Office of
Aeronautics and
Space
Technology

SPACE RESEARCH & TECHNOLOGY BASE

Presentation to

AIAA/OAST Conference on Space Technology

Lana M. Couch
Deputy Director for Space
September 12, 1988

SPACE R&T STRATEGY

OAST

REVITALIZE TECHNOLOGY FOR LOW EARTH ORBIT APPLICATIONS

DEVELOP TECHNOLOGY FOR EXPLORATION OF THE SOLAR SYSTEM

MAINTAIN FUNDAMENTAL R&T BASE

BROADEN PARTICIPATION OF UNIVERSITIES

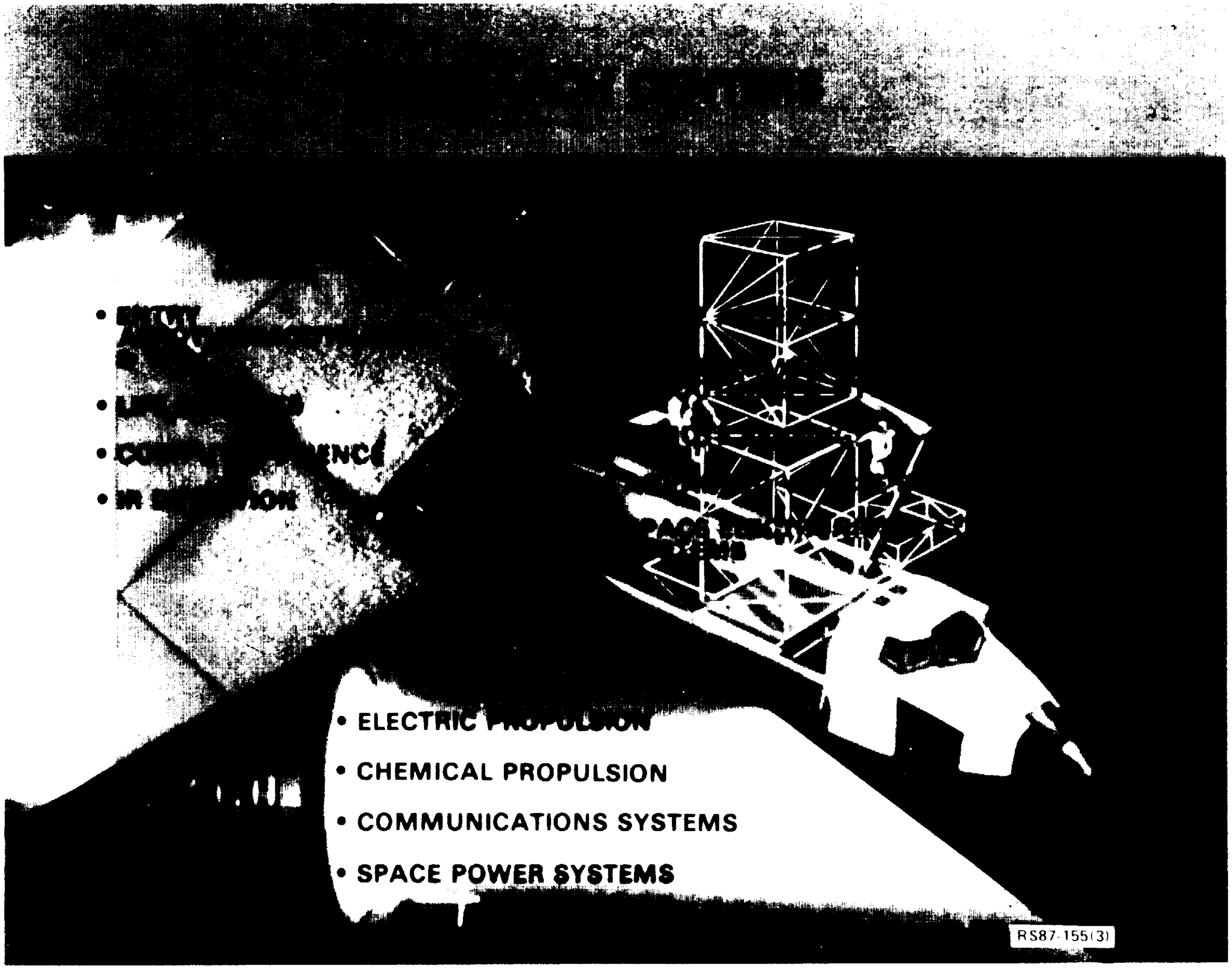
EXTEND TECHNOLOGY DEVELOPMENT TO IN-SPACE EXPERIMENTATION

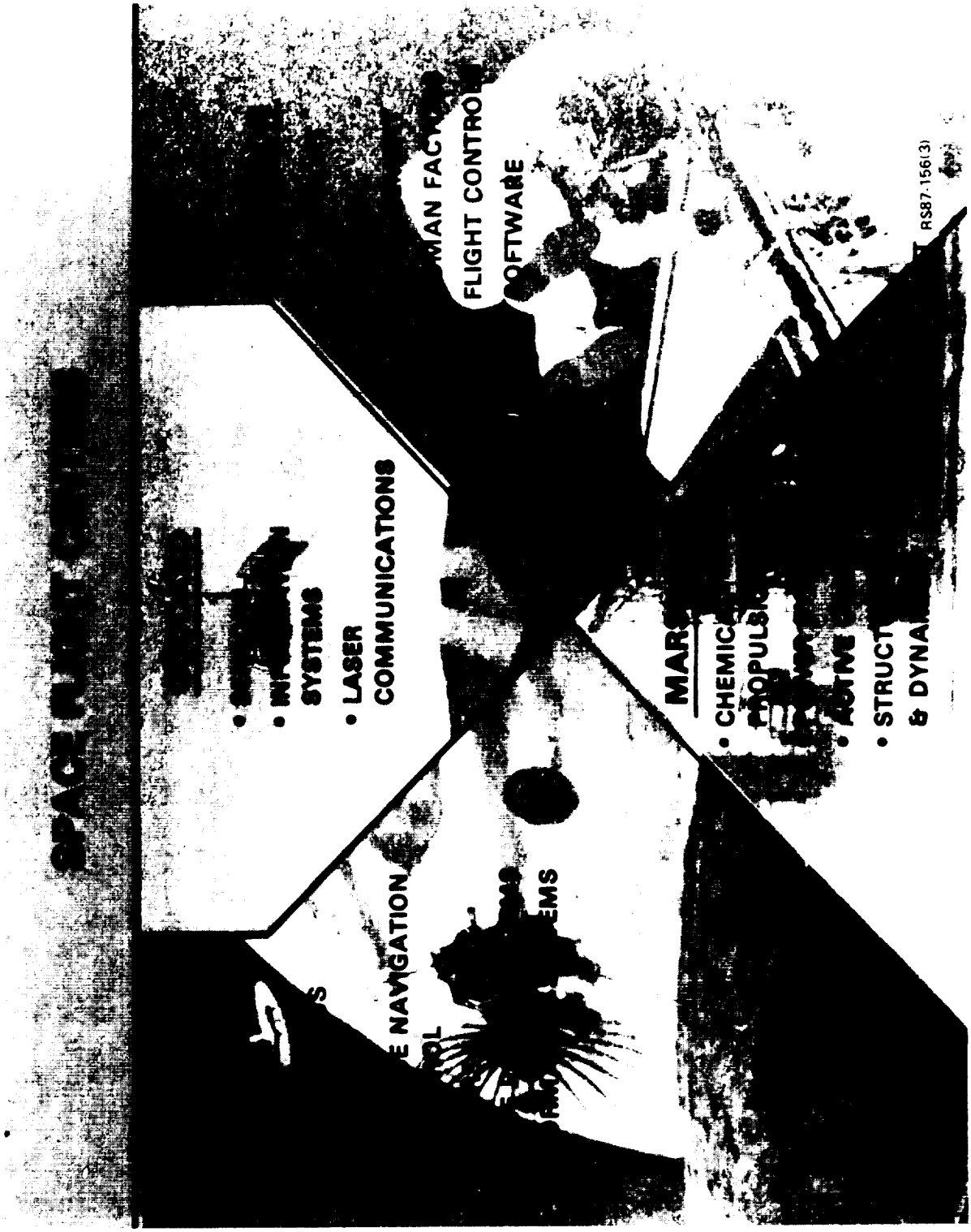
FACILITATE TECHNOLOGY TRANSFER TO USERS

R&T BASE CHARACTERISTICS

OAST

- LABORATORY RESEARCH
- GENERIC, FUNDAMENTAL
- ANALYTICAL MODELING
- ENGINEERING DATA BASE
- HIGH RISK, HIGH PAYOFF
