

REPORT DOCUMENTATION PAGE

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MEMORANDUM FOR PRS (In-House Publication)

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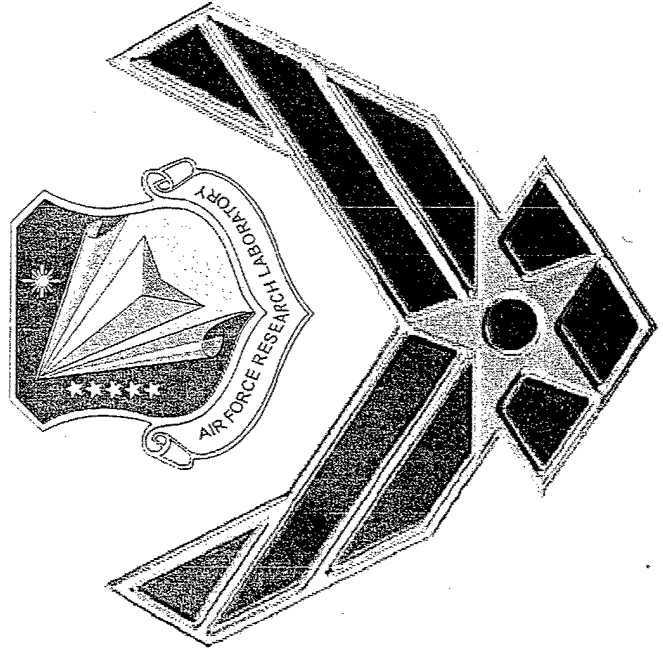
23 Apr 2003

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2003-100**
5642 C.T. Liu, "Investigating the Crack Growth Behavior in a Particulate Composite Material under Multi-Axial Loading Conditions"

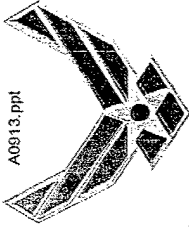
**International Conference on Mechanical Behavior of Materials
(Geneva, Switzerland, 25-29 May 2003) (Deadline: 14 May 2003)**

(Statement A)

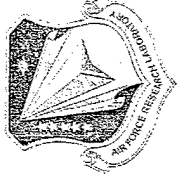
Investigating the Crack Growth Behavior in a Particulate Composite Material under Multi-Axial Loading Conditions.



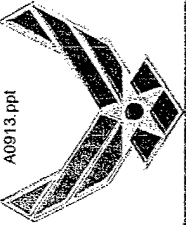
C. T. Liu
U.S. Air Force Research Laboratory
Edwards AFB CA



Objectives

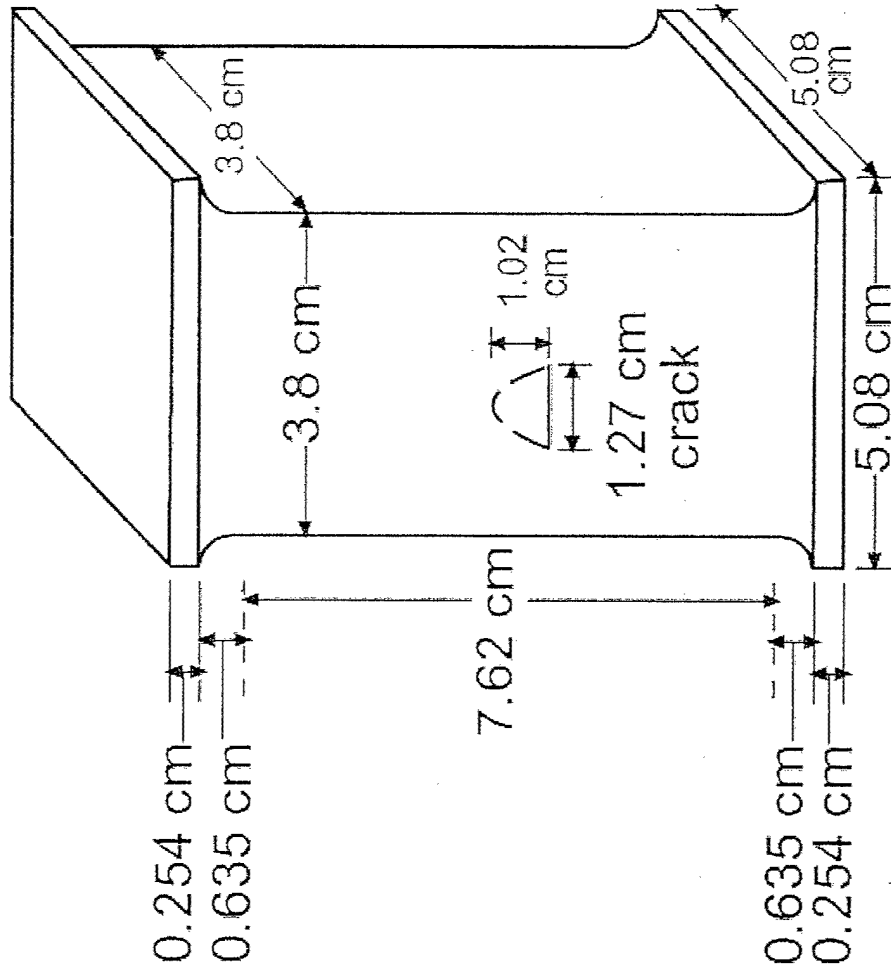
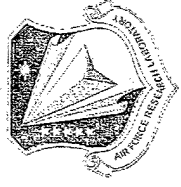


