March 1967

Brief 67-10049

NASA TECH BRIEF

Cryogenic Fatigue Data Developed for Inconel 718

A material evaluation program for liquid propellant rocket motor components was initiated to study the effect of surface finish on the flexural reverse bending fatigue properties of Inconel 718 sheet materials at room, liquid nitrogen, and liquid hydrogen temperatures. Data were also obtained on the cryogenic fatigue properties of Inconel 718 bar, utilizing axial loading and rotating beam fatigue tests.

As a result of these tests the following conclusions were reached:

1. The tensile strength and the fatigue strength of Inconel 718 increases with decreasing temperature.
2. In reverse bending, the fatigue strength of Inconel 718 is approximately 30% of the ultimate tensile strength.
3. In axial loading, the fatigue strength of Inconel 718 is over 40% of the ultimate strength.
4. The effect of surface finish on Inconel 718 sheet material in flexural bending is most pronounced at liquid hydrogen temperatures.
5. Flexural bending and rotating beam fatigue tests are more critical than axial loading fatigue tests.

A description of the test procedure and discussion of the test results are contained in "Cryogenic Fatigue Tests of Inconel 718—Progress Report No. 1," by E. H. Schmidt, NAR #50264, North American Aviation, Inc. 15 November 1965. Copies of this report are available from:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10049

Patent status:

No patent action is contemplated by NASA.

Source: E. H. Schmidt
of North American Aviation, Inc.
under contract to
Marshall Space Flight Center

(M-FS-702)

Category 03