

# NASA TECH BRIEF



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## Improved High-Temperature-Strength Nickel-Base Superalloy

A high strength nickel-base superalloy tailored for the 2,000-2,200°F temperature range has recently been developed. The alloy has high tensile strength over the entire temperature range and its strength of 20,000 psi at 2,200°F is approximately double the strength of the strongest available cast nickel-base alloys. The alloy possesses very high impact strength. The alloy is not subject to the formation of embrittling phases upon long-time exposure at intermediate temperatures. Its room temperature, unnotched Charpy impact resistance is 135 ft.-lbs. after 1,000 hours exposure to a 1,600°F temperature.

This alloy which is based on the nickel-aluminum-tungsten system is designated WAZ-20. It has the following nominal composition in weight percent: 17-20 tungsten, 6-7 aluminum, 1.4-1.6 zirconium, 0.10-0.20 carbon, balance nickel. Its incipient melting point is 2,375°F which is approximately 150°F higher than that of currently available cast nickel-base alloys. Also, the alloy is amenable to controlled solidification techniques and in the directionally solidified form exhibits substantially improved tensile and stress rupture properties over the random polycrystalline form.

Although a cast material, the alloy also has reasonable workability potential.

### Notes:

1. Because of this combination of properties, the superalloy has application to such things as stator vanes for advanced gas turbine engines where temperature cycling and long time high temperature operation are required.
2. Documentation is available from:  
 Clearinghouse for Federal Scientific and Technical Information  
 Springfield, Virginia 22151  
 Price \$3.00  
 Reference: TSP69-10352
3. Technical questions may be directed to:  
 Technology Utilization Officer  
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 Cleveland, Ohio 44135  
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### Patent Status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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