

REPORT DOCUMENTATION PAGE

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1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE Technical Papers	3. DATES COVERED (From - To)
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4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER

Please see attached

6. AUTHOR(S)	5d. PROJECT NUMBER 2302
	5e. TASK NUMBER MIG2
	5f. WORK UNIT NUMBER 346120

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Laboratory (AFMC) AFRL/PRS 5 Pollux Drive Edwards AFB CA 93524-7048	8. PERFORMING ORGANIZATION REPORT
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9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Research Laboratory (AFMC) AFRL/PRS 5 Pollux Drive Edwards AFB CA 93524-7048	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S NUMBER(S) <i>Please see attached</i>

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

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15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <i>A</i>	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Leilani Richardson
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code) (661) 275-5015

G2

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

14 May 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-118**
C.T. Liu, "Monitoring Initiation and Growth of Crack in a Particulate composite Material Using
Nondestructive Testing Techniques"

2001 Society for Experimental Mechanics Conf.
(Portland, OR, 4-6 Jun3 2001) (Deadline 25 May 2001)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.
Comments: _____

Signature _____ Date _____

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.
Comments: _____

Signature _____ Date _____

3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required
Comments: _____

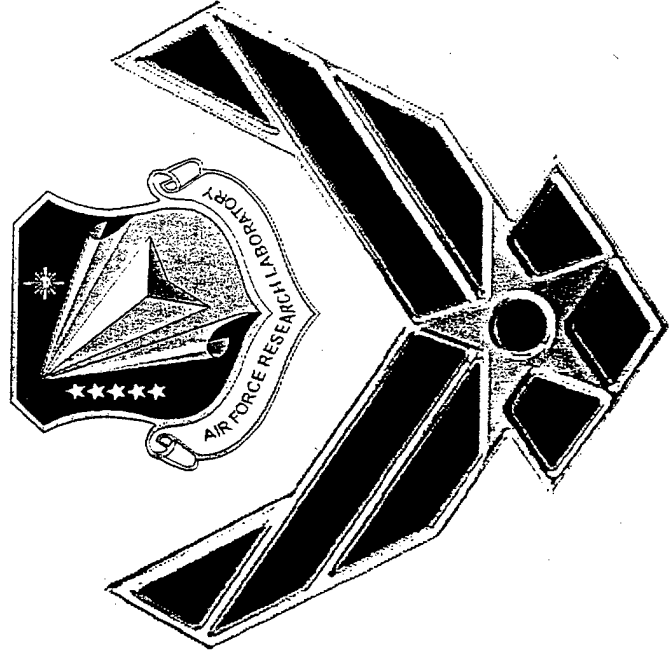
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4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability
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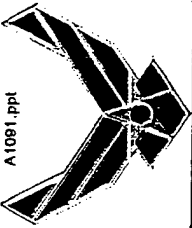
APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

**MONITORING INITIATION AND
GROWTH OF CRACKS IN A
PARTICULATE COMPOSITE
MATERIAL USING
NONDESTRUCTIVE TESTING
TECHNIQUES**



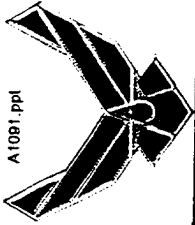
C. T. Liu
AFRL/PRSM
10 E. Saturn Blvd.
Edwards AFB CA 93524-7680



Objective



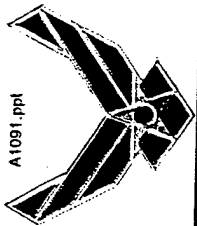
- **Investigate Damage Initiation and Evolution and Crack Growth Behavior in a Highly Filled Polymeric Material.**