- TECHNOLOGY OPPORTUNITIES

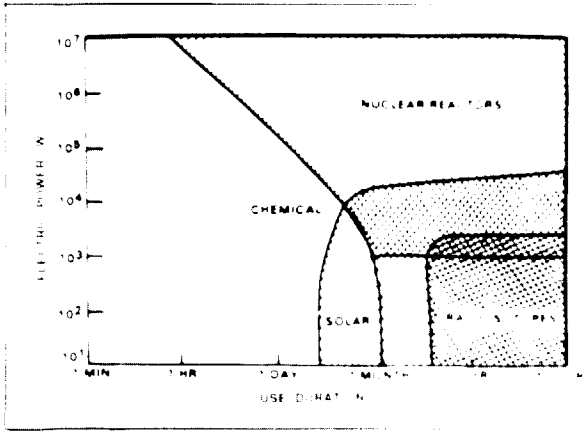




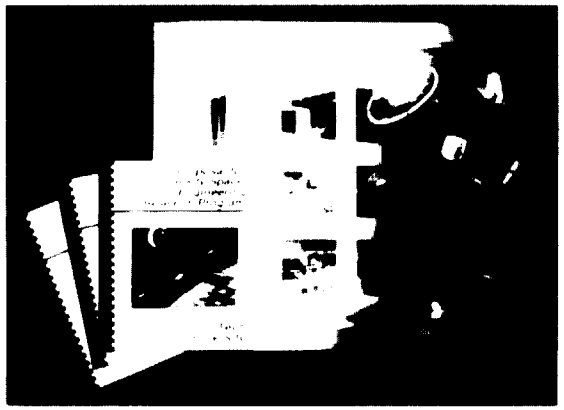
SPACE RESEARCH AND TECHNOLOGY BASE

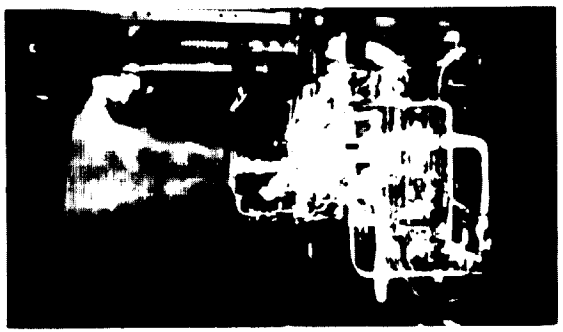
OAST

SYSTEMS ANALYSIS



UNIVERSITY PROGRAMS





DISCIPLINE RESEARCH

FLIGHT EXPERIMENTS

SPACE R&T

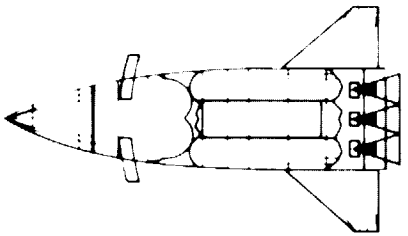
OAST

FY 1989 - $M

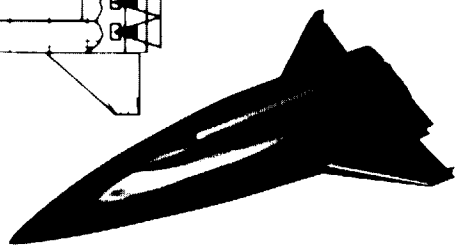
SPACE R&T	**295.9**
R&T BASE	**134.1**
AEROTHERMODYNAMICS R&T	11.5
SPACE ENERGY CONVERSION R&T	13.8
PROPULSION R&T	19.7
MATERIALS AND STRUCTURES R&T	17.5
SPACE DATA AND COMM. R&T	9.3
INFORMATION SCIENCES R&T	9.0
CONTROLS AND GUIDANCE R&T	6.7
HUMAN FACTORS R&T	5.3
SPACE FLIGHT R&T	18.1
SYSTEMS ANALYSIS	6.9
UNIVERSITY SPACE RESEARCH	16.3

