

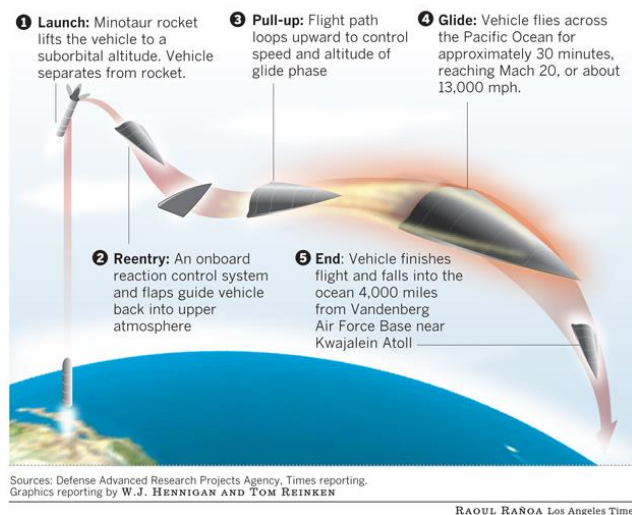
WORK-ENERGY

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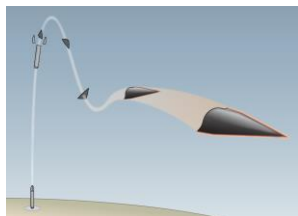
Race for Latest Class of Nuclear Arms Threatens to Revive Cold War

The flight test of the experimental Falcon Hypersonic Technology Vehicle 2, capable of reaching 20 times the speed of sound, ended during its glide phase after it stopped sending telemetry data about 20 minutes into a scheduled 30-minute mission. Here's how the flight was to have occurred:



Fast, Precise and Deadly

A new type of weapon called a **hypersonic glide vehicle** is being developed by both the United States and China. It is an ultrahigh-speed **warhead that can travel up to 17,000 miles per hour.**



DESCENT: The vehicle rises to the edge of space and then descends, guided by aerodynamic controls.

GLIDE: The vehicle glides at speeds of more than a mile a second. It can also maneuver erratically to avoid antimissile defenses.

SEPARATION: The glide vehicle separates from its booster rocket.

PULL UP: Unlike a ballistic missile, which travels in a parabolic arc, the glide vehicle is able to pull up and transition to a glide.

IMPACT: **(((The vehicle dives and hits its target. Because the vehicle travels so quickly, the energy of impact can act as a bomb,))) even without an explosive warhead.**

LAUNCH: The glide vehicle is launched by a booster rocket.

By control of President Xi Jinping, [is flight-testing a novel warhead](#) called a “hypersonic glide vehicle.” It flies into space on a traditional long-range missile but then maneuvers through the atmosphere, twisting and **careening at more than a mile a second.** That can render missile defenses all but useless.

INTRODUCTION: This **Hypersonic Glide Vehicle (HGV)** 13,000 to 17,000 mph. It has **a mass of 907 kg.** according to sciencedirect.com. As article below from the New York Times, “The vehicle dives and hits its target. **Because the vehicle travels so quickly, ((the energy of impact can act as a bomb,)))**” These weapons are called directed-energy weapons. A way of measuring energy of a bomb is Tons of TNT.

1 Ton of TNT produces 4.184×10^9 Joules.

QUESTIONS: (a) Convert 17,000 mph to m./s.? (b) Compute kinetic energy (in joules)of this weapon at impact? (c) For the kinetic energy you found in (b) find how many tons of TNT that KE is equivalent to?

HINTS: $0.446944 \text{ m./s.} = 1 \text{ mph}$, linear kinetic energy = $\frac{1}{2} m v^2$,

ANSWERS: (a) 7598.06 m./s. (b) $\sim 26.18 \times 10^9 \text{ J}$, (c) 6.26 Ton TNT