

REPORT DOCUMENTATION PAGE

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2 items enclosed = 219 + 220

FILE

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

10 September 2002

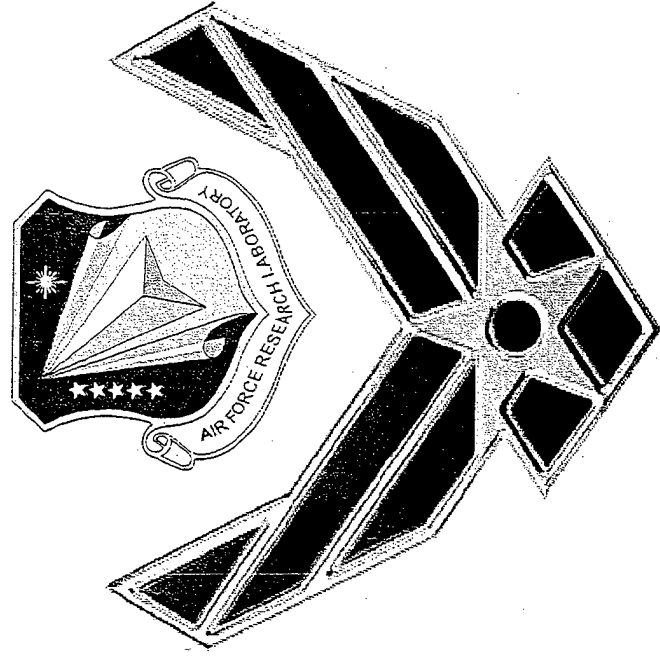
SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-219**
C.T. Liu (PRSM) et al., "Investigating the Effects of Pressure on the Near Tip Behavior and Crack
Growth in a Particulate Composite Material" (viewgraphs only)

GAN

Int'l Conf on Damage & Fracture Mechanics 2002
(Maui, HI, 15-17 October 2002) (Deadline: 11-Oct-02)

(Statement A)

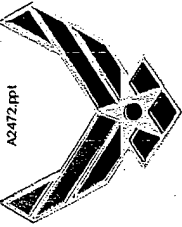
Investigating the Effects of Pressure on the near Tip Behavior and Crack Growth in a Particulate Composite Material



C.T.Liu¹ & M. Tam²

¹ Propulsion Directorate, U.S. Air Force
Research Laboratory, U.S.A.

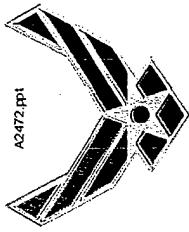
² The Aerospace Co. U.S.A.



Objectives

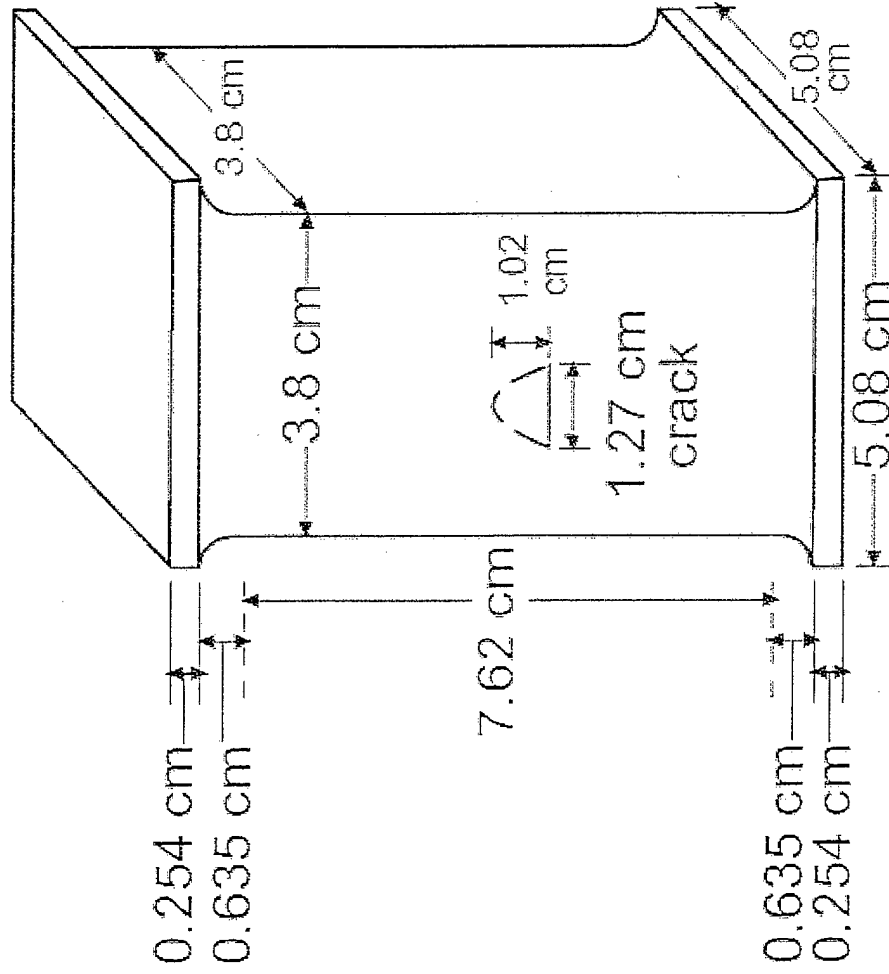
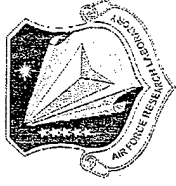