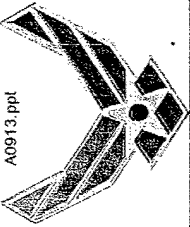
- Investigate the Effect of Loading Conditions on the Crack Growth Behavior in a Particulate Composite Material under Confining Pressure
- Loading Conditions:
 - Constant Strain Rate: 5.8 cm/cm/min
 - Constant Strain: 12%, 15%, and 18%.
 - Confining Pressures: Ambient and 6897 Kpa



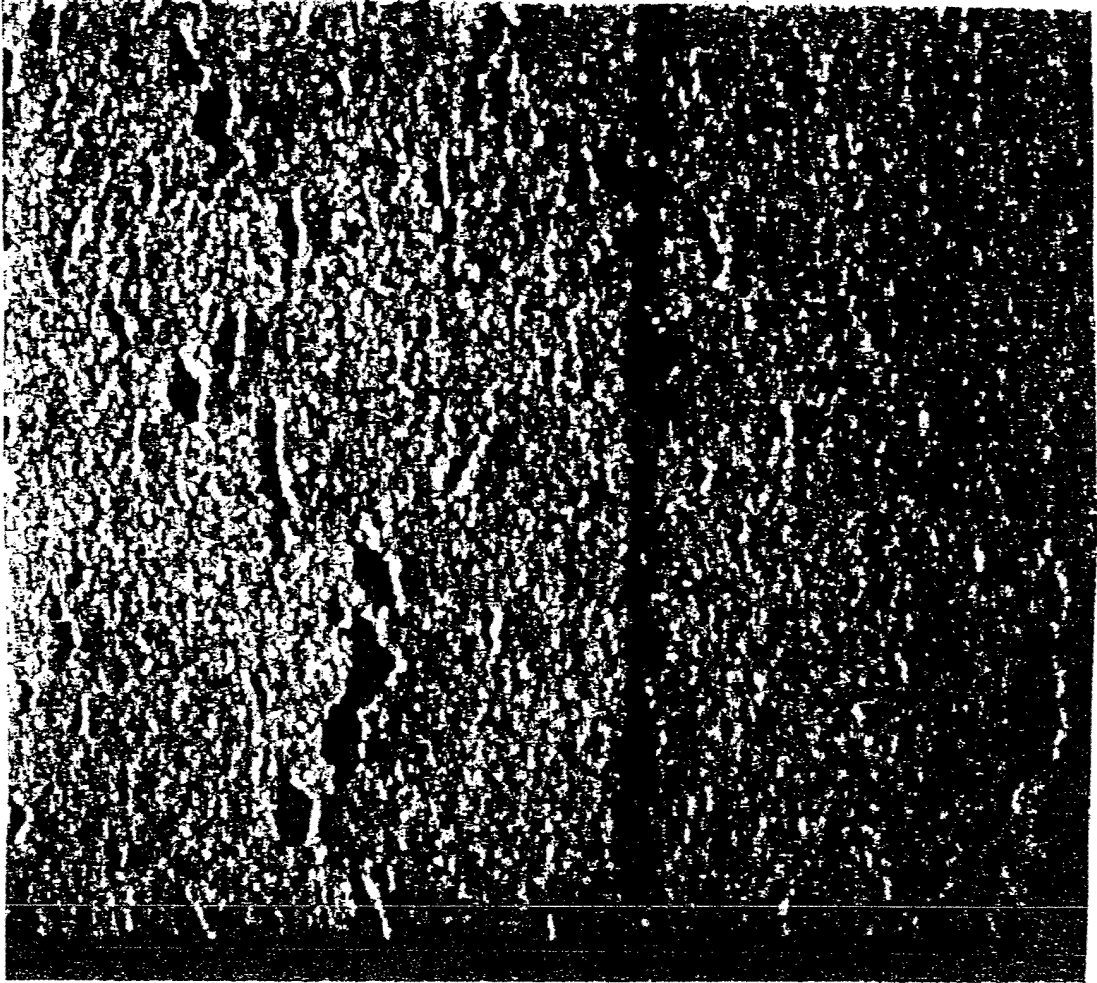
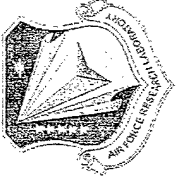
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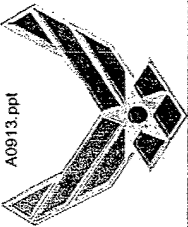
Specimen Geometry





