 2000.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 16 COMMAND (y/n): Y COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Designed to mount in forward 1/4 of payload bay, attached to the middeck via a short Spacelab tunnel. Up to 72 standard middeck lockers can be configured, or two sets of Space Station double racks plus lockers. Spacehab is manifested to fly in November, 1991 on STS 51. Power and heat rejection values are mission dependent.

CARRIER: SPACELAB	CONFIGURATION: LONG MODULE	ACRONYM: SL LM
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 33.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	48.	diameter: 13.54
(internal,ft)	height: -0-		width:	0.	length:	22.84	diameter: 12.89

VOLUME (ft3)

total: 793.98 experiment: 497.77 stowage: 268.21 pressurized: 783.98
mounting area (ft2): -0-

MASS (lbs)

total: 28012.6 experiment: 13123. carrier: 14889.6

POWER

	Total to Carrier	Available to User
NORMAL (watts)	8200.	3400.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	289.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 3100. AIR: 5200.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Spacelab Long-Module is a reusable, modular laboratory that fits inside the shuttle cargo bay. The long module consist of two segments, the core segment and the experiment segment, and provides the largest pressurized volume for spacelab experiments. In the module, experiment apparatus can be contained in large experiment racks, overhead containers, areas beneath the floor, stowage containers, or attached to the center aisle. A Spacelab transfer tunnel connects Spacelab with the orbiter middeck, utility services are routed from the orbiter to the forward endcone feedthrough provisions into the orbiter interior.

CARRIER: SPACELAB	CONFIGURATION: LONG + 1 PALLET	ACRONYM: SL LMIP
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 37.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	59.558	diameter:	13.54
(internal,ft)	height:	-0-	width:	0.	length:	34.169	diameter:	12.89

VOLUME (ft3)

total: 2192.98 experiment: 1924.77 stowage: 268.21 pressurized: 783.98
mounting area (ft2): -0-

MASS (lbs)

total: 30729.6 experiment: 13332. carrier: 17397.6

POWER

	Total to Carrier	Available to User
NORMAL (watts)	8200.	3000.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	226.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 3100. AIR: 4800.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Combines the long module for research in a pressurized environment and pallet mounting area for experiments requiring exposure to space environment. The pallet is located aft of the long module. Utility services to the pallet are routed from the module aft endcone feedthrough plates to the pallet.

CARRIER: SPACELAB	CONFIGURATION: LONG + 2 PALLET	ACRONYM: SL LM2P
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 41.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external, ft)	height:	0.	width:	0.	length:	59.558	diameter:	13.54
(internal, ft)	height:	-0-	width:	0.	length:	44.33	diameter:	12.89

VOLUME (ft3)

total: 3425.51 experiment: 3157.3 stowage: 268.21 pressurized: 783.98
mounting area (ft2): -0-

MASS (lbs)

total: 30795.6 experiment: 12232. carrier: 18563.6

POWER

	Total to Carrier	Available to User
NORMAL (watts)	8200.	3000.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	226.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 3100. AIR: 4800.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV, NONE): CCTV

REMARKS: This configuration increases the space-exposed mounting area by connecting two pallets in a train aft of the pressurized long module.

CARRIER: SPACELAB	CONFIGURATION: SHORT + 2 PALLET	ACRONYM: SL SM2P
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 23.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	59.558	diameter:	13.54
(internal,ft)	height:	-0-	width:	0.	length:	34.04	diameter:	12.89

VOLUME (ft3)

total: 2750.99 experiment: 2669.77 stowage: 81.22 pressurized: 268.39
mounting area (ft2): -0-

MASS (lbs)

total: 30784.6 experiment: 14333. carrier: 16451.6

POWER

	Total to Carrier	Available to User
NORMAL (watts)	7800.	3000.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	226.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 3100. AIR: 4800.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Utilizes the short Spacelab module for pressurized environment. The Spacelab short module consists of the core segment and two endcones from the long module, the experiment segment is not used. Mounted aft of the short module are two pallet segments allowing experiments exposure to the space environment.

CARRIER: SPACELAB	CONFIGURATION: SHORT + 3 PALLET	ACRONYM: SL SM3P
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 27.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	58.575	diameter:	13.54
(internal,ft)	height:	-0-	width:	0.	length:	43.35	diameter:	12.89

VOLUME (ft3)

total: 3994.09 experiment: 3912.87 stowage: 81.22 pressurized: 268.39
mounting area (ft2): -0-

MASS (lbs)

total: 30850.6 experiment: 13233. carrier: 17617.6

POWER

	Total to Carrier	Available to User
NORMAL (watts)	7800.	3000.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	226.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 3100. AIR: 4800.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: The Spacelab short module is used in conjunction with three pallet structures. This configuration offers the largest pallet mounting area which may be used in a module/pallet configuration. The three segments are rigidly attached to form a single pallet train.

CARRIER: SPACELAB	CONFIGURATION: 3 PALLET	ACRONYM: SL 3P
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 12.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	55.95	diameter: 14.718
(internal,ft)	height:	-0-	width:	0.	length:	38.28	diameter: 12.9594

VOLUME (ft3)

total: 6479.5 experiment: 6479.5 stowage: 0. pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 30632.8 experiment: 20625. carrier: 10007.8

POWER

	Total to Carrier	Available to User
NORMAL (watts)	7300.	4800.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	507.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 7100.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Consist of three independently suspended pallet segments. The pallet segments are spaced along the length of the cargo bay. An "igloo" must be used in this configuration in the abscence of a module. The igloo is mounted on the end of the forward pallet, provides a controlled, pressurized environment for Spacelab subsystems normally carried in the core segment. Utility services are routed dircetly from the orbiter to the igloo/first pallet segment. For the accommodation of experiment structures, it must be ensured that such structures do not act as a rigid connection between the pallet segments.

CARRIER: SPACELAB	CONFIGURATION: 4 PALLET	ACRONYM: SL 4P
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 16.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	59.558	diameter:	14.718
(internal,ft)	height: -0-		width:	0.	length:	42.21	diameter:	12.9594

VOLUME (ft3)

total: 6479.5 experiment: 6479.5 stowage: 0. pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 30676.8 experiment: 20042. carrier: 10634.8

POWER

	Total to Carrier	Available to User
NORMAL (watts)	7300.	4800.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	507.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 7100.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Well-suited configuration for a number of astronomy missions. Consists fo two independently suspended pallet trains composed of two pallet segments each. As in the 3 pallet configuration an "igloo" is used to house the support equipment. For the accommodation of payload structures, it must be ensured that such structures do not act as a rigid connection between the two pallet trains.

CARRIER: SPACELAB	CONFIGURATION: 5 PALLET	ACRONYM: SL 5P
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 20.

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height:	0.	width:	0.	length:	59.558	diameter: 14.718
(internal,ft)	height:	-0-	width:	0.	length:	48.95	diameter: 12.9594

VOLUME (ft3)

total: 6479.5 experiment: 6479.5 stowage: 0. pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 30236.8 experiment: 18282. carrier: 11954.8

POWER

	Total to Carrier	Available to User
NORMAL (watts)	7300.	4800.
PEAK (watts)	11400.	4300.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	890.	507.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 8500. AVAILABLE TO EXPERIMENTS LIQUID: 0. AIR: 7100.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): 50000 COMMAND (y/n): Y COMMAND LINK (kbps): 70

VENTING

CAPABILITY (y/n): Y VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): Y VIDEO (i.e. CCTV,NONE): CCTV

REMARKS: Consists of two independently suspended pallet trains separated by a dynamic clearance gap. One pallet train consists of three and the other consists of two structurally connected pallet segments. This configuration provides the longest possible experiment platform for Spacelab payloads requiring exposure to the space environment. An "igloo" must be used to house support equipment. For the accommodation of payload structures, it must be ensured that such structures do not act as a rigid connection between the two pallet trains.

CARRIER: SPACELAB MIDDECK EXPERIMENT	CONFIGURATION: SMIDEX PLATE	ACRONYM: SMIDEX
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 1.3

PARENT: SPACELAB

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft)	height: -0-	width:	2.1	length:	3.45	diameter:	0.
(internal,ft)	height: -0-	width:	2.	length:	3.34	diameter:	0.

VOLUME (ft3)

total: 8. experiment: 8. stowage: 0. pressurized: 8.
mounting area (ft2): -0-

MASS (lbs)

total: -0- experiment: 240. carrier: -0-

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	-0-
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): MISS DEP COMMAND (y/n): Y COMMAND LINK (kbps): MISS DEP

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): - VIDEO (i.e. CCTV,NONE): -0-

REMARKS: SMIDEX plates are installed in Spacelab double and single racks, allowing middeck type experiments to be flown in the laboratory module for increased flight oppurtunities. Possible configurations are 4 middeck lockers and 2 EACs for a double rack and 2 middeck lockers and 1 EAC for a single rack.

CARRIER: SPACELAB DOUBLE RACK	CONFIGURATION: DOUBLE	ACRONYM: SL DR
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: 3.3

PARENT: SPACELAB

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 8.99 width: 3.44 length: 2.5 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 61.79 experiment: 41.3 stowage: 0. pressurized: 61.79
mounting area (ft2): -0-

MASS (lbs)

total: 1428. experiment: 1279. carrier: 149.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	425.	425.
PEAK (watts)	538.	538.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	36.	36.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 663. AVAILABLE TO EXPERIMENTS LIQUID: 241. AIR: 421.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): MISS DEP COMMAND (y/n): Y COMMAND LINK (kbps): MISS DEP

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): -0-

REMARKS: The Spacelab double rack is a flight qualified structure designed to accommodate two stacks of side-by-side mounted standard 19-inch pieces of equipment. For experiments requiring the full-width of the double rack, the truss middle frame may be removed in the lower part of the rack. An experiment power switching panel (EPSP), a remote acquisition unit (RAU), and the Spacelab signal interface unit are located in each rack to serve the user. Up to six double racks and four single racks can be installed in the long module.

