

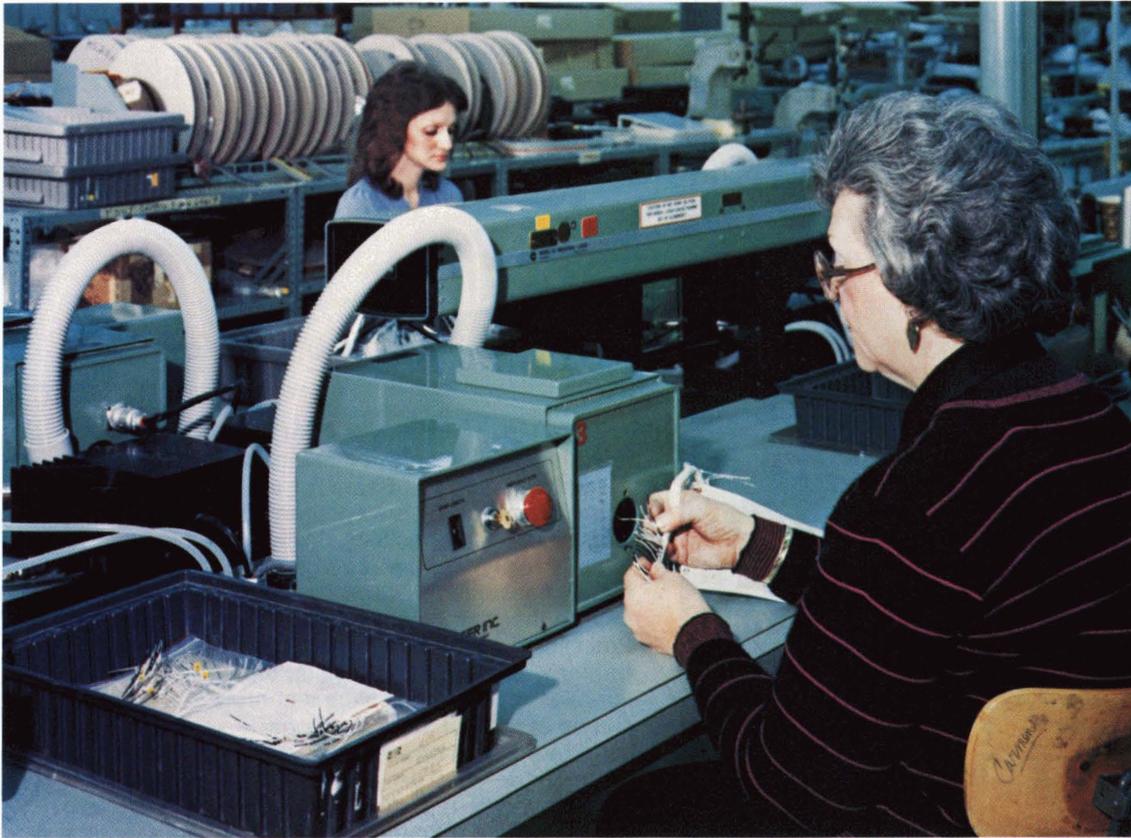
## LASER WIRE STRIPPER

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Aircraft and spacecraft have miles of wiring, so a small reduction in wire weight can add up to a total vehicle saving of hundreds of pounds. For that reason, the aerospace industry adopted a type of electrical wiring with very light plastic insulation. But the weight saving created a problem in stripping the insulation to make connections: some of the insulating films are so thin and so tough it was difficult to get the required precision with mechanical wire cutters. The result was frequent cutting or nicking some of the wire strands, unacceptable under rigid aerospace quality control standards.

The need for flawless wiring in the Space Shuttle prompted NASA to start a program to develop a better way to strip insulation. An effort involving Shuttle prime contractor Rockwell International, Johnson Space Center and NASA's Manufacturing Applications Team at IIT Research Institute, Chicago, Illinois resulted in successful development of both hand-held and bench-mounted laser wire strippers. A laser beam can cut through the insulation on a wire without damaging the conductive metal, because the laser radiation that melts the plastic insulation is merely reflected by the metal. The laser process is fast, clean, precise and





repeatable; it eliminates the quality control problems and the expense of rejected wiring. Several aerospace firms are now using the NASA developed technology in systems manufactured by Lincoln Machine Company, Milwaukee, Wisconsin and Photon Sources, Livonia, Michigan.

Raytheon Company's Missile Systems Division, West Andover, Massachusetts has adapted the NASA technology to laser systems of its own design. The West Andover plant originally stripped wire manually for missile harnesses, then introduced an automatic system in which thermal heads removed the insulation. Edward J. Cenik, a section manager in the company's Product Development Department, had the job of proving and "debugging" the machine, which generally worked well but had a major flaw: the high temperature needed for stripping degraded the thermal head, necessitating frequent replacement.

Looking for an alternative, Cenik studied NASA's technical report on its laser wire stripper work, which provided a basis for Raytheon's system. In cooperation with Coherent, Inc., Palo Alto, California manufacturer of industrial lasers, Raytheon designed a laser device to replace the thermal heads in the company's automatic stripping machine. The success of this modification led to design and introduction of other machines for three different types of wiring—shielded wire, jacketed cables and harness terminations; the laser systems were built for Raytheon by Laser Inc., Sturbridge, Massachusetts, a subsidiary of Coherent, Inc. At left is a four-position laser system for stripping harness terminations. An operator simply inserts a wire into the stripping head (above); the rest of the operation is automatic. The machine senses the wire's presence, energizes the carbon dioxide laser, strips to the required length and ejects the stripped wire. At right is a companion system for stripping jacketed cable.

