



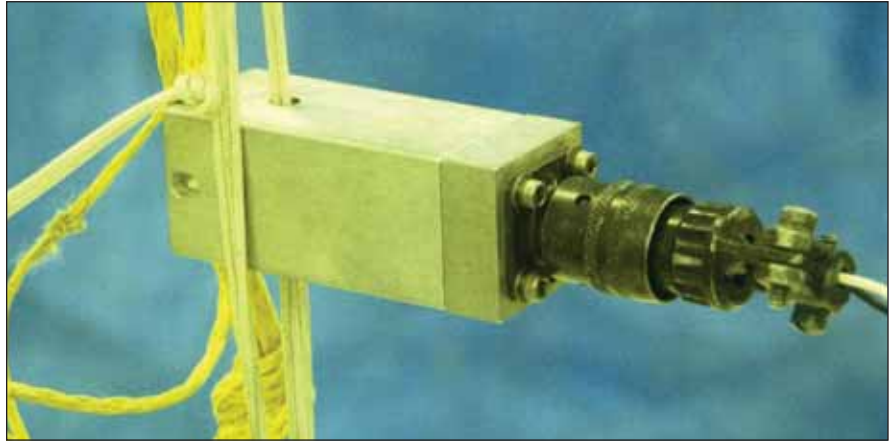
Reusable Hot-Wire Cable Cutter

This device can be used to cut any type of small synthetic cable.

NASA's Jet Propulsion Laboratory, Pasadena, California

During the early development stage of balloon deployment systems for missions, nichrome wire cable cutters were often used in place of pyro-actuated cutters. Typically, a nichrome wire is wrapped around a bundle of polymer cables with a low melting point and connected to a relay-actuated electric circuit. The heat from the nichrome reduces the strength of the cable bundle, which quickly breaks under a mechanical load and can thus be used as a release mechanism for a deployment system. However, the use of hand-made heated nichrome wire for cutters is not very reliable. Often, the wrapped nichrome wire does not cut through the cable because it either pulls away from its power source or does not stay in contact with the cable being cut. Because nichrome is not readily soldered to copper wire, unreliable mechanical crimps are often made to connect the nichrome to an electric circuit.

A self-contained device that is reusable and reliable was developed to sever cables for device release or deployment. The nichrome wire in this new device is housed within an enclosure to prevent it from being damaged by handling. The electric power leads are internally connected within the unit to the nichrome wire using a screw terminal connection. A bayonet plug, a quick and secure method of connecting the cutter to the power source, is used to connect the cutter to the power leads similar to those used in pyro-cutter devices.



The Reusable Hot-Wire Cable Cutter installed on a deployment line.

A small ceramic tube [0.25-in. wide 0.5-in. long (\approx 6.4-mm wide 13-mm long)] houses a spiraled nichrome wire that is heated when a cable release action is required. The wire is formed into a spiral coil by wrapping it around a mandrel. It is then laid inside the ceramic tube so that it fits closely to the inner surface of the tube. The ceramic tube provides some thermal and electrical insulation so that most of the heat generated by the wire is directed toward the cable bundle in the center of the spiral. The ceramic tube is cemented into an aluminum block, which holds it in position. The leads of the nichrome wire are attached to screw terminals that connect them to power leads. A bayonet plug mounted at the bottom of the rectangular block connects the power leads to a relay circuit. A

thin aluminum shell encloses the entire structure, leaving access points to attach to the bayonet plug and to feed a cable into the cylinder. The access holes for the deployment cable are a smaller diameter than the nichrome coil to prevent the cable from coming in direct contact with the nichrome when loaded.

It uses the same general method of severing a cable with a heated wire as was used previously, but implements it in such a way that it is more reliable and less prone to failure. It creates a mechanism to create repeatability that was nonexistent in the previous method.

This work was done by Michael T. Pauken and Joel M. Steinkraus of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-47265

Deployment of a Curved Truss

This structure is potentially useful to the military or emergency service providers to rapidly deploy enclosures for shelter or storage.

NASA's Jet Propulsion Laboratory, Pasadena, California

Structures capable of deployment into complex, three-dimensional trusses have well known space technology applications such as the support of spacecraft payloads, communications antennas, radar

reflectors, and solar concentrators. Such deployable trusses could also be useful in terrestrial applications such as the rapid establishment of structures in military and emergency service situations, in particular

with regard to the deployment of enclosures for habitat or storage. To minimize the time required to deploy such an enclosure, a single arch-shaped truss is preferable to multiple straight trusses