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Lightweight Acoustic Potential of helicopter main gearbox components made of composite materials

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The increased use of helicopters for public transport has led to a demand for reduced noise levels inside helicopter cabins. Therefore, a major research interest is to reach noise levels comparable to the one of turboprop airplanes by reducing the sound emission from the major noise sources. The helicopters gearbox is commonly known to be the dominant contributor to the cabin noise. Here, composite materials have multifunctional properties allowing the realization of light and acoustically improved components. The material characteristics can be adjusted to meet not only the dynamic but also the acoustic requirements. In the presented work the related vibro-acoustic properties of selected composites were characterized and then compared to commonly used materials (e.g. steel, aluminium). One of the covers of a main gearbox housing was chosen as technology demonstrator, which shows a reduced sound emission by having full functionalities at the same time. The design process included several structural-dynamic and acoustic analyses. Different composite prototypes were manufactured and tested on a vibro-acoustic test bench especially designed and manufactured for these purposes. The results of the measurements proofed the high lightweight acoustic potential of sandwich composites for future "quieter" helicopter components.