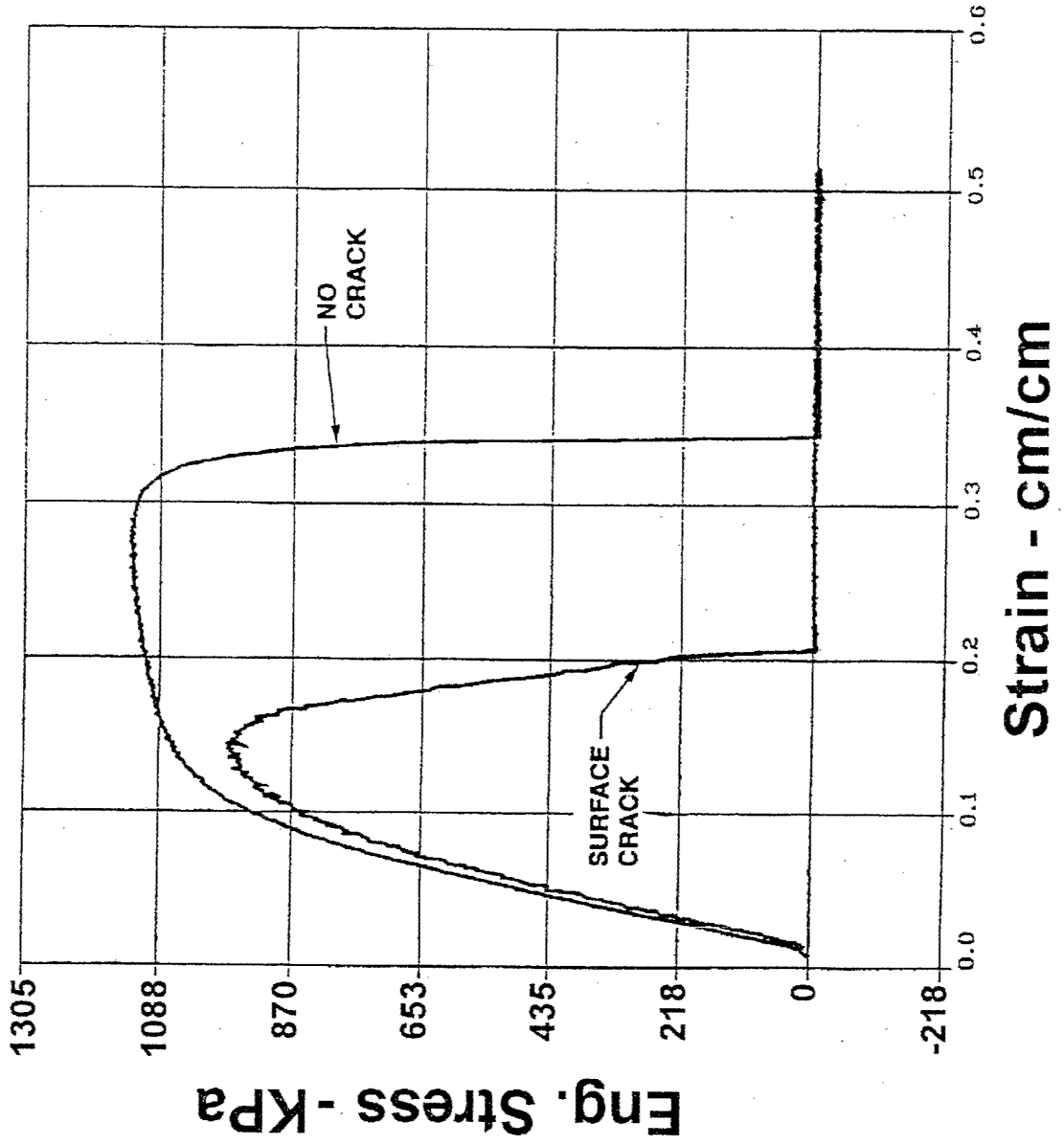
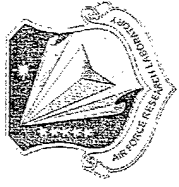
Microcracks in the Specimen under Pressure