CARRIER: SPACELAB SINGLE RACK	CONFIGURATION: SINGLE	ACRONYM: SL SR
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FED'S: 1.7

PARENT: SPACELAB

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 8.99 width: 1.85 length: 2.5 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: 31.4 experiment: 17.23 stowage: 0. pressurized: 31.4
mounting area (ft2): -0-

MASS (lbs)

total: 742. experiment: 640. carrier: 102.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	215.	215.
PEAK (watts)	270.	270.
PEAK LENGTH (hours)	0.25	0.25
ENERGY (kwh)	18.	18.

COOLING (w)

TOTAL AVAILABLE TO CARRIER: 332. AVAILABLE TO EXPERIMENTS LIQUID: 121. AIR: 211.

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): MISS DEP COMMAND (y/n): Y COMMAND LINK (kbps): MISS DEP

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): N VIDEO (i.e. CCTV,NONE): -0-

REMARKS: The Spacelab single rack is a flight qualified structure designed to accommodate a single stack of standard 19-inch payloads. An experiment power switching panel (EPSP), a remote acquisition unit (RAU), and the Spacelab signal interface unit are located in each rack to serve the user. Up to six double racks and four single racks can be installed in the long module.

CARRIER: SPARTAN FLIGHT SUPPORT STRUCTURE	CONFIGURATION: CROSS-BAY	ACRONYM: SFSS
COMPANY/SPONSOR: NASA	MISSION LENGTH (DAYS): 7.	FEO'S: 1.5

PARENT: SHUTTLE

CURRENT STATUS OF HARDWARE (definition, design, existing): EXISTING

DIMENSIONS

(external,ft) height: 9.39 width: 2.79 length: 14.24 diameter: -0-
(internal,ft) height: -0- width: -0- length: -0- diameter: -0-

VOLUME (ft3)

total: -0- experiment: -0- stowage: -0- pressurized: 0.
mounting area (ft2): -0-

MASS (lbs)

total: 6300. experiment: 5000. carrier: 1300.

POWER

	Total to Carrier	Available to User
NORMAL (watts)	-0-	280.
PEAK (watts)	-0-	-0-
PEAK LENGTH (hours)	-0-	-0-
ENERGY (kwh)	-0-	-0-

COOLING (w)

TOTAL AVAILABLE TO CARRIER: -0- AVAILABLE TO EXPERIMENTS LIQUID: -0- AIR: -0-

COMMAND/CONTROL

TELEMETRY (y/n): Y TELEMETRY DOWNLINK (kbps): -0- COMMAND (y/n): Y COMMAND LINK (kbps): -0-

VENTING

CAPABILITY (y/n): - VACUUM (mbar): -0- FLOW (gm/s): -0- QUANTITY (grams): -0-

EXPOSURE (y/n): - VIDEO (i.e. CCTV,NONE): -0-

REMARKS: The base structure is a Multi-Purpose Experiment Support Structure (MPESS) with a detachable upper structure which houses unique instruments for each Spartan mission. The upper structure is released and retrieved by the orbiter during the course of flight. The upper structure is unique to each mission and consists of the upper housing, Instrument cannister (IC), the ACS pnuematics system with cold gas supply and support for the remote manipulator system grapple fixture. 2 carriers are available.

4.0 SHUTTLE AVAILABILITY ASSESSMENT COMMERCIAL FLIGHTS ACCOMMODATION PLAN

4.0 SHUTTLE AVAILABILITY ASSESSMENT COMMERCIAL FLIGHTS ACCOMMODATION PLAN

To help the Office of Commercial Programs plan for future activity, a Commercial Flight Accommodation Plan (CFAP) was developed. Inputs for the plan were required from the "Commercial User Requirements" task to ascertain the needs of the commercial users. The inputs included: carrier required, initial flight data, and number and date of reflights. The "Carriers and Facilities: database was used to compare the carriers' capabilities and resources with the requirements of the commercial users to verify the needs of the users were met. To assess shuttle availability, analysis of the shuttle manifests (primarily and secondary) was performed. From the manifests a flight by flight listing of carriers available to commercial users was generated. Integration of the commercial user requirements, "Carriers and Facilities" database and shuttle availability assessment resulted in a Commercial Flights Accommodation Plan.

In this section a summary of the CCDS and JEA flight requests and a definition for the flight experiment opportunity (a standard unit of carrier capability) are presented. Next, is the Commercial Flights Accommodation Plan. Included are assumptions used in the plan, a projected manifest for the calendar years 1988 - 1994 and a list of flight requests for each year complete with unmanifested payloads from previous years. A graphical representation of the CFAP follows, showing the comparison of the resources requested and the resources available to commercial users. Further, long-range flight projections utilizing the STS and Space Station are included. Finally, a list of conclusions from the study are presented.

COMMERCIAL PAYLOAD FLIGHT REQUESTS BY YEAR (1988 - 1984)

Flight activity by the commercial users will increase as shuttle flights regain a regular schedule. The chart on the facing page is a summarization of the, "Office of Commercial Program (OCP) Flight Requests", showing the number of flight requests per year for JEAs and CCDSs. A total of 183 flight requests have been requested for the years 1988 - 1994.

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COMMERCIAL PAYLOADS FLIGHT REQUESTS BY YEAR (1988-1994)

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

	88	89	90	91	92	93	94	TOTAL
JOINT ENDEAVOR AGREEMENTS	1	3	2	4	8	6	6	30
CENTERS FOR THE COMMERCIAL DEVELOPMENT OF SPACE	1	6	27	28	48	29	14	153

FLIGHT EXPERIMENT OPPORTUNITY (FEO)

To perform an accommodation study of the shuttle, a standard unit of carrier capability was required to compare the diversified types of carriers available to shuttle users. A standard middeck user allocation was assumed to be 3 locker volumes or 6 ft^3. A Flight Experiment Opportunity (FEO) value of 1 was given to 3 lockers. All other carriers were given a value based on this standard middeck users allocation.

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FLIGHT EXPERIMENT OPPORTUNITY (FEO)

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

FLIGHT EXPERIMENT OPPORTUNITY (FEO): A UNIT OF ACCOMMODATIONS AND RESOURCES THAT IS USEFUL FOR CARRIER CAPABILITY COMPARISON AND LONG RANGE MANIFEST PLANNING. A STANDARD SINGLE USER ALLOCATION IN THE MIDDECK IS 3 LOCKER VOLUMES, WHICH IS APPROXIMATELY 6 FT^3, 1 FEO IS EQUAL TO APPROXIMATELY 6 FT^3 OF PAYLOAD VOLUME. ALL OTHER FEO EQUIVALENTS ARE BASED ON THIS DEFINITION.

CARRIER	FEO
3 LOCKERS	1
DOUBLE RACK	3.3
MAR/SINGLE RACK	1.7
GAS CAN	.5
HITCHHIKER-M	1.5
HITCHHIKER-G	1.5
MSL	3.0
EOS CARRIER	1.5

CCDS FLIGHT REQUEST DATA

The CCDSs taken as a whole, have compiled an aggressive flight schedule for the near future. Utilization of both middeck and cargo bay carriers has been requested. The first chart on the facing page, shows the number of each carrier requested by year. Carriers such as MLS or Hitchhiker-M can accommodate more than one experiment per flight, resulting in some of the values representing partial utilization of the carrier. The bottom chart shows the FEO equivalent values of the carriers requested in the top chart. A total of 147.33 FEOs have been requested by the CCDSs from 1988 - 1994.

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CCDS FLIGHT REQUEST DATA

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

CCDS REQUESTS

	88	89	90	91	92	93	94
LOCKERS	2.00	13.00	37.00	49.00	60.00	37.00	24.00
DOUBLE RACK	0.00	0.00	0.00	0.00	4.00	3.00	2.00
MAR/SINGLE RACK	0.00	0.00	0.00	5.00	3.00	3.00	0.00
GAS CAN	0.00	0.00	2.00	4.00	2.00	1.00	4.00
HITCHHIKER-M	0.00	0.00	0.00	0.00	0.33	0.00	0.33
HITCHHIKER-G	0.00	0.00	0.00	0.00	0.00	0.33	0.00
MSL	0.00	0.00	0.00	0.00	1.33	1.33	0.00
EOS CARRIER	0.00	0.00	0.00	0.00	4.00	2.00	0.00

CCDS EQUIVALENT FEOs

	88	89	90	91	92	93	94
LOCKERS	0.66	4.33	12.33	16.33	20.00	12.33	8.00
DOUBLE RACK	0.00	0.00	0.00	0.00	13.33	10.00	6.66
MAR/SINGLE RACK	0.00	0.00	0.00	8.33	5.00	5.00	0.00
GAS CAN	0.00	0.00	1.00	2.00	1.00	0.50	2.00
HITCHHIKER-M	0.00	0.00	0.00	0.00	0.50	0.00	0.50
HITCHHIKER-G	0.00	0.00	0.00	0.00	0.00	0.50	0.00
MSL	0.00	0.00	0.00	0.00	4.00	4.00	0.00
EOS CARRIER	0.00	0.00	0.00	0.00	6.00	3.00	0.00

TOTAL 147.33 FEOs

JEA FLIGHT REQUEST DATA

The JEAs have also requested a mix of middeck and cargo bay carriers but not in the numbers requested by the CCDSs. The first chart on the facing page, shows the number of each carrier requested by year. Carriers such as MLS or Hitchhiker-M can accommodate more than one experiment per flight, resulting the some of the values representing partial utilization of the carrier. The bottom chart shows the FEO equivalent values of the carriers requested in the top chart. A total of 30.66 FEOs have been requested by the JEAs from 1988 - 1994.

