

# SAMPE Abstract

## Use of Graphite Continuous hinge as a High Performance Mechanical Fastener for Composite Parts

While most wouldn't argue about the strength and light weight of composite parts, mechanical attachments of removable parts has often been vexing. Most composites are prone to severe weakening once penetrated by large holes that would typically be drilled in order to fasten removable composite pieces. Good examples are aircraft engine cowlings that are most often very thin, light weight, flexible and have complex curves. Traditional fasteners such as "Camlocks" require holes that weaken the structure, tend to crack with age and they leave the lock and washer assembly visible. In some applications requiring laminar flow, these may trip the boundary layer and initiate turbulent separation as well as contribute to unwanted drag. Though flush mounted, Camlocks, et. al. show unaesthetic departure from the smooth contours of the composite or formed metal surface.

There is an alternative, however. The Zippin™ process was developed using the successful Carbinge™, a carbon fiber piano hinge requiring no metal fasteners by virtue of being bonded to place with adhesive. This is used in conjunction with Carbinge Keepers™ that have a threaded end. The system allows composite parts to be "zipped" together mechanically revealing virtually zero visible means of attachment. The Zippin™ system does this while making the components stronger. Further, it may be used to attach parts that are substantially curved. It has been used successfully as a means of attaching aircraft wing tips, and winglets in addition to cowlings while being "invisible". This revolutionary process saves parts count, weight and installation time in addition to saving assembly/disassembly time during maintenance procedures.