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EVOLVING TECHNOLOGIES FOR SPACE STATION
FREEDOM COMPUTER-BASED WORKSTATIONS

MAN-SYSTEMS DIVISION

J. LEWIS, Ph.D. January 16, 1990

TECHNOLOGY FOR SPACE STATION EVOLUTION - A WORKSHOP

EVOLVING TECHNOLOGIES FOR SPACE STATION FREEDOM COMPUTER-BASED WORKSTATIONS

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164 INTERNATIONAL BRAND



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THE HCI SOFTWARE ENVIRONMENT HAS THE FOLLOWING SEVEN MODULES

- **WINDOW MANAGER**
Provides and controls on-screen windows
- **USER INTERFACE MANAGEMENT SYSTEM**
Provides dialog, help and information, and error message management
- **CONTROL AND MONITOR DISPLAY MANAGER**
Provides the capability to define and build dynamic displays and store them in Data Definition Files (DDF), and provides the runtime environment to link dynamic displays with operational data and commands
- **USER INTERFACE LANGUAGE MANAGER**
Generates and executes User Interface Language commands and procedures
- **CAUTION AND WARNING ANNUNCIATION MANAGER**
Displays caution and warning events and messages and accepts crewmember acknowledgements
- **VIDEO DISPLAY MANAGER**
Routes and displays video images intermixed with text and graphics
- **USER SUPPORT ENVIRONMENT SESSION MANAGER**
Provides initialization, user login authorization and encryption, security logging, user profile management, and word processing



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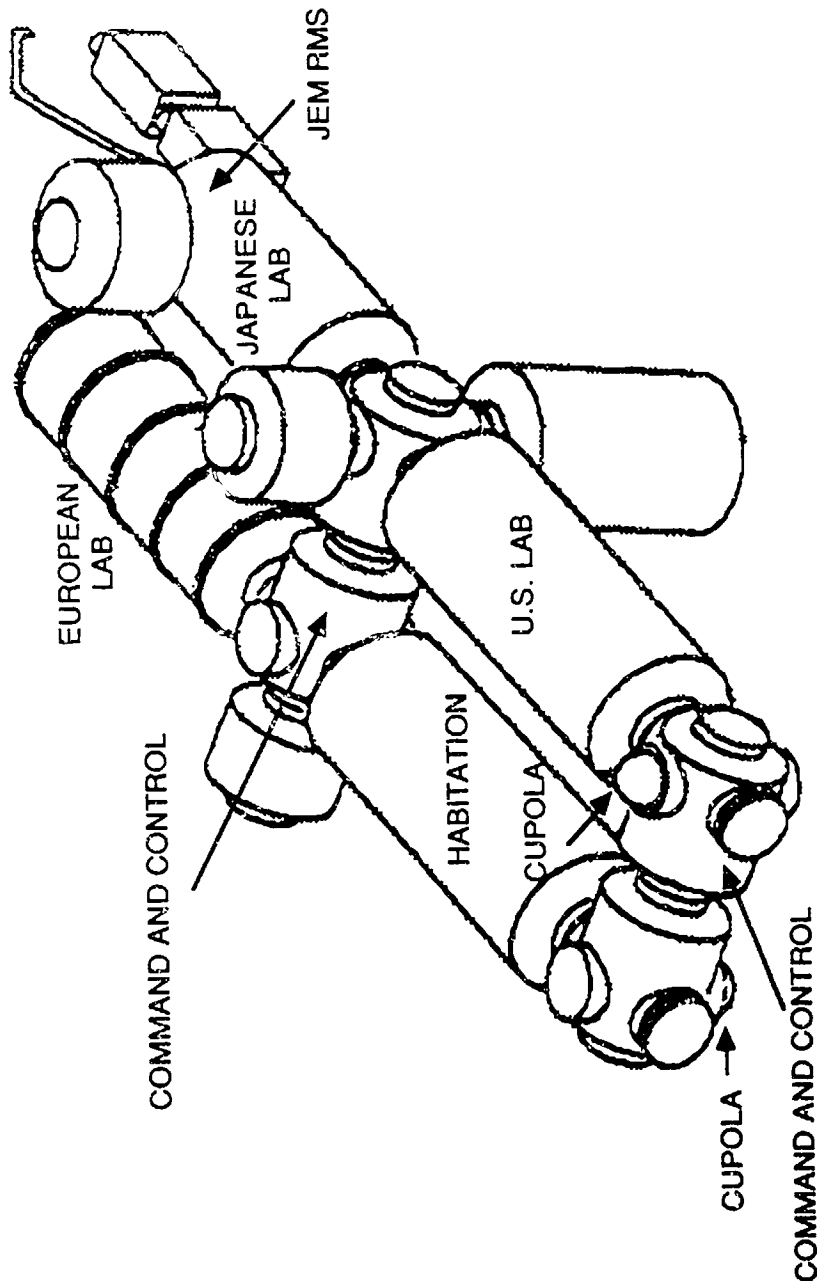
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INTRODUCTION

