

SpaceX

Space Exploration Technologies works to break down the cost and engineering barriers to space travel using Altium Designer's unified design environment.



"As a PCB design tool, Altium Designer is second to none. The unified design environment is intuitive and has made managing my project trouble free. In just two weeks I was able to learn the tool, design my board, and have a fully assembled PCB ready for test. Altium Designer is an incredibly flexible and capable tool. I would recommend every circuit designer consider making the switch."

Matt Soule

Engineer,
SpaceX

The Need

Space has long been a field reserved for big spenders such as governments and large companies. However with rapid advances in electronics and information technology, Space Exploration Technologies, or SpaceX, of El Segundo, California, seeks to break through the cost barrier with its family of low-cost Falcon launch vehicles and the Dragon spacecraft. Through a combination of innovative practices, intuitive tools and lateral management, SpaceX has been able to develop cost efficient vehicles fitted with high quality avionics. This philosophy helped SpaceX to secure the Commercial Orbital Transport Services (COTS) contract with NASA. This contract aims to demonstrate that private launch vehicles have the ability to provide launch and delivery services to the International Space Station (ISS).

The Challenge

Space technology is unique. All electronics and related components must meet the highest level of quality and reliability, all whilst fulfilling a number of industry and government guidelines. The physical rigors of the vehicle launch and the extreme conditions of space place the highest demands on all systems, especially electronics.

To ensure its launch vehicles always perform at this extraordinary level, SpaceX develops many of its boards and controllers under the fault-tolerant discipline. This time consuming engineering technique ensures that all systems can continue to operate despite a given component failing. Controllers and PCBs are fitted with additional components and back-up mechanisms for greater reliability. With designs being as complex as a fault-tolerant controller with multiple FPGAs, the challenge for SpaceX was to complete these designs on time whilst maintaining quality and low costs.

The Solution

Since incorporating Altium Designer into its production process, SpaceX has found the design

process has simplified. Altium's unified system offers a much greater level of version control than its previous toolset and now SpaceX can better manage its ongoing design development. Altium's live design capabilities mean that the simplest modifications are automatically adjusted in all previous board and schematic work. The result: a flexible but reliable development and documentation process for SpaceX's catalogue of PCB designs.

Altium's comprehensive libraries were found to be one of the biggest development boons for SpaceX. The library feature provided engineers with the latest and most up-to-date components in a user-friendly system. Engineers were also able to add new components, which allowed for greater customization and board enhancements.

In addition, design flows were complemented by Altium Designer's ready-to-use FPGA-based components for instant FPGA integration. This feature meant SpaceX could immediately employ FPGAs into its designs, easily capturing them at the schematic level. With the features combined, SpaceX had a complete set of solutions in a single platform system.

The Results

SpaceX found that by using Altium Designer, it could continue to improve on its low cost, high reliability designs. For example, SpaceX has built avionic systems that meet the same quality standards as those used in multi-million dollar satellite projects.

Since introducing Altium Designer into its development process, SpaceX has enjoyed considerable improvements in its productivity. Without prior knowledge of the software, engineers were easily able to complete designs without the usual rigorous training required from separate or loosely integrated tools. Within just two weeks of applying Altium technology, engineers were able to create a power distribution and regulation board. This trend has continued. SpaceX has found its project turn over has increased exponentially.

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Product Information

Falcon 1, Falcon 9 and Falcon 9 Heavy are all part of the SpaceX line of low cost and reusable space launch vehicles. The Falcon 1 is the smallest and can lift up to 570kg to Low Earth Orbit (LEO). The largest, the Falcon 9 Heavy, will carry up to 28,700kg to LEO and 10,350kg to Geosynchronous Transfer Orbit (GTO).

Launched aboard a Falcon 9 launcher, the Dragon pressurized spacecraft capsule can transport up to 2500kg of cargo, or a crew of up to seven astronauts to LEO. Its capacity to carry passengers is an important part of the overall SpaceX vision of reducing the costs and increasing access to space for both government and private customers.

Customer Information

Since 2002, SpaceX has been creating a family of low-cost, reliable launch vehicles for the burgeoning private and commercial space sectors. The ability to reduce costs of space technology whilst increasing the power and reliability has been possible through innovative engineering practices and a flat management structure. By developing commercially viable launch vehicles, SpaceX intends to break down the barriers of space travel and open up the future to greater possibilities.

For more information, visit www.spacex.com



Altium's technology
implemented in the
space exploration industry

About Altium

Altium is a global developer and supplier of electronic product development software for the Microsoft Windows environment. Founded in 1985, Altium released the world's first Microsoft Windows-based printed circuit board design tool in 1991, and continues to provide advanced, easy-to-use and affordable design systems to electronics engineers, designers and developers worldwide.

Altium Designer is a single, unified application that provides all the technologies and capabilities necessary for complete electronic product development. Altium Designer integrates board- and FPGA-level system design, embedded software development and PCB layout, editing and manufacturing.

For more information, visit www.altium.com

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