

Electronic Parachute Deployment System	Michigan State University
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TI university program

TI Innovation Challenge 2014 Project Report

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Date:	5/23/14	
Qty.	List all TI analog IC or TI processor part number and URL	1) Explain where it was used in the project? 2) What specific features or performance made this component well-suited to the design?
1	MSP430G2553	The MSP430 determines the height of the rocket and when the deployment charge should be fired. It is low power, easy to incorporate into a custom printed circuit board, and easy to program via the TI Launchpad.
1	INA326	This component was used to amplify the output of the analog altimeter. The high common mode rejection ratio was important to properly adjust the level of the altimeter output and provide reasonable gain.
1	LM2574	A buck converter was chosen to step down the voltage from a 9V battery to 5V. A buck converter was chosen due to its power efficiency and necessity to power both the analog altimeter and instrumentation amplifier.
1	LP2950	The LP2950 was selected for its small size and power requirements. This voltage regulator supplied the 3.3V rail for the MCU from the LM2574.
Submit your TI Innovation Challenge project to TI's Project repository. Your team is encouraged to post your project as early as possible- Your submission will be kept offline until the contest has officially closed! Instructions: - Project Name must be labelled "TI IC Design Contest North America: Electronic Parachute Deployment System; Michigan State University" - Fill out project form (template is completely flexible) and include the following documents - The TI report template - Your full class report - Supplemental photos - A video of your partially or fully built out design. We'd love to see your team engaging with TI products!		

Project abstract (a short high level written description of the design and motivation behind project), 1,000 words max:

The electronic parachute deployment system replaces the traditional parachute deployment method on a large model rocket that employs the use of a multistage parachute. The system will allow for improved consistency and reliability over the traditional, timed fuse system. The system will be controlled by the Texas Instruments MSP430G2553 microcontroller in conjunction with an analog altimeter sensor, amplification of the sensor output, power regulator, and parachute deployment system. The team pursued low-cost innovative solutions in developing the electronic parachute deployment system.

Through several tests the team was able to ensure proper functionality of each of the components required for the project. Using light emitting diodes on the microcontroller, the team simulated tests to ensure the pressure was properly detected from the analog-to-digital converter. Afterwards, the team checked for change in the instrumentation amplifier, the microcontroller detecting a peak to deploy the drogue chute, and the distance at half the peak height from ground level for the main chute. The final step in the design was to fabricate a printed circuit board. The team then tested the final revision using a pressure chamber prior to launch.

For a complete test of the system, the team launched the electronic parachute deployment system in both a large-scale rocket and mid-size rocket. The rocket launches both failed to reach their expected average altitude. However, even in the failure of the launches, the designed system functioned as specified. Our system grants model rocket hobbyists with a cheap alternative to launch and safely recover a rocket.

Please submit your class report with this one page document. Your class report should include the following (Max of 30 pages, excluding appendix):

- Table of contents
- List of figures and tables
- A detailed written description of the project design
- Hardware Design
- Any Software Architecture used (include any software code as part of Appendix)
- Testing and Results / Conclusions
- Future Work / Recommendations
- Acknowledgements and/or References
- Appendix: schematics, CAD drawings, Critical IC Bill of Materials (Entrants may use Digikey Online BOM tool on www.Digikey.com), User Manual, etc.