

## COMPOSITE MATERIALS USAGE IN ACOUSTIC ABSORPTION CONSTRUCTIONS OF AIRCRAFT ENGINES

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There is composite materials usage considered in aircraft propulsion designs. Hard weight restrictions and requirements to create an effective sound proofing engine, necessitate more widespread adoption to design parts and components from composite materials. First variants of the implementation composite materials have been proposed in the early 90s for aircraft gas turbine engine PS-90, mass-produced. To introduce composites were selected low load thin outer contour body parts, nozzle, and the reverse. Easy access for periodic visual inspection, diagnosis, repair and replacement, if necessary, provide them safe testing while operating propulsion system. Made from composite materials, body parts have up to 20-25% less mass than metal counterparts. The fundamental technology of mass production of composite parts and assemblies of the outer contour traction engines has been developed.

Molding of composite body parts is carried out by hand laying on the mandrel differently oriented layers of glass and epoxy resin binder for carbon prepreps, followed by curing in an autoclave. A technology of flanged units and parts made of composite materials manufacturing, that provides additional weight reduction compared with embedded metal flange composite parts has been developed. Computational and experimental studies have shown a sufficient stock of static strength and resources of develop composite parts, and it is confirmed by current data on flying hours of composite parts in engines. Currently, composite parts are mass-produced instead of original metal counterparts for modified versions of PS-90 - PS-90A2 engines.

D30KU-154 operated in the TU-154 is the second engine in which composite parts were used. Aircraft engines required their revision to satisfy ICAO noise reduction requirements. In this case the only possible solution was to install additional sound-absorbing panels, because of existing inner contour engine restricted dimensions. In this case polymeric composite materials were the most effective panel's embodiment.

Currently widespread use of composite materials is planned in construction of newly designed aircraft propulsion engines, intended to equip the near-and medium-haul aircraft such as MS-21. New design solutions in this case are creation more than 60% of sites nacelle engine from composite materials, creation of multi-cellular sound-absorbing panels contour, making the fairing, power components, etc. It is planned to use new processes while creating new composite engine components such as RTM, infusion, automatic layout. Introduction of composite materials should ensure engine weight reduction to perform required environmental standards.