

# NASA TECH BRIEF

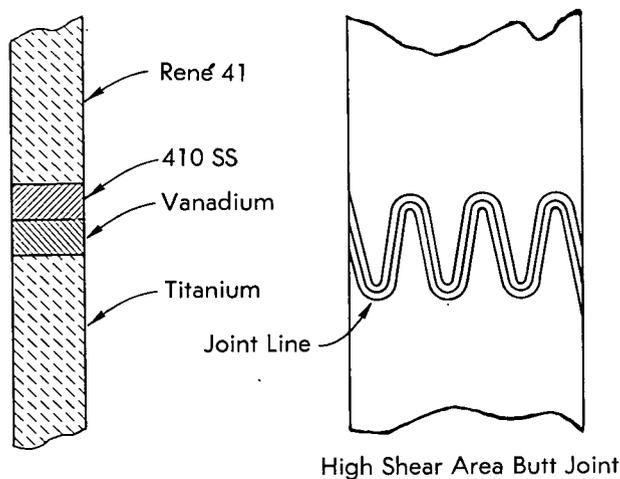
## Ames Research Center



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### Bonding Titanium to René 41 Alloy

Successful welds over small areas have been obtained between titanium and René 41 alloy by the use of a pair of intermediate materials joined by the electron-beam welding method. Development of this



High Shear Area Butt Joint

bond was made necessary by design requirements of the lift-fan rotor for VTOL aircraft, where there is need for combining into one structure high strength-to-density ratio titanium fan blades and temperature-resistant nickel-base alloy turbine-buckets.

Initial attempts to weld titanium to René 41 alloy directly were unsuccessful, as was also the attempt to find a single intermediate material compatible

with both. Eventually, two materials were found that formed a compatible "bridge" when welded by an electron-beam technique. The series of weldments used in a typical butt weld joining René 41 to titanium (Ti-6Al-4V) is indicated in the diagram. Joints of this type consistently show ultimate test strength values of 40,000 psi (275 MN/m<sup>2</sup>); most failures occur within one hour at the vanadium-to-410 SS weld at temperatures of 1000°F (538°C).

The high shear area butt-joint configuration also shown on the diagram has been proposed as a method of placing the low-strength annealed vanadium layer into shear stress rather than tensile stress to increase joint efficiency.

#### Note:

Requests for further information may be directed to:

Technology Utilization Officer  
Ames Research Center  
Moffett Field, California 94035  
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#### Patent status:

No patent action is contemplated by NASA.

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