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THE EFFECTIVENESS OF REUSABLE AERIAL VEHICLES MADE OF COMPOSITE MATERIALS

Abstract

Polymer composite materials—carbon fiber-reinforced plastic, organic plastic, and their combinations—have recently occupied one of the leading positions among other structural and special-purpose materials used in the aircraft and helicopter engineering and space technology. The present-day aircraft and rocket engineering is paying a close interest in polymer composite materials based on epoxy compounds. These materials enable a considerably lighter weight and an extended operation life of equipment. Of the wide range of available polymer composites, the materials whose strength falls by not more than 10–20% are the most promising. Operation conditions, temperature, and operation time have a very strong effect on the stress-strain properties of polymer composites. As compared to metal parts, the parts made of polymer composites are more sensitive to the aggressive influence of temperature and ambient conditions. The ageing of polymer composites is a complex process. Therefore, not only the influence of particular aggressive factors should be investigated, but also their joint effect of accelerating the wear of materials should be taken into account. The most critical influencing factors are water saturation, high temperatures, thermal cycling, and mechanical loads. The climatic ageing of polymer composites is known to cause the irreversible changes in their stress-strain properties. The climatic ageing slowdown opens many possibilities for the further improvement of polymer composite structures and the expansion of their functionality.