WORKSTATION LOCATIONS





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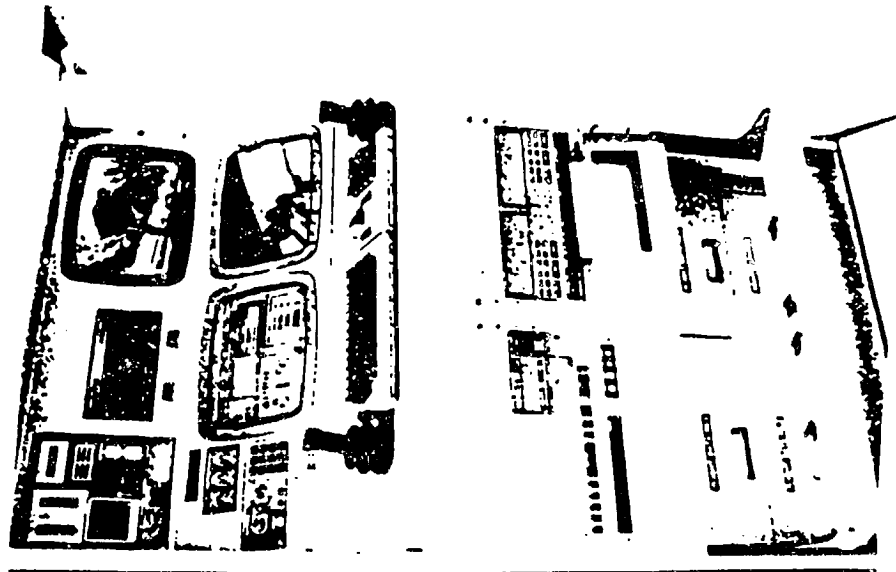
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INTRODUCTION

COMMAND AND CONTROL WORKSTATION CONCEPT



Features

- Three 15" Displays
- Full Keyboard
- Trackball
- Hand Controllers
- Audio/Video Recorders
- Hard-Copy Printer/Plotter
- Safety-Critical D&C
- Lighting
- Crew Restraints

Functions

- Systems Management
- Customer Support
- Proximity Operations
- Telerobotic (MSS,FTS) Control
- External Operations Support



