

# NASA TECH BRIEF



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## Pre-Weld Heat Treatment Improves Welds in René 41

### The problem:

During post-weld heat treatment, René 41 is subject to cracking. A simple technique was sought for reducing the incidence of post-welding, "strain-age" cracking of René 41.

### The solution:

It was found that if, preliminary to welding, the René 41 was slowly (40°F/min) cooled from the solution-annealing temperature, the degree of "strain-age" cracking could be reduced by 90 percent or more. The technique virtually ensures the absence of cracks perpendicular to the weld and will confine cracks to the vicinity of the fusion line, thus simplifying repairs. The treatment may conveniently be integrated with normal processing and, in many cases, simplifies heat-treating requirements (replaces a quenching operation). Slower cooling rates should be necessary for heats of very-low-carbon content (<0.06 percent) to achieve a given degree of cracking reduction. The microstructure formed during the slow

cooling rate tested (and slower ones) favors elevated-temperature ductility. Some vestiges of this microstructure are apparently retained during welding and thus enhance "strain-age" crack resistance in air.

### Notes:

1. The technique may be used for jet engine components of René 41 and should also apply for similar precipitation-hardenable nickel-base alloys such as Waspaloy, U500, etc.
2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
Marshall Space Flight Center  
Huntsville, Alabama 35812  
Reference: B68-10285

### Patent status:

No patent action is contemplated by NASA.

Source: Martin Prager  
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