

Wing Skin Contour Test System

Major airplane manufacturer's research division needed a new, improved test system.

Main Objective

The objective of the Wing Skin Contour Test System was to test the contour of an aluminum wing skin after the ball preening process is completed. This new system will replace the current means of a precision test fixture with variances measured with feeler gages to verify the correct contour.

Customer Results

Once the prototype unit is complete and all software issues are resolved, a full sized production unit (110 ft x 10 ft) with 125 Pogos can be constructed for production. Since all wing configurations can be accommodated with the same test structure via software and setup parameters, production demands will determine the number of required fixtures.

Application Description

The project scope is being implemented in a phased format as an R&D project. The test unit is comprised of a prototype X, Y strut structure with 15 testing Pogos mounted on the y-axis struts. Each Y-axis strut has five Pogos mounted to be automatically positioned at any location along the strut. Each Pogo is comprised of an electric cylinder (Parker Automation ET Series), vertically mounted on the Y-axis linear slide with an end-mounted strain gage unit and vacuum interface, and a smart motor drive unit (Animatics 3450) to position the Pogo along the Y-axis slide. The prototype unit has a centralized vacuum system to provide hold down vacuum for the wing to Pogo interface.

The control system is comprised of a PC with a Windows NT operating system along with the Wonderware Suite of HMI tools for operator interface. The PC supports network interface via Ethernet. The PC works in conjunction with an Allen-Bradley SLC-504 PLC controller. Communications between the PC, PLC and Pogo position motors is via an RS-485 interface. The same interface is used to position the electric cylinders and acquire the test data from each Pogo. Current Wonderware screens include:

- ◆ **Main Welcome Screen:** System logo, startup, shutdown and version screen
- ◆ **Database Skin Profile Maintenance Screen:** Add/delete/modify data table in the database for a particular piece of wing skin including the Pogo/beam positions for testing the wing skin's contour.
- ◆ **Database Pogo Running Parameters Screen:** Configure database for system parameters of the Pogo and Beam.
- ◆ **Auto Pogo Control Screen:** Setting up and running a test including identifying the skin, e.g., part number, skin serial number, skin type, wing type (left, right), temperature, etc.
- ◆ **I/O Status and Diagnostics Screen:** Monitoring system discrete I/Os and errors for system
- ◆ **Manual Pogo Control Screen:** Allows the operator to move manually one or all Pogo/Beams.



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