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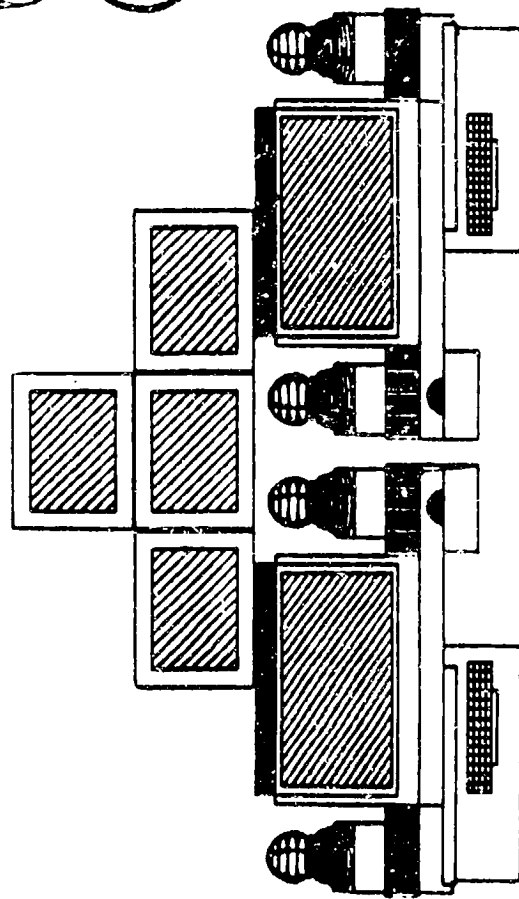
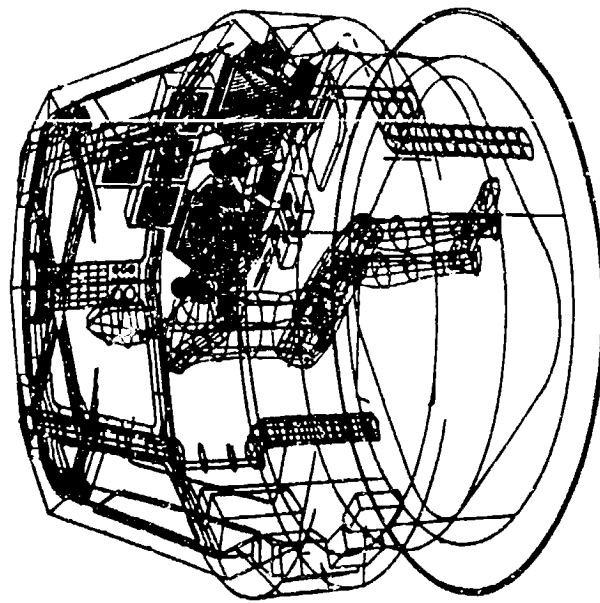
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CUPOLA WORKSTATION CONCEPT





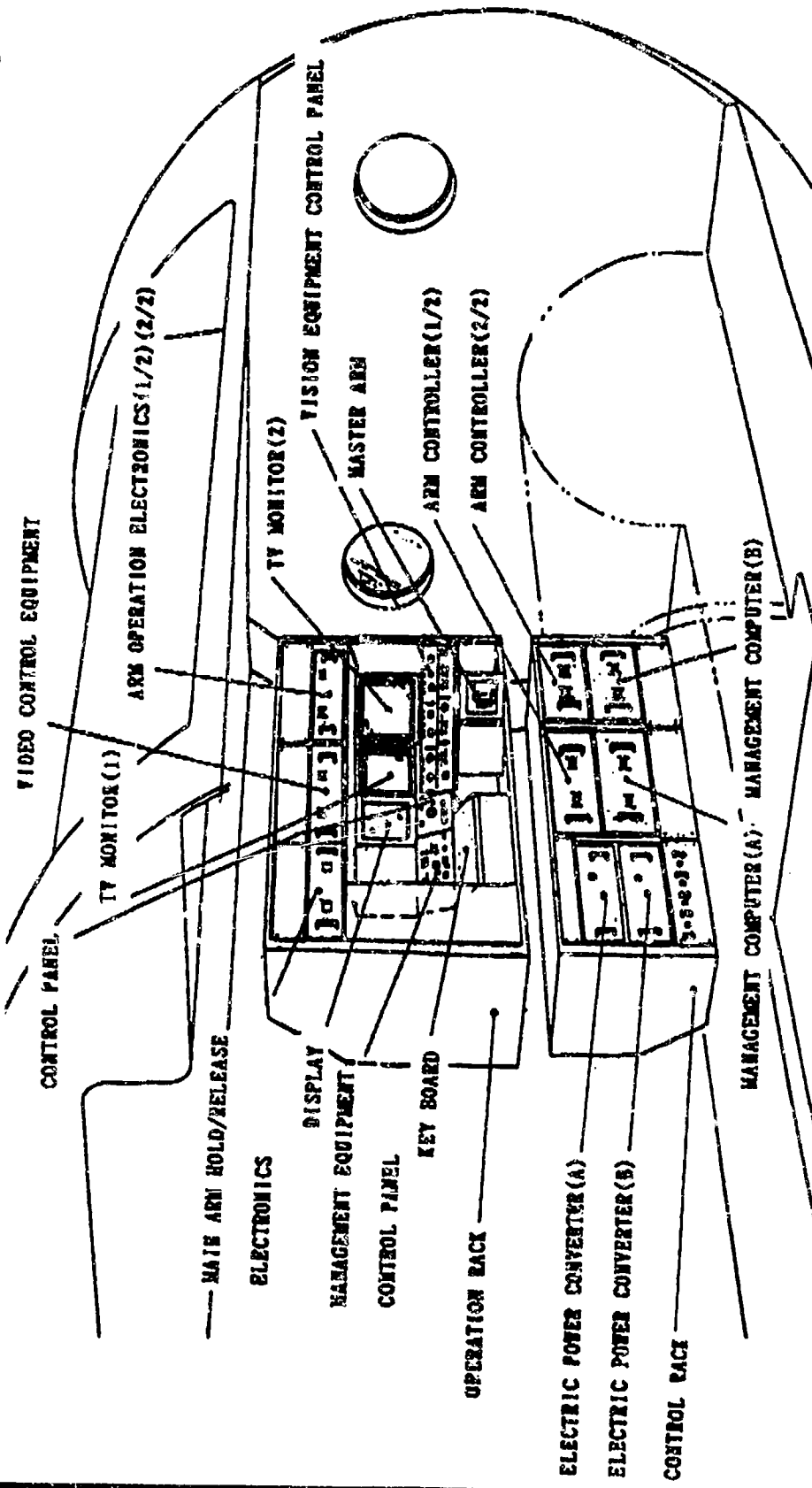
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INTRODUCTION JAPANESE EXPERIMENT MODULE RMS WORKSTATION CONCEPT





