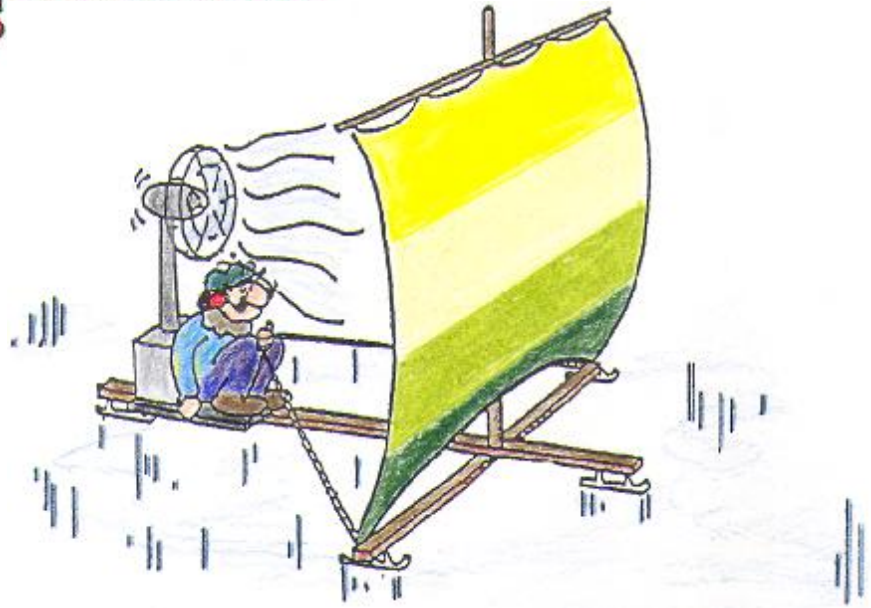
NEXT-TIME QUESTION



An ice sail craft is stalled on a frozen lake on a windless day. A large fan blows air into the sail. If the wind produced by the fan strikes and bounces backward from the sail, the sail craft will move

a) to the left (backward).
b) to the right (forward).
c) not at all.

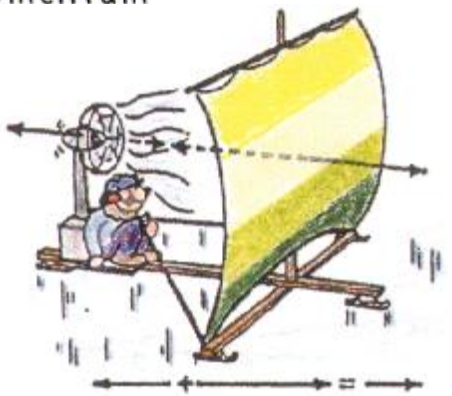
NEXT-TIME QUESTION

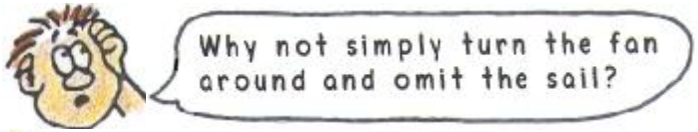
An ice sail craft is stalled on a frozen lake on a windless day. A large fan blows air into the sail. If the wind produced by the fan strikes and bounces backward from the sail, the sail craft will move

a) to the left (backward).
b) to the right (forward).
c) not at all.

Answer: b

You might think the sail craft wouldn't move—that the force of wind impact on the sail would be balanced by the reaction force on the fan—which would be true if the wind came to an abrupt halt upon striking the sail. But it doesn't. The wind bounces from the sail and produces a greater force on the sail than if it merely stopped (like any collision, more force is required to reverse the direction of something than to merely start or stop it). So there is a net force on the sail craft and a forward acceleration. Or consider impulse and momentum. The impulse on the sail is greater than the impulse on the fan. Why? Because the air undergoes more change in momentum bouncing from the sail than starting from the fan. Note there are two force pairs to consider: (1) the fan-air force pair, and (2) the air-sail force pair. Because of bouncing, the air-sail pair is greater. Solid vectors show forces exerted on the sail craft; dashed vectors show forces exerted on the air. The net force on the sail craft is forward, to the right.





CONCEPTUAL Physics

ARBOR SCIENTIFIC
TOOLS THAT TEACH.