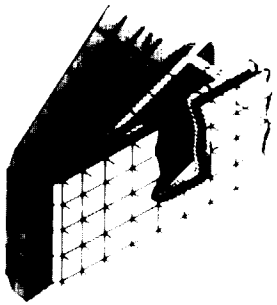
AEROTHERMODYNAMICS

ADVANCED COMPUTATIONAL METHODS

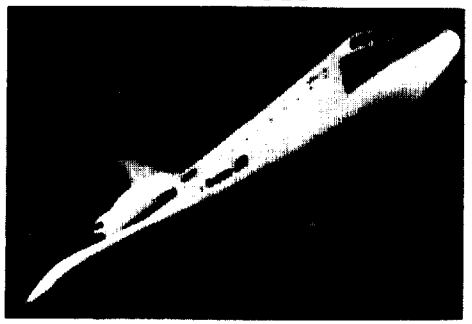


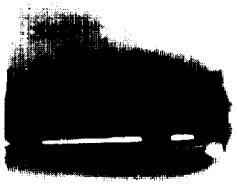
CONFIGURATION ANALYSES

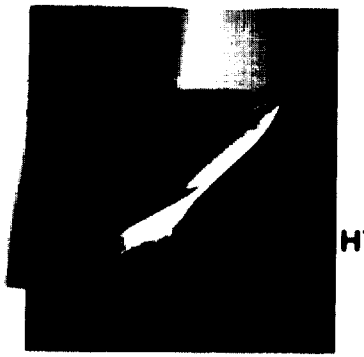




FLIGHT DATA ANALYSES







INTEGRATED AEROTHERMAL ANALYSES

HYPERSONIC WIND TUNNEL TESTING

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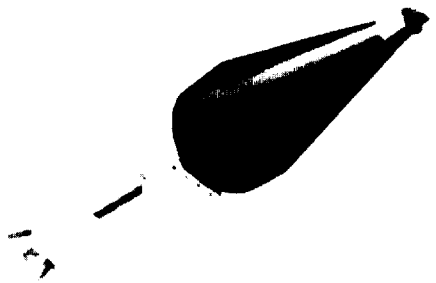
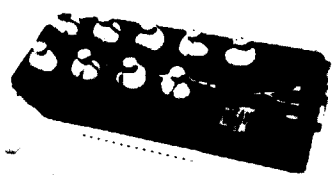
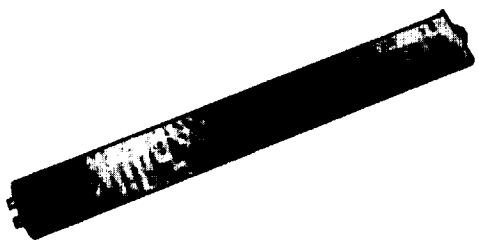
SPACE ENERGY CONVERSION



- SP-100
- SOLAR DYNAMICS

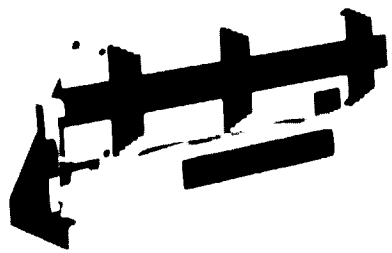


- PRIMARY/SECONDARY BATTERIES
- FUEL CELLS



- LIGHTWEIGHT ARRAYS
- CONCENTRATORS
- ADVANCED CELLS

- POWER DISTRIBUTION COMPONENTS



- TWO-PHASE HEAT PIPES
- ADVANCED RADIATORS

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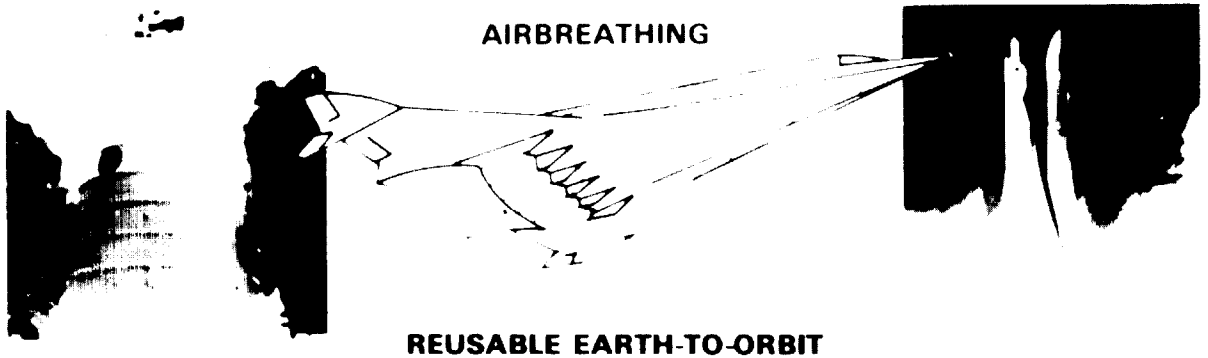
PROPULSION

LOX/HYDROGEN

AIRBREATHING

LOX/HYDROCARBON



REUSABLE EARTH-TO-ORBIT

ELECTRIC PROPULSION

OTV PROPULSION

NASA

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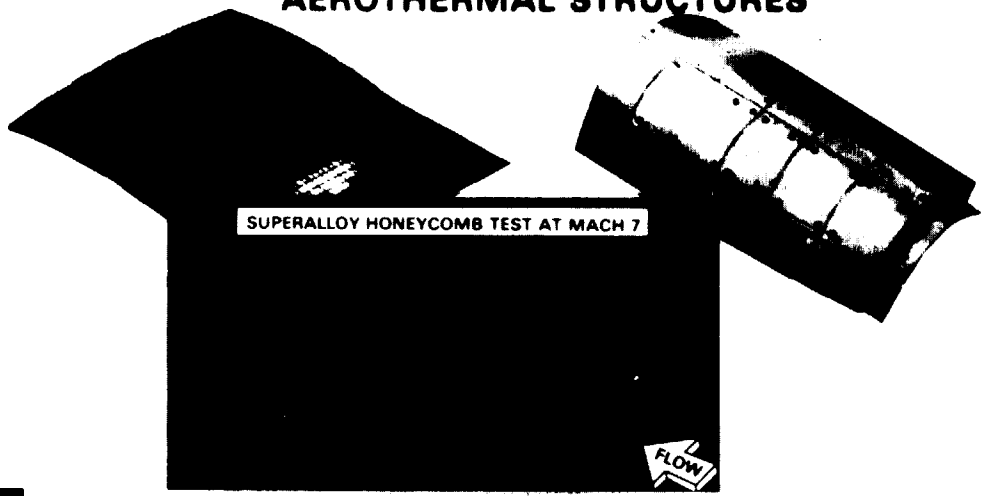
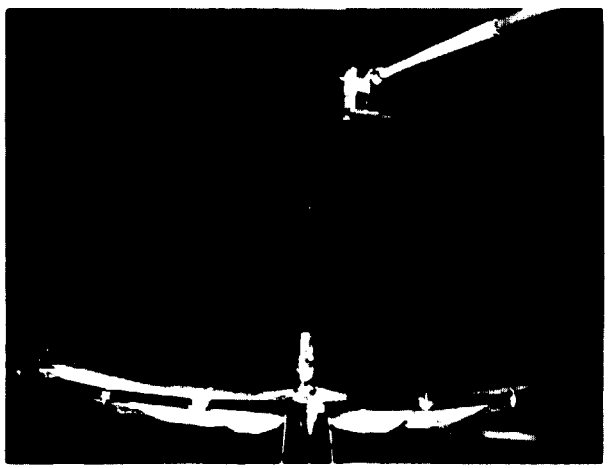
MATERIALS AND STRUCTURES

