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Space Station Models, Mockups, and Simulators

by

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- **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**



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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**



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Space Station Classes of Models, Mockups and Simulators

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



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Characteristics of Models

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- **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**



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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**



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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**



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Approach for Space Station

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- **Maximize use of CAD/CAM**
- **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**