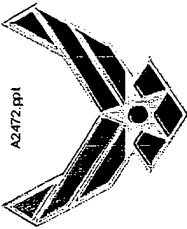
- Investigate the Effects of Confining Pressure and Loading History on the Near Tip Behavior and Crack Growth in a Particulate Composite Material.
- Confining Pressure:
 - Ambient and 8697 KPa
- Loading History:
 - Constant Strain Rate (5.8 cm/cm/min)
 - Constant Strain (18%)



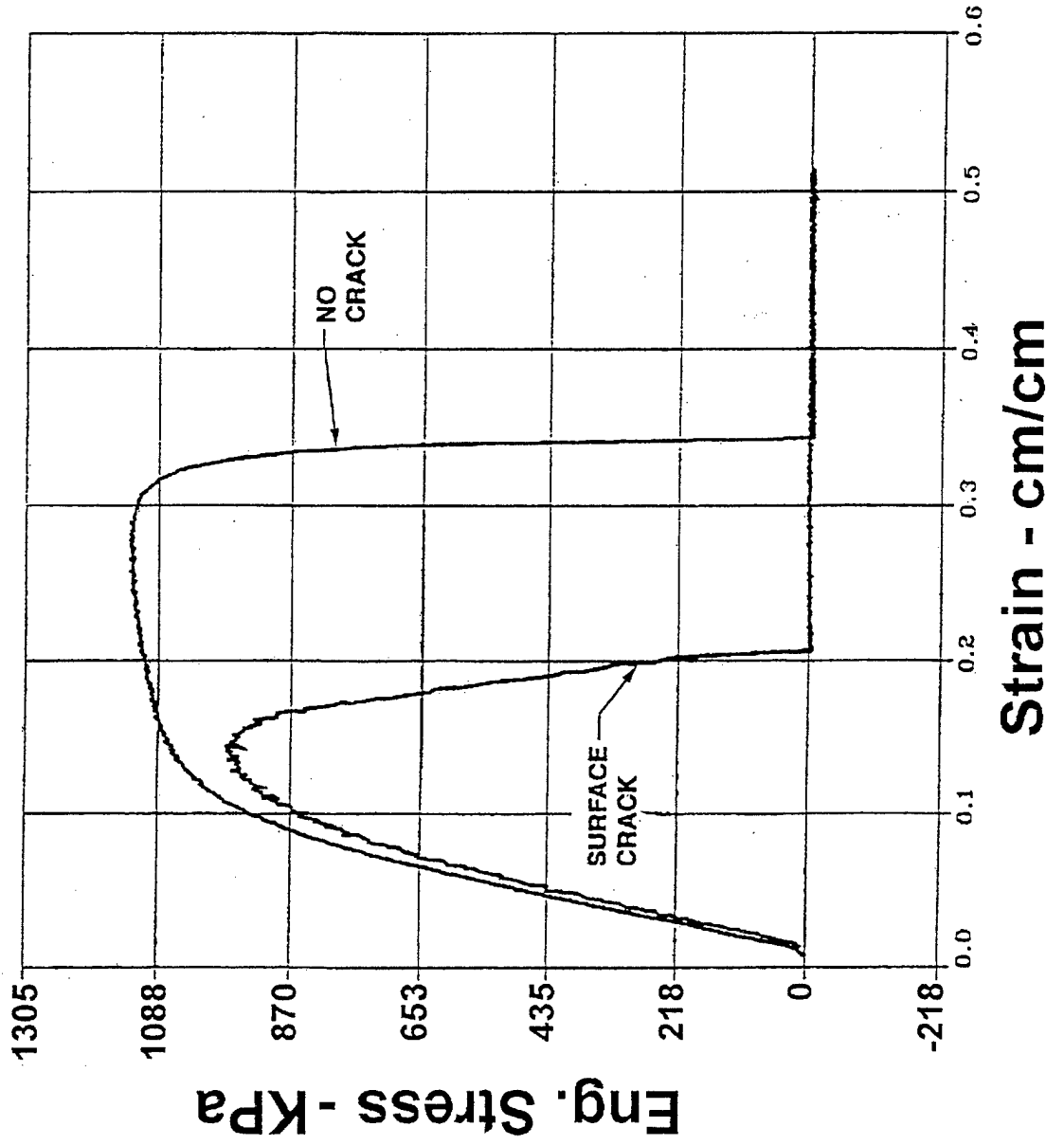
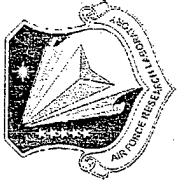
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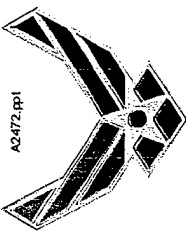
Specimen Geometry