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INTRODUCTION

REMOTE DEVICES CONTROLLED FROM WORKSTATIONS

FREE FLYERS

- EUROPEAN SPACE AGENCY MAN-TENDED FREE FLYER
- CREW AND EQUIPMENT RETRIEVAL SYSTEM
- ORBITAL MANEUVERING VEHICLE

LARGE MANIPULATORS

- SPACE STATION REMOTE MANIPULATOR SYSTEM (RMS)
- JAPANESE EXPERIMENT MODULE RMS

DEXTEROUS MANIPULATORS

- JAPANESE SMALL FINE ARM
- FLIGHT TELEROBOTIC SERVICER
- SPECIAL PURPOSE DEXTEROUS MANIPULATOR



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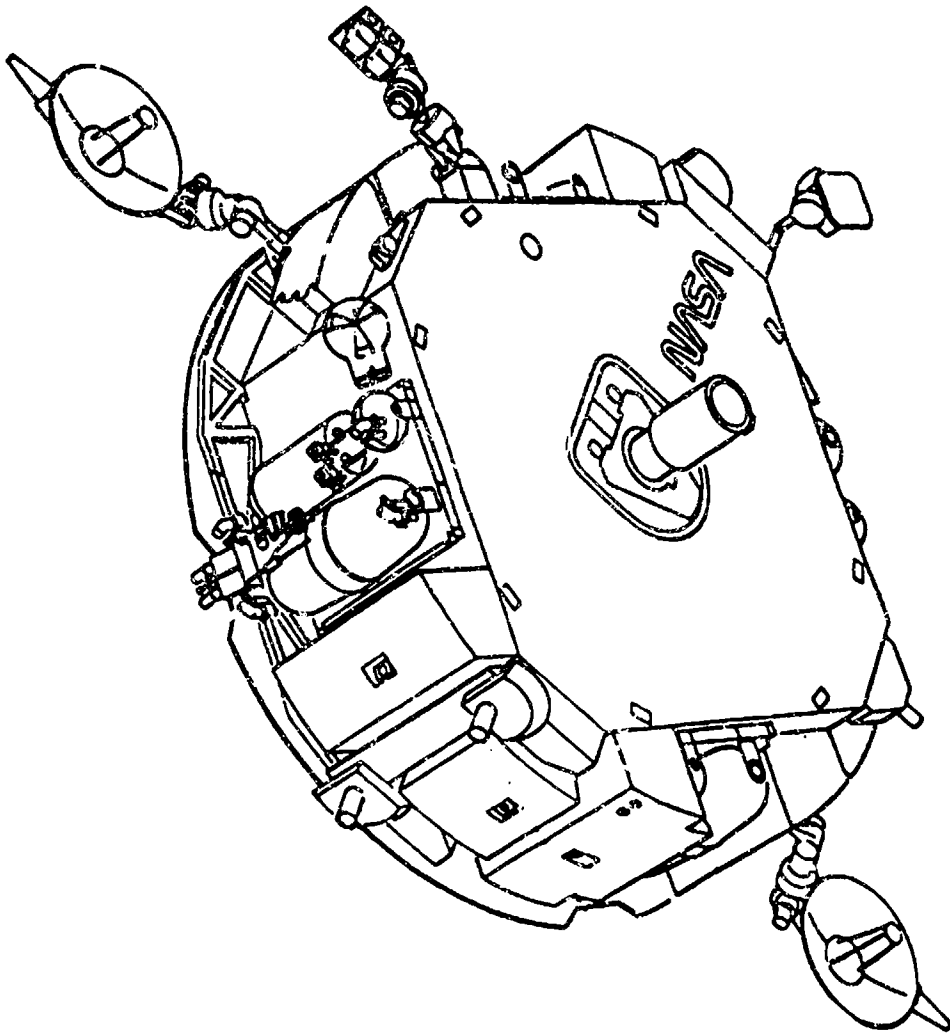
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ORBITAL MANEUVERING VEHICLE FREE FLYER





