PHYSICS

THE SPEED OF SOUND

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When a stone is dropped into a pond. Ripples of disturbance propagate outwards at a specific speed. The same is true for sound. When a sound wave is created, it travels through a given medium at constant speed.

Sound will travel ***faster*** through mediums that are ***more dense***. This is because the transfer of energy from one molecule to the next happens much faster due to the closeness of the particles.

Temperature also plays a role. The warmer the substance, the faster sound will travel through it. So, sound will travel at different speed through air due to the variance in temperature. The speed of sound in air can be calculated by:

Ex: What is the speed of sound in air at **(a)** 20°C and **(b)** -20°C?

a)

b)

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MACH NUMBER

Some vehicles have the ability to travel faster than the speed of sound. Because they are travelling so fast, a new unit was created to better describe their speeds. This new unit is called the ***Mach Number***.

Mach Number:

Thus, if an object is travelling exactly the speed of sound ...

This means the object is travelling .

Ex: The speed of sound at 0°C is 332 m/s, What is the mach number of a plane travelling at 1800 km/h?

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THE DOPPLER EFFECT

Like a stone dropping into a pond, sound moves away from a source in waves. However, this wave pattern changes when the source is in motion ...

Notice in the moving object, the sound waves bunch up in front of the object. This will change the frequency of the sounds waves. The waves in front of the object will have a shorter wavelength (higher pitch) and the waves behind the object will have a longer wavelength (lower pitch).

http://www.youtube.com/watch?v=ZPJyYaXhuv4

http://www.youtube.com/watch?v=XZaDqLk8ids&feature=related

http://www.youtube.com/watch?v=GvtAElaDVz8&feature=related

Breaking The Sound Barrier

If an object moves fast enough, faster than the speed of sound, it will rip through the bunching of vibrations that have built up in front of it. When this happens, a ***SONIC BOOM*** occurs as the air molecules are literally ripped apart.

http://www.youtube.com/watch?v=LbqDYbnmKbA