

Background & NASPAX Needs

The Cargo and Special Operations team at NASPAX does not have access to a CH-47 to conduct cargo testing and certification of pallet loads and large vehicles.

The objective was to design and install all systems necessary to turn a stripped CH-47 airframe into a working test facility.



Stripped CH-47 Airframe



Cargo Special Ops Test Bed

Required systems include a ramp and loading winch that are functionally identical to CH-47 original equipment, lighting to illuminate the cabin during tests, and a camera system to record and view tests. All systems operate on existing facility power sources.

Lighting & Electrical

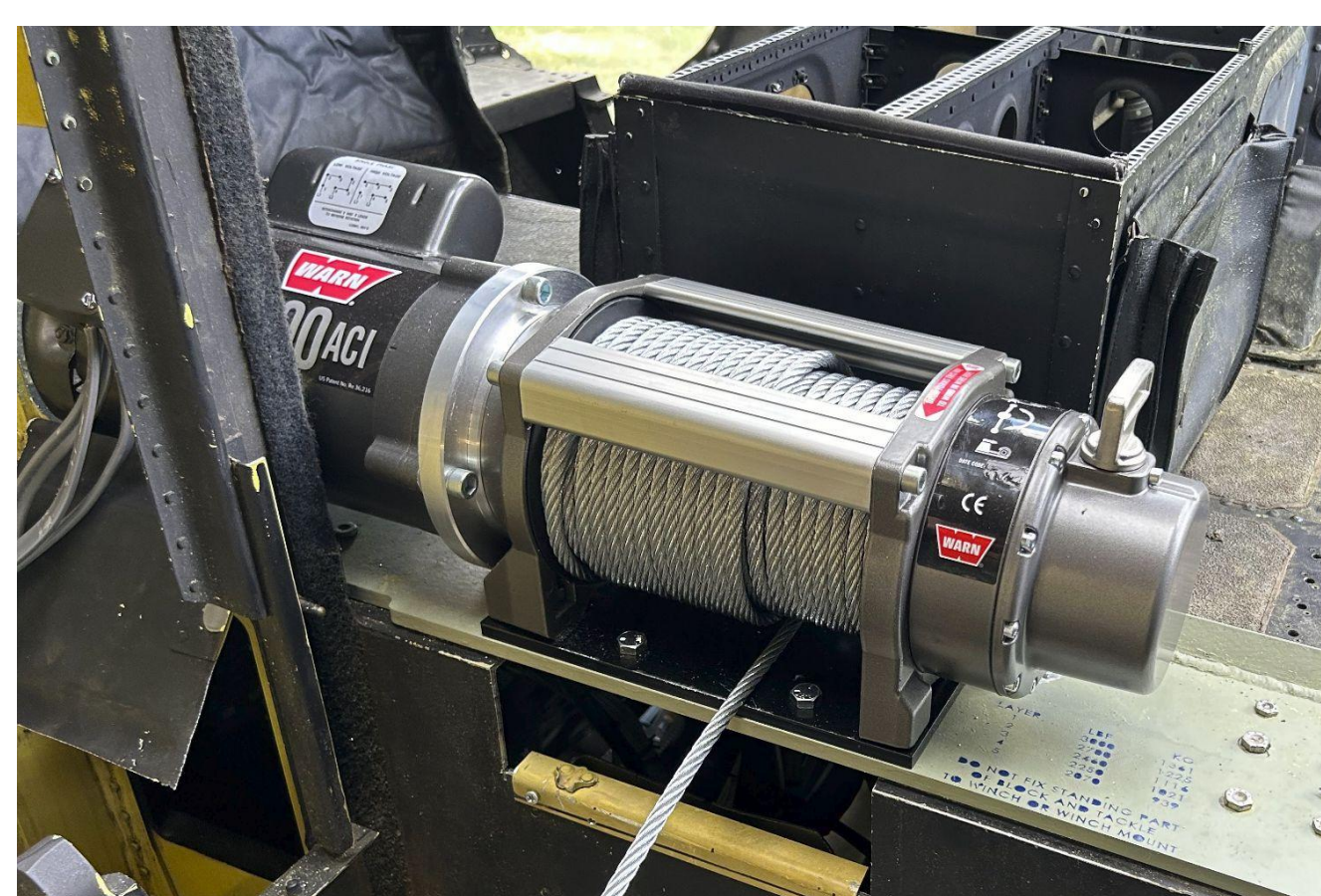
The CH-47 electrical system includes independently controlled dimmable lighting, electrical receptacles, and a cargo loading winch.

