

# Aircraft Assembly

## Aircraft Structural Component Alignment

### CUSTOMER CHALLENGE

Customer wanted to lift and position aircraft structural sections which needed to be aligned very accurately with pre drilled holes on the surface of the aircraft fuselage frame.

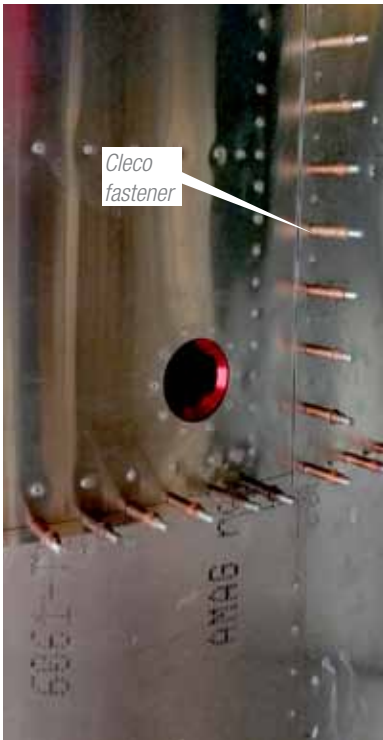
### APPLICATION CONCERNS

Due to the massive size of the structures they were very concerned about alignment issues for the holes drilled for Cleco fasteners. The current system they used involved a manual hydraulic jack system that took forever to align the structural members sufficiently, wasting a lot of man hours. Based upon the nature of the assembly process, they required the ability to individually locate each jacks lifting screw position, and based upon the location of each jack, a mechanical linkage between the jacks was not practical.

### SOLUTION

A complete solution combining four Screw Jacks was provided delivering high accuracy and reliability, ease of use, and a low airborne noise level, which was needed due to the density of personnel in the assembly area.

The system is fully electronic, utilizing a remote control pendant to provide the flexibility desired for individual and highly accurate positioning of each jacks travel. Redundant travel position sensors were used on each screw jack providing absolute position feedback augmented by a rotary encoder on the servo drive motors. - Continued on page 2



*Aircraft structural components aligned and held together using Cleco fasteners prior to final assembly.*

Duff-Norton Products:  
Screw Jacks  
Bidirectional Drives  
PLC Controller  
Remote Control Pendant  
w/Graphical User interface



*View from inside an aerospace manufacturing plant facility (shown for illustrative purposes only).*

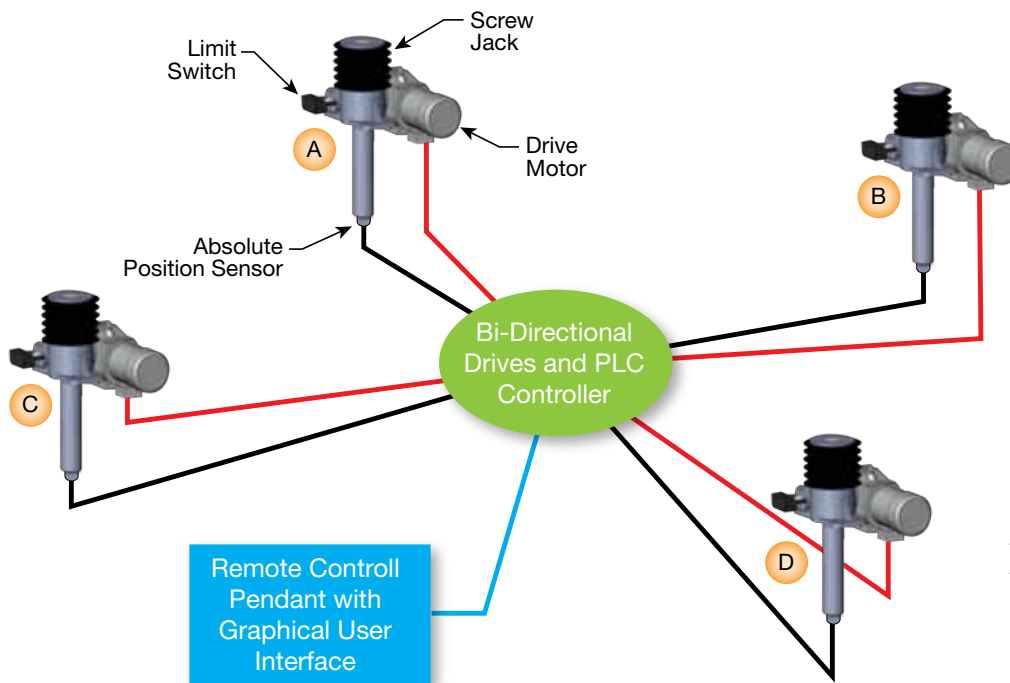
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## SOLUTION - continued

Each screw jack can be controlled within  $\pm 0.005"$  or alternatively the screw jacks can be controlled in pairs of two to provide a more rapid alignment.

For this Electronic Control System the loads were in compression, but could just as easily been in tension as well. A Graphical Touch Screen Remote Pendant was incorporated into the design to provide users with a multitude of features, including:

- Automated or manual axial speed control for each jack
- Ability to lock in the position of each jack so that the axial travel can be automated to return all jacks to a specific position.
- An automated brake system on each servo motor was provided in addition to a non-back driving screw jack design to provide the optimum safe working environment.
- The position for each screw jack was indicated on the pendant for ease of use
- Alarms were provided for the general health of the system
- A manual crank system provided allows for the lowering of the individual jacks should that be needed in the event of a power failure
- A back-up power supply was provided to allow servo motor brakes to be disengaged during a power failure



*Electronically Controlled Four Screw Jack System Providing High Accuracy And Reliability, Ease Of Use, and Low Airborne Noise Level.*

## DUFF-NORTON ADVANTAGES

- The system was provided as a turn-key installation including all mechanical components, sensors, controls, as well as electrical wiring meeting local and national standards.
- Documentation that included all programming code as well as full system training for both operators as well as maintenance personnel.
- Eliminating the need for hydraulic systems that could potentially leak and impact the production environment, and finished product.
- Meeting today's personnel environment requirements for low noise solutions.
- Providing proven robust reliable solutions across a long service life.