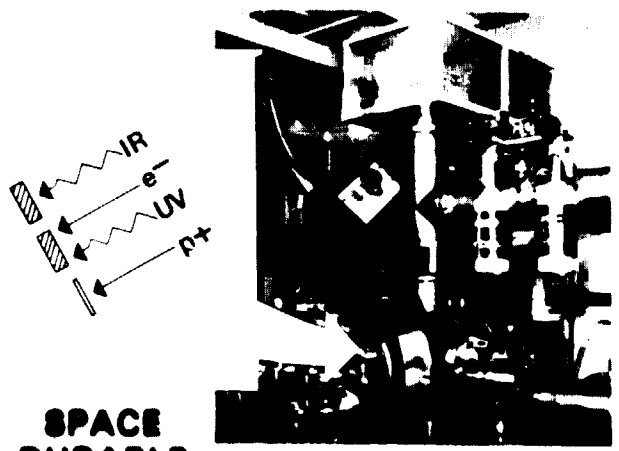
STRUCTURAL CONCEPTS

AEROTHERMAL STRUCTURES





DYNAMICS OF FLEXIBLE STRUCTURES



SPACE DURABLE MATERIALS

NASA

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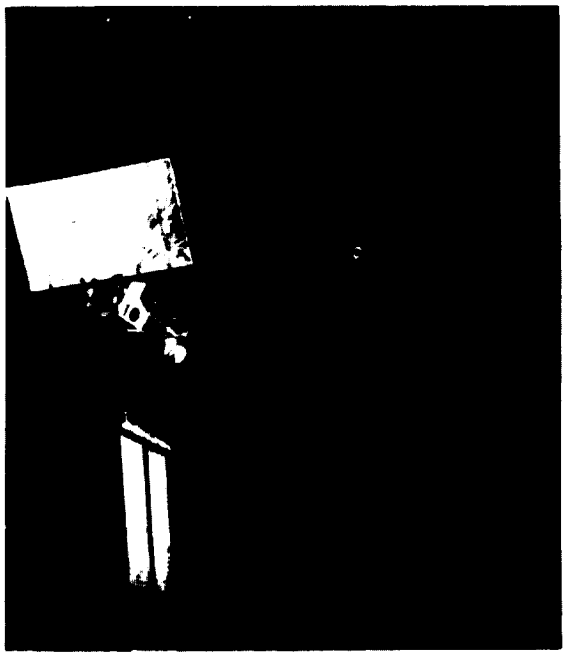
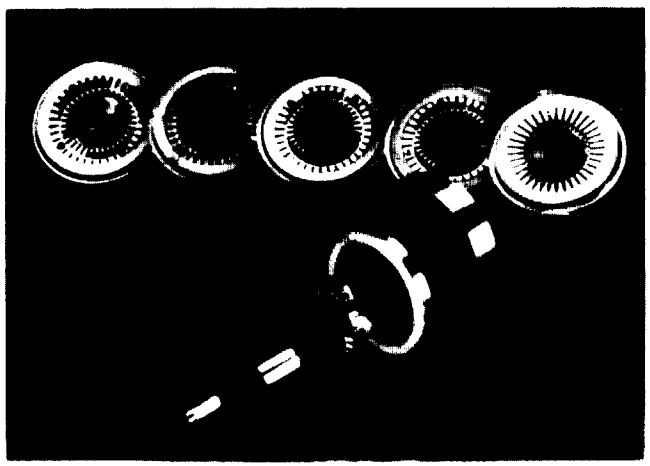
SPACE DATA AND COMMUNICATIONS

LASER COMMUNICATIONS

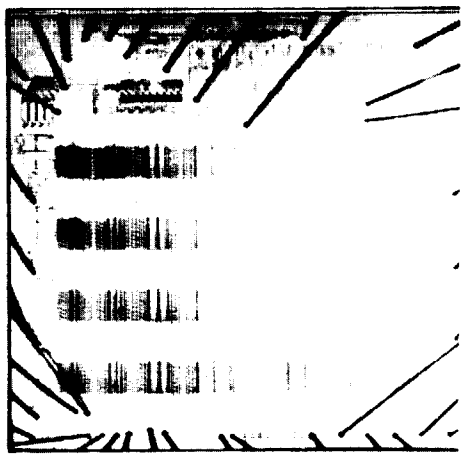
LARGE APERTURE ANTENNA





ADVANCED TRAVELING WAVE TUBE

ON-BOARD PROCESSING COMPONENTS



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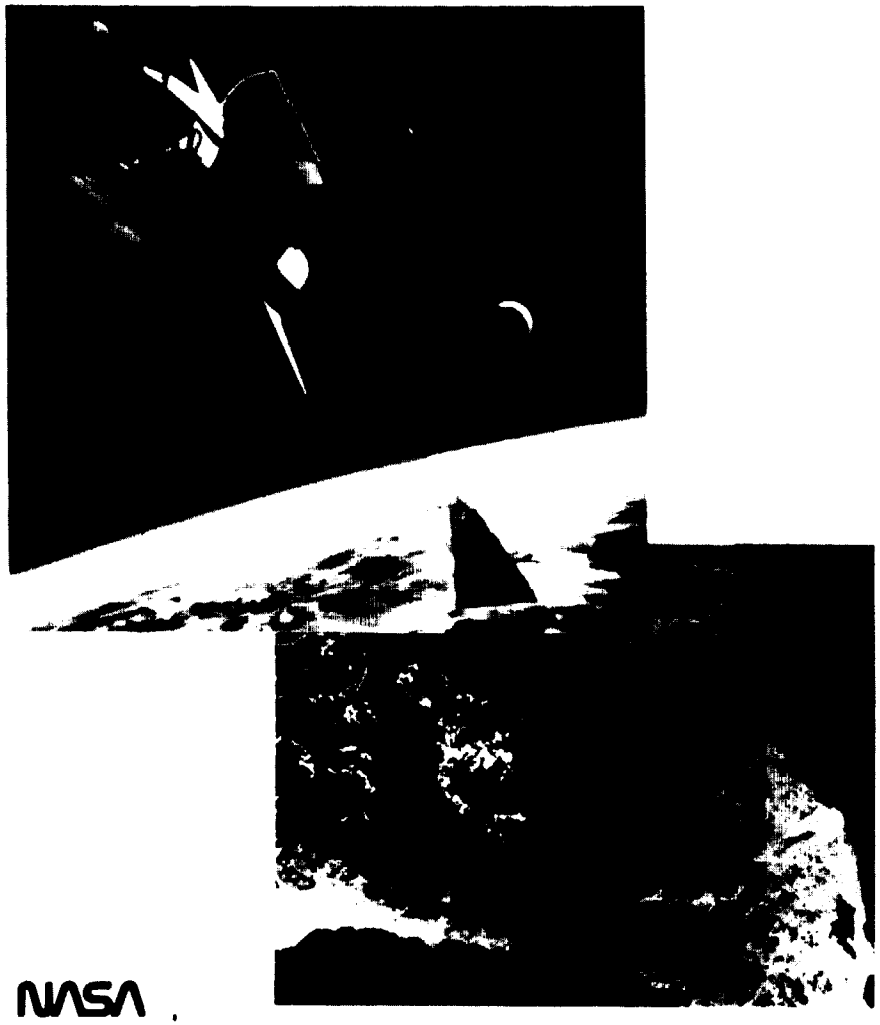
OAST
RC86 4403