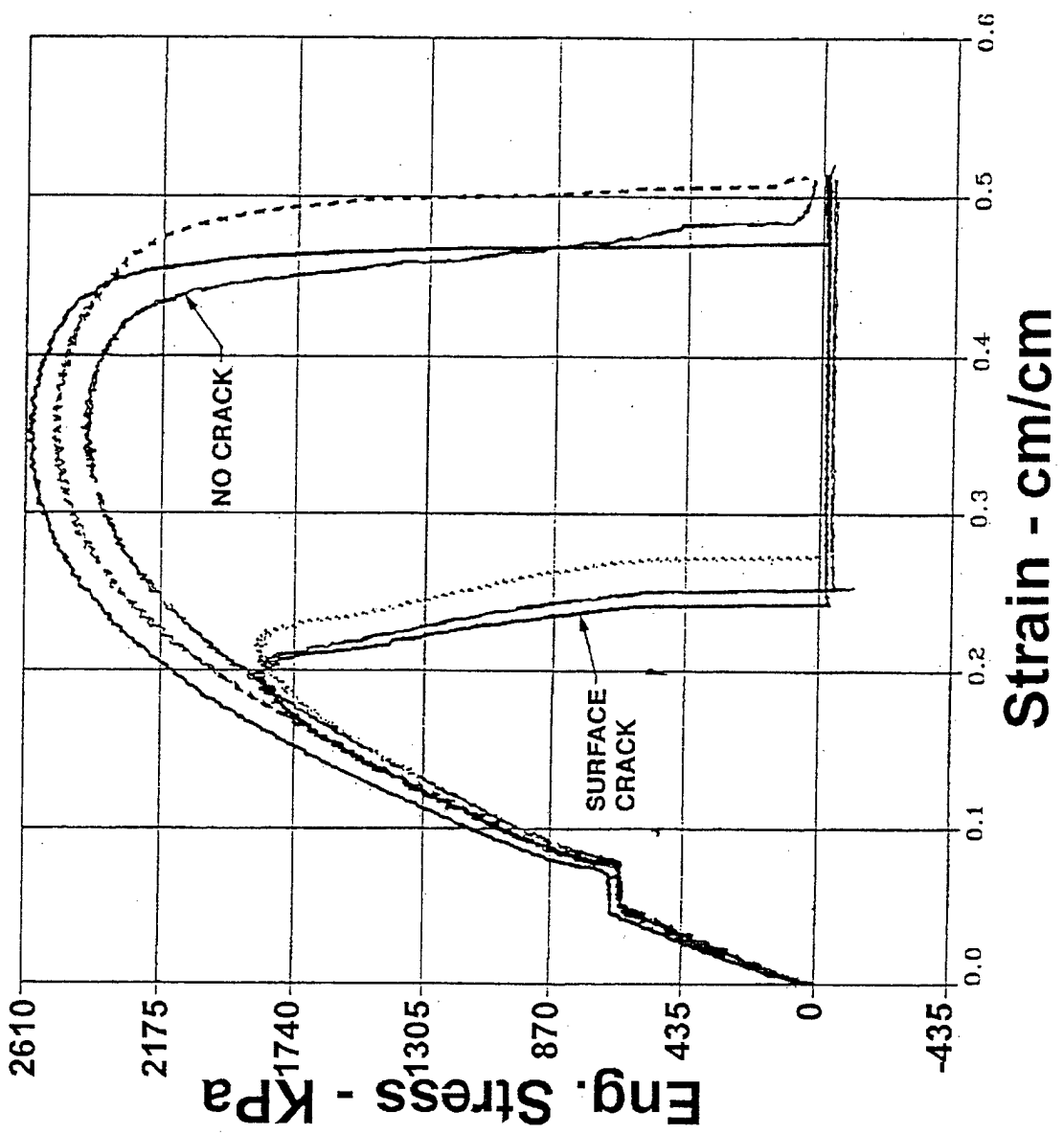
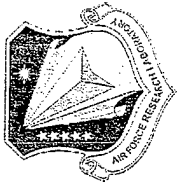
Engineering Stress Vs. Strain (Ambient Pressure)

