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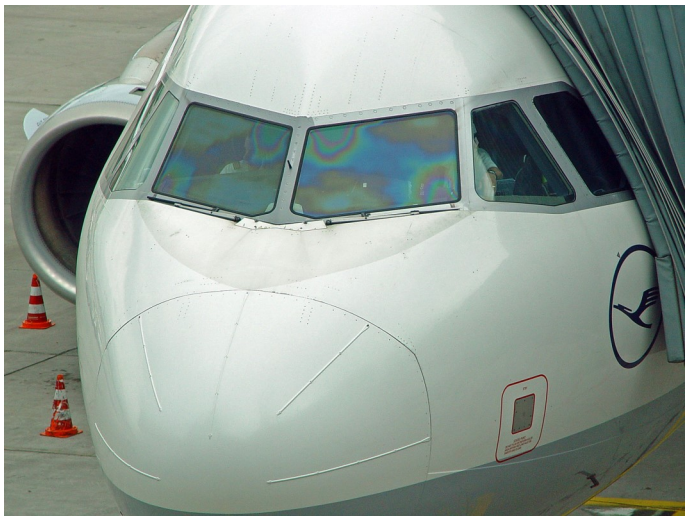
Physics 203

Week 03 quiz | Corvallis

4/14/2021

Collaboration is not allowed. You will have 25 minutes to download this PDF, solve, take pictures, AND upload this exam to Gradescope. You will have an additional 5 minute buffer in case technological issues arise.

Aircraft windows are complex structures made from glass, acrylic, interlayers, and electrical devices. The interlayers in the windows are used for anti-fog and de-icing purposes. It turns out that these interlayers are thin materials (typically Indium tin oxide) which are thin enough that interference patterns can be seen when sunlight (white light) shines on the windows as seen in the image. Let's simplify the construction of the aircraft window as follows: the layer on the inside of the plane is a thin layer of Indium tin oxide (index of refraction of about 2.05), and the second layer which is directly connected to the first layer and exposed to the outside of the plane is a thick piece of acrylic (index of refraction of about 1.50).



By Etan J. Tal - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=26174866

(a) Using this simplified model, what would be the second thinnest layer of the Indium tin oxide in the region of the windows that is brightly reflecting blue light (λ_{wacuum} = 430 nm)? Assume the sunlight is always perpendicular to the surface of the window. The sunlight is coming from the outside of the plane, and you are viewing the window from the outside as well.

(b) Is the layer of Indium tin oxide a uniform thickness? Use the image to justify your answer.