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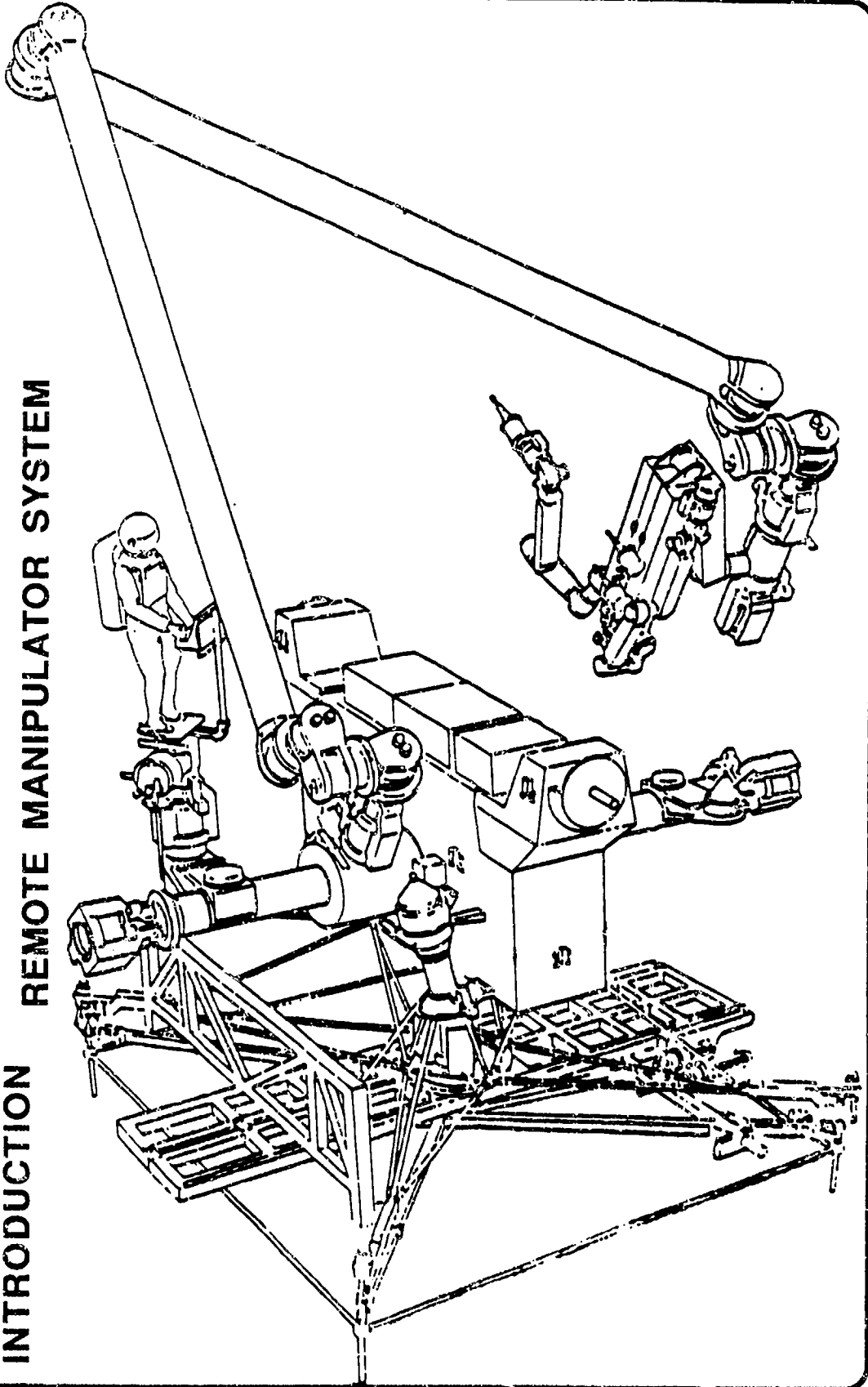
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REMOTE MANIPULATOR SYSTEM