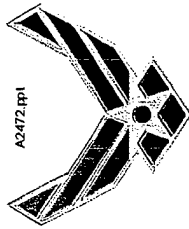




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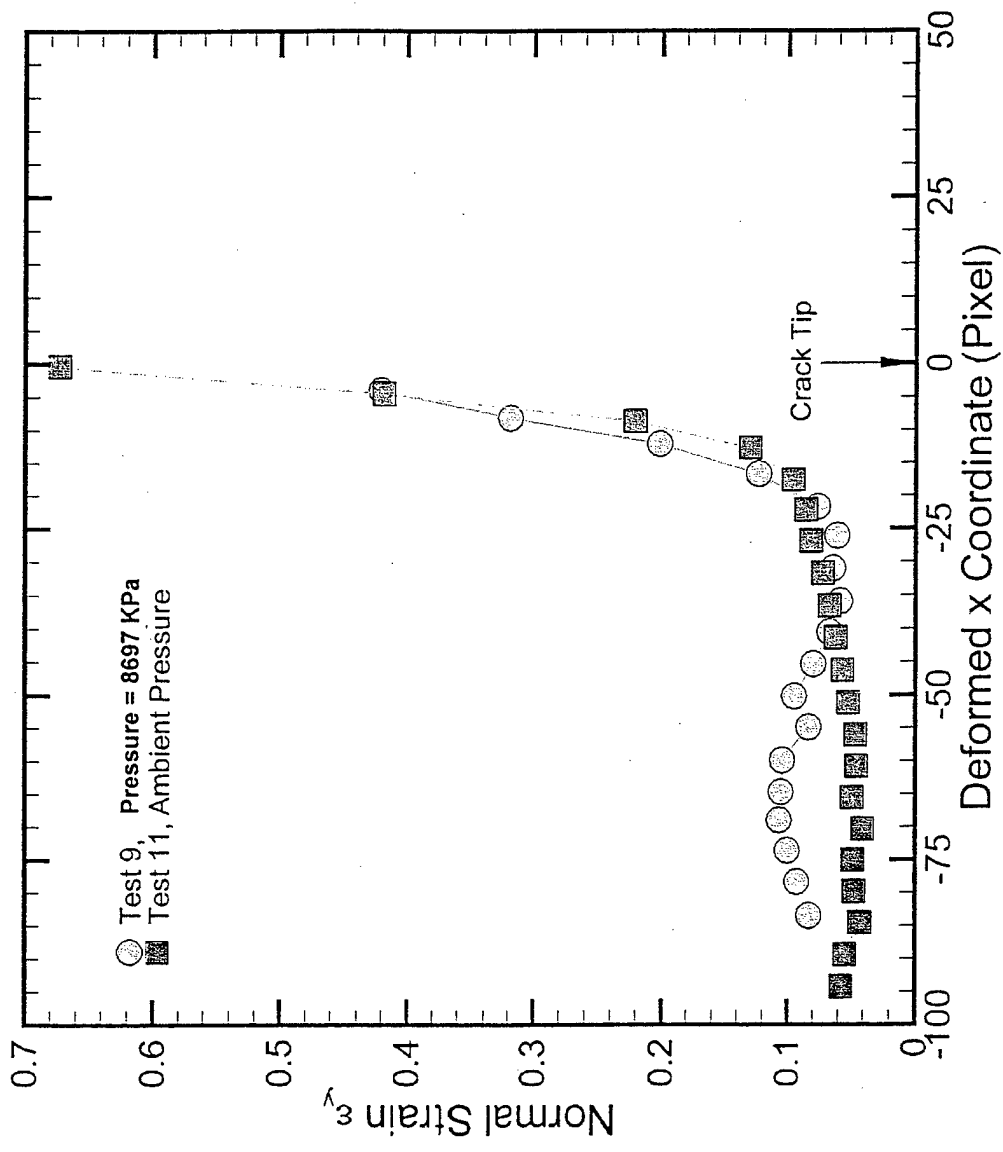
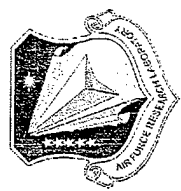
Engineering Stress Vs. Strain (8697 Kpa Pressure)

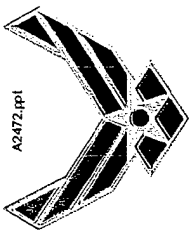




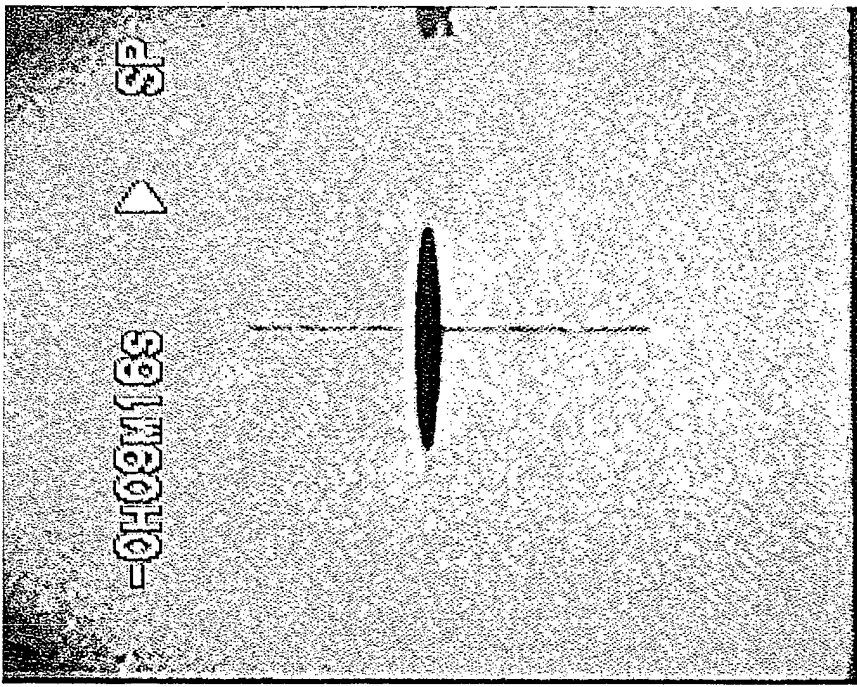
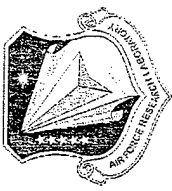
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Normal Strain Distribution Ahead of the Crack Tip at the Onset of Crack Growth