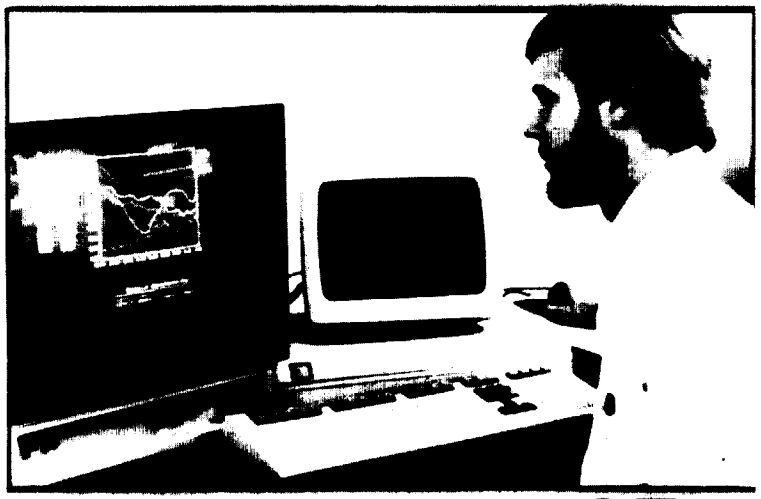
INFORMATION SCIENCES

REMOTE SENSING



NASA

COMPUTER SCIENCES



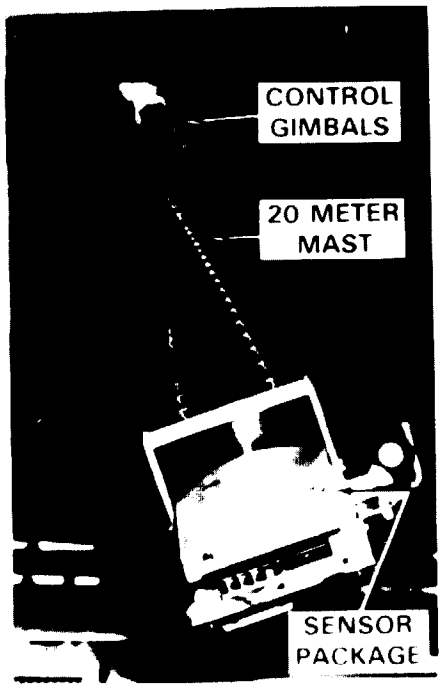
EXPERT SYSTEMS

OAST

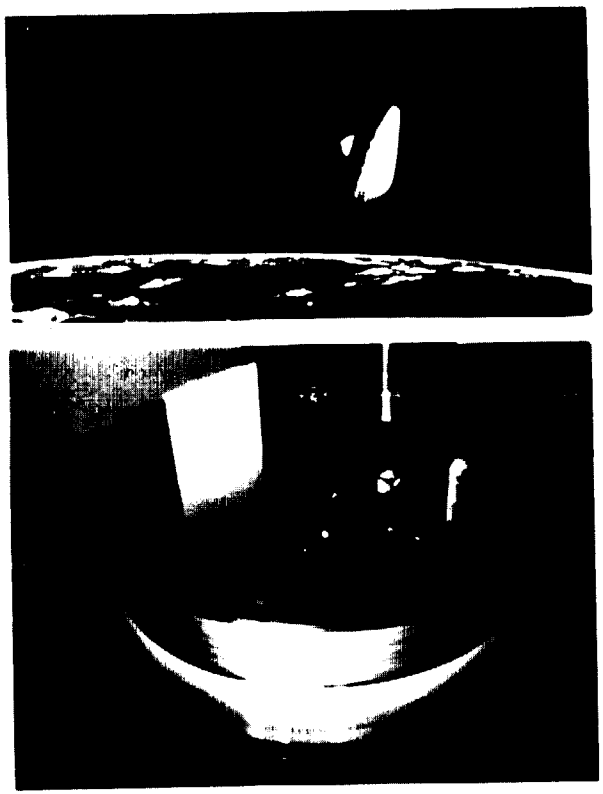
RC86-437(3)

CONTROLS AND GUIDANCE

BEAM DYNAMICS

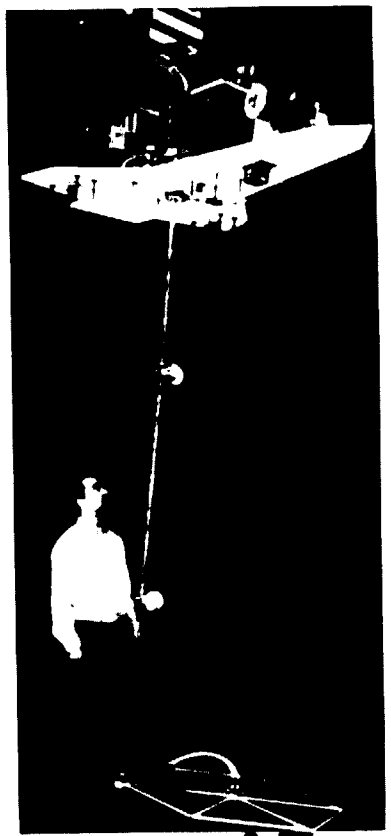


ADAPTIVE CONTROL (AFE)



LASER GUIDANCE RESEARCH

SPACECRAFT CONTROL LABORATORY EXPERIMENT



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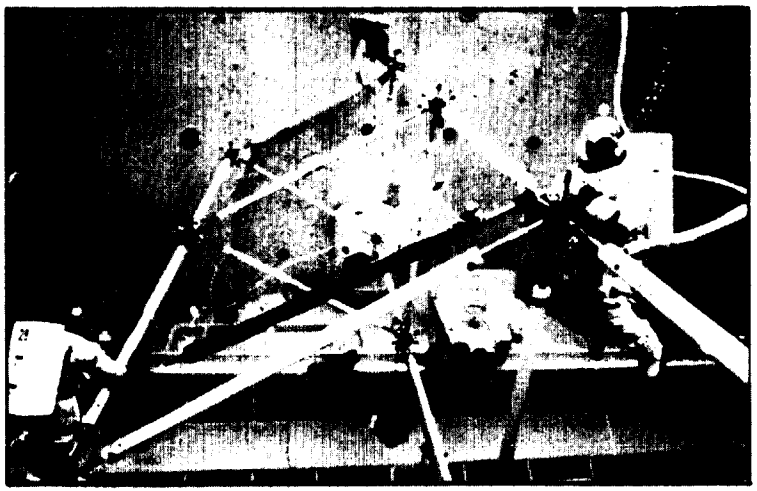
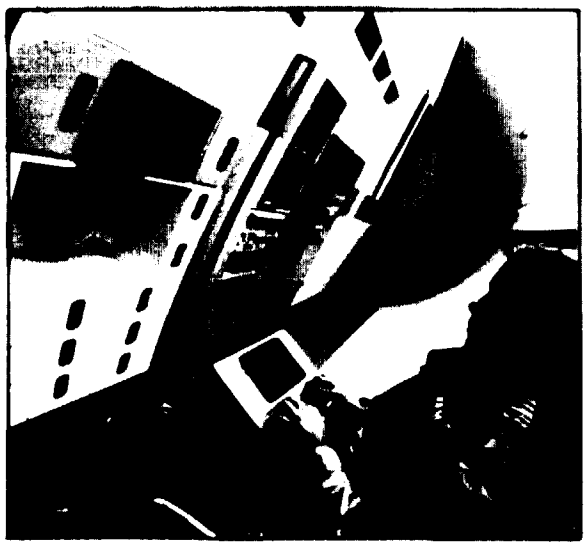
HUMAN FACTORS