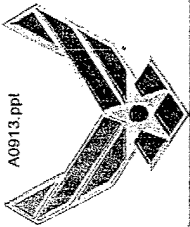




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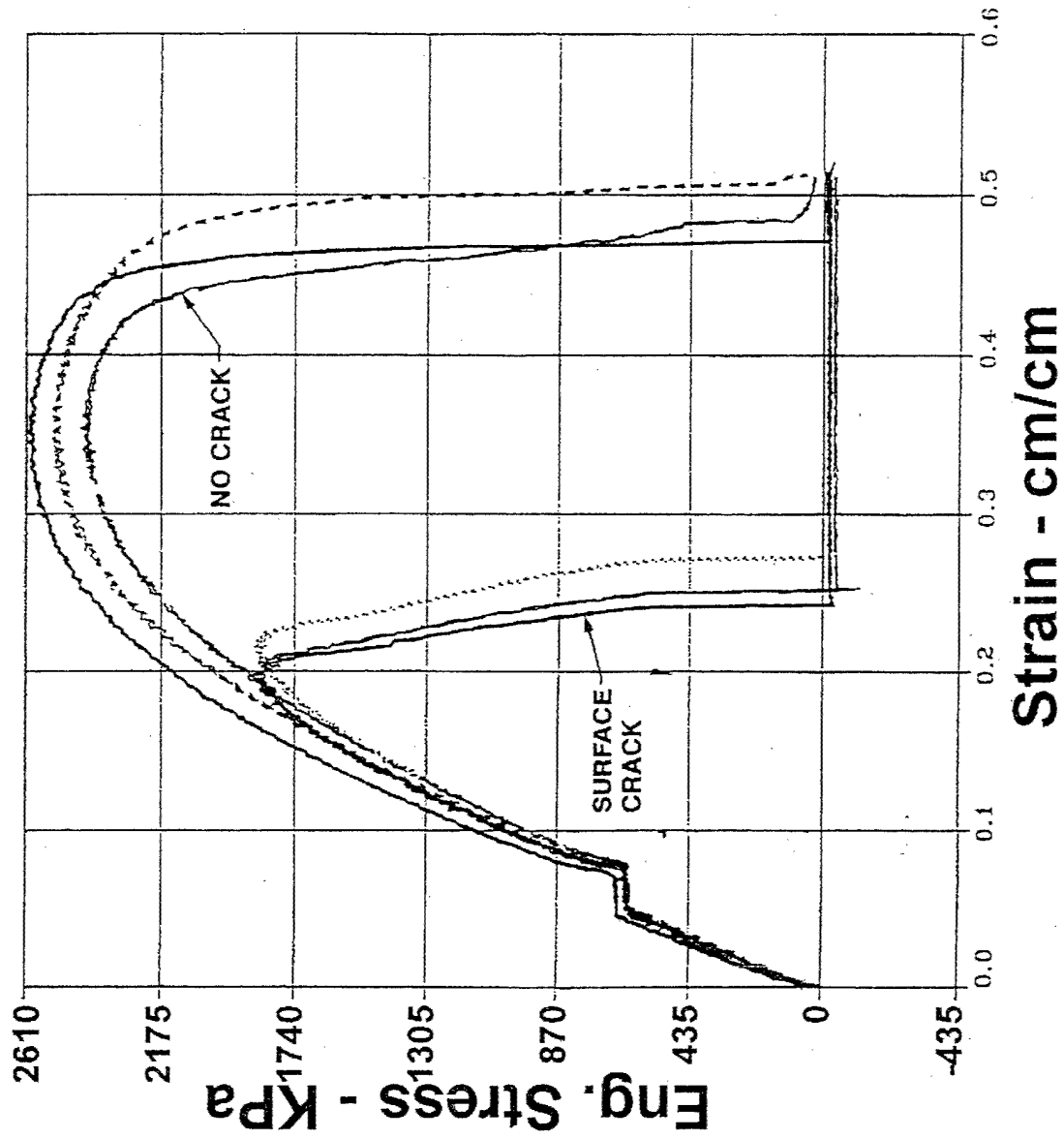
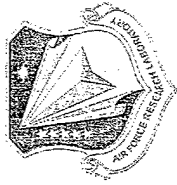
Engineering Stress Vs. Strain (Ambient Pressure)

