

Applications for Additive Manufacturing Technology for Reducing the Weight of Body Parts of Gas Turbine Engines

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Abstract : Aircraft engines are developing along the path of increasing resource, strength, reliability, and safety. The building of gas turbine engine body parts is a complex design and technological task. Particularly complex in the design and manufacturing are the casings of the input stages of helicopter gearboxes and central drives of aircraft engines. Traditional technologies, such as precision casting or isothermal forging, are characterized by significant limitations in parts production. For parts like housing, additive technologies guarantee spatial freedom and limitless or flexible design. This article presents the results of computational and experimental studies. These investigations justify the applicability of additive technologies (AT) to reduce the weight of aircraft housing gearbox parts by up to 32%. This is possible due to geometrical optimization compared to the classical, less flexible manufacturing methods and as-casted aircraft parts with over-insured values of safety factors. Using an example of the body of the input stage of an aircraft gearbox, visualization of the layer-by-layer manufacturing of a part based on thermal deformation was demonstrated.

Keywords : additive technologies, gas turbine engines, topological optimization, synthesis process

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