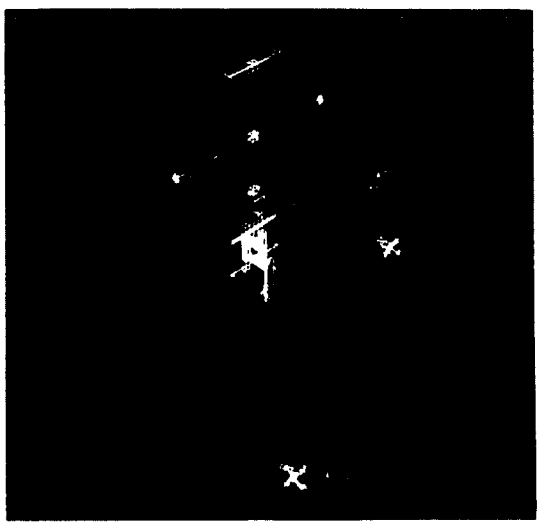
SPACE SUIT

EVA AIDS



CREW STATION DESIGN





DISPLAY MODELING

NASA

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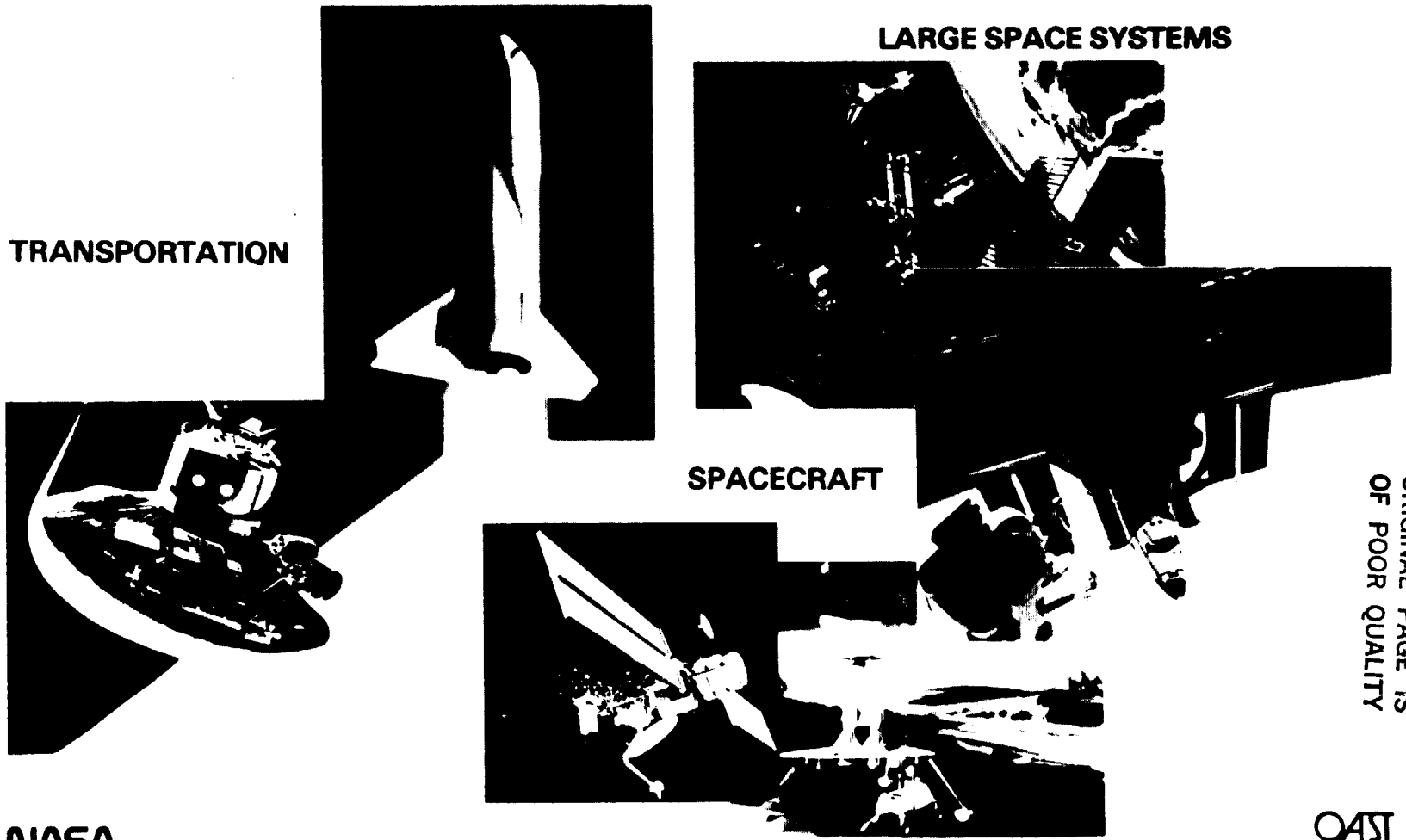
SYSTEMS ANALYSIS

