LSS-1224

Space Station Models, Mockups, and Simulators

by

Keith H. Miller

Alan Osgood

5-11

Space Station Human Productivity Working Group Meeting
NASA-Ames Research Center
February 27–March 2, 1984

Space Station

NASA

L86-1226

- Types of Boeing models, mockups and simulators
- Classes of models, mockups and simulators
- Use of models in 767 program
- Use of models, mockups, and simulators for Space Station Program

Space Station

NASA

LSS-1226

Types of Boeing Models, Mockups, and Simulators

- Stationary work stations — Flight decks, E-3A multipurpose consoles, communications consoles, gunner stations etc.
- Larger work areas — Galleys, cargo handling, E-3A & E-4B mission crew areas, maintenance areas
- Leisure areas — Airplane passenger cabins, lavatories, E-3A & E-4B rest areas
- Complete facility — Airplane, office and production areas

Space Station Classes of Models, Mockups and Simulators

NASA LSS-1227

Class		Use	Users
Models	–	Compare variety of concepts	Staff and engineering
1/100th–1/20th scale		– Area layout and access	
1/10–1/4th scale		– Personnel accommodation	
Full scale mockups	–	Progressive development of design	
Class 1		– Foam core, wood & paper of overall configuration	Staff and engineering
Class 2		– Subsystems mockup (plumbing, wiring)	
"Lighted" mockup		– Lighting, display and control	
Class 3		– Real equipment & materials (not qualified)	Manufacturing
Engineering simulators	–	Develop and test design and procedures	Engineering
Developmental		– Single task or subsystem	
Configuration		– Integrated tasks, and subsystems	
Training devices	–	Train and test personnel	Training
Part task trainers		– Single task	
Procedures trainers		– Integrate tasks	
Training simulators		– Realistic situation	

Space Station

NASA

LSR-1228

Characteristics of Models

- Inexpensive side by side comparison of concepts and designs
  - Humans much better at comparative judgments than absolute judgments
  - Provides 3-D views and perspective
  - Easy to transport

- Used by technical staff, engineering, marketing research and public relations

- Range of model scales
  - 1/100th–1/20th scale — Area layout and access
  - 1/10th–1/4th scale — Component layout and personnel accommodation

- Evaluations of interior layouts and color schemes closely approximate evaluations of actual interiors

Space Station

NASA

LSS-1229

Use of Models for 767 Program

- Verification of value of models for design evaluation
- Evaluation of alternative passenger cabin configurations
- Prediction of 767 market share in competitive markets
- Demonstration of 767 passenger appeal to airlines

Space Station

NASA

LBS-1230

Computerized Human Factors Tools

- Analyses for anticipated user groups
  - Conducted before hardware built
- Anthropometry
  - Accessibility of controls
- Vision
  - Readability of displays
  - Vision through windows
- Timeline evaluation

Space Station

NASA

LBS-1231

Approach for Space Station

- Maximize use of CADCAM
  - Concept development and evaluation
  - Early problem identification and resolution
- Maximize use of models
  - Comparison of alternative concepts
  - Initial development of procedures
  - Initial training
- Use partial mockups, subsystem simulators, and part task trainers to maximum utility
- Minimize demands on complete mockups, engineering simulators and training simulators