All lighting and receptacle are weatherproof, most of which are rated to IP65

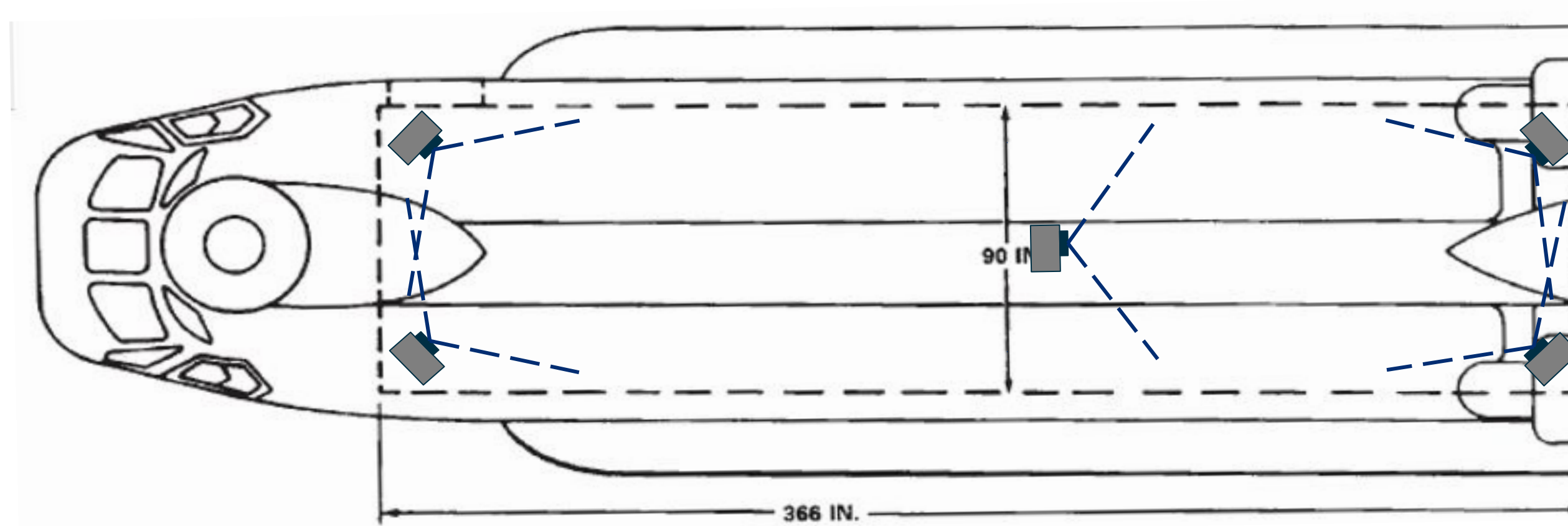


Above: Six courses of LED light fixtures installed in the cargo area

Right: 3000lb winch and mounting plate installed on the cabin seat rails for cargo loading