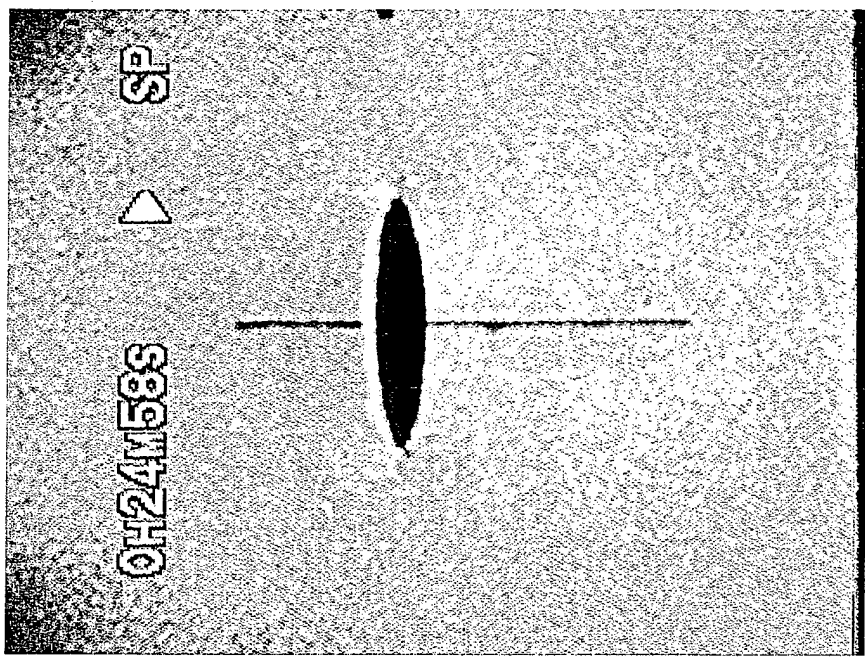




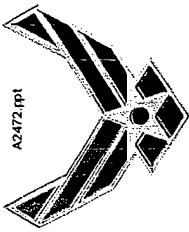
Crack Profiles at the Onset of Crack Growth