WYLE LABORATORIES

JEA FLIGHT REQUEST DATA

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

JEA REQUESTS

	88	89	90	91	92	93	94
LOCKERS	4.00	8.00	8.00	8.00	9.00	8.00	8.00
DOUBLE RACK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAR/SINGLE RACK	0.00	0.00	0.00	2.00	1.00	0.00	0.00
GAS CAN	0.00	0.00	0.00	0.00	2.00	2.00	2.00
HITCHHIKER-M	0.00	0.00	0.00	0.00	0.33	0.33	0.00
HITCHHIKER-G	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MSL	0.00	0.00	0.00	0.00	0.33	0.33	0.66
EOS CARRIER	0.00	0.00	0.00	0.00	0.00	0.00	0.00

JEA EQUIVALENT FEOs

	88	89	90	91	92	93	94
LOCKERS	1.33	2.66	2.66	2.66	3.00	2.66	2.66
DOUBLE RACK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAR/SINGLE RACK	0.00	0.00	0.00	3.33	1.66	0.00	0.00
GAS CAN	0.00	0.00	0.00	0.00	1.00	1.00	1.00
HITCHHIKER-M	0.00	0.00	0.00	0.00	0.50	0.50	0.00
HITCHHIKER-G	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MSL	0.00	0.00	0.00	0.00	1.00	1.00	2.00
EOS CARRIER	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TOTAL 30.66 FEOs

TOTAL FLIGHT REQUEST DATA

This chart is a summary of the two previous CCDS and JEA flight request charts. Values from the CCDSs and JEAs were added to show the total requests of the commercial partners. Combining the CCDS and JEA requests produced a total of 178 FEOs requested for the years 1988 - 1994.

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TOTAL FLIGHT REQUEST DATA

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

TOTAL REQUESTS

	88	89	90	91	92	93	94
LOCKERS	6.00	21.00	45.00	57.00	69.00	45.00	32.00
DOUBLE RACK	0.00	0.00	0.00	0.00	4.00	3.00	2.00
MAR/SINGLE RACK	0.00	0.00	0.00	7.00	4.00	3.00	0.00
GAS CAN	0.00	0.00	2.00	4.00	4.00	3.00	6.00
HITCHHIKER-M	0.00	0.00	0.00	0.00	0.66	0.33	0.33
HITCHHIKER-G	0.00	0.00	0.00	0.00	0.00	0.33	0.00
MSL	0.00	0.00	0.00	0.00	1.66	1.66	0.66
EOS CARRIER	0.00	0.00	0.00	0.00	4.00	2.00	0.00

TOTAL EQUIVALENT FEOs

	88	89	90	91	92	93	94
LOCKERS	2.00	7.00	15.00	19.00	23.00	15.00	10.66
DOUBLE RACK	0.00	0.00	0.00	0.00	13.33	10.00	6.66
MAR/SINGLE RACK	0.00	0.00	0.00	11.66	6.66	5.00	0.00
GAS CAN	0.00	0.00	1.00	2.00	2.00	1.50	3.00
HITCHHIKER-M	0.00	0.00	0.00	0.00	1.00	0.50	0.50
HITCHHIKER-G	0.00	0.00	0.00	0.00	0.00	0.50	0.00
MSL	0.00	0.00	0.00	0.00	5.00	5.00	2.00
EOS CARRIER	0.00	0.00	0.00	0.00	6.00	3.00	0.00

TOTAL 178.00 FEOs

ACCOMMODATION PLAN DEVELOPMENT ASSUMPTIONS
COMMERCIAL FLIGHTS ACCOMMODATION PLAN

On the facing page is a list of assumptions used in developing the Commercial Flights Accommodation Plan. The series of charts following the assumptions show a flight-by-flight breakout of commercial flight opportunities. The flights are listed by calander year along with possible payloads available to commercial users, the carriers available, and the CFAP projection of the commercial users to be manifested. On the page facing the yearly projected manifests is a list of flight requests by the commercial users for that year along with unmanifested payloads from prvious years.

ACRONYMS

3M	-	Minnesota, Mining and Manufacturing
ADV	-	Advanced
AUB	-	Auburn University
BAT	-	Battelle Columbus Laboratories
BFEA	-	Bioprocessing Fluids Experiment Apparatus
BMDA	-	Bioserve Materials Dispersion Apparatus
CAS	-	Case Western Reserve University
CBE	-	Chemical Beam Epitaxy
CFES	-	Continuous Flow Electrophoresis System
CGAS	-	Commercial Get-Away-Special
CHSF	-	Consortium Spacehab Facility
CLA	-	Clarkson University
CM	-	Commercial Middeck Payload
CMDSF	-	Consortium for Materials Development in Space Facility
CMG	-	Middeck Accommodations Rack
CMSE	-	Composite Materials Space Exposure
COL	-	University of Colorado-Boulder
CSE	-	Commercial Hitchhiker-G
CVTE	-	Chemical Vapor Transport Experiment
CXH	-	Commercial Hitchhiker-M
CXM	-	Commercial Material Science Laboratory
DOD	-	Department of Defense
DSCT	-	Directional Solidification of Cadmium Telluride
EOS	-	Electrophoretic Operations in Space
ERIM	-	Environmental Research Institute of Michigan
FEA	-	Fluids Experiment Apparatus
FEO	-	Flight Experiment Opportunity
FZCG	-	Float Zone Crystal Growth
FZP	-	Float Zone Processing
GAS	-	Get-Away-Special Cannister
GBA	-	Get-Away-Special Bridge Apparatus
IML	-	International Microgravity Laboratory
ISC	-	International Space Corporation
ISEM	-	ITA Standard Experiment Module
ISF	-	Industrial Space Facility
ITA	-	Instrumentation Technology Associates
JEA	-	Joint Endeavor Agreement
LDE	-	Long-Duration Exposure
LEMZ	-	Liquid Encapsulated Melt Zone
MAR	-	Middeck Accommodations Rack
MBE	-	Molecular Beam Epitaxy
MDA	-	Materials Dispersion Apparatus
MDP	-	Middeck Payload
MLR	-	Mono-Disperse Latex Reactor
MSL	-	Material Science Laboratory
NFF	-	Normal Freezing Furnace
NLO	-	Non-Linear Optic
PCG	-	Protein Crystal Growth
PEN	-	Pennsylvania State University
PM	-	Polymer Morphology
PSE	-	Physiological Systems Experiment
PVTCG	-	Physical Vapor Transport Crystal Growth
PVTOS	-	Physical Vapor Transport of Organic Solutions
SH	-	Spacehab
SL	-	Spacelab
SLS	-	Space Life Sciences
TEX	-	Texas A&M University
UAB	-	University of Alabama-Birmingham
UAH	-	University of Alabama-Huntsville
USML	-	United States Microgravity Laboratory
USMP	-	United States Microgravity Payload
VAN	-	Vanderbilt University
VDA	-	Vapor Dispersion Apparatus
WIS	-	University of Wisconsin-Madison
WSF	-	Wake Shield Facility
ZCG	-	Zeolite Crystal Growth

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ACCOMMODATIONS PLAN DEVELOPMENT ASSUMPTIONS

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

- UNMANIFESTED FLIGHT REQUESTS FROM A PREVIOUS YEAR HAVE TOP PRIORITY IN THE FOLLOWING YEAR.
- THE TERM "OPPORTUNITY" SPECIFIED IN THE OFFICAL NASA MANIFEST IS ASSUMED TO EQUAL 4 MIDDECK LOCKER OPPORTUNITIES WHEN NO OTHER CARRIER IS IDENTIFIED.
- AFTER THE FIRST SPACEHAB FLIGHT, ALL OTHER SPACEHAB FLIGHTS WILL ACCOMMODATE 50% COMMERCIAL USERS.
- INVESTIGATORS REQUESTING FLIGHTS IN 1993 - 1994 COULD BE PREPARED TO FLY UP TO 3 MONTHS EARLIER IF A FLIGHT OPPORTUNITY WAS AVAILABLE.

1988 FLIGHT REQUEST DATA

UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER

1988 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
3M	JEA	PVTOS2	3 QTR 88	4CM
UAB	001	PCG/VDA	3 QTR 88	2CM

1988 CFAP MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
26 9/29/88	PVTOS-2 PGC-II-01	MDP/4 MDP/2	3M/JEA PVTOS-2 UAB/001 PCG/VDA
27 12/2/88	(DOD)		

UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER

1989 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
3M	JEA	PM1	4 QTR 90	4CM
ROCKWELL	JEA	FEA	2 QTR 89	2CM
			4 QTR 89	2CM
UAB	001	PCG/VDA	1 QTR 89	2CM
			4 QTR 89	3CM
			4 QTR89	3CM
BAT	F002	Membrane Formation	2 QTR 89	1CM
			4 QTR 89	1CM
	F003	MLR	3 QTR 89	3CM

1989 CFAP PROJECTED MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
29 3/10/89	PCG-III-01	MDP/2	UAB/001 PCG/VDA
30 4/28/89	FEA-01	MDP/2	ROCKWELL/JEA FEA-01
28 7/1/89	(DOD)		
33 8/10/89	(DOD)		
34 10/12/89	PM-01	MDP/4	3M/JEA PM-01
32 11/13/89	FEA-02 PCG-III-02	MDP/2 MDP/3	ROCKWELL/JEA FEA-02 UAB/001 PCG/VDA
31 12/11/89	PCG-III-03 CM-II-01	MDP/3 MDP/1	UAB/001 PCG/VDA BAT/F002 Mem. Formation