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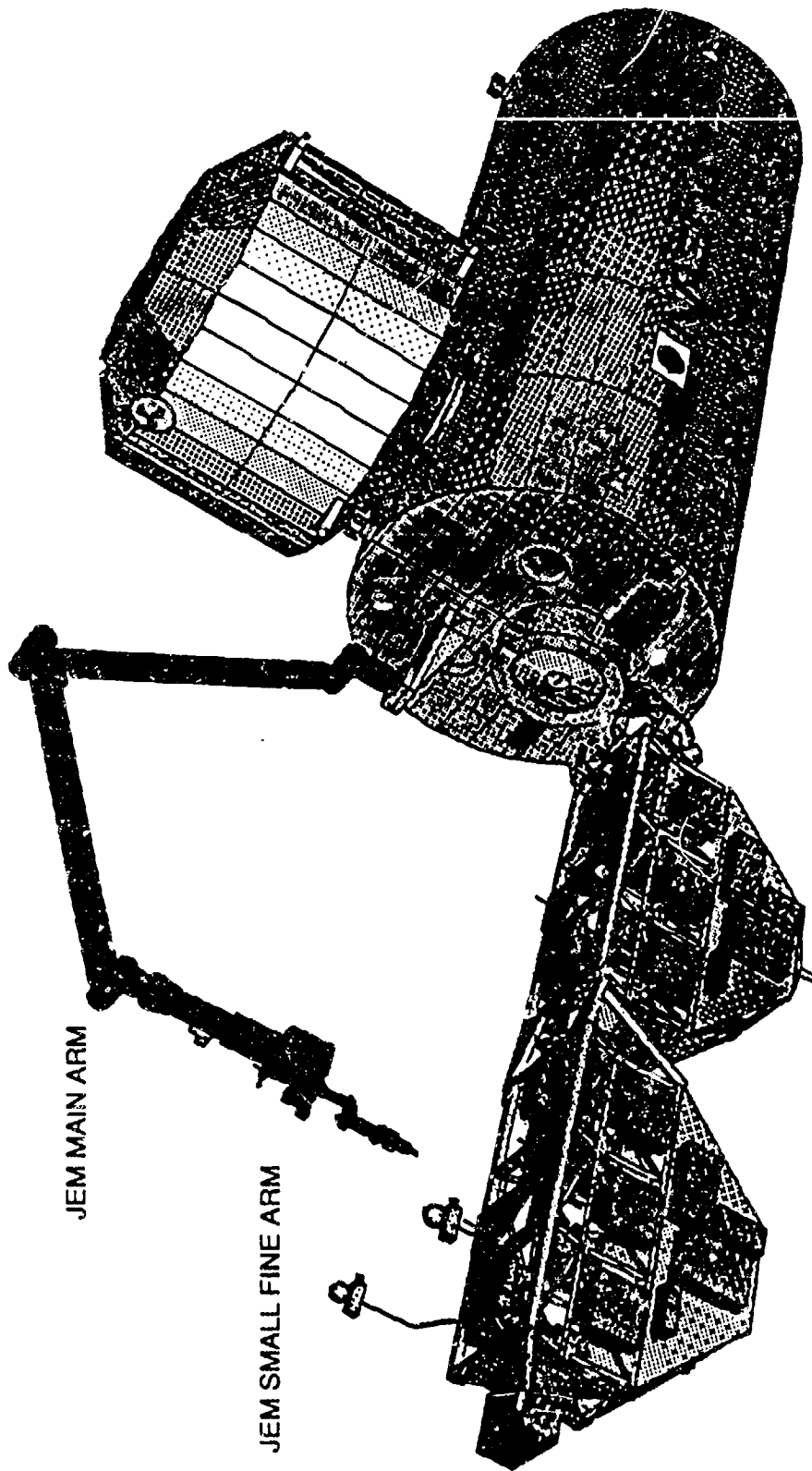
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INTRODUCTION JAPANESE EXPERIMENT MODULE EXPOSED FACILITY



