

# Orientation Effects in the Mechanical Behavior of Anisotropic Structural Materials



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# ORIENTATION EFFECTS IN THE MECHANICAL BEHAVIOR OF ANISOTROPIC STRUCTURAL MATERIALS

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## Foreword

The Symposium on Orientation Effects in the Mechanical Behavior of Anisotropic Structural Materials sponsored by the ASTM Division of Materials Sciences was held in one session on Nov. 2, 1965, in Seattle, Wash., during the Fifth Pacific Area National Meeting of ASTM. Anisotropic characteristics of structural materials have received increased emphasis with the advent of recent man-made materials such as composites and sandwich constructions which need these determinations. This influenced the development of the symposium as being a timely presentation of information. The session was opened by Stephen Yurenka, Douglas Aircraft Co., and symposium chairman, who reviewed the purpose of the symposium and introduced the speakers.

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**COVER PHOTO:** This photograph of fiberglass cloth embedded in a polybenzothiozole resin was submitted to the 1966 ASTM Photographic Exhibit by Elroy P. Harich, University of Dayton, Research Inst., Dayton, Ohio. The magnification is  $\times 250$ .

## Introduction

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Because of the rapidly growing importance of composite structural materials to both the Aerospace Industries and the Forest Products Industries, the subject of the anisotropic characteristics of these materials has merited special attention. Anisotropy in a material means, of course, that its basic mechanical properties are widely different in its three perpendicular directions. Recent man-made materials which have joined wood in this category are fiberglass, metal matrix fibrous composites, sandwich constructions, and fortisan composites.

Under the sponsorship of the Division of Materials Sciences of ASTM, a symposium was held which was concerned with the nature and effects of the orientation of the reinforcing component of such materials on the mechanical behavior of anisotropic composites. Several of the papers consider the mechanics of fibrous media and the effects of material orthotropy from a purely theoretical and mathematical standpoint. The succeeding papers each then concentrate on a particular type of anisotropic material, drawing upon recent experimental and observational results which illustrate some of the fundamental principles involved. The authors are all well known composite experts in their respective fields and represent a cross section of government, private, and educational institutions or laboratories.

*Steven Yurenka*

Douglas Aircraft Co., Long  
Beach, Calif.; symposium  
chairman.