1990 FLIGHT REQUEST DATA

1989 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F002	Membrane Formation	4 QTR 89	1CM
	F003	MLR	3 QTR 89	3CM

1990 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
3M	JEA	PVTOS	4 QTR 90	4CM
	JEA	PM-2	2 QTR 90	4CM
UAB	001	PCG/VDA	1 QTR 90	3CM
			2 QTR 90	1CM
UAH		GAS #105	2 QTR 90	SLS-1 GBA
		Superconductor	3 QTR 90	STP1
PEN	F001	PSE	1 QTR 90	2CM
			3 QTR 90	2CM
	D003	Drug Delivery	2 QTR 90	1CM
COL	D001	BFEA I	3 QTR 90	2CM
	F002	BFEA II	3 QTR 90	2CM
	F003	BMDA	2 QTR 90	1CM
			3 QTR 90	1CM
	D001	Higher Plant Growth	1 QTR 90	2CM
	D003	Losses in mG	2 QTR 90	2CM
AUB	001	Fuel Cell	3 QTR 90	2CM
	002	Power Converter	3 QTR 90	2CM
BAT	F001	Polymer Membranes	2 QTR 90	1CM
			3 QTR 90	1CM
			4 QTR 90	1CM
	F002	Membrane Formation	1 QTR 90	1CM
			2 QTR 90	1CM
			3 QTR 90	1CM
	F003	MLR	2 QTR 90	3CM
	D001	Catalyst Cure	3 QTR 90	1CM
			4 QTR 90	1CM
	D002	NLO Polymers	2 QTR 90	1CM
			3 QTR 90	1CM
			4 QTR 90	1CM

1990 CFAP PROJECTED MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
36 2/1/90	(DOD)		
35 3/1/90	PCG-III-05	MDP/3	UAB/001 PCG/VDA
37 4/5/90	PM-02	MDP/4	3M /JEA PM-2
	PCG-III-06	MDP/3	UAB/001 PCG/VDA
	PCG-III-04	MDP/3	COL/FOO3 BMDA
38 5/10/90	(DOD)		
40 6/7/90	GAS BRIDGE	GAS CAN	UAH/001 GAS CAN #105
39 8/6/90	GAS	GAS CAN	UAH/002 Superconductor
41 10/5/90	POSSIBLE OPPORTUNITY		
42 11/1/90	(DOD)		
43 12/10/90	CM-IV-01	MDP/4	3M/JEA PVTOS-3
	CM-IV-02	MDP/2	PEN/F001 PSE

1991 FLIGHT REQUEST DATA

1989 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F002	Membrane Formation	4 QTR 89	1CM
	F003	MLR	3 QTR 89	3CM

1990 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
COL	F003	BMDA	3 QTR 90	1CM
	F001	BFEA I	3 QTR 90	2CM
	F002	BFEA II	3 QTR 90	2CM
	D001	Higher Plant Growth	1 QTR 90	2CM
	D003	Losses in mG	2 QTR 90	2CM
PEN	F001	PSE	3 QTR 90	2CM
	D003	Drug Delivery	2 QTR 90	1CM
BAT	F001	Polymer Membranes	2 QTR 90	1CM
			3 QTR 90	1CM
			4 QTR 90	1CM
	F002	Membrane Formation	1 QTR 90	1CM
			2 QTR 90	1CM
			3 QTR 90	1CM
	F003	MLR	2 QTR 90	3CM
	D001	Catalyst Cure	3 QTR 90	1CM
			4 QTR 90	1CM
	D002	NLO Polymers	2 QTR 90	1CM
			3 QTR 90	1CM
			4 QTR 90	1CM

1991 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
3M	JEA		2 QTR 91	4CM
			3 QTR 91	4CM
BOEING	JEA	CVTE	1 QTR 91	CMG
			4 QTR 91	CMG
UAB	002	PCG/ADV	1 QTR 91	2CM
			3 QTR 91	2CM
			4 QTR 91	2CM
UAH		GAS #637	2 QTR 91	CGAS-5
		GAS #638	4 QTR 91	CGAS-5
	F003	PVTCG	4 QTR 91	CMG (SH)
		CMDSF	4 QTR 91	CMG (SH)
ERIM	001	Plant Cell	1 QTR 91	2CM
			4 QTR 91	2CM
	002	mG Actuator	2 QTR 91	1CM
			4 QTR 91	1CM
PEN	F001	PSE	1 QTR 91	2CM
			3 QTR 91	2CM
	D001	Granules	3 QTR 91	CMG (CFES)
	D002	Bone Density	3 QTR 91	3CM
	D003	Drug Delivery	2 QTR 91	1CM
COL	F001	BFEA I	2 QTR 91	2CM
	F002	BFEA II	2 QTR 91	2CM
	D003	Losses in mG	1 QTR 91	2CM
BAT	F003	MLR	1 QTR 91	3CM
			4 QTR 91	3CM
TEX	D003	Heat Pipe	1 QTR 91	1CM
CAS	F002	CMSE	2 QTR 91	CGAS-5
			4 QTR 91	CGAS-5
AUB	001	Fuel Cell	1 QTR 91	3CM
			3 QTR 91	3CM
	002	Power Converter	1 QTR 91	2CM
			3 QTR 91	2CM

1991 CFAP PROJECTED MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
44 1/31/91	CVTE-01	RACK	BOEING/JEA CVTE
	CM-IV-03	MDP/2	UAB/002 PCG-ADV
		MDP/2	ERIM/001 Plant Cell
	CM-IV-04	MDP/1	PEN/D003 Drug Delivery
		MDP/2	COL/D001 BFEA I
		MDP/1	COL/F003 BMDA
	GBA	GAS CAN	UAH/GAS #637
		GAS CAN	UAH/GAS #638
45 2/21/91	NO OPPORTUNITY		
46 3/28/91	(DOD)		
47 5/2/91	NO OPPORTUNITY		
48 7/1/91	NO OPPORTUNITY		
49 8/1/91	CM-IV-05	MDP/4	3M/JEA
	CM-II-02	MDP/2	UAB/002 PCG-ADV
	CM-I-01	MDP/2	PEN/F001 PSE
	CM-I-02		
50 10/10/91	NO OPPORTUNITY		
51 11/14/91	CMG-01	RACK	BOEING/JEA CVTE
	SPACEHAB-01	RACK	UAH/F003 PVTCG
		RACK	UAH/CMDSF
		RACK (CFES)	PEN/D001 Granules
		MDP/3	3M/JEA
		MDP/2	UAB/002 PCG-ADV
		MDP/2	ERIM/001 Plant Cell
		MDP/2	PEN/F001 PSE
		MDP/2	PEN/D002 Bone Density
		MDP/1	PEN/D003 Drug Delivery

1991 CFAP PROJECTED MANIFEST (CONTINUED)

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
51 11/14/91	SPACEHAB-01 (Continued)	MDP/2	COL/F001 BFEA I
		MDP/2	COL/D001 Plant Growth
		MDP/2	COL/D003 Losses in mG
		MDP/1	BAT/F001 Polymer Mem.
		MDP/1	BAT/F002 Mem. Formation
		MDP/3	BAT/F003 MLR
		MDP/1	BAT/D001 Catalyst Cure
		MDP/1	BAT/D002 NLO Polymers
		MDP/1	TEX/D003 Heat Pipe

1990 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F001	Polymer	3 QTR 90	1CM
			4 QTR 90	1CM
	F002	Membrane	1 QTR 90	1CM
			2 QTR 90	1CM
			3 QTR 90	1CM
	F003	MLR	2 QTR 90	3CM
	D001	Catalyst Cure	4 QTR 90	1CM
	D002	NLO Polymers	3 QTR 90	1CM
			4 QTR 90	1CM
PEN	F001	PSE	3 QTR 90	2CM
COL	F002	BFEA	3 QTR 90	2CM
	D001	Higher P.G.	4 QTR 90	CGAS-05
AUB	001	Fuel Cell	3 QTR 90	3CM
	002	Power Converter	3 QTR 90	2CM

1991 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
VAN	D001	FZP	4 QTR 91	MAR
TEX	D003	Heat Pipe	1 QTR 91	CGAS-05
CAS	F002	CMSE	2 QTR 91	CGAS-05
			4 QTR 91	CGAS-05
AUB	001	Fuel Cell	1 QTR 91	3CM
			3 QTR 91	3CM
	002	Power Converter	1 QTR 91	2CM
			3 QTR 91	2CM
ERIM	001	Plant Cell Growth	2 QTR 91	2CM
			4 QTR 91	2CM
	002	mG Actuator	2 QTR 91	1CM
			4 QTR 91	1CM

1992 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F005	Hydrothermal	1 QTR 92	1CM
			4 QTR 92	1CM
VAN	F002	High Temp. Alloys	2 QTR 92	MSL (CXM)
	F001	D.S. of CuPb Alloys	1 QTR 92	SL/RACK
			4 QTR 92	SL/RACK
	D001	FZP	2 QTR 92	MAR (Partial)
			4 QTR 92	MAR (Partial)
PEN	F001	PSE	1 QTR 92	2CM
	D002	Bone Density	3 QTR 92	3CM
CLA	D001	NLO-1	4 QTR 92	CGAS-5
	F001	ZCG	1 QTR 92	2CM
			4 QTR 92	2CM
	D002	LEMZ-1	1 QTR 92	CM
			4 QTR 92	CM
	D003	CVTE	1 QTR 92	MAR (Partial)
			4 QTR 92	MAR (Partial)
UAH	F003	PVTCG	3 QTR 92	MAR
	F004	CHSF	4 QTR 92	2CM L/RACK
	F005	CMDSF	1 QTR 92	2CM L/RACK (USML-1)
WIS	F001	Astroculture	1 QTR 92	1CM (USML-1)
			3 QTR 92	1CM
		Robo Manip.	2 QTR 92	1 FEO
TEX	D001	Microwave Phase I	2 QTR 92	HH-M (Partial)
CAS	F001	CMSE	1 QTR 92	CGAS-5 (USML-1)
UAB	001	PCG/VDA	1 QTR 92	4CM (USML-1)
	002	PCG/ADV	1 QTR 92	4CM
			3 QTR 92	4CM
ISC	JEA	NFF	4 QTR 92	1/3 MSL