Test Observation Cameras



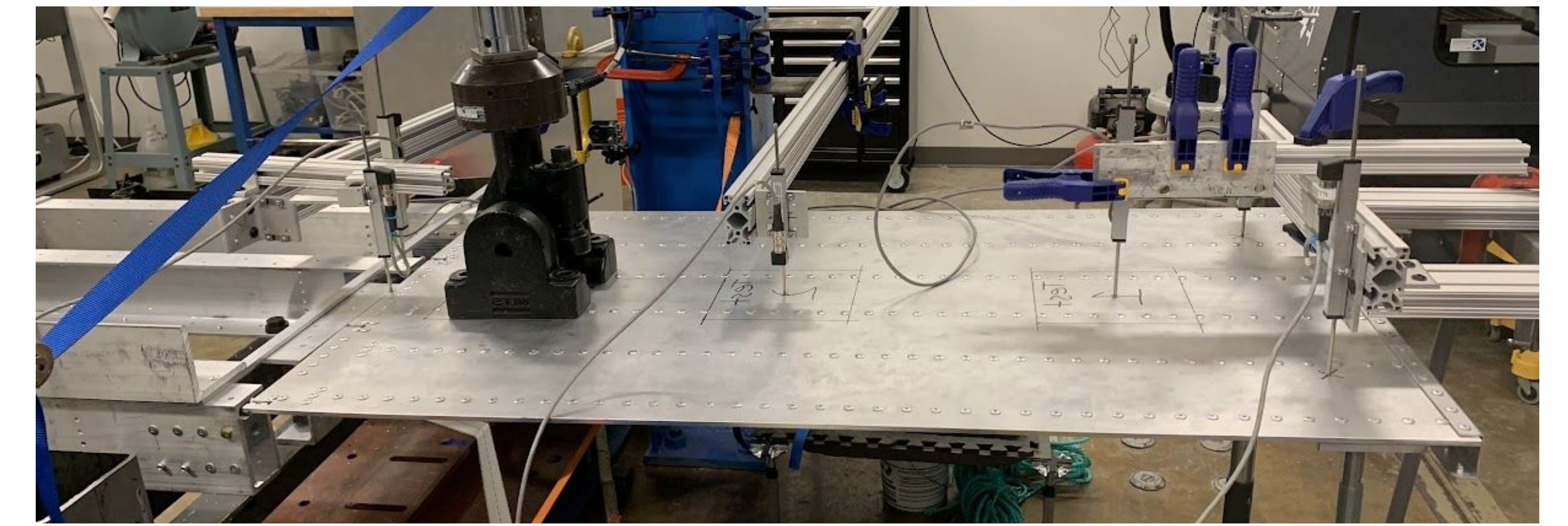
Top: Camera placement within the airframe

Bottom left: Observation camera mounted in the airframe

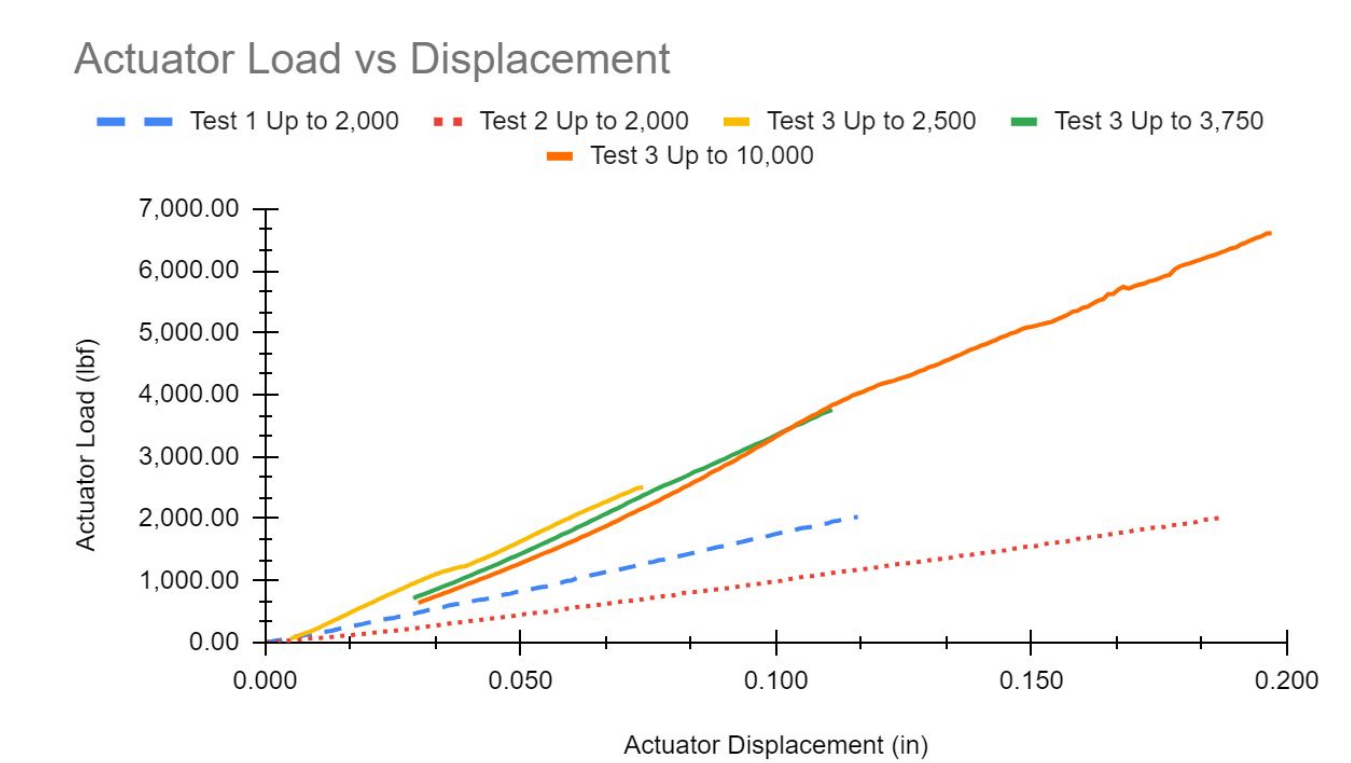
Bottom right: wireless observation monitor

