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# NASA TECH BRIEF

*Lyndon B. Johnson Space Center*



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## Explosive Welding Technique for Joining Aluminum and Steel Tubes

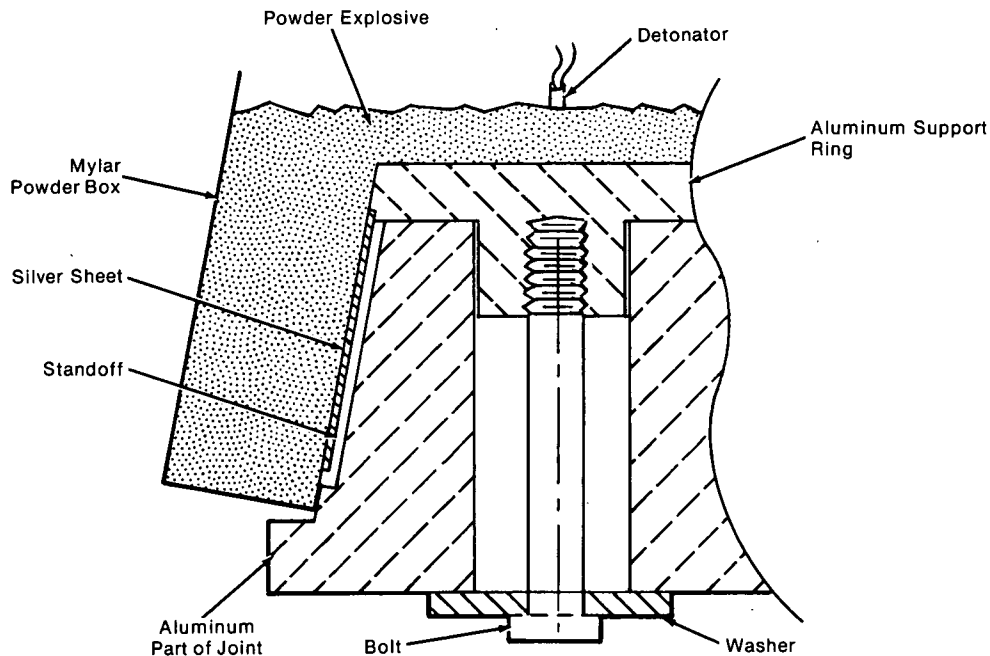


Figure 1. Welding of Silver to Aluminum Member

Dissimilar metals such as aluminum and steel are frequently joined by mechanical means, which adds unnecessary weight. Standard welding procedures, on the other hand, are inadequate because it is difficult to form strong joints between dissimilar metals without interface defects. An alternate procedure is an explosive welding technique which was developed for joining tubing made from 2219 aluminum with that made from 304L stainless steel.

In this procedure, a silver sheet is wrapped around the aluminum portion of the joint, as shown in Figure 1. A Mylar powder box is wrapped over the silver sheet and is detonated. The resulting explosion welds the silver to the aluminum.

A stainless-steel tube member then is placed over the silver-aluminum interface and is fastened to the aluminum member with a special nut-and-bolt assembly, as shown in Figure 2. A similar Mylar powder box is wrapped around the steel member, is covered with layers of Mylar tape, and is detonated, welding the steel to the silver-aluminum interface. The impurities generated by this explosion are pumped out through a vacuum cup placed on the end of the steel member. After the nut-and-bolt assembly is removed and excess metal is machined off to form the tubular configuration (see Figure 3), conventional welding techniques can be used to join the steel end to a steel pipe and the aluminum end to an aluminum pipe.

(continued overleaf)

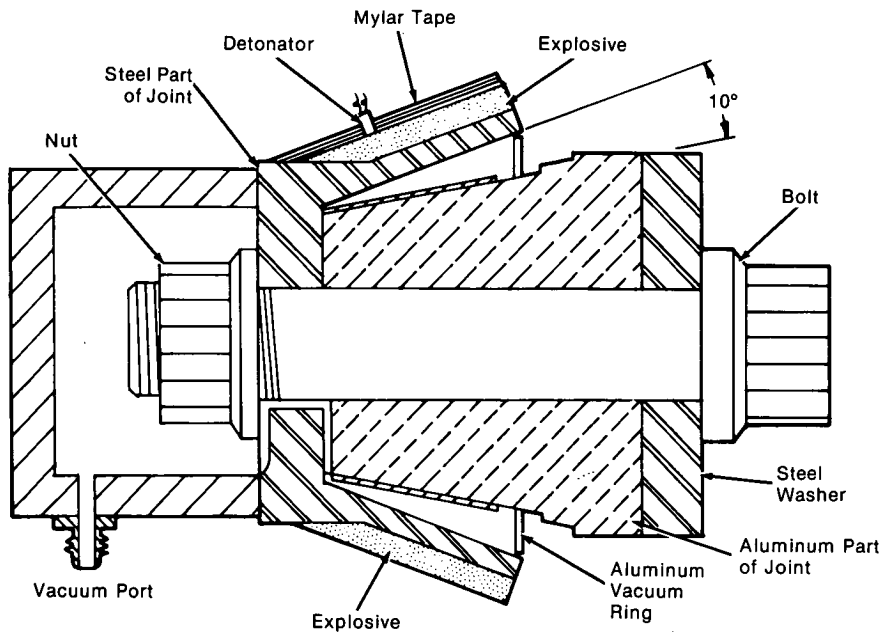


Figure 2. Welding of Stainless-Steel Member to Silver-Aluminum Interface

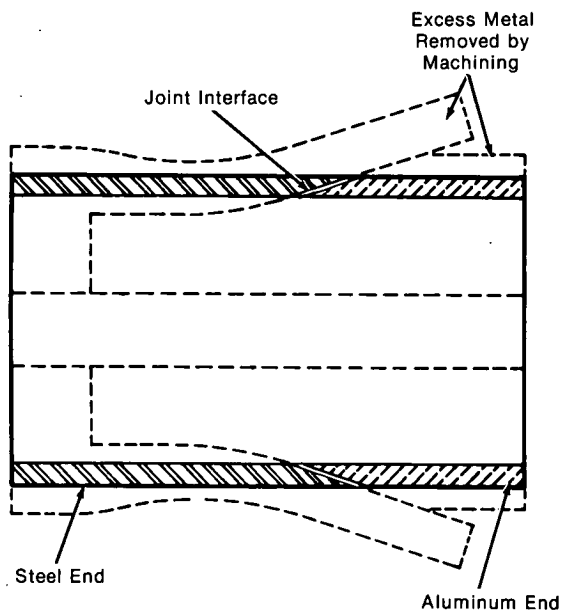


Figure 3. Final Tube Joint Configuration

The joined members are fitted at an angle to each other for increased mechanical strength. The resulting joint is as strong as a mechanical one and does not add extra weight.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
 Johnson Space Center  
 Code AT3  
 Houston, Texas 77058  
 Reference: TSP74-10272

**Patent status:**

NASA has decided not to apply for a patent.

Source: M. E. Wakefield of  
 Martin Marietta Corp.  
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 (MSC-14721)