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QUARTERLY PROGRESS REPORT NO. 1A

MATERIAL EVALUATION FOR A MACH III TRANSPORT PLANE

for

Office of Research Grants and Contracts
Code 30
National Aeronautics and Space Administration

July 1962

Metallurgical Research Laboratories
Department of Chemical Engineering and Metallurgy
Syracuse University

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(Period from April 23, 1962 to June 30, 1962)

MATERIAL EVALUATION FOR A MACH III TRANSPORT PLANE

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Office of Research Grants and Contracts
Code 50
National Aeronautics and Space Administration

by

R. J. Bell, C. Chave and V. Weiss

Contract No. NASr-43
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MATERIAL EVALUATION FOR A MACH III TRANSPORT PLANE

This report covers work performed during the period April 23, 1962 through the period June 30, 1962. The period reported was shortened to enable the data herein to be available for the sixth meeting of the Special Committee for Materials Research for Supersonic Transports which meets in Washington, D. C. on July 17 and 18, 1962.

Data obtained during this period for Ti-6Al-4V-0.75Cr-1.25Mo (RS-140) annealed and Ti-6Al-4V-0.75Cr-1.25Mo (RS-115) annealed, is shown in figures 1 through 4. Preliminary data on Arco PH 15-7 Mo heat number 880656, in condition CR-900 is also presented in figures 5 and 6. In addition, notch strength ratio versus stress concentration factor for Ti-6Al-4V (RS-120A) in the annealed condition and solution treated and aged condition and Republic PH 15-7 Mo in condition CR-900 and RS-1100 are presented in figures 7 and 8.

Table I shows stress concentration factor (Kt) for the various notch root radii used.
FIG. 3 THE EFFECT OF TESTING TEMPERATURES ON THE TENSILE STRENGTH, YIELD STRENGTH, THE MODULUS OF ELASTICITY AND THE ELONGATION IN PERCENT OF Ti-6Al-4V (RS-115) ANNEALED. MATERIAL TESTED PRIOR TO EXPOSURE AND IN THE EXPOSED CONDITION.

FIG. 4 THE EFFECT OF TESTING TEMPERATURES ON THE NOTCH STRENGTH AND NOTCH STRENGTH RATIO OF Ti-6Al-4V (RS-115) ANNEALED. MATERIAL TESTED PRIOR TO EXPOSURE AND IN THE EXPOSED CONDITION.
FIG. 5 THE EFFECT OF TESTING TEMPERATURES ON THE TENSILE STRENGTH, YIELD STRENGTH, MODULUS OF ELASTICITY, AND ELONGATION IN PERCENT OF PH 15-7 Mo CONDITION ON 900. MATERIAL TESTED Prior PRIOR TO EXPOSURE.

FIG. 6 THE EFFECT OF TESTING TEMPERATURES ON THE NOTCH STRENGTH AND NOTCH STRENGTH RATIO OF PH 15-7 Mo CONDITION ON 900. MATERIAL TESTED PRIOR TO EXPOSURE AND IN THE EXPOSED CONDITION.
**FIG. 7** Notch strength ratio versus stress concentration factor ($K_\text{f}$) for Ti-6Al-4V (88-120A) in the annealed condition and in the solution treated and aged condition. Tested at 75°F. Single point designates average of two tests having close NFR values.

**FIG. 8** Notch strength ratio versus stress concentration factor ($K_\text{f}$) for PH15-7 Mo in condition CH-500 and in condition RH-1100. Tested at 75°F. Single point designates average of two tests having close NFR values.
<table>
<thead>
<tr>
<th>NOTCH ROOT RADIUS</th>
<th>STRESS CONCENTRATION FACTOR (K_c)</th>
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<tbody>
<tr>
<td>&lt; .001</td>
<td>&gt;17.31</td>
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<tr>
<td>.002</td>
<td>12.75</td>
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<tr>
<td>.005</td>
<td>6.30</td>
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<td>.010</td>
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<td>1.63</td>
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