Introduction to Aircraft Design
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Lecture - 27
Winglets

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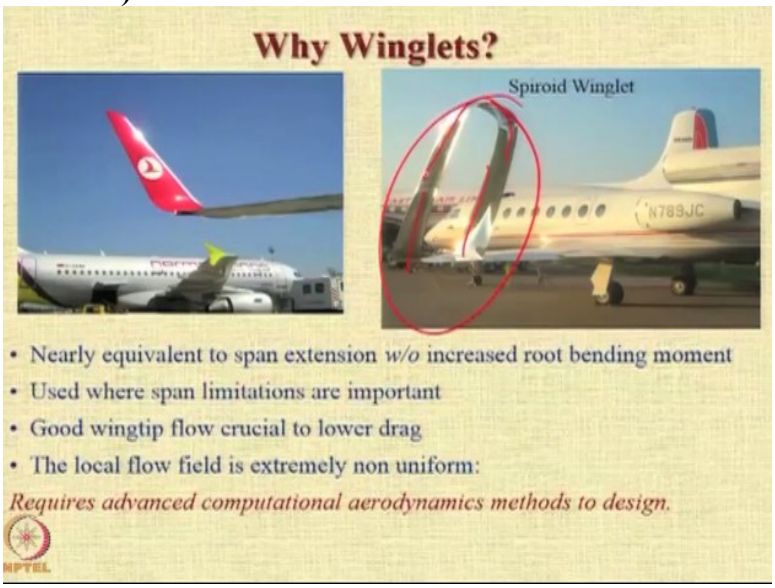

Another interesting variation that you see are winglets, winglets are essentially used to reduce the strength of the wingtip vortex and hence, reduce the induced drag. In some cases, we also provide winglets, where we have a limitation on the span. There are various types of winglets there could be simple upward bend type winglets or there could be more complicated ones, such as a winglet, which has got something on the top and something on the bottom, you can have the winglets of this particular type also.

And when you install winglets the performance of the wing is nearly equivalent to the span extension without the increased root bending moment, one can always go for span extension, but then when you extend the span, you get a higher aspect ratio indeed. So the wingtip vortex is weakened, but you also get larger wing root bending moment and hence, you have to design the aircraft wing to carry larger moment.

So, the wing will become little bit heavier by providing a winglet you provide a span extension effect without creating this additional root bending moment. And good wingtip flow is crucial to lower drag. In fact, if you do not design it carefully, you might actually end

up messing the wing tip flow and increase the drag the local flow field at the tips of the wing is highly non uniform.

And hence, it is very important that very accurate aerodynamic estimation techniques are used or precise wind tunnel testing is used to design the winglets. There are also some variations like this, which are a spiroid winglet, where you have not 1 but 2 winglets and join together and you know there are many advantages of this related to how the vortex and the tips is manipulated. Thanks for your attention we will now move to the next section.