NASA TECH BRIEF

Lewis Research Center

Fracture Toughness Testing Data: A Technology Survey and Bibliography

When metals are fabricated into structures, small flaws often develop or will develop within the service lifetime which can drastically change the metal's behavior. A relatively small crack can greatly reduce the conventional metal strength and lead to catastrophic failure. Stringent requirements of high strength-to-weight ratios and high reliability over long operating lifetimes for aircraft and spacecraft structures have necessitated continuing research in fracture mechanics and the development of fracture toughness testing. Fracture toughness tests determine material properties which quantitatively relate critical crack sizes to applied loads and structure geometries.

A substantial body of information on fracture toughness testing has been accumulated which can be profitably applied in structural design and testing in many fields. A technology survey and bibliography have been assembled to provide ready sources of information on fracture toughness testing data.

The technology survey includes a summary history of the development of fracture mechanics and focuses on the current problems of relating fracture mechanics to design. Some 90 significant reports covering the time period from 1962 to 1974 are abstracted and evaluated, with references to other pertinent papers. These reports cover fracture toughness testing for various structural materials including information on plane strain and the developing areas of mixed mode and plane strain test conditions.

The bibliography comprises approximately 800 references over the same time period related to the mechanics of failure in aerospace structures. These references cite work and conclusions in fracture toughness testing and the application of fracture toughness test data, and in fracture mechanics analysis.

Notes:

1. These two documents have been published as:

   NASA CR-134752 (N75-18625), Fracture Toughness Testing Data - A Technology Survey

   NASA CR-134753 (N75-18610), Fracture Toughness Testing Data - A Bibliography

2. Also, a Register of Experts on the Mechanics of Structural Failure has been assembled comprising some 300 people from 90 organizations who have recently published the results of theoretical and/or experimental research related to: life prediction for structural materials, fracture toughness testing, fracture mechanics analysis, hydrogen embrittlement, protective coatings, and composite materials. The register provides sources of expert information on failure modes and mechanisms. Each expert is listed by organizational affiliation, address, and principal field of expertise. Criteria for selection of the names were recent contributions to the literature, participation in or support of relevant research programs, and referral by peers. It is recognized as an incomplete listing but should be useful as a guide to those who seek related information. This register has been published as:

   NASA CR-134754 (N75-22187), Register of Experts for Information on Mechanics of Structural Failure

3. Additionally, a Technology Survey and a Bibliography have been assembled on Life Prediction of Materials Exposed to Monotonic and Cyclic Loading (announced in NASA Tech Brief 75-10138). These two documents have been published as:

   NASA CR-134750 (N75-21669), Life Prediction of Materials Exposed to Monotonic and Cyclic Loading - A Technology Survey

   NASA CR-134751 (N75-21668), Life Prediction of Materials Exposed to Monotonic and Cyclic Loading - Bibliography

4. All of these documents may be obtained at cost from:

   Aerospace Research Applications Center
   Indiana University
   400 East Seventh Street
   Bloomington, Indiana 47401
   Telephone: 812-337-7833
   Reference: B75-10139

(continued overleaf)

5. Specific technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B75-10139
6. NASA's Aerospace Safety Research and Data Institute, located at the NASA Lewis Research Center, collects, evaluates, and organizes safety-related information for use by NASA and others. The documents announced in this Tech Brief have been compiled and published as part of this effort.

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