1992 CFAP PROJECTED MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
53 3/2/92	"OPPORTUNITY"	MDP/1	BAT/F002 Membrane
		MDP/3	BAT/F003 MLR
54 3/30/92	USML-1	RACK	VAN/F001 D.S. of CuPb Alloys
		RACK/2CM	UAH/F005 CMDSF
		GAS CAN	CAS/F001 CMSE
		MDP/1	BAT/F005 Hydrothermal
		MDP/2	CLA/F001 ZCG
		MPD/1	WIS/F001 Astroculture
		MDP/4	UAB/001 PCG/VDA
		MDP/4	3M/JEA
		MDP/1	ROCKWELL/JEA FEA
55 5/7/92	"OPPORTUNITY"	MDP/1	BAT/F002 Membrane
		MDP/3	AUB/001 Fuel Cell
56 5/28/92	USMP-02	1/3 MSL	WIS/F002 Robo Manipulator
57 6/11/92	CM-II-03	MDP/2	AUB/002 Power Converter
	CM-IV-06	MDP/2	PEN/F001 PSE
		MDP/2	COL/F002 BFEA II
	CM-II-04	MDP/1	BAT/D002 Non-linear Op. Sub.
		MDP/1	BAT/D001 Polymer
58 7/16/92	SLS-02	NO OPPORTUNITY	
59 8/13/92	CXH-01	HH-M	ITA/JEA ISEM
			TEX/D001 Microwave Phase I
60 9/3/92	CM-IV-07	MDP/1	BAT/F002 Membrane
		MDP/1	BAT/D001 Catalyst Cure
		MDP/2	COL/D003 Losses In mG

1991 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F003	MLR	1 QTR 91	3CM
			4 QTR 91	3CM
COL	F002	BFEA I	2 QTR 91	2CM
	D003	Losses In mG	1 QTR 91	2CM

1992 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
COL	F001	BFEA I	1 QTR 92	2CM
			4 QTR 92	2CM
	F002	BFEA II	1 QTR 92	2CM
			4 QTR 92	2CM
	D002	GBA	2 QTR 92	1CM
			4 QTR 92	1CM
	D004	Micro-Org. Reactor	2 QTR 92	1CM
	D005	Cent. Fluid Men.	2 QTR 92	1CM
	F004	Blood Rheology	2 QTR 92	1CM
HOU	F001	WSF	2 QTR 92	EOS CARRIER
			4 QTR 92	EOS CARRIER
	D003	WSF-CBE	3 QTR 92	EOS CARRIER
	D002	WSF-MBE	1 QTR 92	EOS CARRIER
AUB	001	Fuel Cell	1 QTR 92	3CM
			3 QTR 92	3CM
	002	Power Converter	1 QTR 92	2CM
			3 QTR 92	2CM
ERIM	001	Plant Cell Growth	2 QTR 92	2CM
			4 QTR 92	2CM
	002	mG Actuator	2 QTR 92	1CM
			4 QTR 92	1CM
3M	JEA		2 QTR 92	4CM (USML-1)
			4 QTR 92	4CM
			1 QTR 92	CGAS-5
			3 QTR 92	CGAS-5
ROCKWELL	JEA	FEA	1 QTR 92	1CM (USML-1)
BOEING	JEA	CVTE	4 QTR 92	CVTE RACK
ITA	JEA	ISEM-H	1 QTR 92	ISEM HH-M

1992 CFAP PROJECTED MANIFEST (CONTINUED)

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
61 9/24/92	SPACEHAB-02	RACK	UAH/F003 PVTCG
		RACK/2CM	UAH/F004 CHSF
		MDP/3	PEN/D002 Bone Density
		MDP/1	WIS/F001 Astroculture
		MDP/3	AUB/001 Fuel Cell
		MDP/2	AUB/002 Power Converter
		MDP/4	UAB/002 PCG/ADV
	CM-I-03	MDP/1	BAT/D002 Non-linear Op Sub.
	CM-IV-08	MDP/1	BAT/F001 Polymer
		MDP/3	AUB/001 Fuel Cell
	CM-II-05	MDP/2	AUB/002 Power Converter
62 10/22/92	IML-02	MAR	VAN/D001 FZP
	CGAS-02	GAS CAN	COL/D001 Higher Plant Growth
63 11/10/92	(DOD)		
64 12/14/92	CMG-02	MAR	CLA/D003 CVTE
			VAN/D001 FZP
	CM-II-06	MDP/3	BAT/F003 MLR
	CM-II-07	MDP/1	ERIM/002 mG Actuator

1993 FLIGHT REQUEST DATA

1991 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
TEX	D003	Heat Pipe	1 QTR 91	CGAS-5
BAT	F003	MLR	4 QTR 91	3CM
COL	F002	BFEA I	2 QTR 91	2CM
CAS	F002	CMSE	2 QTR 91	CGAS-5
			4 QTR 91	CGAS-5
AUB	001	Fuel Cell	3 QTR 91	3CM
	002	Power Converter	3 QTR 91	3CM
ERIM	001	Plant Cell Growth	2 QTR 91	2CM
			4 QTR 91	2CM
	002	mG Actuator	4 QTR 91	1CM

1992 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F005	Hydrothermal	4 QTR 92	1CM
VAN	F002	High Temp. Alloys	2 QTR 92	MSL
	F001	D.S. of CuPb Alloys	4 QTR 92	S/L RACK
	D001	FZP	4 QTR 92	MAR
PEN	F001	PSE	1 QTR 92	2CM
CLA	D001	NLO-1	4 QTR 92	CGAS-5
	F001	ZCG	4 QTR 92	2CM
	D002	LEMZ-1	1 QTR 92	1CM
			4 QTR 92	1CM
	D003	CVTE	4 QTR 92	MAR (Partial)
COL	F001	BFEA I	1 QTR 92	2CM
			4 QTR 92	2CM
	F002	BFEA II	1 QTR 92	2CM
			4 QTR 92	2CM
	D002	GBA	2 QTR 92	1CM
			4 QTR 92	1CM
	D004	Micro. Org. Reactor	2 QTR 92	1CM
	D005	Cent. Fluid Man.	2 QTR 92	1CM
	F004	Blood Rheology	2 QTR 92	1CM

1993 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F004	FZCG CdTe	3 QTR 93	S/L RACK
VAN	F002	High Temp. Alloys	1 QTR 93	MSL
	D001	FZP SE	2 QTR 93	MAR (Partial)
			4 QTR 93	MAR (Partial)
PEN	D001	Granules	1 QTR 93	MAR (CFES)
CLA	D001	NLO-1	2 QTR 93	CGAS-5
	D004	DSCT	1 QTR 93	MSL (Partial)
UAH	F003	PVTCG	2 QTR 93	MAR
	F004	CSHF	4 QTR 93	DOUBLE RACK
	F005	CMDSF	1 QTR 93	2CM, L/RACK
WIS	F002		2 QTR 93	1 FEO (3CM)
			4 QTR 93	1 FEO (3CM)
COL	D002	GBA	3 QTR 93	1CM
	D004	Micro. Org. Reactor	1 QTR 93	1CM
	D005	Cen. Fluids Man.	1 QTR 93	1CM
	F004	Blood Rheology	1 QTR 93	1CM
CAS	F001	CMSE	1 QTR 93	HH-G CGAS
HOU	F001	WSF	2 QTR 93	EOS CARRIER
	F004	WSF-MBE	1 QTR 93	EOS CARRIER
AUB	001	Fuel Cell	1 QTR 93	3CM
	002	Power Converter	1 QTR 93	2CM
ERIM	001	Plant Cell Growth	2 QTR 93	2CM
			4 QTR 93	2CM
	002	mG Actuator	2 QTR 93	1CM
			4 QTR 93	1CM
	003	Bio Reactor Design	2 QTR 93	3CM
			4 QTR 93	3CM
UAB	002	PCG/ADV	1 QTR 93	4CM
			3 QTR 93	4CM

1993 CFAP PROJECTED MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
65 1/11/93	CM-III-01	MDP/3	AUB/001 Fuel Cell
	CM-IV-09	MDP/2	ERIM/001 Plant Cell Growth
		MDP/2	COL/F002 BFEA I
	ISF-01		
		RACK	VAN/F001 D.S. of Cu Pb Alloys
		RACK/2	UAH/F005 CMDSF
		MDP/3	AUB/002 Power Converter
		MDP/2	ERIM/001 Plant Cell Growth
		MDP/1	ERIM/002 mG Actuator
		MDP/3	BAT/F003 MLR
		MDP/3	AUB/001 Fuel Cell
66 2/11/93	CGAS-01	GAS CAN	TEX/D003 Heat Pipe
	CM-II-08	MDP/2	PEN/F001 PSE
67 3/22/93	USMP-03	MSL & MPESS	VAN/F002 High Temp. Alloys
			ISC/JEA NFF
	CMG-03	MAR (Partial)	BOEING/FJEA CVTE
		MAR (Partial)	VAN/D001 FZP
	CM-IV-10	MDP/4	UAB/002 PCG/ADV
	CM-IV-11	MDP/2	AUB/002 Power Converter
		MDP/2	COL/F001 BFEA I
68 4/12/93	CM-IV-12	MDP/1	CLA/D002 LEMZ-1
		MDP/2	COL/F002 BFEA II
		MDP/1	COL/D002 GBA
	CM-IV-13	MDP/1	COL/D004 Micro-Org Reactor
		MDP/1	COL/D005 Cent. Fluid Mem.
		MDP/2	ERIM/001 Plant Cell Growth
69 5/6/93	"OPPORTUNITY"	MDP/1	COL/F004 Blood Rheology
		MDP/1	ERIM/002 mG Actuator
		MDP/2	ERIM/001 Plant Cell Growth