ambient pressure

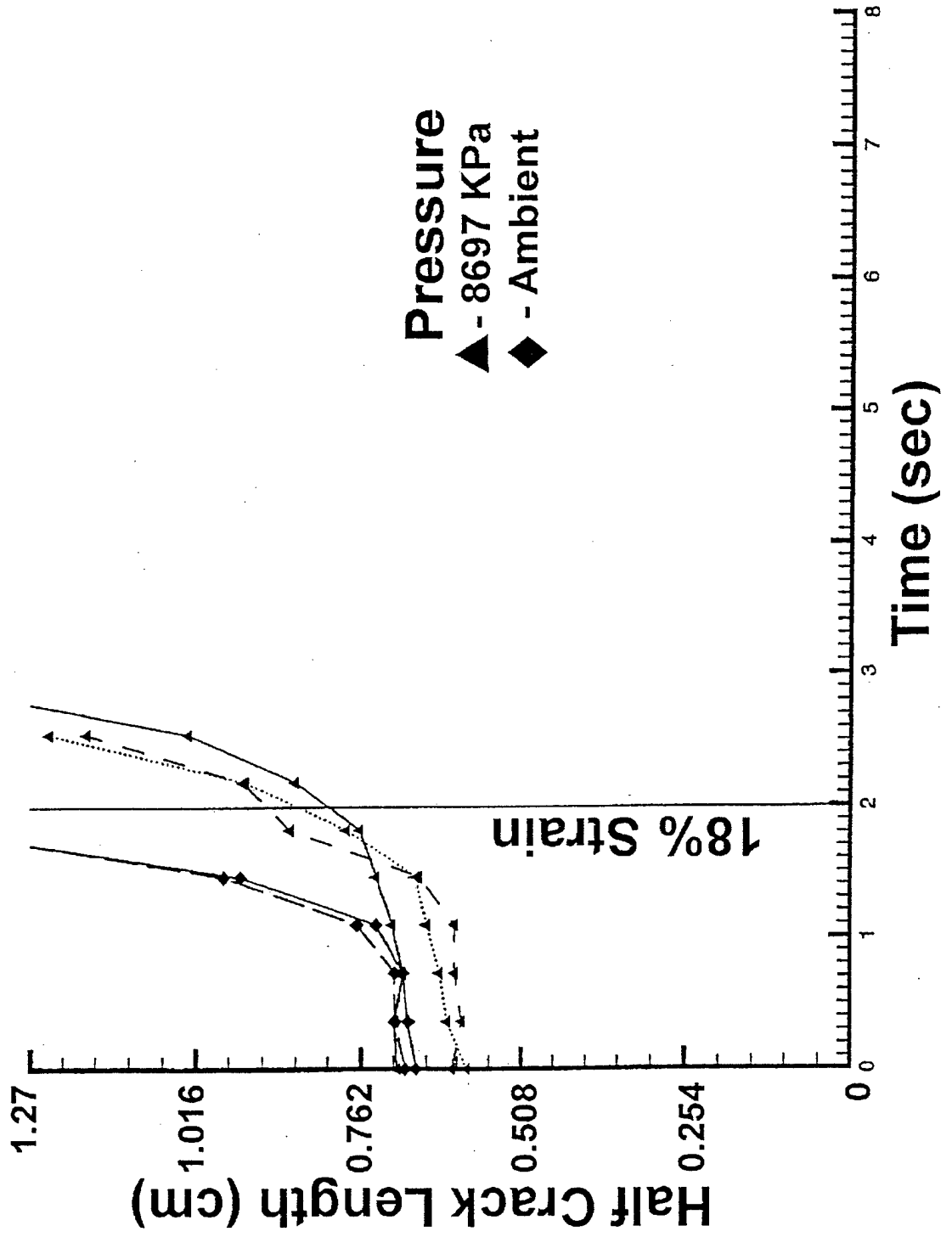


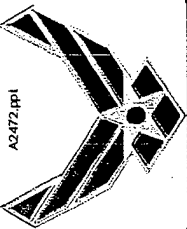
8697 Kpa confining pressure



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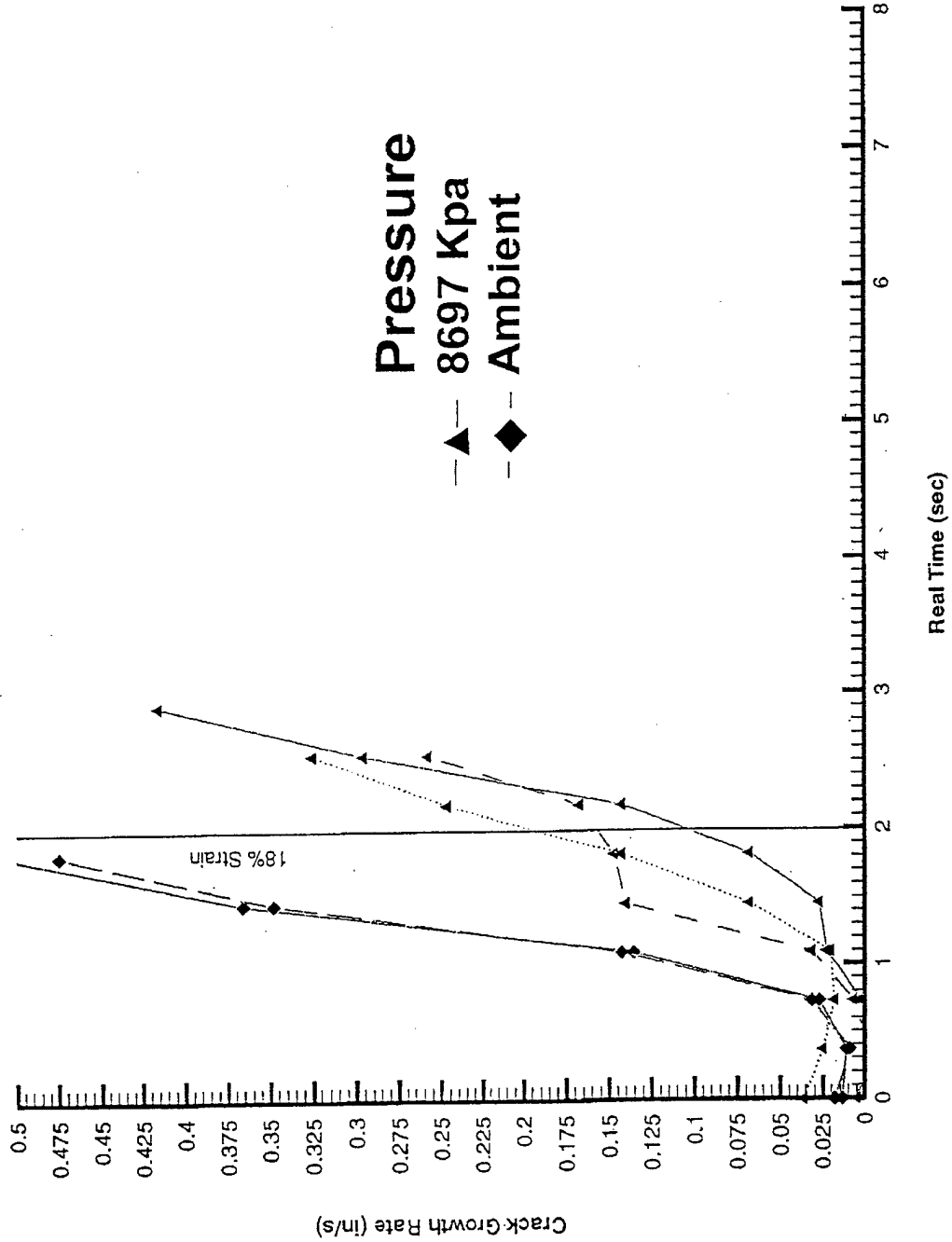
Half Crack Length Vs. Time (Constant Strain Rate Condition)

