m+p+NASA = Successful Ares I-X Modal Tests

A series of modal tests on NASA's Ares I-X flight test vehicle were performed using m+p international's SO Analyzer and VXI hardware for data acquisition. The modal tests were performed with the 327-foot-tall launch vehicle fully assembled on a mobile launcher platform in the Vehicle Assembly Building at NASA's Kennedy Space Center.

The vehicle is one of the largest processed in the bay, rivaling the height of the Apollo Program's 364-foot-tall Saturn V. Five super stacks make up the rocket's upper stage that is integrated with the four-segment solid rocket booster first stage. Ares I-X is the test vehicle for the Ares I, which is part of the Constellation Program to return men to the moon and beyond.

The SO analyzer software allowed 104 channels of data to be collected while exciting the vehicle with up to four hydraulic shakers. The SO analyzer's throughput option was used to store time history data from all channels directly to disk during test runs so that it could be reprocessed as desired using the post-processing feature. Excitation techniques utilized during testing included multi-shaker random and single-shaker, force-controlled sine sweep.

Tap tests were also performed to investigate local modes inside the vehicle. Many of these tap tests utilized m+p international's eight-channel VibPilot system for data acquisition. The modal test data were used to successfully identify and investigate the first four bending mode pairs of the launch vehicle on the mobile launcher platform. These experimental modal parameters were used to calibrate the finite-element model.

Additional analyses predicted in-flight modal parameters, which were used to ensure the robustness of the flight control system design. The modal test was a multi-center effort including NASA Langley Research Center, Glenn Research Center, Marshall Space Flight Center, Kennedy Space Center, and the Aerospace Corporation.

Founded in Hanover/Germany in 1980, m+p international develops and manufactures test and measurement systems for vibration control, noise and vibration analysis, data acquisition, process monitoring and test stand engineering.

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