

SYMPOSIUM ON MATERIALS FOR AIRCRAFT, MISSILES, AND SPACE VEHICLES

INTRODUCTION

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It has recently become apparent that the topic of combined environmental effects on materials is receiving increased amounts of attention in the missile and airframe field. This interest stems from the fact that certain combined environments occurring in a number of the newer flight regimes cause different, and generally more severe, effects on materials than the simple sum of each effect taken separately. For example, radiation damage in metals at cryogenic temperature has recently been shown to cause significantly different effects than would be expected from a consideration of the effect of either environment taken separately. Likewise for plastics, radiation effects in vacuum have been shown to cause more severe effects than would either environment acting separately. Many other similar effects could be cited. In each of these cases the reason for the more severe combined effect can be deduced from fundamental considerations of material behavior. Thus the cryogenic - nuclear radiation effects

in metals are more severe because the low diffusion rates which exist at low temperature prevent the "annealing out" of radiation-induced lattice defects that normally occur in metals at elevated temperatures. Likewise, the radiation-vacuum effects are more severe for plastics because the radiation acts to split long-chain organic molecules into lower molecular weight fragments which then exhibit higher vapor pressures, and are thus more prone to vaporization when subjected to high vacuum.

It was the purpose of the present symposium to bring together a number of papers whose common point of interest was a study of combined environmental effects on materials of interest to airframe and missile applications. Although the individual environments and materials may vary widely, it was thought that a grouping of papers of this sort would provide a common ground for discussion of combined environmental testing and evaluation problems, and provide an awareness that this subject of synergistic effects is becoming of rapidly increasing importance to the selection and application of materials in airframe and missile application.

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