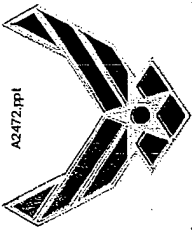




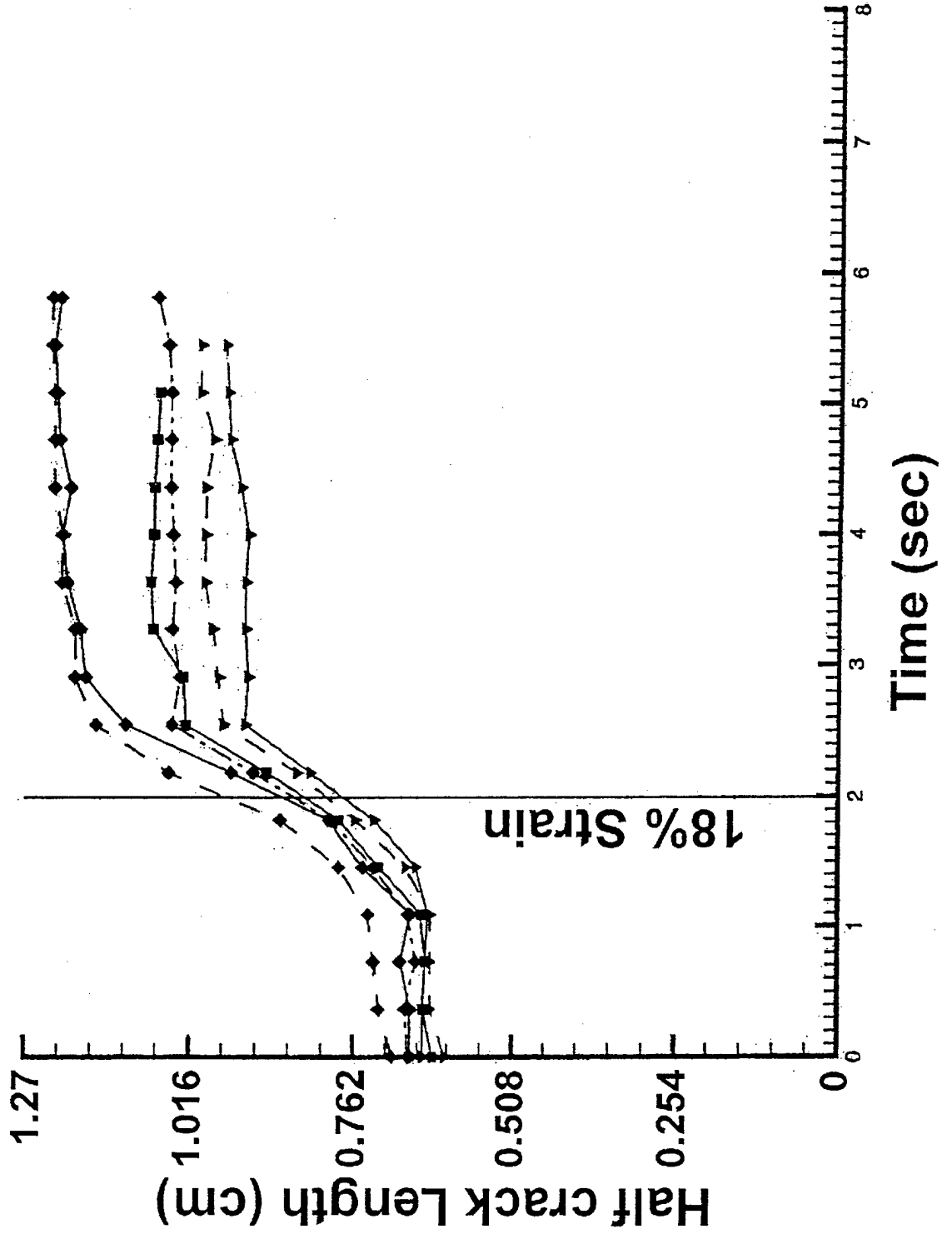
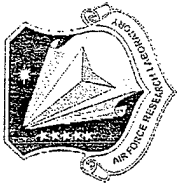
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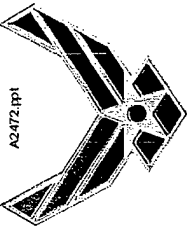
Crack Growth Rate Vs. Time (Constant Strain Rate Condition)