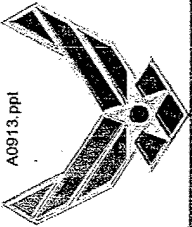




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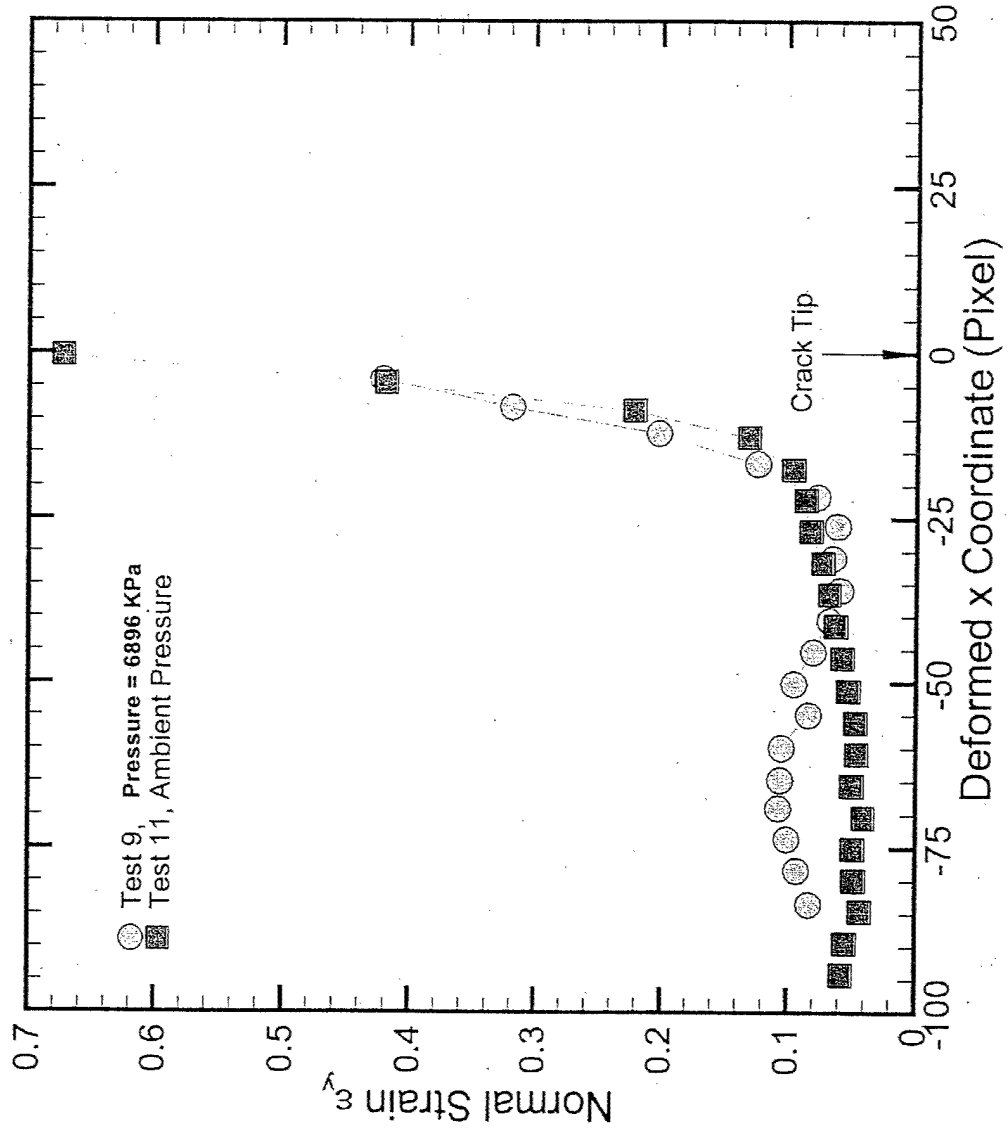
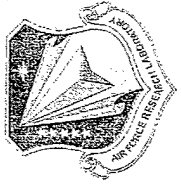
Engineering Stress Vs. Strain (6897 Kpa Pressure)

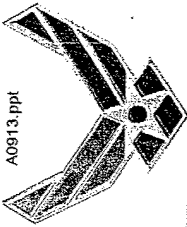




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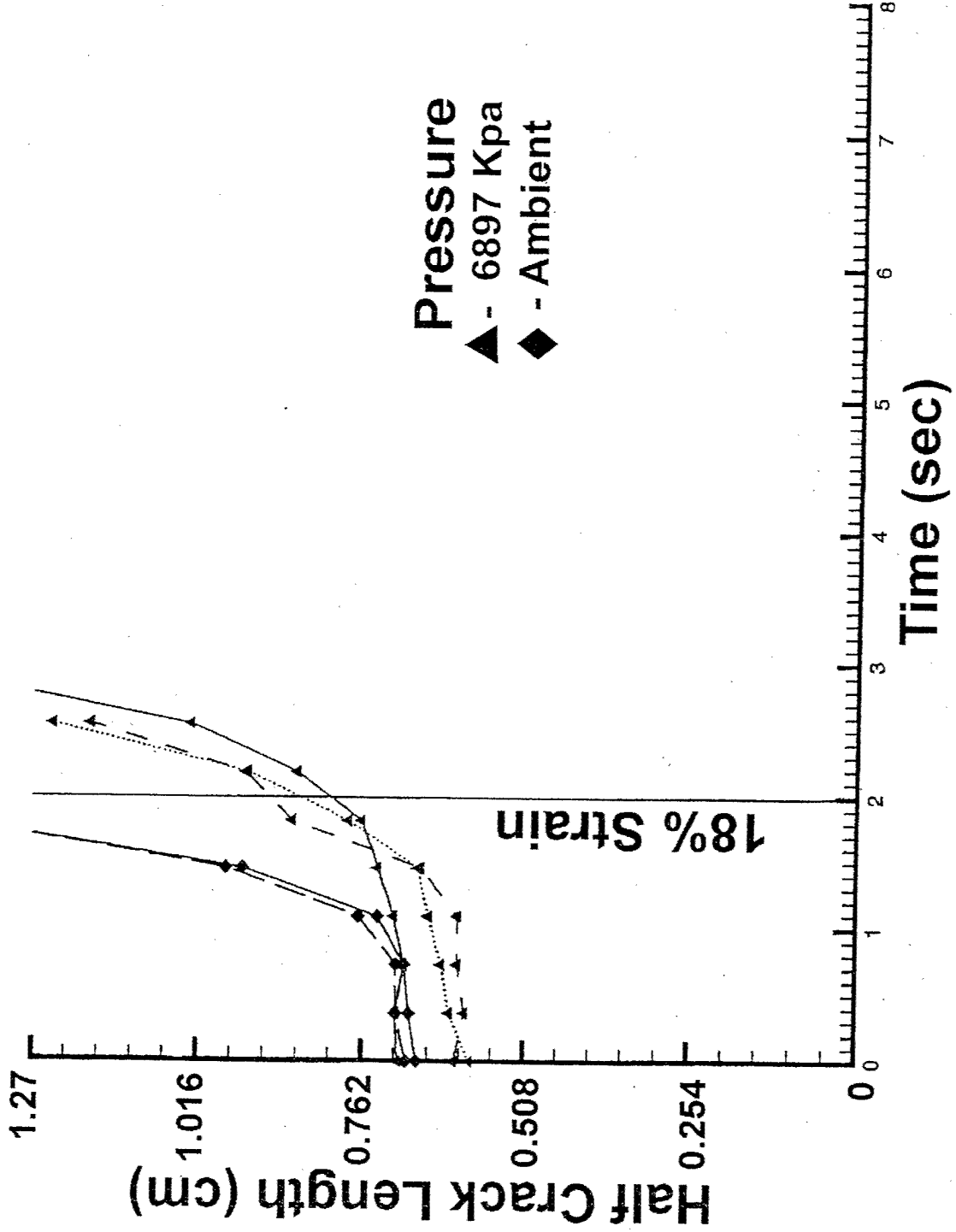
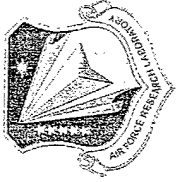
Normal Strain Distribution Ahead of the Crack Tip at the Onset of Crack Growth