Five cameras were installed in the CH-47 to view the cabin during tests. Cameras were connected with HDMI cords to a multi-viewer and wireless transmitter contained in an IP54 electrical box to transmit all camera views simultaneously to a monitor outside of the airframe.

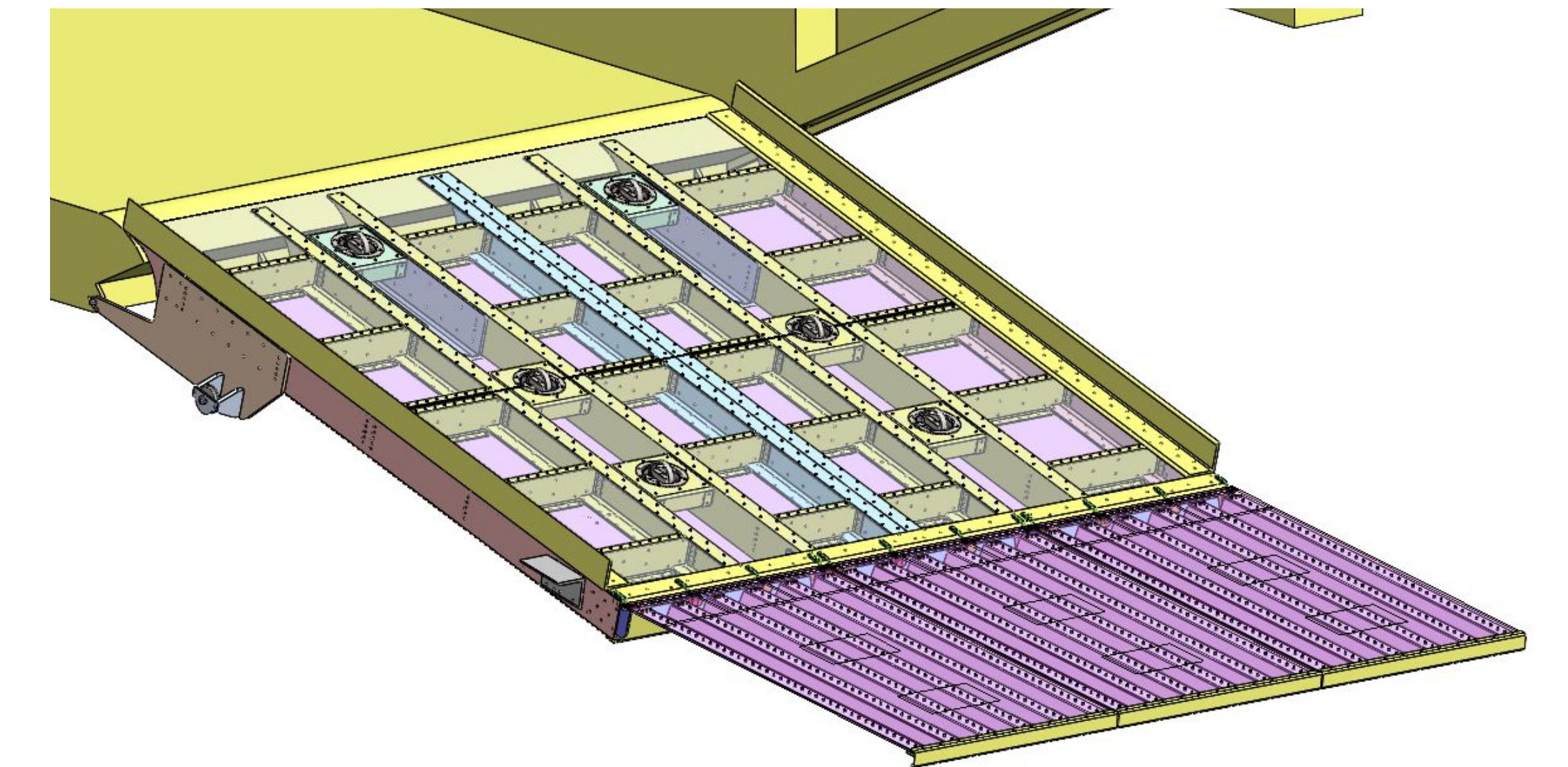
Ramp Design & Testing



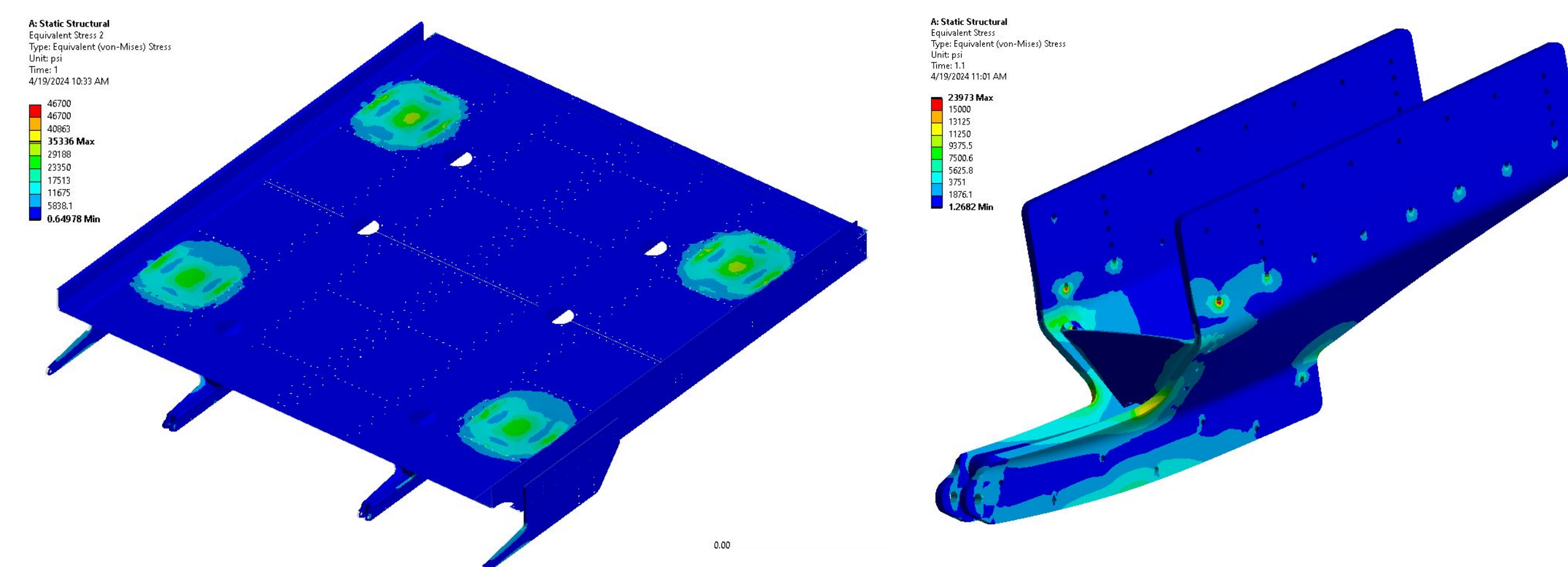
Above: Hydraulic ram ramp extension test up to 10,000 lbf
Right: Load vs. Displacement plots of ramp extension tests



Ramp extensions were tested with help from the JHU CaSe's Thin-Walled Structures Lab to validate extension FEA simulations and load capacity. Our tests showed that the designed extensions exceed minimum load requirements, revealed potential failure points in need of updates, and validated our extensive FEA simulations.



Above: Full CAD model of ramp structure which can be raised and supported by integrated feet for varying loading operations. Below: FEA analysis of full ramp structure and components.



Acknowledgments

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