TECHNOLOGY FOR FUTURE SPACE SYSTEMS



NASA

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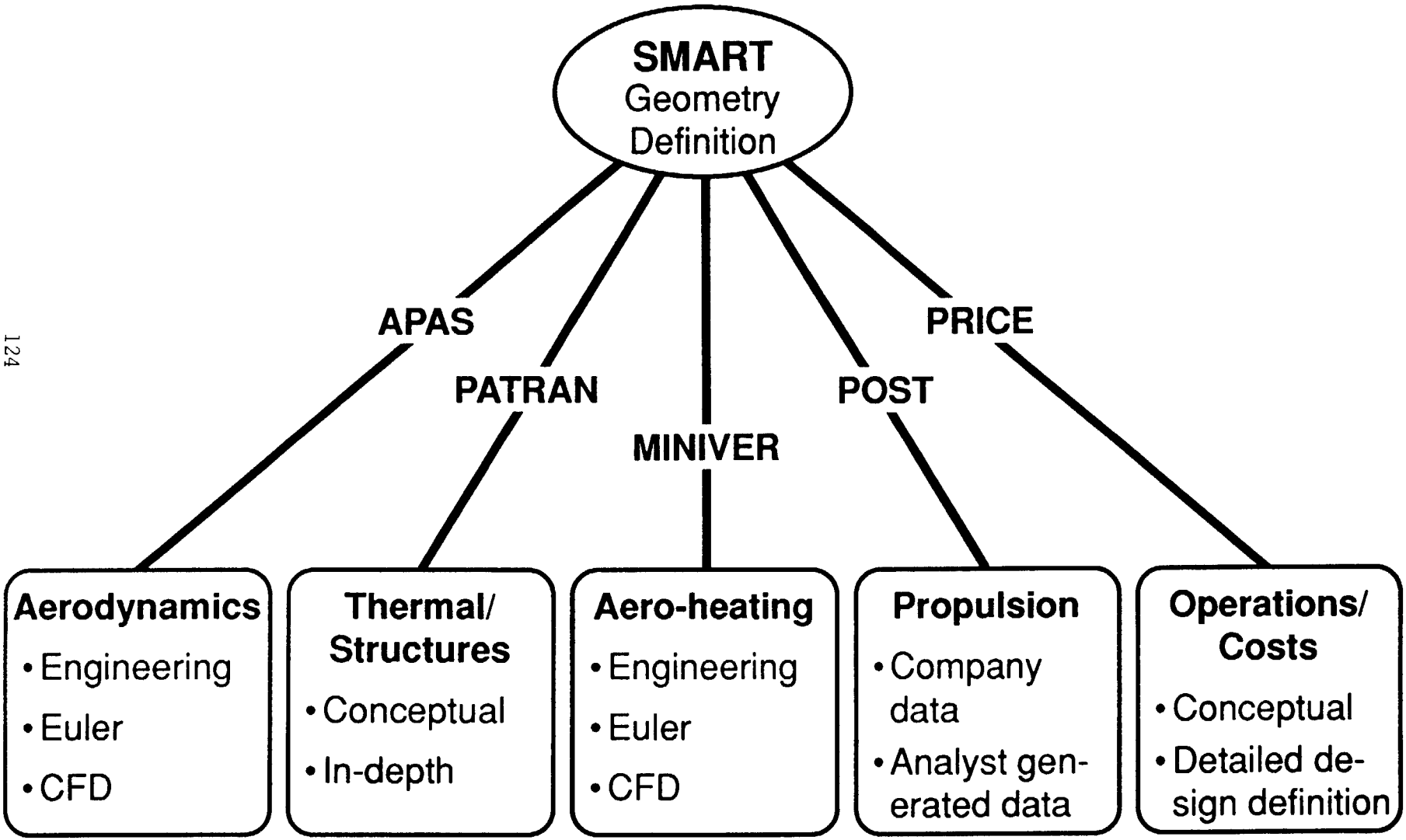
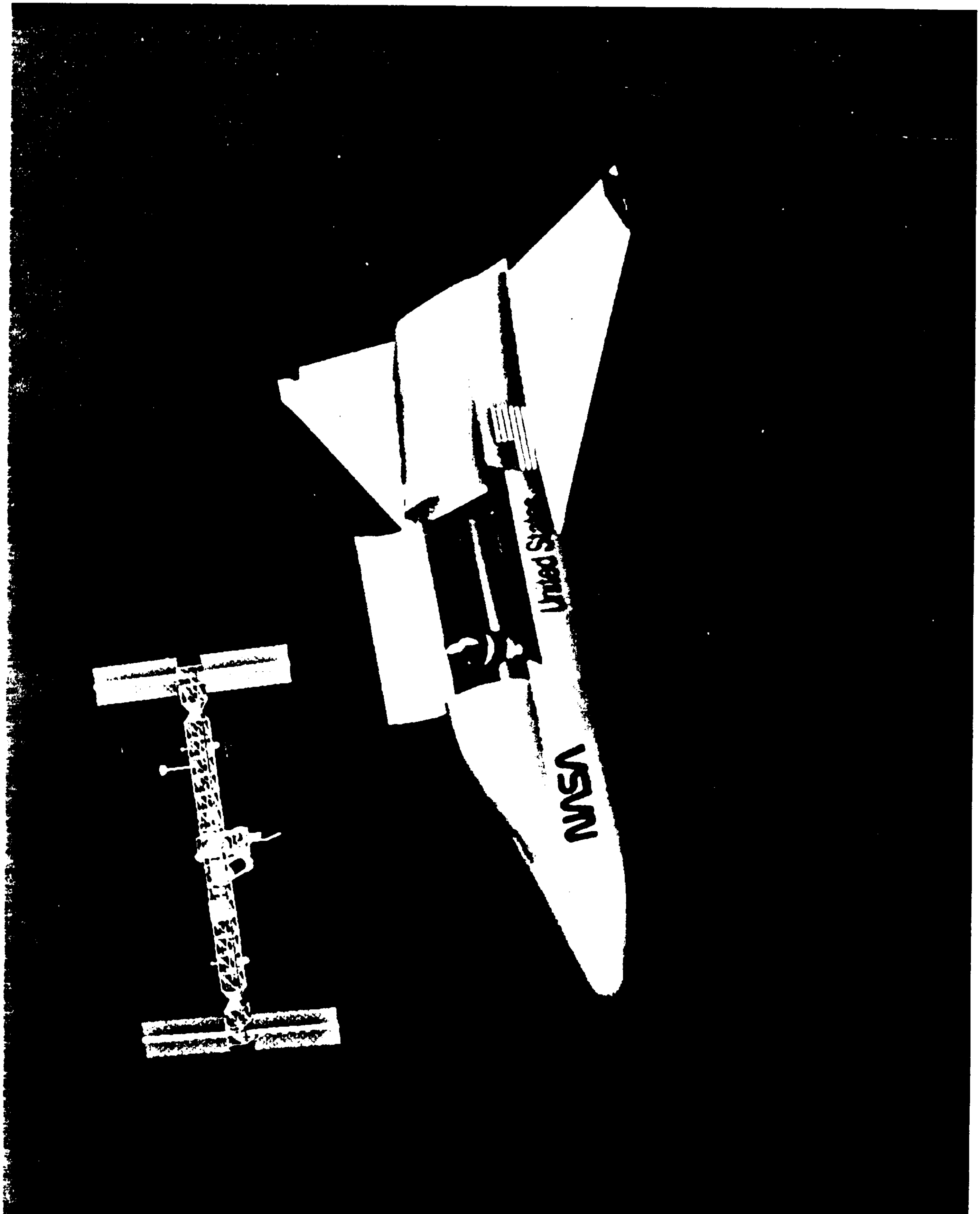
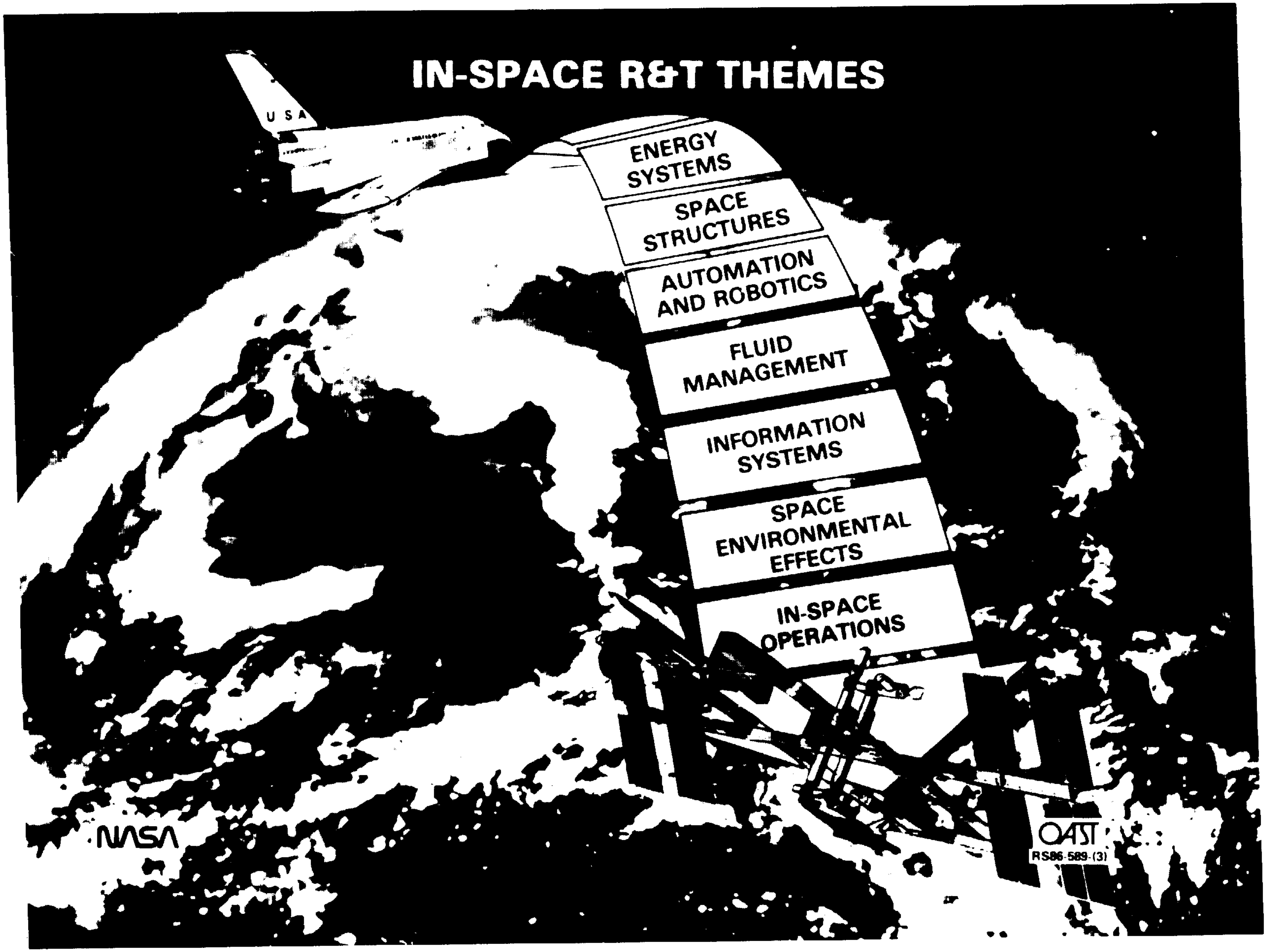
OF POOR QUALITY