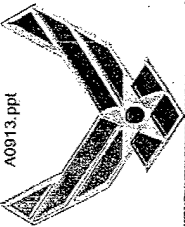




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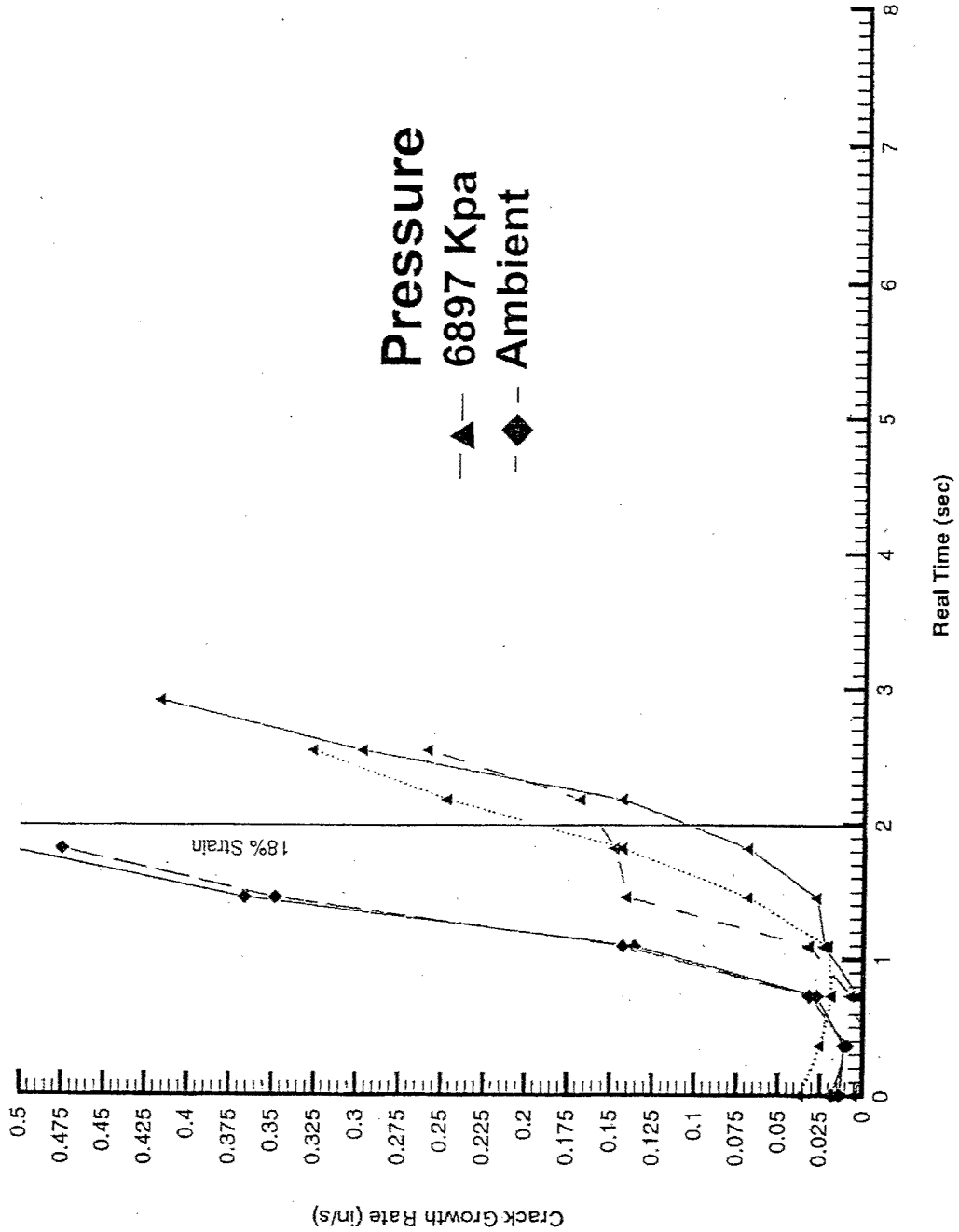
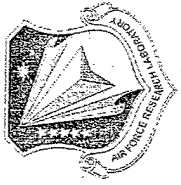
Half Crack Length Vs. Time (Constant Strain Rate Condition)

