Johnson Space Center-Houston, Texas

TECHNOLOGY FOR SPACE STATION EVOLUTION - A WORKSHOP DATA MANAGEMENT SYSTEM	SYSTEMS DEVELOPMENT & SIMULATION DIVISION	
	EF2/G. C. BLACKBURN	JANUARY 1990

SPACE STATION DISPLAYS AND CONTROLS TECHNOLOGY EVOLUTION

GREG C. BLACKBURN
SYSTEMS DEVELOPMENT MANAGER
FOR
SPACE STATION DMS DISPLAYS & CONTROLS
(713) 483-1517

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- A HISTORICAL PERSPECTIVE
- MAJOR DEVELOPMENT OBJECTIVES
- CURRENT DEVELOPMENT ACTIVITIES
- KEY TECHNOLOGY AREAS
- TECHNOLOGY EVOLUTION ISSUES

- A HISTORICAL PERSPECTIVE
  - DEDICATED DISPLAYS & CONTROLS (D&C) IN PAST PROGRAMS
    - ORBITER HAS OVER 1,200 DEDICATED SWITCHES
    - MULTIFUNCTIONAL D&C HAS BEEN LIMITED
  - LIMITED ONBOARD DATA PROCESSING
  - MUCH OF DATA RECORDED OR TELEMETERED TO THE GROUND FOR PROCESSING
  - EXTENSIVE GROUND MONITORING OF ALL SYSTEMS
  - OPTIMIZATION OF PROGRAM OBJECTIVES
    - CREW INTERFACE CONSIDERED SECONDARY

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- MAJOR DEVELOPMENT OBJECTIVES
  - LOWER COSTS, IMPROVE MAINTENANCE/RELIABILITY
  - MINIMIZE PARTS/SKILL OBSOLENCE
  - MINIMIZE POWER, WEIGHT, VOLUME CONSUMPTION
  - PROVIDE A DESIGN WHICH ALLOWS FOR INFUSION OF NEW TECHNOLOGY
  - REDUCE CREW'S OVERALL WORKLOAD
  - MAXIMIZE FLIGHT SAFETY AND CREW EFFICIENCY
  - PROVIDE A SOFTWARE RECONFIGURABLE INTERFACE
  - MINIMIZE THE USE OF PAPER ON-ORBIT

- CURRENT DEVELOPMENT ACTIVITIES
  - DISTRIBUTED SYSTEM ARCHITECTURE
  - CREW COMMAND AND CONTROL INTERFACE VIA MULTIPURPOSE WORKSTATIONS
    - MULTIPLE MULTIFUNCTION DISPLAY DEVICES
    - KEYBOARD
    - CURSOR CONTROL DEVICE
    - PROGRAMMABLE SWITCHES
    - HAND CONTROLLERS

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- KEY TECHNOLOGY AREAS
  - COLOR FLAT PANEL TECHNOLOGY
    - COLOR ACTIVE MATRIX LIQUID CRYSTAL DISPLAYS
    - LARGE COLOR PLASMA DISPLAYS
  - ADVANCED PROCESSORS
    - LATER GENERATION GENERAL PURPOSE PROCESSORS
    - ADVANCED GRAPHICS PROCESSORS
    - HIGHER DENSITY MEMORIES

- KEY TECHNOLOGY AREAS (CONTINUED)
  - NEW AND IMPROVED CREW I/O DEVICES
    - VOICE RECOGNITION
    - VOICE SYNTHESIS
    - ADVANCED CURSOR CONTROL
  - ADVANCED MANIPULATOR/ROBOTIC CONTROL
    - HAND CONTROLLER TECHNOLOGY
  - IMPROVED CREW INTERFACE SOFTWARE
    - NEW CREW INTERFACE TECHNIQUES
    - USE OF AI/EXPERT SYSTEMS

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- TECHNOLOGY EVOLUTION ISSUES
  - MATURITY OF COLOR FLAT PANEL TECHNOLOGY
  - NO SPACEFLIGHT EXPERIENCE WITH ADVANCED INTERACTIVE MULTIPURPOSE SOFTWARE SYSTEMS
    - DEFINITION OF DISPLAY FORMATS
    - DEFINITION OF GRAPHIC OBJECTS
    - EFFICIENT NAVIGATION THROUGH A HIGH NUMBER OF DIFFERENT FORMATS
    - ELIMINATION OF DEDICATED SYSTEM D&C PANELS

- TECHNOLOGY EVOLUTION ISSUES (CONTINUED)
  - MATURITY AND UTILIZATION OF AI/EXPERT SYSTEM TECHNOLOGY IN A SPACECRAFT
  - CREW ACCEPTANCE OF A WORKSTATION INPUT VIA VOICE COMMAND
  - DANGER OF MAKING CREW BORED (MACHINE MINDERS)
  - LATER INCORPORATION OF NEW TECHNOLOGY
    - DIFFICULTY IN UPGRADING AN EXISTING OPERATIONAL NASA SPACECRAFT
    - ON-ORBIT CHECK-OUT/VERIFICATION