

## Field Programmable Gate Array Reliability Analysis Guidelines for Launch Vehicle Reliability Block Diagrams

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### ABSTRACT

Field Programmable Gate Arrays (FPGAs) integrated circuits (IC) are one of the key electronic components in today's sophisticated launch and space vehicle complex avionic systems, largely due to their superb reprogrammable and reconfigurable capabilities combined with relatively low non-recurring engineering costs (NRE) and short design cycle. Consequently, FPGAs are prevalent ICs in communication protocols and control signal commands.

This paper will identify reliability concerns and high level guidelines to estimate FPGA total failure rates in a launch vehicle application. The paper will discuss hardware, hardware description language, and radiation induced failures. The hardware contribution of the approach accounts for physical failures of the IC. The hardware description language portion will discuss the high level FPGA programming languages and software/code reliability growth. The radiation portion will discuss FPGA susceptibility to space environment radiation.