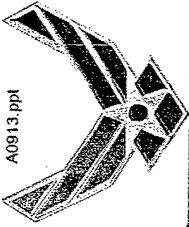




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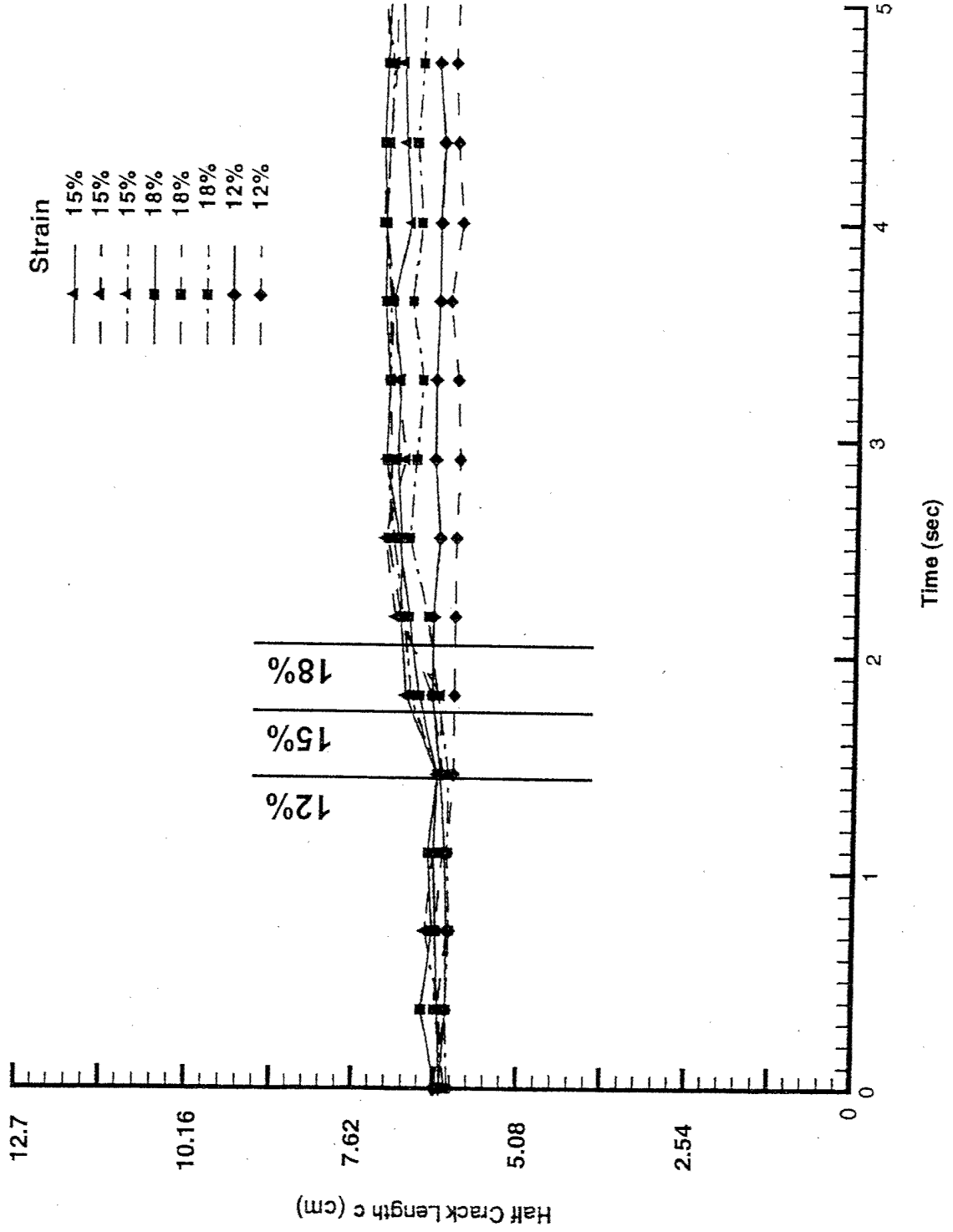
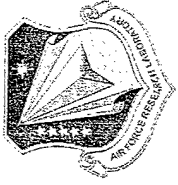
Crack Growth Rate Vs. Time (Constant Strain Rate Condition)