ADVANCED SPACE TRANSPORTATION SYSTEMS ANALYSIS




NASA
United States



SYSTEMS ANALYSIS STUDIES

OAST

IDENTIFY TECHNOLOGY FOR:

ADVANCED TRANSPORTATION

- SHUTTLE II
- ADVANCED LAUNCH SYSTEMS
- LUNAR/MARS VEHICLES
- TRANSPORTATION NODES

HUMAN EXPANSION

- ADVANCED SPACE STATION
- VARIABLE GRAVITY FACILITY
- LUNAR BASES
- ADVANCED POWER SYSTEMS

GLOBAL CHANGE TECHNOLOGY

- GEO SCIENCE PLATFORMS
- LEO EOS

INNOVATIVE CONCEPTS

- EXTRA-SOLAR PLANET DETECTION
- OPTICAL INTERFEROMETRY
- MICRO-SPACECRAFT
- TETHER SYSTEMS
- DESIGNS FROM NATURE
- SUPERCONDUCTORS

GIJ-0041A

SPACE RESEARCH & TECHNOLOGY BASE

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INCREASED EMPHASIS FOR FUTURE

- SOFTWARE ENGINEERING
- HIGH TEMPERATURE SUPERCONDUCTORS
- OPTICS
- COMPUTATIONAL CONTROLS
- NDE/NDI
- TECHNOLOGY FOR SELF REPAIR
- BASIC RESEARCH IN "INHERENT RELIABILITY"
- MICROSAT TECHNOLOGY
- WORLD MODELING DATA SYSTEMS

SPACE RESEARCH & TECHNOLOGY BASE
CANDIDATE EXAMPLES FOR FUTURE EMPHASIS

OAST

• SOFTWARE ENGINEERING	Objective is to develop methods, technologies, and skills to enable NASA to cost-effectively specify, build, and manage reliable complex software which is evolvable and maintainable over and extended period of time.
• HIGH TEMPERATURE SUPERCONDUCTORS	Objective is to study the suitability in the space environment of the new and rapidly evolving class of high temperature superconducting materials to a variety of space applications including sensors, processors, power, and propulsion.
• OPTICS	Objective is to enhance the on-going (CSTI and R&T Base) effort in sensors, communications, large space structures, and precision segmented reflectors with a complementary program in optics. Included are improvements in optical performance, adaptive optics, distributed apertures, and enhanced modeling capability.
• COMPUTATIONAL CONTROLS	Objective is to enhance the proceedure, tools, and theories used by space system designers to improve control system evaluation time by a factor of 40. Currently evaluation of control system performance is the limiting factor in option/trade studies and annomally response.
• NDE/NDI	Objective is to enhance the capability to inspect, monitor, evaluate, and validate space materials and structures both pre- and in-flight in order to assure a very high level of initial and continued reliability.
• TECHNOLOGY FOR SELF REPAIR	Objective is to develop self-diagnostic capabilities extending to the ability to select alternative modes of operating and/or to substitute back-up components/equipment. Efforts will include fault compensating architectures for data processors and power integrated circuits, as well as monitoring and control approaches for other spacecrft subsystems such as power and attitude control.
• BASIC RESEARCH IN "INHERENT RELIABILITY"	Objective is to conduct studies and evaluations seeking break-throughs in inherent reliability on the order of the reliability of transistors over vacuum tubes. For example, the power integrated circuit (PIC) promises to produce power systems with the reliability and reduced parts counts associated with conventional integrated circuits.
• MICROSAT TECHNOLOGY	Objective is to evaluate the technologies needed for micro-spacecraft (5 to 10 kg) that are high g-force tolerant. These spacecraft could be launched using chemical propulsion or a rail-gun launcher and used for science missions including solar system exploration.
• WORLD MODELING DATA SYSTEMS	Objective is to develop the on-board capability to store, analyze, and compare global models of the earth with spacecraft sensor data. This effort complements the Software Engineering activity and builds upon the CSTI on-board data processing and storage efforts.

GIJ-0030B

UNIVERSITY SPACE ENGINEERING RESEARCH PROGRAM

GOAL:

BROADEN INVOLVEMENT IN SPACE ENGINEERING AND STIMULATE INNOVATION IN TECHNOLOGY

OBJECTIVES:

- BUILD ENGINEERING SPECIALTIES
- STIMULATE CROSS-DISCIPLINE RESEARCH
- PROVIDE ENVIRONMENT FOR GENERATION OF INNOVATIVE CONCEPTS
- INCREASE NUMBER OF U.S. GRADUATES
- SUSTAINED LONG-TERM COMMITMENT