1992 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
HOU	F001	WSF	2 QTR 92	EOS CARRIER
			4 QTR 92	EOS CARRIER
	D003	WSF-CBE	3 QTR 92	EOS CARRIER
	D002	WSF-MBE	1 QTR 92	EOS CARRIER
AUB	001	Fuel Cell	1 QTR 92	3CM
	002	Power Converter	1 QTR 92	2CM
ERIM	001	Plant Cell Growth	2 QTR 92	2CM
			4 QTR 92	2CM
	002	mG Actuator	2 QTR 92	1CM
			4 QTR 92	1CM
UAB	002	PCG/ADV	1 QTR 92	4CM
3M	JEA		4 QTR 92	4CM
			1 QTR 92	CGAS-5
			3 QTR 92	CGAS-5
BOEING	JEA	CVTE	4 QTR 92	CVTE RACK
ISC	JEA	NFF	4 QTR 92	1/3 MSL

1993 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
ITA	JEA	ISEM	1 QTR 93	HH-M
ISC	JEA	NFF	4 QTR 93	MSL (Partial)
3M	JEA		2 QTR 93	4CM
			4 QTR 93	4CM
			1 QTR 93	CGAS-5
			3 QTR 93	CGAS-5

1993 CFAP PROJECTED MANIFEST (CONTINUED)

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	• CURRENT PLAN
70 6/3/93	CXE-01	EOS CARRIER	HOU/D002 WSF-MBE
	CM-IV-14	MDP/4	3M/JEA OPPE
	CM-IV-15	MDP/1	ERIM/002 mG Actuator
		MDP/1	BAT/F005 Hydrothermal
		MDP/2	CLA/F001 ZCG
71 6/24/93	SPACEHAB-03	RACK	CLA/D003 CVTE
		RACK	UAH/F003 PVTCG
		MDP/1	CLA/D002 LEMZ-1
		MDP/2	COL/F001 BFEA-I
		MDP/2	COL/F002 BFEA-II
		MDP/1	COL/D002 GBA
		MDP/4	UAB/002 ADV/PCG
		MDP/2	AUB/002 Power Converter
		MDP/3	AUB/001 Fuel Cell
	CXH-02	CGAS	CAS/F002 CMSE
		CGAS	3M/JEA
		ISEM	ITA/JEA ISEM
	CM-IV-16	MDP/1	COL/D004 Micro-Org. Reactor
		MDP/1	COL/D005 Cen. Fluid Men.
		MDP/1	COL/F004 Blook Rheology
		MDP/1	ERIM/002 mG Actuator
	CM-IV-17	MDP/4	3M/JEA
	CM-IV-18	MDP/3	WIS/F002 Robo Manip.
		MDP/1	COL/D002 CBA
72 7/15/93	ISF-02	RACK	PEN/D001 Granules
		RACK	UAH/F004 CSHF
		RACK	VAN/F002 FZP SE
		MDP/2	ERIM/001 Plant Cell Growth

1993 CFAP PROJECTED MANIFEST (CONTINUED)

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
72 7/15/93 (Continued)	CXH-03	CGAS	CAS/F002 CMSE
		CGAS	3M/JEA
		CGAS	CLA/D001 NLO-1
	CM-III-02	MDP/3	ERIM/003 Bio Reactor Design
	CM-IV-19	MDP/4	UAB/002 PCG/ADV
73 8/12/93	CGAS-03	GAS CAN	3M/JEA
	USML-02	RACK	BAT/F004 FZCG CdTe
		MDP/3	WIS/F002 Robo Manip.
		MDP/2	ERIM/001 Plant Cell Growth
		MDP/1	ERIM/002 mG Actuator
		MDP/3	ERIM/003 Bio Reactor Design
		MDP/4	3M/JEA
74 9/2/93	(DOD)		
75 9/30/93	USMP-04	MSL	VAN/F002 High Temp. Alloys
76 10/21/93	(SLS-3)		
77 11/17/93	"NO OPPORTUNITY"		
78 12/9/93	(DOD)		

1994 FLIGHT REQUEST DATA

1992 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
HOU	F001	WSF	2 QTR 92	EOS CARRIER
			4 QTR 92	EOS CARRIER
	D003	WSF-CBE	3 QTR 92	EOS CARRIER

1993 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
VAN	D001	FZP	4 QTR 93	MAR
CLA	D001	NLO-1	2 QTR 93	CGAS-5
	D004	DSCT	1 QTR 93	MSL (Partial)
CAS	F001	CMSE	1 QTR 93	HH-G CGAS
HOU	F001	WSF	2 QTR 93	EOS CARRIER
	F004	WSF-MBE	1 QTR 93	EOS CARRIER
ISC	JEA	NFF	4 QTR 93	MSL (Partial)
3M	JEA		3 QTR 93	CGAS-5

1994 FLIGHT REQUESTS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
BAT	F004	FZCG CdTe	2 QTR 94	SL/RACK
UAH	F005	CMDSF	1 QTR 94	2CM, L/RACK
WIS	F002	Robo Manip.	2 QTR 94	1 FEO (3CM)
			4 QTR 94	1 FEO (3CM)
COL	D004	Micro. Org. Reactor	4 QTR 94	CGAS
	D005	Cen. Fluids Man.	4 QTR 94	1CM
	F004	Blood Rheology	4 QTR 94	1CM
TEX	D002	Microwave Phase II	2 QTR 94	HH-M (Partial)
CAS	D002	LDE of Comp. Mat.	2 QTR 94	SH/LDEF
	F001	CMSE	1 QTR 94	CGAS-5
ERIM		Bio Reactor Design	2 QTR 94	3CM
			4 QTR 94	3CM
UAB	002	PCG/ADV	1 QTR 94	4CM
			3 QTR 94	4CM
3M	JEA		2 QTR 94	4CM
			4 QTR 94	4CM
			1 QTR 94	CGAS-5
			3 QTR 94	CGAS-5
ISC	JEA	NFF	2 QTR 94	MSL (Partial)
			4 QTR 94	MSL (Partial)

1994 CFAP PROJECTED MANIFEST

STS/DATE	POSSIBLE PAYLOADS	MODE/LOCKERS	CURRENT PLAN
79 1/13/94	CMG-04	MAR	VAN/D001 FZP SE
	CM-IV-20	MDP/4	UAB/002 ADV-PCG
	SPACEHAB-04	RACK/2	UAH/F005 CMDSF
80 2/3/94	CSW-01	GAS CAN	CAS/F001 CMSE
		GAS CAN	CLA/D001 NLO-1
	ISF-03	MDP/3	WIS/F002 Robo Manip.
		MDP/4	3M/FEA
		MDP/3	ERIM/003 Bio. Reactor Design
81 2/24/94	IML-03		
82 3/24/94	"NO OPPORTUNITY"		
83 4/14/94	CSW-02	GAS CAN	3M/JEA
		GAS CAN	CAS/F001 CMSE
	CXH-04	HH-M	TEX/D002 Microwave Phase II
84 5/12/94	"OPPORTUNITY"		
85 6/9/94	(S/L-D3)		
86 7/14/94	CXH-05	1 FEO	CAS/D002 LDE of Comp. Mat.
	SPACEHAB-05	RACK	BAT/F004 FZCG CdTe
		MDP/4	UAB/002 PCG-ADV
		MDP/1	COL/F004 Blood Rheology
		MDP/1	COL/D005 Cen. Fluids Man.
		MDP/4	3M/JEA
		MDP/3	WIS/F002 Robo Manip.
87 8/25/94	(DOD)		
88 9/22/94	"OPPORTUNITY"	MDP/3	ERIM/003 Bio Reactor Design

UNMANIFESTED PAYLOADS AFTER 1994

On the facing page is the list of commerical flight requests that remained unmanifested as of STS 88. It is assumed that a review of the requirements requested by commercial users, namely more cross-bay carriers, would result in several of these payloads being manifested.

UNMANIFESTED PAYLOADS AFTER 1994

1992 UNMANIFESTED PAYLOADS

CCDS/ JEA	NASA CONTROL NUMBER	EXPERIMENT NAME	DATE REQUESTED	CARRIER
HOU	F001	WSF	2 QTR 92	EOS CARRIER
			4 QTR 92	EOS CARRIER
	D003	WSF-CBE	3 QTR 92	EOS CARRIER
	1993 UNMANIFESTED PAYLOADS			
CLA	D004	DSCT	1 QTR 93	1/3 MSL
HOU	F001	WSF	2 QTR 93	EOS CARRIER
	D004	WSF-MBE	1 QTR 93	EOS CARRIER
ISC	JEA	NFF	4 QTR 93	1/3 MSL
	1994 UNMANIFESTED PAYLOADS			
COL	D004	Micro-Org. Reactor	4 QTR 94	CGAS-5
3M	JEA		1 QTR 94	CGAS-5
			3 QTR 94	CGAS-5
ISC	JEA	NFF	2 QTR 94	1/3 MSL
			4 QTR 94	1/3 MSL

FLIGHT REQUIREMENTS

This graph is a comparison of FEOs available to commercial users on the shuttle and the FEOs requested by commercial users, by year. The available FEOs were obtained through analysis of the Shuttle Primary Manifest, January 1989 and the Secondary Payload Flight Projection, February 1989. A decline in FEOs available for 1994 results from the manifest ending in September of that year, if the same level of 14 Shuttle flights in 1993 are flown in 1994, the number of available FEOs will level out at a value of 65 - 70 FEOs. The requested FEOs were taken from the flight requests submitted to NASA by the commercial partners. In the later years a decline in flight requests is represented. It is believed as results from previous investigations flown in the 1989-1992 time frame and as new commercial partners are identified flight requests will actually continue to increase from the level shown in 1992. With the data available at present, this chart shows a shortfall in flight opportunities, by year, for commercial users into 1992.

