



**Abstract for  
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### **Using Test to Drive Design**

**Terry Scharton, Chia Yen Peng, Ben Tsoi  
JPL, California Institute of Technology**

**Mary Baker, Dan Hensley, Kurt Knutson, Ralph Brillhart  
ATA Engineering, Inc.**

Test and analysis data from the Mars Exploration Rover have been used to predict and compare spacecraft structural characteristics and responses. The intent is to use test data to improve the accuracy of analysis such that analytical models can effectively lead the design of future similar spacecraft. NASA has been trying to reduce the amount of testing to cut program cost and time. Yet experience has shown that analyses often have errors when compared to actual test data indicating that tests are still critical to successful missions. To reduce testing time and costs but still maintain the benefits, it has been proposed that we combine tests. Specifically it has been proposed to combine modal testing and qualification testing. In the work presented here, we investigate this process using existing test data from the MER program. First, we compare modes extracted from the base excitation test with modes from a more traditional modal test. We also compare analytically predicted random vibration responses with base shake random vibration measurements. Also explored are the modeling questions that need to be answered in order to depend more heavily on analysis for spacecraft optimization and verification. Since the qualification test comes late in the program, it is important that the value of testing can be extended beyond the current program to future programs. It is also important that analyses done prior to this point in the program are as accurate as possible. These objectives introduce data accessibility goals as well as test planning and data analysis requirements that are discussed.