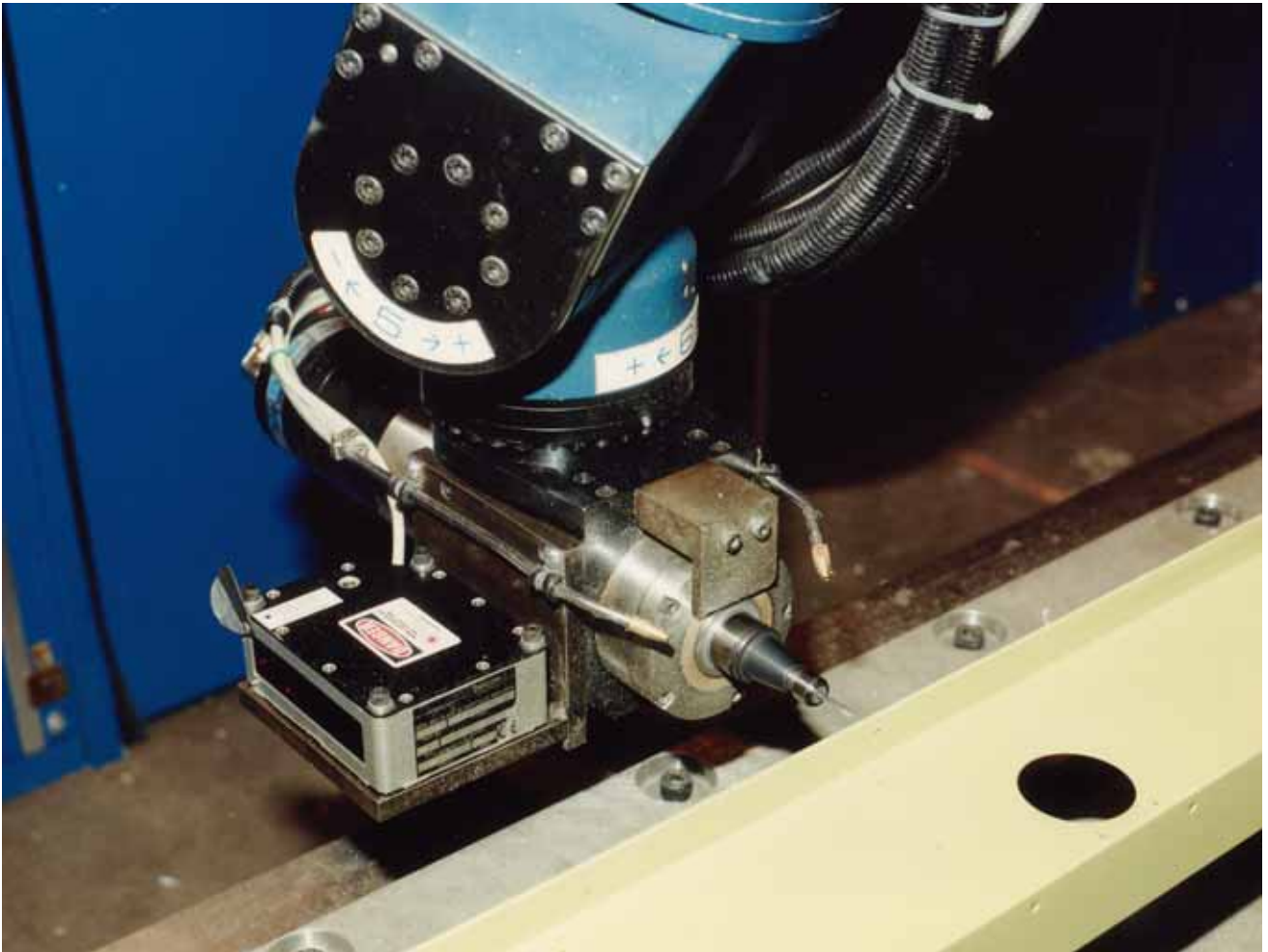


TRICEPT ROBOT AND PRECISE HIGH SPEED SPINDLE SYSTEM TEAM UP TO INCREASE DRILLING VERSATILITY AT BOEING



PROBLEM SOLVED

Boeing Commercial Aircraft was hand-drilling multiple holes in floor beams for its popular 737 models. Not only was accuracy less than desired, but the large variations between floor beams, customer configurations, and hole locations, required a huge number of special drilling and clamping fixtures. With a Tricept robotic CNC machining center, equipped with a **precise** High Speed Spindle System, the company achieves higher productivity, greater accuracy, and improved finish.

CUSTOMER BENEFITS

- Higher spindle speeds deliver effective cutting speeds with smaller diameter carbide tooling.
- Spindle rigidity helps maintain accuracy and repeatability.
- Compact, yet powerful design integrates well with robotic system for greater versatility.
- HSK toolholder accommodates multiple tool changes for complex parts.

PRECISE SPINDLE SYSTEM EMPLOYED

- [Type SC 50104](#) High Speed Spindle System

APPLICATION DETAILS



At its 11 million square-foot Wichita facility, Boeing Commercial Airplane Group builds 75 percent of the 737, the world's most popular commercial jetliner. One task is to drill a large number of holes in the multiple floor beams for customer-specific structures required on each airplane. The beams are produced from aircraft aluminum. Not only is the configuration of each beam slightly different, but the size and number of holes varies from one beam to another. In some cases, a part may have up to 25 different-sized holes, typically ranging from .098" to .257" in diameter.

Previously, because of the large variety of sizes and range of locations, most holes were hand drilled, using special fixtures. This required a separate fixture for each floor beam configuration, slowing both setup and production.

To improve productivity and increase accuracy, Boeing purchased a Tricept Robotic System from JMC Technology Group, Indianapolis. It incorporates a patented, movable tripod system with ball screws that provide increased rigidity. The machine has six degrees of freedom (DOF) and can drill holes in horizontal and vertical planes of a floor beam.

Although the robot cannot duplicate the positioning tolerances of a conventional machine tool, it will hold positions within 0.008". This represents a big improvement over the previous hand-drilling method. Greater accuracy is then achieved by incorporating the laser to check the "X" and "Y" locations in relation to the beam before drilling. Close to 150 different parts are produced on the robotic machining center. In addition to drilling, the machine also will be used to mill larger "penetration holes," which can range from one inch to 3-1/2" in diameter.

Because higher rpm is needed to reach effective cutting speeds with the small-diameter tools used for precision drilling and milling, the machine incorporates a [precise SC 50104](#) High Speed Spindle System. The 7.00 kW (9.38 hp) spindle provides speeds up to 30,000 rpm. Most drilling operations are being done with high-speed carbide drill bits at 15,000 rpm, with travel speeds of 30" per minute. High rpm allows the small-diameter drills to reach proper cutting speeds for higher productivity and better finish.

To permit fast, accurate tool changes, the spindle is equipped with an HSK 32E toolholder. A 12-tool magazine accommodates a variety of cutting tools and is equipped with an automatically retracting cover to keep the toolholders free of chips and debris.

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