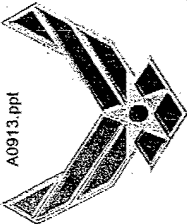




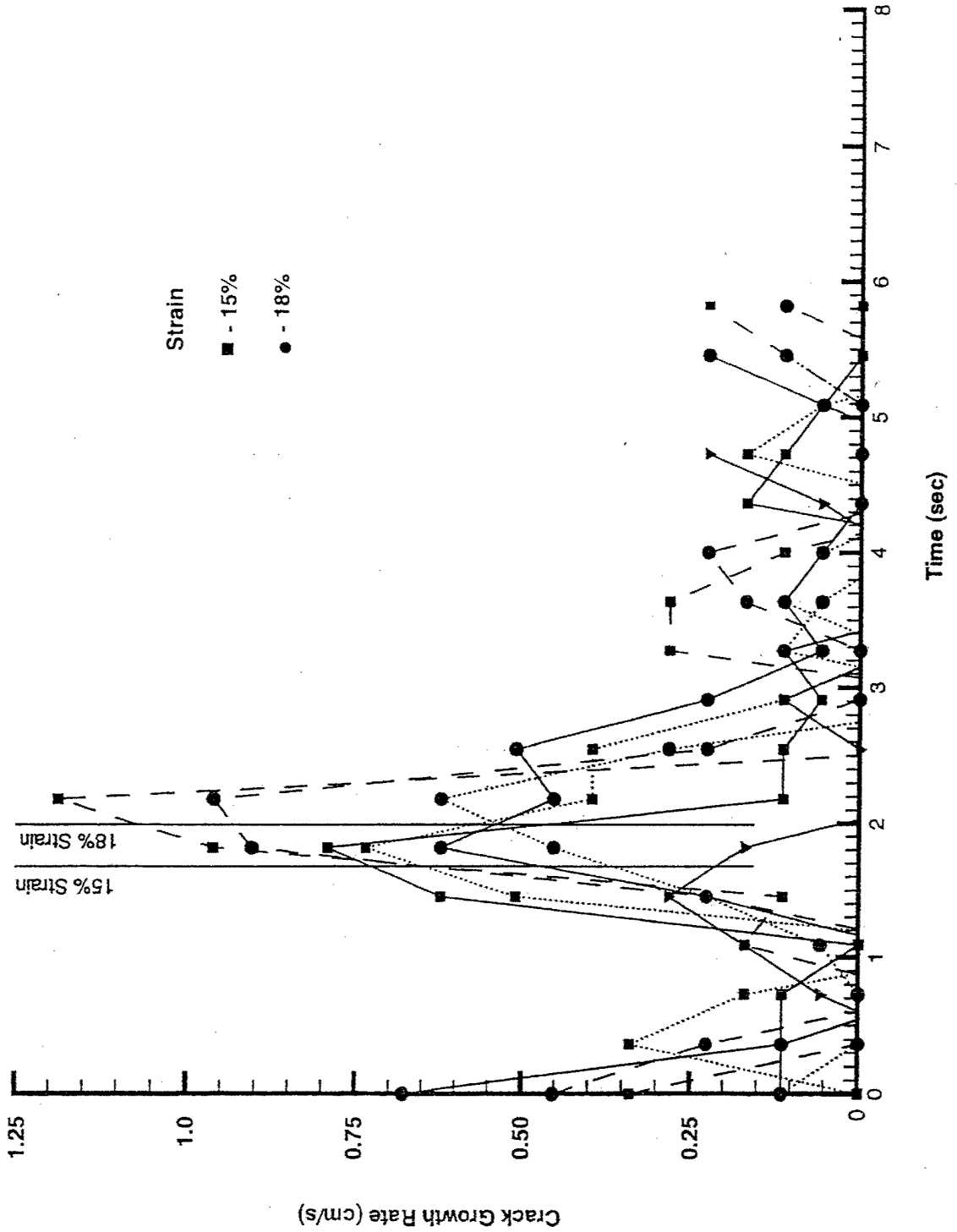
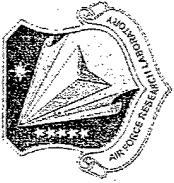
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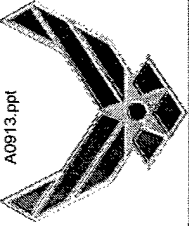
Half Crack Length c Vs. Time





Crack Growth Rate Vs. Time





Conclusions



- Under constant strain rate condition, the crack growth rate under ambient pressure is significantly higher than that under 6897 Kpa confining pressure.
- Under constant strain condition, in general, the crack growth rate decreases as the applied strain level is decreased.
- Under constant strain condition, the crack stops growth after it propagates a short distance.
- At the onset of crack growth, confining pressure has no significant effect on the size of the high strain region.