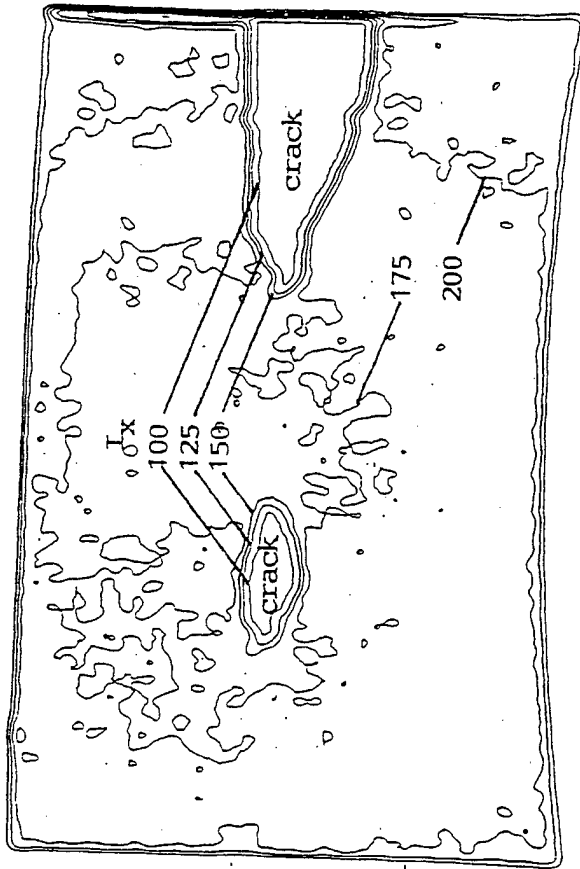
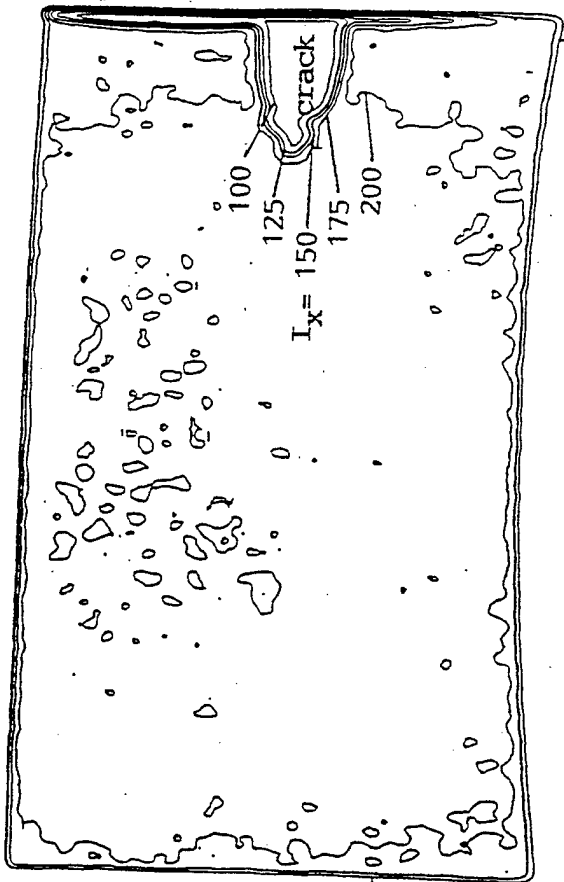
Conclusions

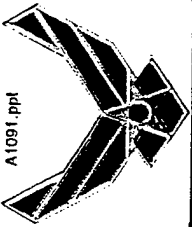


- Real-time x-ray data reveals that damage rate increases rapidly prior to the formation of a crack.
- During the stable crack growth stage, the damage zone size and the intensity of damage increase with increasing time.
- During the unstable crack growth stage, the damage zone size and the intensity of damage decrease with increasing time.
- The results of strain measurement and numerical analysis reveal that the normal strain increases rapidly prior to the formation of a crack.
- The real-time x-ray technique is a promising technique to monitor damage initiation and evolution processes in the particulate composite material.

