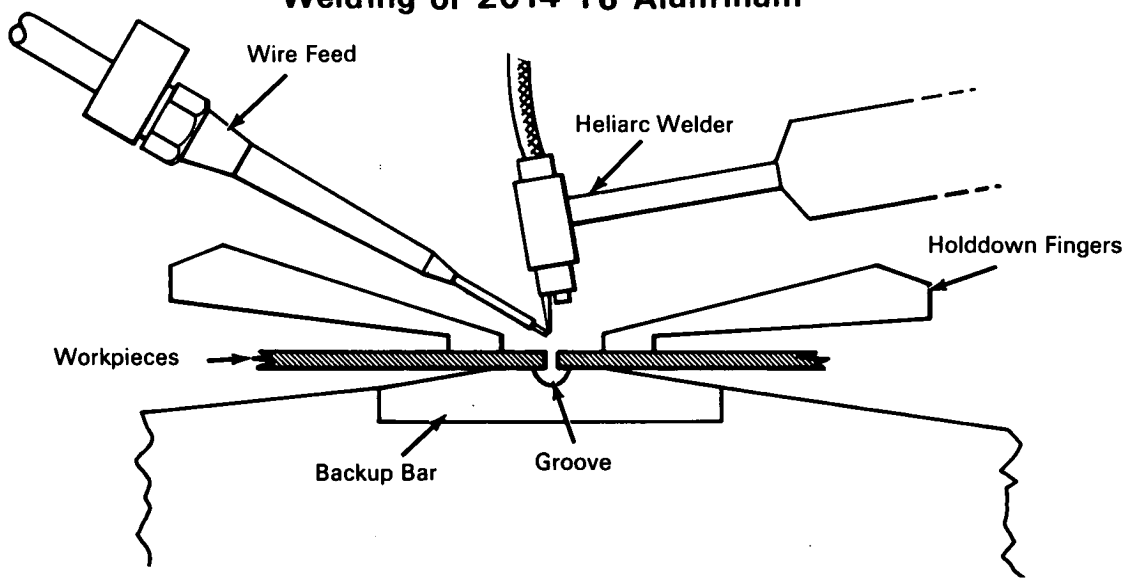
NASA TECH BRIEF

New Backup-Bar Groove Configuration Improves Heliarc Welding of 2014-T6 Aluminum



The problem:

To find the optimum groove size in backup chill bars when welding 2014-T6 aluminum in an effort to decrease weld defects, reduce shrinkage, and increase tensile strength.

The solution:

Extensive testing showed that the best results were obtained with a backup chill bar with the following grooved dimensions: 0.187-inch width X 0.040-inch depth X 0.125-inch radius.

How it's done:

The incorporation of a shallow radius drop-through groove 0.040-inch deep by 0.187-inch wide in the backup bar produced a breakthrough in the welding of 0.051/0.064 thickness 2014 aluminum. This groove geometry afforded optimum chilling characteristics, reduced shrinkage and the weld bead was narrower and consistently free from impurities or voids.

Notes:

1. With the use of this backup bar, 90 percent of 63 inner structure welds were made in 1 welding pass. Also, in this same program, approximately 450 inches of defect-free weld was accomplished in a a single pass. It has also been found that tensile strength has been increased by about 30 percent and shrinkage reduced by 50 percent.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   Houston, Texas 77058
   Reference: B66-10443

(continued overleaf)

Patent status:

No patent is contemplated by NASA.

Source: F. J. Black
of North American Aviation, Inc.
under contract to
Manned Spacecraft Center
(MSC-806)