



National Aeronautics and  
Space Administration



## TECHNOLOGY SOLUTION

**Aerospace**

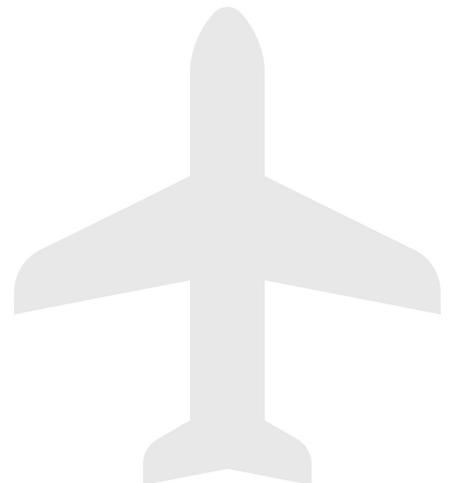
# SpaceCube Demonstration Platform

[An on-orbit platform for demonstrating advanced fault tolerance technologies](#)

The SpaceCube Demonstration Platform is a processing system including an FPGA having a dual port RAM and for use in hostile environments. The FPGA includes three portions: a C&DH portion; a first scratch pad portion receiving a first set of data, processing the first set of data, and outputting a first set of processed data to a first location of the RAM; and a second scratch pad portion receiving a second set of data identical to the first set of data, processing the second set of data in the same way that the first set of data is processed, and outputting a second set of processed data to a second location of the RAM. The C&DH portion compares the first set of processed data to the second set of processed data and, if the first set of processed data is the same as the second set of processed data, outputs one set of processed data.

### BENEFITS

- Fault tolerant framework allows for recovery from radiation upsets
- Robust telemetry packet structure
- Reconfigurable from the ground while in orbit
- Onboard compression to upload from the ground to SpaceCube



## THE TECHNOLOGY

The HST SM4 SpaceCube flight spare was modified to create an experiment called the SpaceCube Demonstration Platform (SC DP) for use on the MISSE7 Space Station payload (in collaboration with NRL). It is designed to serve as an on-orbit platform for demonstrating advanced fault tolerance technologies.

With the use of Xilinx commercial Virtex4 FX60 FPGAs, the fault tolerant framework allows the system to recover from radiation upsets that occur in the rad-soft parts (Virtex4 FPGA logic, embedded PPCs in Virtex4 FPGAs, SDRAM and Flash), the C&DH system that runs simultaneously on both Virtex4 FPGAs that uses a robust telemetry packet structure, checksums, and the rad-hard service FPGA to validate incoming telemetry. The ability to be reconfigured from the ground while in orbit is a novel benefit, as well as is the onboard compression capabilities that allow compressed files from the ground to be uploaded to the SpaceCube.

## APPLICATIONS

The technology has several potential applications:

- Production of fault tolerance technologies
- Generic data processing solution for space-based applications

## PUBLICATIONS

Patent No: 8,484,509

Patent Pending

## More Information

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