SPACE STATION POWER MANAGEMENT AND DISTRIBUTION

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The power system architecture is presented by a series of schematics which illustrate the PMAD system at the component level, including converters, controllers, switchgear, rotary power transfer devices, power and data cables, remote power controllers, and load converters. Power distribution options, reference power management, and control strategy are also outlined. A summary of advanced development status and plans and an overview of system test plans are given.

TECHNOLOGY OPTIONS FOR FUTURE HIGH POWER AEROSPACE ELECTRIC SYSTEMS

- DC
- ELECTRONICS NEEDED FOR VOLTAGE CHANGE
- SIMPLE DISTRIBUTION
- DIFFICULT SWITCHING
- EFFICIENT
- HIGH VOLTAGE
- AC
- EASY VOLTAGE CHANGE
- MORE COMPLEX DISTRIBUTION
- EASY SWITCHING
- LOWER EFFICIENCY
- HIGH FREQUENCY
- LIGHT WEIGHT
- QUIET
- NOT WIDELY USED
- LOW FREQUENCY
- HEAVIER
- POSSIBLE NOISE
- WIDELY USED
- MANY POTENTIALLY ATTRACTIVE CONCEPTS
- NEED UNBIASED ASSESSMENT

Figure 1.
Figure 2.

REFERENCE PHOTOVOLTAIC POWER SYSTEM ARCHITECTURE

Figure 3.

REFERENCE PHOTOVOLTAIC POWER SYSTEM ARCHITECTURE
OUTBOARD TRANSVERSE BOOM

SOLAR ARRAY

\[ \text{B-JOINT} \]

\[ \text{DC INVERTER} \]

\[ \text{AC} \]

\[ \text{AC} \]

\[ \text{TO INBOARD TRANSVERSE BOOM} \]

\[ \text{DC CONVERTER} \]

\[ \text{DC REGENERATIVE FUEL CELL} \]

\[ \text{DC INVERTER} \]

\[ \text{ENERGY STORAGE CONTROLLER} \]

\[ \text{UNINTERRUPTIBLE POWER SUPPLY (UPS)} \]
REFERENCE PHOTOVOLTAIC POWER SYSTEM ARCHITECTURE
INBOARD TRANSVERSE BOOM

Figure 4.

REFERENCE PHOTOVOLTAIC SYSTEM ARCHITECTURE (LOWER BOOM)

Figure 5.

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REFERENCE PHOTOVOLTAIC POWER SYSTEM ARCHITECTURE (STARBOARD KEEL EXTENSION AND LOWER BOOM)

Figure 6.

REFERENCE PHOTOVOLTAIC POWER SYSTEM ARCHITECTURE (MHAB NO. 1)

Figure 7.

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REFERENCE SOLAR DYNAMIC POWER SYSTEM ARCHITECTURE  
( INBOARD TRANSVERSE BOOM )

Figure 8.

ADVANCED DEVELOPMENT TASKS

- POWER COMPONENT AND SUBSYSTEM DEVELOPMENT
  - FUNCTIONAL AND LIFE TESTING
  - SYSTEM DEMONSTRATION
- POWER MANAGEMENT INTEGRATED CONTROL NETWORK
  - COMPUTER CONTROL HARDWARE
  - NETWORK CONTROL SCHEME
  - SYSTEM SOFTWARE
- POWER SYSTEM SIMULATION AND CONTROL
  - COMPONENT AND SYSTEM MODELS
  - REAL AND NON-REAL TIME SIMULATION
  - CONTROL ALGORITHMS
  - POWER MANAGEMENT ALGORITHMS
- POWER MANAGEMENT AND DISTRIBUTION SYSTEM DEMONSTRATIONS

ADVANCED DEVELOPMENT

POWER COMPONENTS
- ROLL RINGS
- TRANSMISSION LINE
- AC POWER CONTROLLERS AND BUS ISOLATORS
- SEMI-CONDUCTOR PACKAGING
- DC SWITCHGEAR
POWER SYSTEM HARDWARE
- HIGH FREQUENCY (20KHZ) POWER SYSTEM
- HIGH EFFICIENCY CONVERTERS
- LOW FREQUENCY (400 Hz) POWER SYSTEM
POWER MANAGEMENT AND CONTROL
- NETWORK CONTROL SYSTEM
- SIMULATIONS
- CONTROL ALGORITHMS

Figure 9.

Figure 10.

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LEWIS RESEARCH CENTER POWER SYSTEMS TEST FACILITY

Figure 11.

Figure 12.

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Figure 13.