

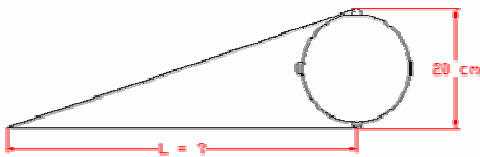


JETS Challenge 124
Fighter Pilots Use Sound to Locate Enemies

According to NASA research, people can discriminate sound source locations within 2 degrees of angular separation, a time difference of about 15 microseconds (μs) in the most sensitive region directly in front of the listener. The researchers plan to use this auditory signal accuracy to help fighter pilots locate ground enemies by “hearing” where their radar signals are coming from.

During a test, a sound source is located directly in front of the left ear of a subject. Assume their head is 20cm wide and that sound travels at 335 m/s and the signal takes 15 microseconds (μs) to reach the right ear.

The Challenge: Determine the distance in meters (m) in front of the listener the source is located.



$$xm = \frac{335m}{1s} \cdot 15\mu s \cdot \frac{1s}{1,000,000\mu s} = 0.005025m$$

$$(L+0.005025)^2 = 0.2^2 + L^2$$

$$L^2 + 0.01005L + 2.5250625 \times 10^{-5} = 0.04 + L^2$$

$$0.01005L = 0.039974$$

$$L=3.97 \text{ m} \cong 4 \text{ m}$$

ANSWER: 4 m

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JETS Challenge problems are generously provided by Dave Meredith, Associate Professor, Penn State University-Fayette