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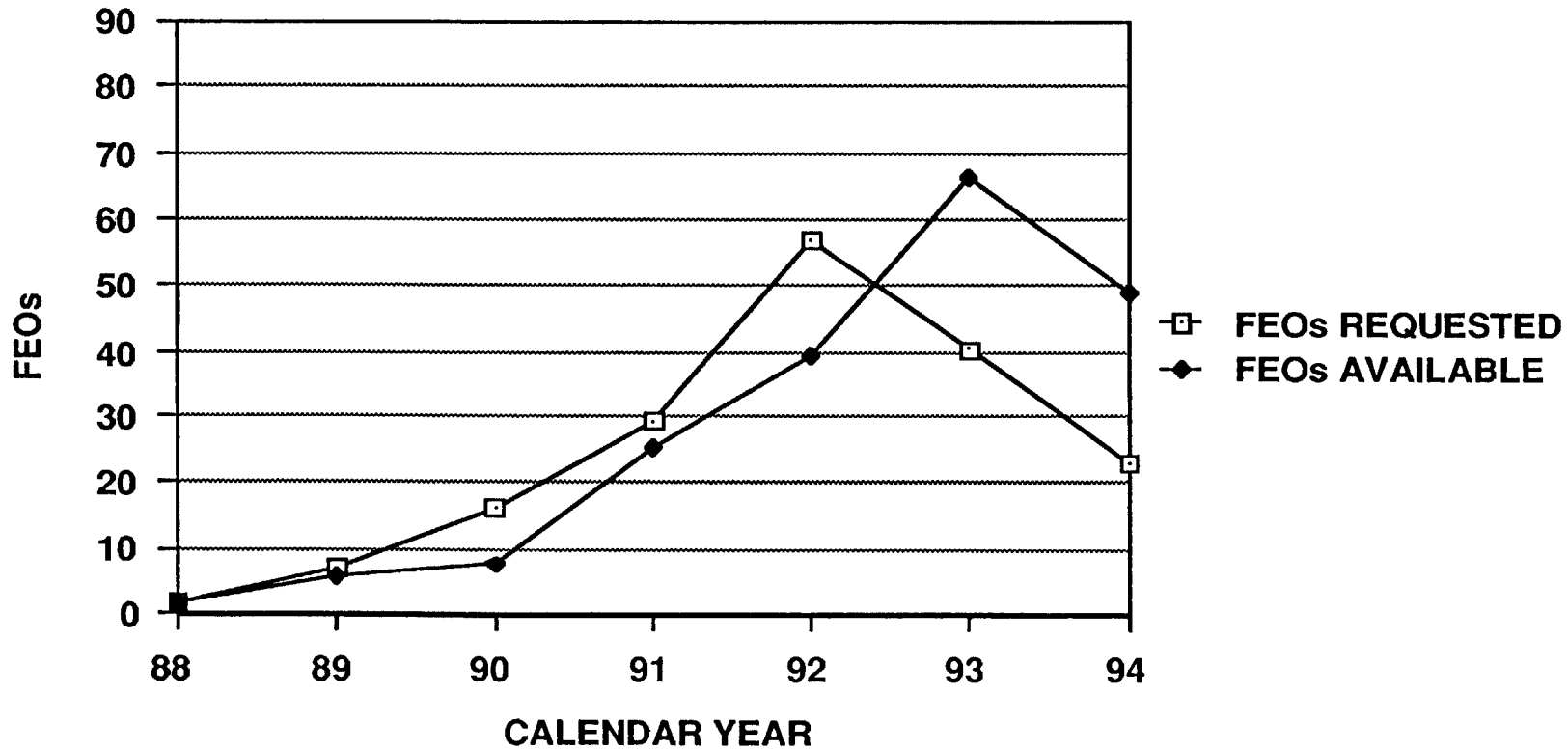
FLIGHT REQUIREMENTS

COMMERCIAL
FLIGHTS
ACCOMMODATION
PROGRAM
(CFAP)

FLIGHT EXPERIMENT OPPORTUNITIES
REQUESTED VS. AVAILABLE (BY YEAR)



FLIGHT REQUIREMENTS

This chart uses the same sources and analysis as the previous chart, but reflects the impact of unmanifested payloads on the flight requirements. If flight requests could not be accommodated in the specified year they were carried over to the following year(s) and given top priority for flight opportunities. Some flight requests remained unmanifested for up to two years. This chart is a more realistic representation of the flight requirements for commercial users, because it does not ignore unmanifested flight requests. The shortfall of flight opportunities grows dramatically from the previous chart as the requests carried over increases the backlog of flight ready commercial partners and demand on the Shuttle.

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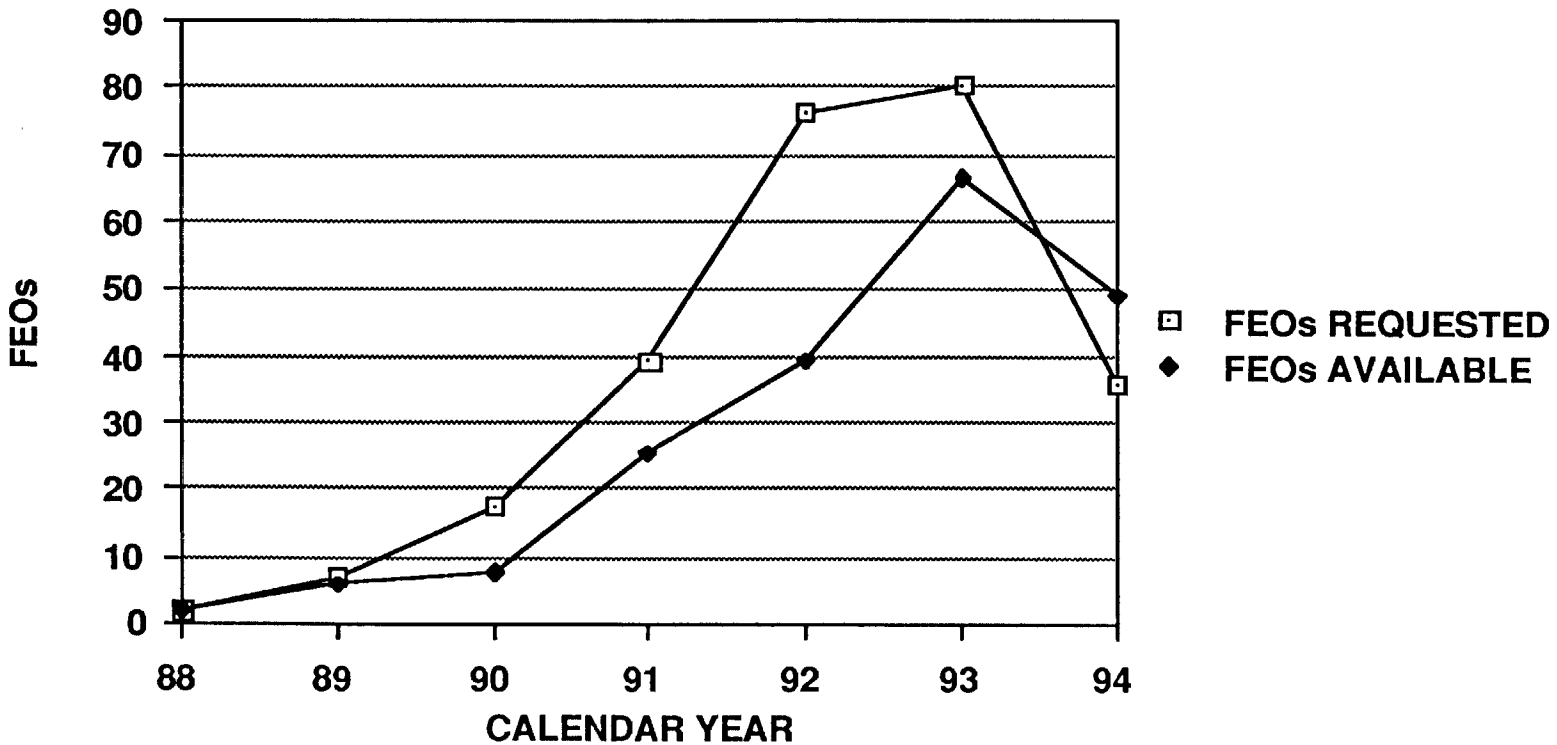
FLIGHT REQUIREMENTS

COMMERCIAL
FLIGHTS
ACCOMMODATION
PROGRAM
(CFAP)

FLIGHT EXPERIMENT OPPORTUNITIES
REQUESTED VS. AVAILABLE (CUMULATIVE)



LONG RANGE FLIGHT OPPORTUNITIES

This chart is a projection of the flight requirements (FEOs requested) and the flight opportunities (FEOs available) out to the year 1999 utilizing only the STS. The available FEOs are assumed to increase steadily to a level of 85 FEOs in 1999 or 16-18 shuttle flights per year. The requested FEOs are also projected to follow an upward trend as existing commercial partners obtain knowledge from earlier flight experiments and new commercial partners are brought in. As time passes, the two lines diverge representing an increasing number of unmanifested commercial payloads. It should be noted that a scientific or technological breakthrough by one of the commercial partners could cause the level of FEOs requested to increase at a much higher rate, thus causing even more commercial payloads to go unmanifested.