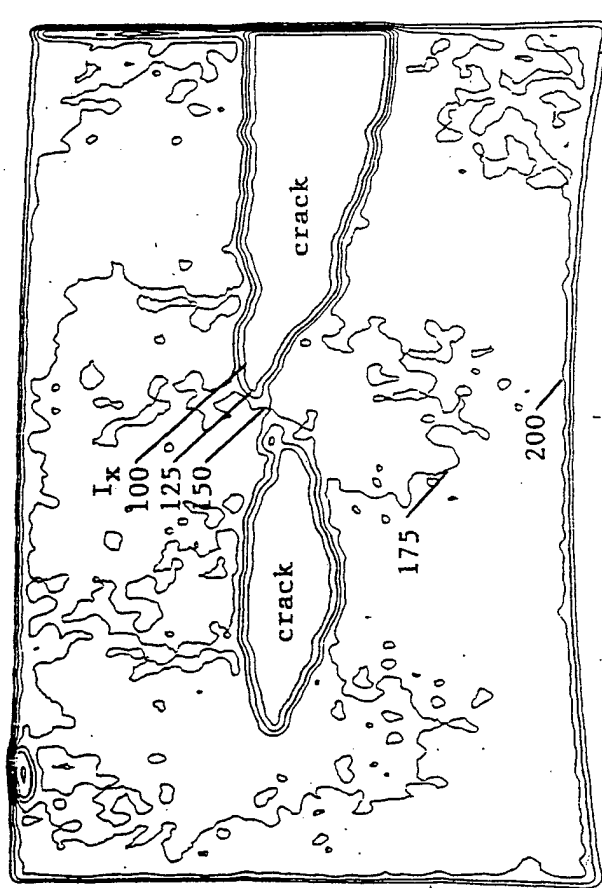


Iso-Intensity Contours of Transmitted X-Ray Energy I_x

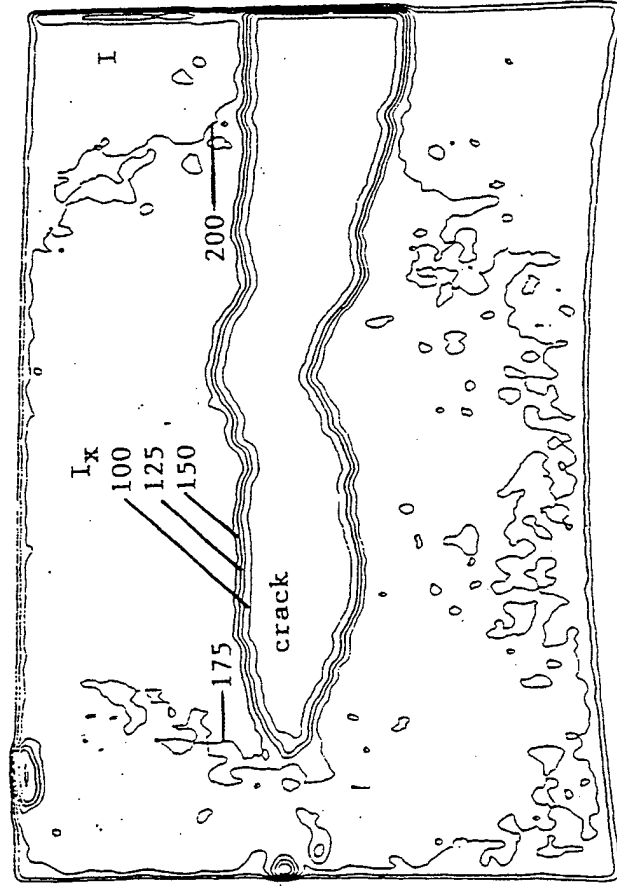




Iso-Intensity Contours of Transmitted X-Ray Energy I_x



Time: 7:50



Time: 7:56

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Normal and Shear Strains Versus Young's Modulus

Normal and Shear Strains (%)

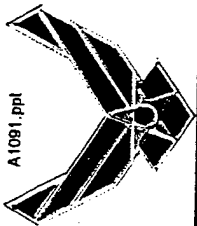
Young's Modulus (Mpa)	Normal Strain (%)	Shear Strain (%)
0.0	145.0	25.0
25.0	145.0	25.0
50.0	145.0	25.0
75.0	100.0	25.0
100.0	90.0	25.0
125.0	85.0	25.0
150.0	80.0	25.0
175.0	75.0	25.0
200.0	70.0	25.0
225.0	65.0	25.0
250.0	60.0	25.0
275.0	55.0	25.0
300.0	50.0	25.0
325.0	45.0	25.0
350.0	40.0	25.0
375.0	35.0	25.0
400.0	30.0	25.0