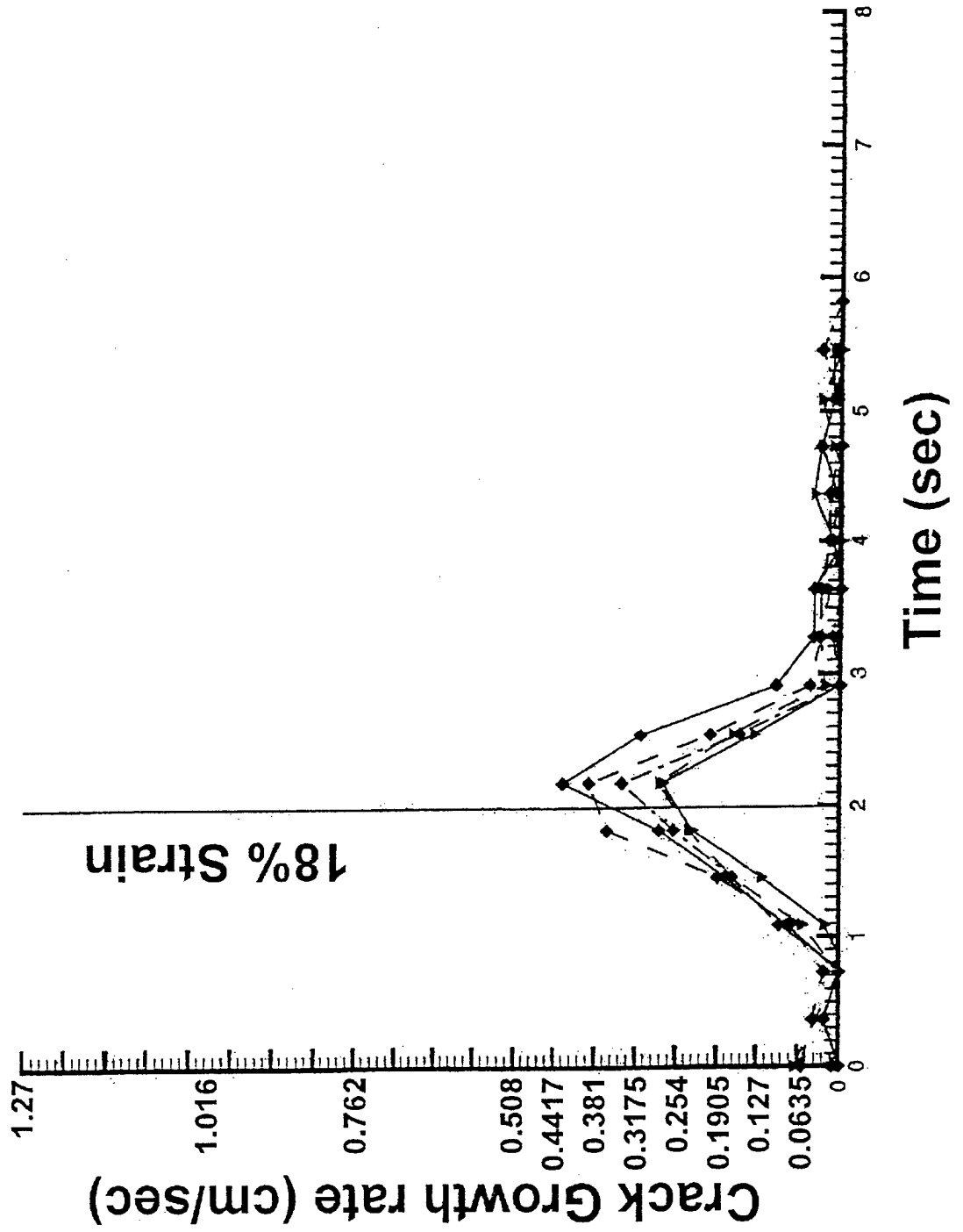
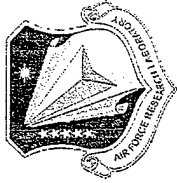
Half Crack Length Vs. Time (Constant Strain Condition)

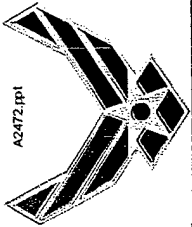




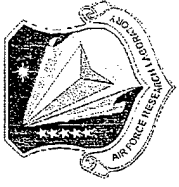
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Crack Growth Rate Vs. Time (Constant Strain Condition)





Conclusions



- The crack growth rate under ambient pressure is significantly higher than that under 8697 KPa confining pressure.
- At the onset of crack growth, the crack opening displacement under 8697 KPa confining pressure is greater than that under ambient pressure.
- At the onset of crack growth, confining pressure has no significant effect on the size of the high-strain zone.
- Under constant strain condition, the crack stops growing after it propagates a short distance.