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Commentary on Aeronautics and Aerospace Engineering

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I have two aeronautical questions for which I would like to have information. I do hope that these questions may have already been answered by those currently working in the fields of flight-testing and aeronautics but, just in case they have not, they are as follows:

Which is the most accurate and tested manner of using pressure-belts for obtaining flight-pressure measurements on aircraft that have significant leading-edge vertical flows?

My colleagues and I have obtained useful results with pressure-belts oriented both perpendicular to the leading-edge on a 60 degree delta-wing aircraft (F-106B-reported in NASA TP-3374) as well as stream wise on a cropped arrow aircraft (F-16XL-1-reported in NASA/TP-2001-210629). Stream wise is best for integrating the pressure data at specific butt lines, plus the ports can be staggered along these belts so that data can be plotted /integrated at constant fuselage-stations. But for wings with significant vertical flows, I have not seen the answer to the pressure-accuracy question. (I am familiar with the paper by Poisson-Quinton, Philippe. Eight Theodore von Karman Memorial lecture: Slender Wings for Civil and Military Aircraft. Israel Journal of Technology 1978;16(3):97-131 in which Concorde flight- and wind-tunnel-pressures compare very well, but I do not know the details of how the flight-pressure data was obtained.)

The question goes away if one can use holes in the structure for the pressure-measurements, but that is not always possible in aircraft-due to its wet wing-as it is for a wind-tunnel model. I know that for sharp-edged delta-wing wind-tunnel models, a preferred placement of these holes is along rays, emanating from the apex, that correspond to fixed longitudinal-locations; this enables one to look for stream wise changes in the vortex structure and the onset of the trailing-edge influence.

Why is there a difference in commercial jet-transport wing-tip designs?

I am familiar with the work of Dr. Richard Whitcomb of NASA Langley Research Center in terms of his upper- and lower-winglets to increase the aerodynamic-thrust at the wing-tips during transonic speeds, as I was a NASA reviewer of the paper. Through careful tailoring of the winglets, his solution could also be used to reduce the wing-root bending moment.

Some commercial aircraft use mostly a full-chord upper-winglet while others have a basic triangle at the tip extending both above and below the wing. I am sure there are analytical and experimentally-verified reasons why there should be these two different solutions for this problem and would be interested in the answer. I do understand that some of the rationale may be company sensitive.

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