

SPACE SYSTEMS SYMPOSIUM (D1)
Lessons Learned in Space Systems (5)

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FLIGHT AND DEVELOPMENT EXPERIENCE WITH COTS EMBEDDED HARDWARE AND
VISUAL PROGRAMMING TECHNIQUES**Abstract**

The VECTOR experiment (VERification of Concepts for Tracking and ORientation), launched on a sounding rocket for suborbital flight in March 2010, employed the National Instruments Single Board RIO System as its OnBoard computer, running experiment control, telemetry, telecommand and CCSDS conform communication functions.

This paper describes implementation approach and techniques suitable for this particular hardware using the LabView programming environment as well as problems and drawbacks encountered during development.

The Single Board RIO family of embedded computers combines a PowerPC CPU, running a VXWorks based realtime operating system with a Spartan 3 FPGA and a wide range of configurable I/Os. This makes it quite attractive for space research projects requiring a powerful OBC with multiple interfacing options, while having only a limited lifetime or not being exposed to too harsh environmental conditions. Development with the graphical LabView development system has also interesting aspects, especially for teams and developers with limited embedded systems knowledge. Especially for educational projects like the above mentioned VECTOR experiment or for precursor missions it may prove as a good choice, while not being limited to these specific areas in any way. However there are a number of problems that come with the comfort of the National Instruments based systems which may reduce their wider applicability in several ways. These points will also be discussed providing a wide range of lessons learned. Practical examples and design proposals concerning electrical and software issues are included to illustrate the results.