**A System for Measuring the Sway of the Vehicle Assembly Building**

Tests have shown that the existing facility is safe.

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A system was developed to measure the sway of the Vehicle Assembly Building (VAB) at Kennedy Space Center. This system was installed in the VAB and gathered more than one total year of data. The building movement was correlated with measurements provided by three wind towers in order to determine the maximum deflection of the building during high-wind events.

The VAB owners were in the process of obtaining new platforms for use in assembling very tall rockets when analysis of the VAB showed that a high wind could move the building sufficiently that an upper platform might impact a rocket. The problem arises because safety requires a relatively small gap between the platform and the rocket, while a large enough gap is needed to ensure that stacking tolerances prevent contact between the rocket and the platform. This only leaves an inch or two (≈2 to 5 cm) of total clearance, so when the analysis showed that more than a couple of inches of motion could occur in a high wind, there was a potential for damaging the rocket. The KSC Applied Physics Laboratory was asked to install a system in the VAB that could measure the motion of the building in high winds to determine the actual building sway.

The motion of the VAB roof under wind load was measured optically, and under analysis, it was determined that a relatively large-aperture optical system would be required to reduce diffraction effects to less than a small fraction of an inch (≈mm) at a distance of 500 ft (≈150 m). A 10-in. (≈250 mm) telescope was placed on the floor of the building, looking at the ceiling. On the ceiling, a flat plate with three white LEDs was mounted in an “L” shape, such that the telescope was essentially looking at three stars. Software was written to track the motion of these three points using an image processing system. This provided a better than 1/10-in. (≈2.5-mm) 2D measurement faster than once a second. Data was downloaded once a month for comparison with the wind tower data.

The system was fully operational and provided enough data to show that the VAB will only move 1 in. (≈2.5 cm) at the ceiling under 70-knot winds. Adjustable platforms are not required.

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