JEM MAIN ARM

JEM SMALL FINE ARM



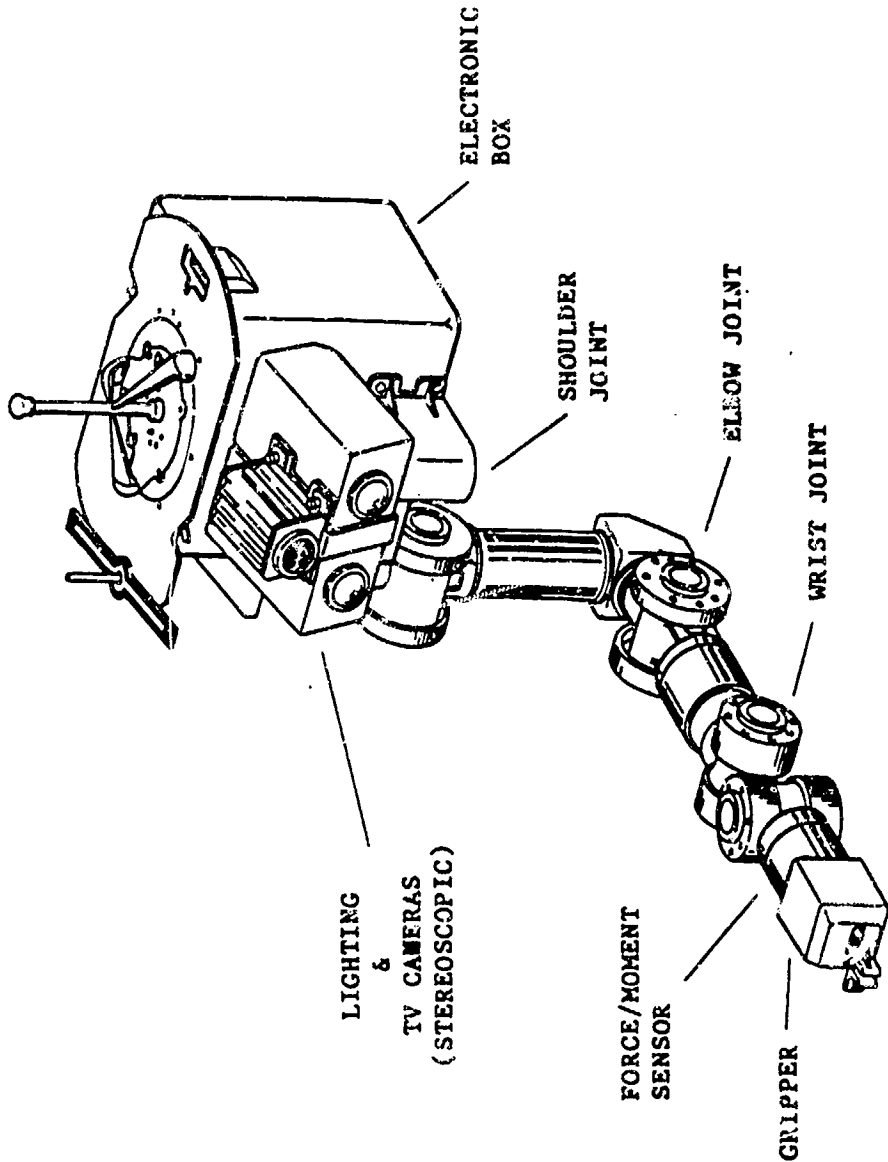
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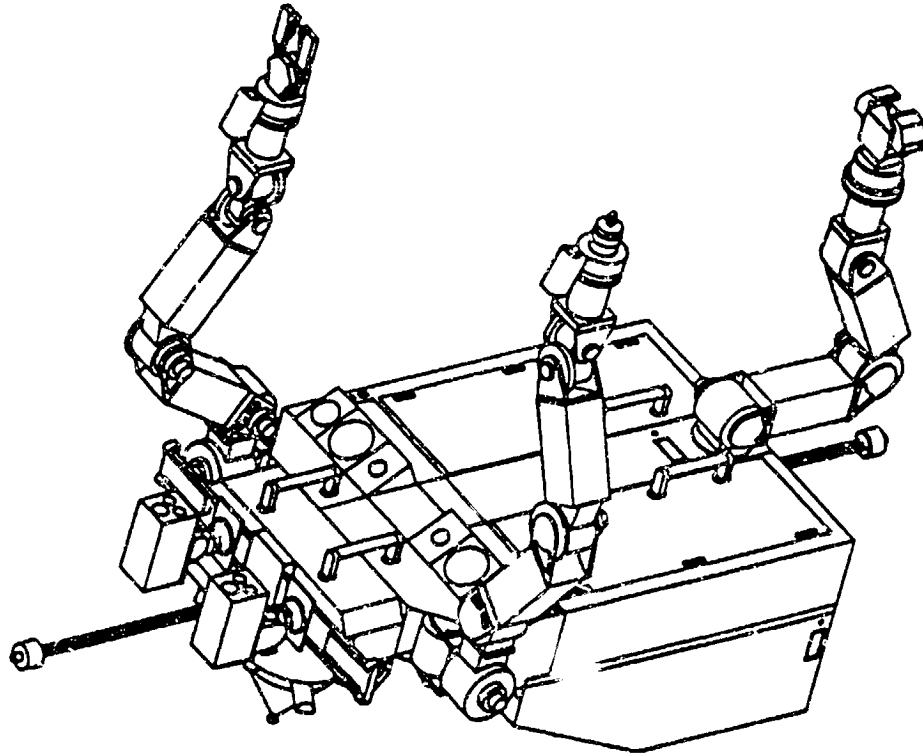
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FLIGHT TELEROBOTIC SERVICER





