TECHNOLOGY FOR SPACE STATION EVOLUTION -
A WORKSHOP

Evolving Technologies for Space Station
Freedom Computer-Based Workstations

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INTRODUCTION

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
INTRODUCTION

WORKSTATION LOCATIONS

- European Lab
- JEM RMS
- Japanese Lab
- Habitation
- Cupola
- Command and Control
- U.S. Lab
- Cupola
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
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
INTRODUCTION

ORBITAL MANEUVERING VEHICLE FREE FLYER
INTRODUCTION

JAPANESE EXPERIMENT MODULE SMALL FINE ARM

LIGHTING & TV CAMERAS (STEREOSCOPIC)

ELECTRONIC BOX

SHOULDER JOINT

FORCE/MOMENT SENSOR

GRIPPER

ELEOW JOINT

WRIST JOINT
INTRODUCTION

FLIGHT TELEROBOTIC SERVICER
HUMAN-COMPUTER INTERACTION

VOICE RECOGNITION AND PRODUCTION
- FACILITATE "HANDS-FULL" TASKS
  (CAMERA CONTROL DURING TELERCBOTIC 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 STEREOS VEWING TECHNIQUES
- MULTI-TASKING MANAGEMENT

SOFTWARE AUTOMATION
KNOWLEGEBASED OR INTELLIGENT SYSTEMS
USER MODEL.ING METHODS AND TOOLS
HCI PROTOTYPING TECHNOLOGY