Normal Strain

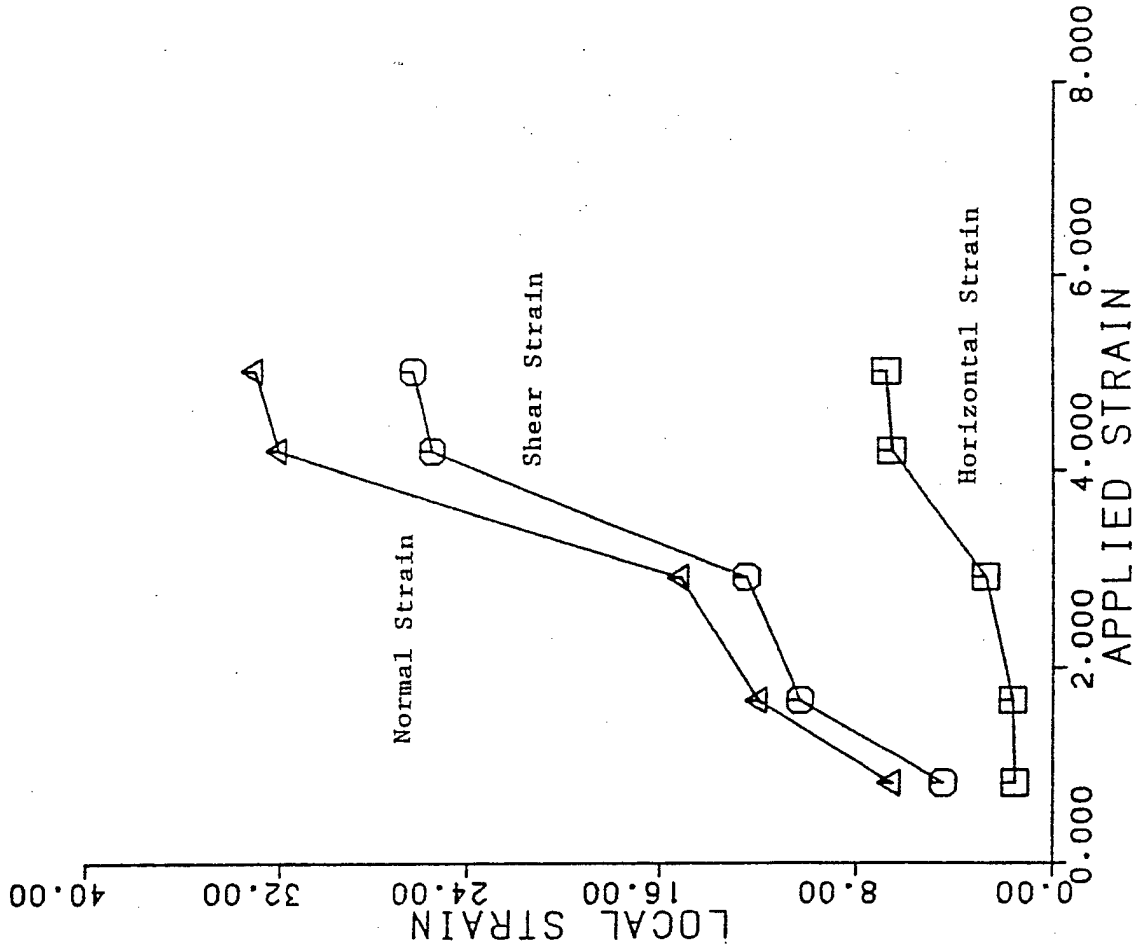
Shear Strain

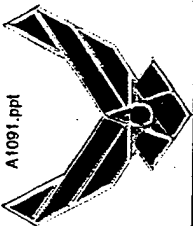
Young's Modulus (145 Mpa)

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Local Strain Versus Applied Strain





X-Ray Intensity \bar{I}_x Versus Applied Strain

