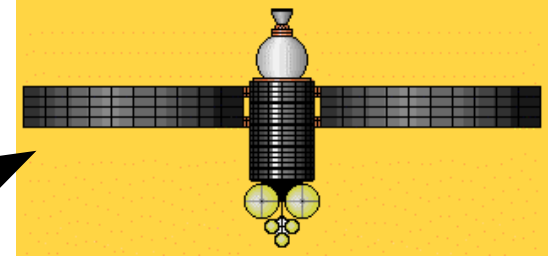


Commercial &  
High-Performance Aerospace



Commercial & Planetary Spacecraft



**SiC High Temperature,  
High Power  
Electronics**

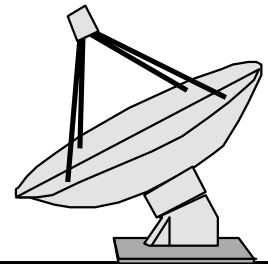
Gasoline & Electric  
Transportation



Public Power Generation & Distribution



Microwave  
Communications & Radar



## Property

## Benefit

Wide Energy Bandgap  
(6H-SiC = 3.0 eV, 4H-SiC = 3.2 eV)

600 °C Electronics,  
Extremely Low Leakage Devices

High Breakdown Field  
(~ 10X of Silicon)

Superior Power Electronics,  
Radiation Hardened Devices

High Thermal Conductivity  
(~ 3X of Silicon)

Simpler Heat Rejection Schemes,  
Increased Power Density

Excellent Physical Stability

Sustained Use in Hostile  
Environments

Processing Similarities to Silicon

Potential for Rapid Commercial  
Development

## **Vastly improved systems enabled by unique SiC device capabilities.**

High power, somewhat high-f RF,  $T < 125$  °C system ambient.

HDTV, radar, communications.

MESFET's, SIT's, Schottky diodes.

High power switching,  $T < 125$  °C system ambient.

Electric motor-drives, high-voltage power transmission & conversion.

Reduced thermal management, reduced system size, increased efficiency.

2-terminal (diodes) & 3-terminal (MOSFET, IGBT, etc.) power switches.

High power switching,  $T > 200$  °C ambient.

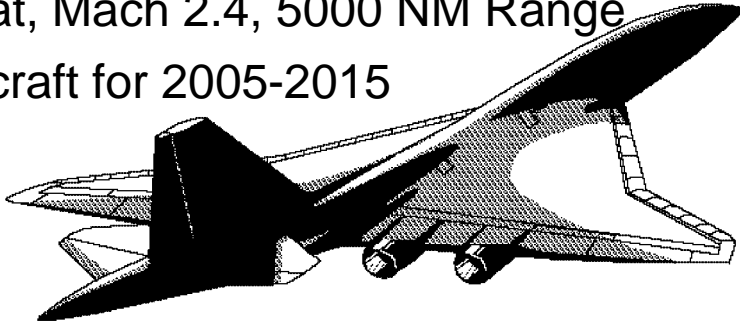
Aerospace electric actuators.

2-terminal (diodes) & 3-terminal (MOSFET, IGBT, etc.) power switches.

Digital and analog signal circuits,  $T > 300$  °C ambient.

Instrumentation & control electronics for aerospace, automotive,  
and industrial process monitoring.

300 Seat, Mach 2.4, 5000 NM Range  
600 Aircraft for 2005-2015



After Carlin & Ray, 2nd HiTEC, Charlotte, NC, 1994

## Conventional Control System (Without High Temperature Electronics)

Each actuator requires 17-26 wires  
Average wire run ~ 100 ft.  
System wire run weight ~ 600 lbs.  
~ **10,000 Connector Pins**

## Distributed Control System (With High Temperature Electronics)

Control signal multiplexing  
System wire run weight < 50 lbs.  
~ **1,000 Connector Pins**

Wiring & connector problems are #1  
cause of propulsion maintenance  
action in commercial aircraft today!

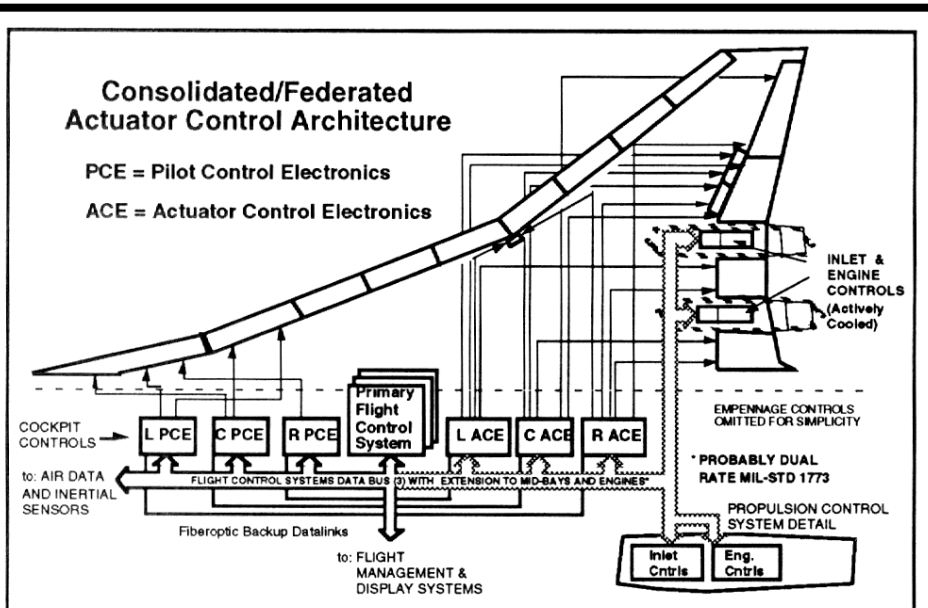


Figure 2 Current Baseline Control System Uses Electronics Only in Environmentally Controlled Areas.