

Case Study: Tow and Cargo Hook Test Stand

Industry:

Aeronautics

Design Task:

The US Marine Corps' Fleet Readiness Center contracted KDY to design and manufacture a test stand to complete the electrical and mechanical testing of tow and cargo hooks from the Bell Boeing V-22 Osprey and the Sikorsky H-53 family of aircrafts. Four categories of tests were required for each unit:

- Performance of the hook assembly under proof tension
- Performance of the release mechanisms in low voltage conditions for a range of loads
- Performance of the release mechanisms in high voltage conditions for a range of loads
- Continuity, ground bond, hipot & resistivity tests on the hook assembly's electrical circuits

Historically, the accuracy of the applied load had been sub-par due to the wide range of force measurement, each units under testing (UUTs) required different mechanical linkage to be secured for being testing and the operator generated a test report by hand. Measurement error was significant and the time required to reconfigure hardware between UUTs was considerable.

The Solution:

High accuracy, semi-automated, efficiently operated test stand.

KDY delivered a redesigned test stand that incorporated elements from the legacy stand for ease of transition, while drastically improving accurate control of the tensioning force and operator efficiency in a more robust and maintenance-free system.

The design featured several improvements over the previous system. Most significantly:

- **Dual-Range Tensioning & Measurement:** The test stand design provided accurate low force tensioning for the small V-22 hooks and accurate high force tensioning for the larger H-53 hooks. KDY supplied:
 - Custom Data Acquisition and Control Software to engage either air-over-oil cylinders or hydraulic intensifiers based on the magnitude of operator input.
 - Two Omega LC1001 high accuracy load cells with a mechanical cross over for measuring smaller forces independent of error proportional to the full scale range of the larger load cell.



Figure 1: Tow and Cargo Hook Test Stand, As Delivered

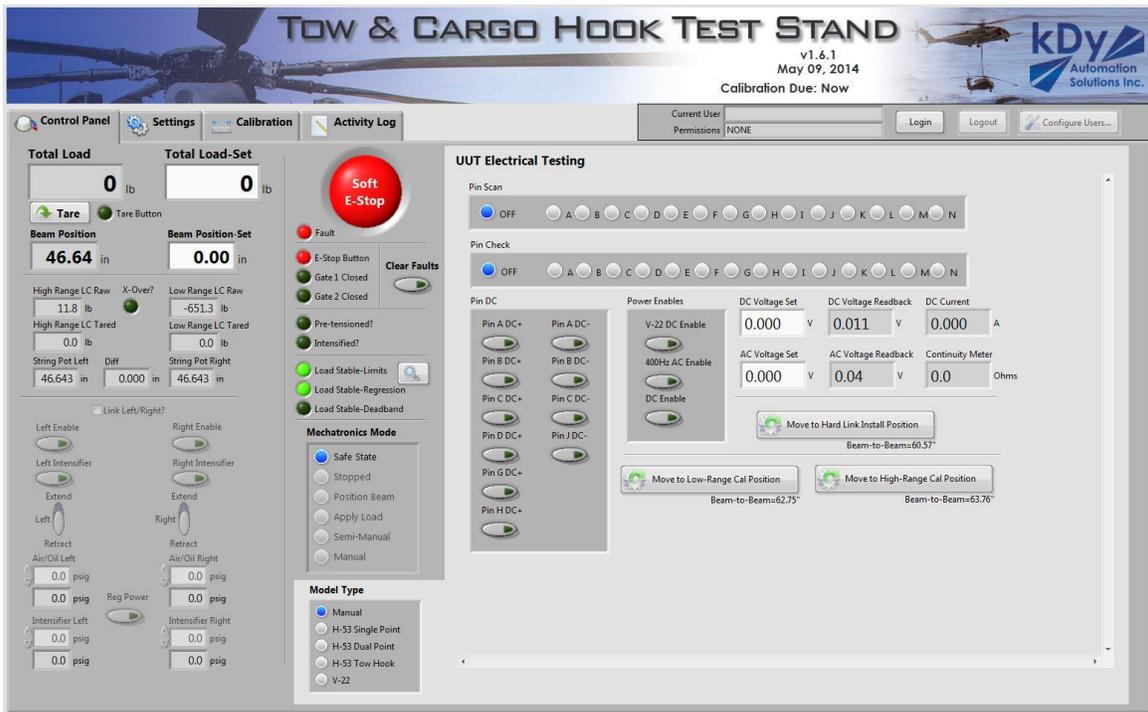


Figure 2: Test Stand Control Panel

- **Automated Positioning:** Automated height adjustment of the mounting bar eliminated hardware change out due to differing UUT heights.
- **Pump-Free Operation:** The air-over-hydraulic power source for hydraulic tensioning lead to quieter and more robust operation.
- **Automated Testing Macros and Report Generation:**
 - The custom PC software enabled fully automated tedious tasks such as continuity, resistivity, & hipot checks and generated a comprehensive test report automatically.
 - KDY provided fully manual control capability that mimicked legacy control surfaces for easy operator familiarity.