

Winglet in an Aircraft

In the present context, the most efficient and safe form of long distance travel is by an Aircraft. Currently, engineers and scientists throughout the world are working to improve the performance and reliability of the Airplane. One of the results of such research gave rise to the use of winglet, which is a taper shaped structure used at the tip of the aircraft wing for the reduction of induced drag which improved performance of the Aircraft as a whole.

There are various drags that resist the movement of the airplane and impede its efficiency. But presently we are interested in induced drag which is one of the major drags. Induced drag can't be avoided since it arises from the pressure difference of the air between the lower surface and the upper surface of the wing in a flight, which is the actual source for the lift. At the wing tips, the two air flows with variable pressure get mixed with each other which produces vortices at the wing tips giving rise to induced drag. The vortices formed near the wingtips alter the direction of the free-stream air affecting the angle of attack of the wing. This causes the tilting of the Lift Force making an angle with the normal, inducing a backward Lift Force component named induced drag. The use of winglet reduces the size of the wingtip vortex as well as alters the flow of the vortices created by the wing avoiding excess effect on the free stream wind. This decreases the induced drag, improving five percent of fuel efficiency, saving 500,000 gallons of fuel per airline per year and reducing five percent in Carbon dioxide emission.

The idea of a winglet is one of the several improvements and modifications implemented in the aircraft structure after various research and analysis, to make the air transportation the most cost efficient in terms of fuel and the safest means of transportation compared to any other transportation available.

Keywords: Lift, Drag, Induced drag, Winglet