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EVOLVING TECHNOLOGIES

HUMAN-COMPUTER INTERACTION

VOICE RECOGNITION AND PRODUCTION

- FACILITATE "HANDS-FULL" TASKS
(CAMERA CONTROL DURING TELEROBOTIC MANIPULATIONS)

DIRECT MANIPULATION

- TOUCH SCREENS
- 3-D DISPLAY MANIPULATION
- ZERO-G CURSOR CONTROL DEVICES

ENHANCED INFORMATION DISPLAY

- 3-D COMPUTER-ENHANCED IMAGES
- VIDEO MANIPULATION (OBJECT ENHANCEMENT & TRACKING)
- VIDEO WITH TEXT AND GRAPHICS OVERLAYS
- VIDEO STEREO VIEWING TECHNIQUES
- MULTI-TASKING MANAGEMENT

SOFTWARE AUTOMATION

**KNOWLEDGE-BASED OR INTELLIGENT SYSTEMS
USER MODELING METHODS AND TOOLS
HCI PROTOTYPING TECHNOLOGY**



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EVOLVING TECHNOLOGIES

WORKSTATION/ROBOTICS RELATED ACTIVITIES

VIRTUAL WORKSTATIONS

MACHINE VISION SYSTEMS

- OPTICAL SYSTEMS - e.g. TRACKING - EARTH'S RAD. BUDGET SAT.
- LASER SYSTEMS - e.g. MODEL-BASED SYSTEMS FOR RECOGNITION
- SUPERVISED AND AUTONOMOUS MODES
- PROVIDING OPERATOR AIDS (e.g. RANGE / RATE)
- EDGE DETECTION

ANIMATION

- REPRESENT RANGE/RATE INFORMATION
- PRODUCE "SYNTHETIC" VIDEO VIEWS (FROM CDA DATABASE)

FORCE REFLECTION (HAND CONTROLLER)

SYNTHESIZED FORCE REFLECTION

- AUDIO
- VISUAL