THE AEROACOUSTICS STUDIES OF THE FLAT PLATES WITH THE TRAILING EDGE MODIFICATIONS

Joanna KOPANIA[1], Władysław KRYŁŁOWICZ[2],
[1]*The Power Engineering Institute,The Aeroacoustics Laboratory of the Heat Engineering Department „ITC", 93-208 Lodz, 113 Dabrowskiego Street, Poland*
[2]*Institute of Turbomachinery, Technical University of Lodz, 90-924 Lodz, 219/223 Wólczańska Street, Poland*
E-mail: joanna.kopania@itc.edu.pl

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Noise is the one of big important problem in our world. The works about these are the subject of many studies all over the world in the research centers and the commercial laboratories. Solutions of the noise problems are also looking for in nature. The science which connect the natural adaptation of the plants and animals with the technique is bionic. The transferring the some solutions from the nature to the engineering is difficult, because its requires a multidisciplinary research. There are more and more examples of the bionic machines or constructions in the literature. The aeroacoustic also tries to derive examples from nature. When we looking around us, it is not difficult to find animals with a very quiet moving like cat, butterfly, bat or owl. It is amazing owls are unseen, because they fly very quiet. The studies of the physiology and anatomy these birds revealed that silent flight is the result of several factors (Graham, 1934; Lilley, 1998). The details their bodies construction associated with their silent flight were been noted. Their silent flight is possible thanks to the special structure of their feathers (Anderson, 1973). Their secondary flight feathers are cut in the shape of the teeth at the leading edges and the combs of the trailing edges. This design of feathers/wings is one of the natural adaptations for silent flight owls. Such comb is a characteristic feature only for the owls (Bachmann et al., 2007). It was also discovered that their wing with velvet surface causes the smaller vortices, which leads to the stabilization flow field at low speeds. Another feature of the owl adapts her to silent flight is very soft plumage of the abdominal part and legs, whose task is to absorb the sounds coming from the their flight (Sarradj et al., 2010).

The attempts transfer some elements (notches) from the wing of the owl (*Tyto alba*) to the profiles was been published in several publications. The effects of noise reducing by cutting the regular teeth of the trailing edge of profiles or blades were been studied (Howe, 1978; 1991; 1998). The result depend on the size of the teeth, the width between the top of the teeth, angle of attack blade, Reynolds number, etc. The some results of cutting the leading edge of the fan blades on the aeroacoustical parameters are reported in the literature (Soderman, 1973). Studies on acoustics of serrated fans were carried out in research centers in China (Lian et al., 2010). But all in these investigations mainly the regular teeth was tested. These studies should be complemented by the use of different types of notches and attempt to explain the phenomena occurring at the edges of cutouts.

In the Aeroacoustic Laboratory studies the modifications of the trailing edge of the flat plates were been taken. Based on studies on the structure of feathers and wings of owls have been proposed cut in the forms the elliptical arcs or rectangular and isosceles teeth. For each of the examined plates the tests were conducted for different values of Reynolds number and FFT spectrum was recorded in the whole frequency range. Conducted research the

aerodynamic noise generated by these modifications showed that the cutting in the regular form of teeth will decrease the level of the acoustic spectrum in certain frequency range. But in other frequency ranges observed increase the spectrum of the sound pressure. The other forms of the cutting gave the similar acoustical spectrum. Generally, if the height of teeth were greater and the width between the top of the teeth was smaller than the better was the acoustical effect. That means that the better was the scattering of acoustic waves by these form of modifications. This contributed to a decrease of the sound pressure level. Also the aerodynamic parameters were more aligned, for example the velocity distribution behind the serrated flat plate were more leveled than behind the flat plate. These studies suggest that the cutting of the trailing edges of the flat plate contribute to the reduction of aerodynamic noise generated by these.

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