Subject: Sound and Elevation Posted by Azuri on Thu, 12 Dec 2013 16:59:59 GMT View Forum Message <> Reply to Message

I was cooking dinner last night and part of the directions for what I was fixing stated that different oven temperatures are needed for higher elevations.

It got me to thinking. Do changes in elevation effect sound waves? (I know, I've got a weird mind sometimes ) Where the air is thinner, do sound waves travel faster for instance?

Subject: Re: Sound and Elevation Posted by Wayne Parham on Thu, 12 Dec 2013 17:16:27 GMT View Forum Message <> Reply to Message

Yes, the speed of sound is different at different elevations, and at different temperatures for any other reason, for that matter. But the difference is small, at least in the temperature range you are comfortable being in.

Subject: Re: Sound and Elevation Posted by Chicken on Thu, 12 Dec 2013 17:47:38 GMT View Forum Message <> Reply to Message

Wayne's got it. It makes sense that as temperature changes, the speed of sound changes.

Subject: Re: Sound and Elevation Posted by Cask05 on Fri, 13 Dec 2013 15:28:22 GMT View Forum Message <> Reply to Message

Azuri wrote on Thu, 12 December 2013 10:59Do changes in elevation effect sound waves?...Where the air is thinner, do sound waves travel faster for instance? No, they don't: it's a function of temperature only:

http://en.wikipedia.org/wiki/Speed\_of\_sound#Practical\_formula\_for\_dry\_air

If you've ever wondered about the speed of high performance aircraft/missiles at relatively high altitudes, it's a function of temperature at that altitude, and it's a surprise to most people that as you ascend from the earth's surface, the temperature isn't monotonically decreasing vs. altitude...

http://en.wikipedia.org/wiki/File:Comparison\_US\_standard\_atmosphere\_1962.svg

This also affects the performance of horn-loaded speakers that operate outside: at room

temperature, speed of sound (celerity) is 1132 ft/s, while at 32 F (zero C) it's 1087 ft/s. In Texas on a hot summer day, the speed at 40 C (104 F) is about 1162 ft/s, which is about 7% faster than at zero C.

It makes a difference in crossover points using horns close to their cutoff points.

Subject: Re: Sound and Elevation Posted by Wayne Parham on Fri, 13 Dec 2013 16:19:25 GMT View Forum Message <> Reply to Message

As an aside, have you ever been on a plane that showed altitude and temperature outside? It's pretty amazing how cold it is at 35,000 feet.

Subject: Re: Sound and Elevation Posted by Cask05 on Fri, 13 Dec 2013 16:47:27 GMT View Forum Message <> Reply to Message

About -72F, generally speaking...

Subject: Re: Sound and Elevation Posted by Azuri on Sat, 14 Dec 2013 15:57:07 GMT View Forum Message <> Reply to Message

Temperature? I never would have guessed that. I can understand a humidity factor because the air is heavier with the moisture, but why does sound speed up as it gets hotter?

Subject: Re: Sound and Elevation Posted by Cask05 on Sat, 14 Dec 2013 18:31:59 GMT View Forum Message <> Reply to Message

From the same Wikipedia article http://en.wikipedia.org/wiki/Speed\_of\_sound#Dependence\_on\_the\_properties\_of\_the\_medium:

"At a constant temperature, the ideal gas pressure has no effect on the speed of sound, because pressure and density (also proportional to pressure) have equal but opposite effects on the speed of sound, and the two contributions cancel out exactly."

from http://www.ndt-ed.org/EducationResources/HighSchool/Sound/tempandspeed.htm

"Temperature is...a condition that affects the speed of sound. Heat, like sound, is a form of kinetic energy. Molecules at higher temperatures have more energy, thus...sound waves can travel more quickly."

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