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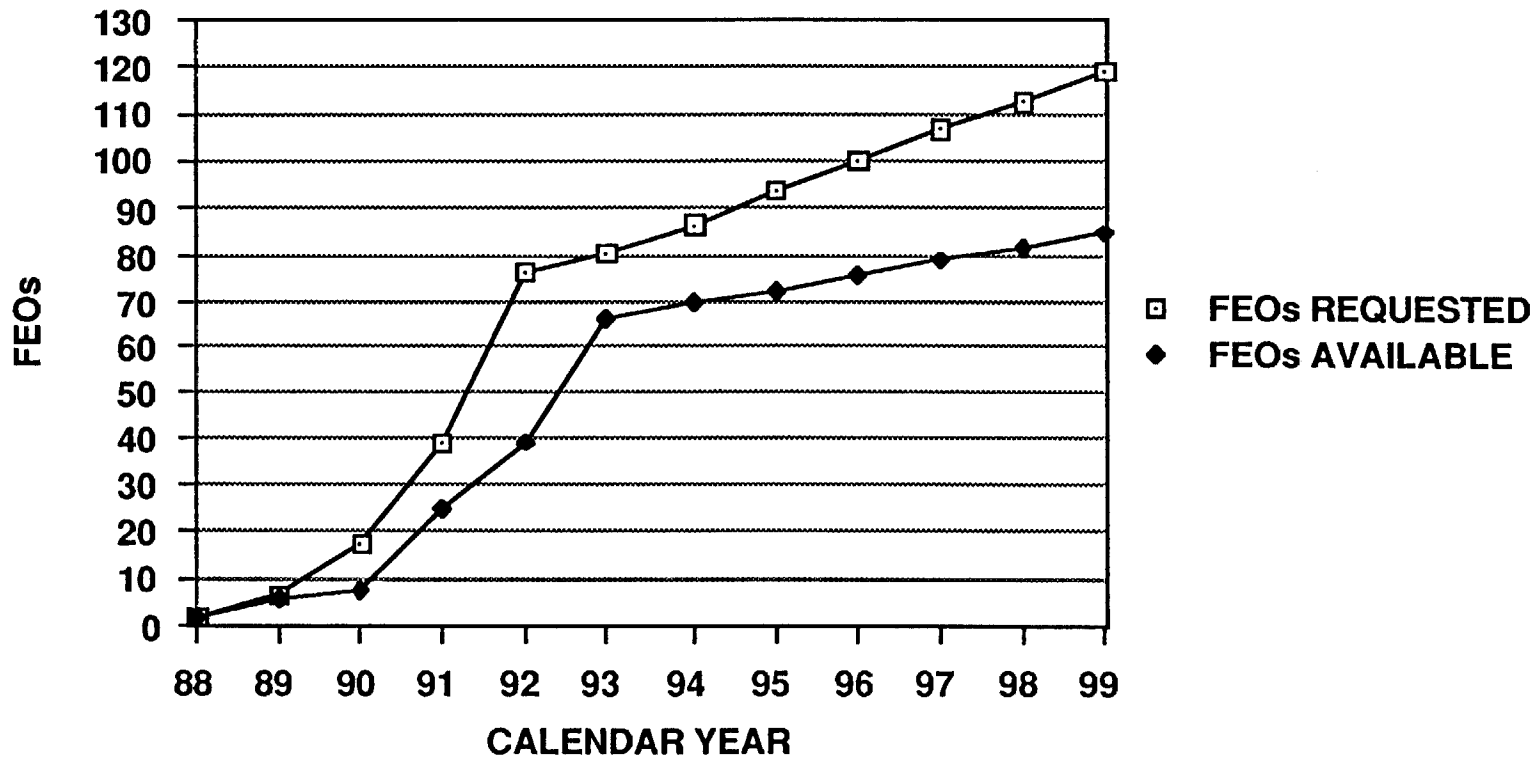
LONG RANGE FLIGHT OPPORTUNITIES

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

FLIGHT EXPERIMENT OPPORTUNITIES REQUESTED VS. AVAILABLE (PROJECTION) USING STS ONLY



LONG RANGE FLIGHT OPPORTUNITIES

This chart uses the same information and assumptions as the previous chart, but shows the additional capacity available to commercial users with the addition of the Space Station. The Space Station is assumed to begin construction in 1995 with completion in 1997. As Space Station construction progresses the flight opportunities available to commercial partners will increase also. Using the Space Station, it is projected that flight requests from commercial users can be met in the 1996-1997 time frame.

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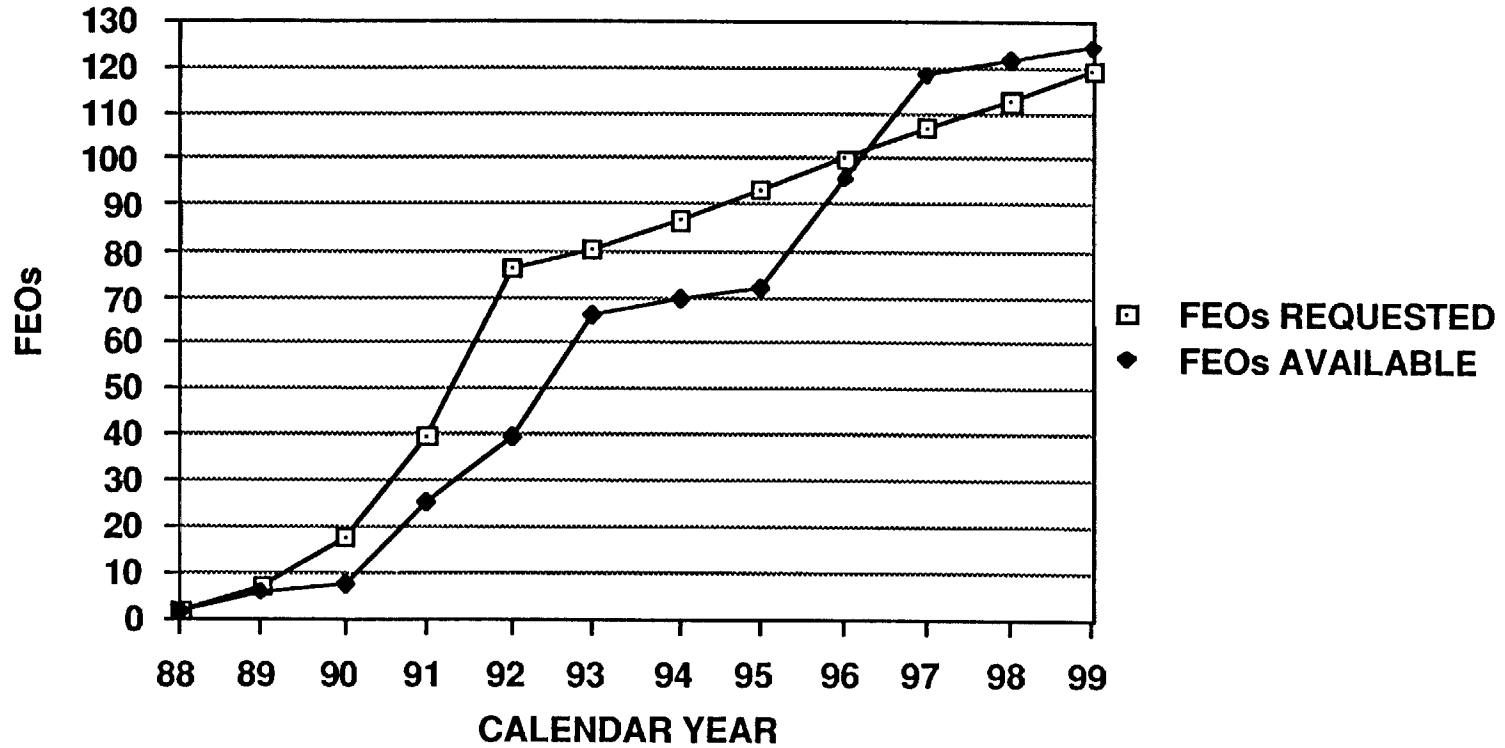
LONG RANGE FLIGHT OPPORTUNITIES

COMMERCIAL FLIGHTS ACCOMMODATION PROGRAM (CFAP)

FLIGHT EXPERIMENT OPPORTUNITIES REQUESTED VS. AVAILABLE (PROJECTION) UTILIZING STS AND SPACE STATION



CONCLUSIONS

- THE COMMERCIAL INFRASTRUCTURE IS STRONG AND PROVING EFFECTIVE IN THE COMMERCIALIZATION OF SPACE.

- INTEREST IS HIGH IN THE COMMERCIALIZATION OF SPACE.
  - 16 CCDS WITH OVER 170 INDUSTRIAL PARTNERS AND AFFILIATES.
  - 10 JEAs
  - 3 SSDAs

- FLIGHT REQUESTS WILL CONTINUE TO GROW AS NEW INVESTIGATORS EXPLORE THE COMMERCIAL ASPECTS OF SPACE.

- ADDITIONAL FLIGHT OPPORTUNITIES ARE REQUIRED TO KEEP THE MOMENTUM OF THE COMMERCIALIZATION OF SPACE EFFORT STRONG.

END DATE FEB. 27, 1990