NOVEMBER 1995

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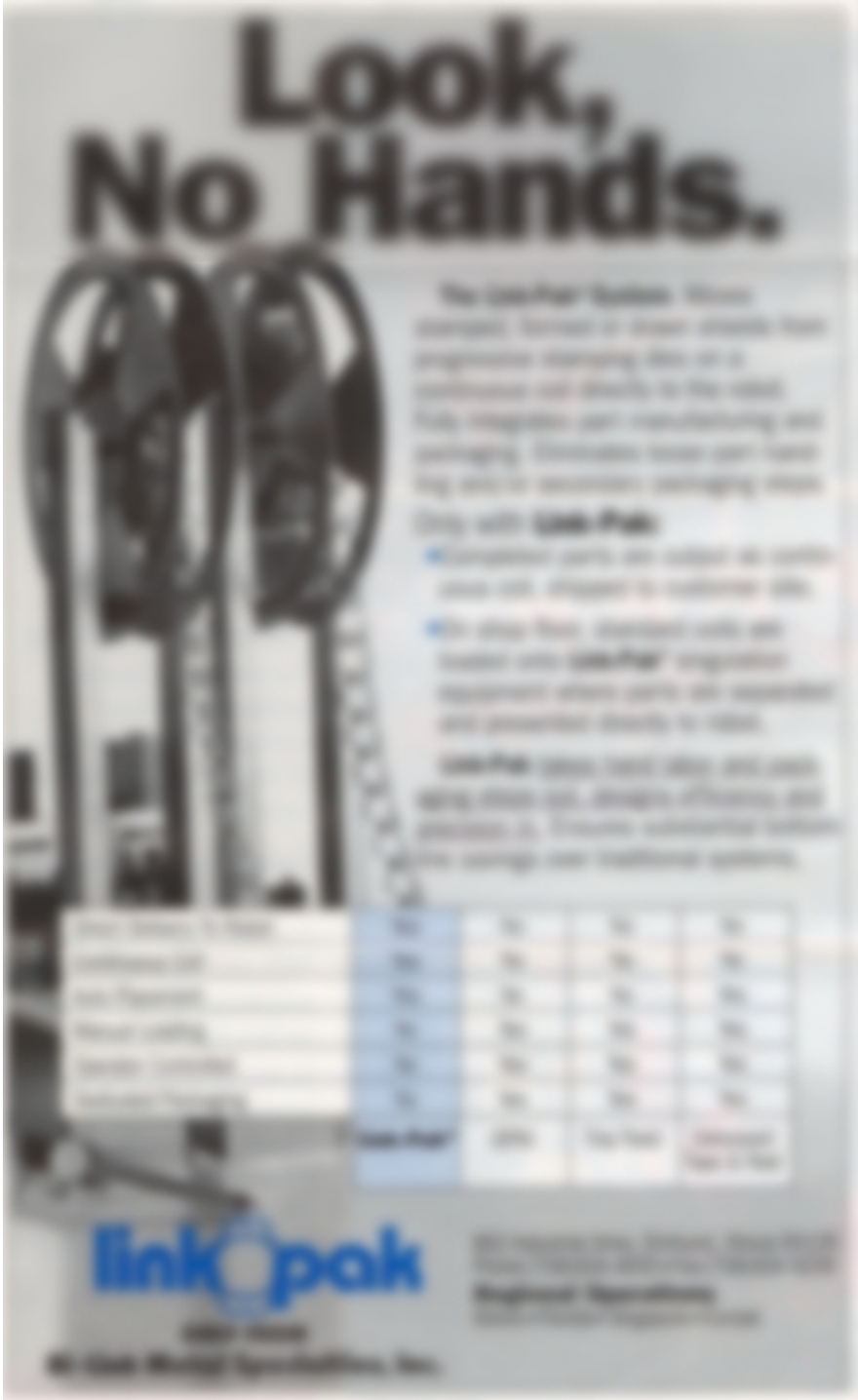

Fixture Flexibly with Pogo Sticks

Replacing dedicated fixturing with flexible fixturing systems may be the solution to the high tooling costs and lengthy setup times common in many aerospace applications. Benefits of this class of technology include reduced hard tooling and tool design costs and time, reduced setup time, and improved machine utilization.

One example of flexible fixturing relies on a special machine tool table equipped with a series of individually actuated programmable pneumatic "pogo sticks" installed within the table structure on 6–18" (152–457 mm) centers. Unlike other systems, pogos move only up and down and not on the table. Each pogo supports a part of the workpiece or sheet from below for routing, abrasive waterjet cutting, drilling, or other processing. Each pogo actuator is communications driven, but uses nonservo pneumatics for low maintenance. Each has a 2" (51-mm)-diam shaft, 72" (1830-mm) maximum stroke,

and 500-lb (227-kg) vertical load capacity. Absolute position feedback locates each pogo vertically to within 0.002" (0.05 mm).

CNA Manufacturing Systems (Redmond, WA), which has a background in custom machinery, has developed the "smart" pneumatics technology to provide such flexible tooling systems at half the cost of their original servodriven systems. Initial systems have been supplied to Boeing, and Cincinnati Milacron is working on a pogo project with Northrop, according to Joe Perez of CNA.

The flexible fixturing system's tables are built in a variety of configurations and may have a mix of pogos in position and pogo-ready pockets for future system expansion. End effectors to secure the workpiece are interchangeable and may be vacuum, mechanical clamps, toe clamps, or part locators.

Perez reports that the fixture control system uses a distributed RS-485 motion control network. Individual embedded pogo controllers handle control and communication tasks, while the central controller hub provides the operator interface and the interface to the machine tool control. It also manages the system configuration, broadcasts messages to the entire fixture of individual pogos, and responds to messages from the machine tool. Examples of fixture-level commands are "extend all pogos" and "configure table." Examples of individual-pogo-level commands are "extend fully" and "move to part program position." For more details on the system, contact Perez at 206-861-4065.