NAME _____

DATE _____

CLASS _____

SPACE TECH SERIES

Elon Musk & SpaceX

Lowering the Cost of Reaching Orbit

The Engineering of Reusable Rockets

Elon Musk founded SpaceX in 2002 with the goal of making spaceflight far less expensive. The biggest reason rockets cost so much is that most of them are used only once. Each launch threw away millions of dollars of hardware.

SpaceX focused on making the first stage, or booster, reusable. After lifting the rocket partway to orbit, the booster separates, flips around, restarts its engines using fuel it saved for the return, and guides itself back down. It uses grid fins to steer and legs to land upright on a pad or on a floating drone ship at sea.

On December 21, 2015, a Falcon 9 booster made the first successful upright landing after an orbital launch. Since then, SpaceX has flown and landed the same boosters many times. The Falcon 9 can carry about 22,800 kilograms of payload to low Earth orbit.

SpaceX also carries people. In 2020, the Crew Dragon spacecraft flew NASA astronauts to the International Space Station on the Demo-2 mission. The company is now developing Starship, a fully reusable heavy-lift vehicle designed to carry even larger payloads.

Part 1 · Reading Comprehension

1. According to the passage, why were rockets so expensive?

_____

_____

2. Describe the steps a Falcon 9 booster takes to land.

_____

_____

3. What did the Demo-2 mission accomplish in 2020?

_____

_____

4. What is Starship designed to be?

Part 2 · Critical Thinking

Reusing a booster requires carrying extra fuel and landing legs, which adds weight. Why might SpaceX accept carrying that extra weight anyway?

Part 3 · STEM Challenge

Cost Savings From Reuse

Suppose building one booster costs $50 million. SpaceX flies a single booster on 10 launches instead of building a new booster each time.

1. Without reuse, 10 launches need 10 boosters. What is the total booster cost? (10 × $50 million)

2. With reuse, only 1 booster is built for all 10 launches. What is that cost?

3. How much money is saved by reusing the booster? (Subtract.)

4. What percent of the booster cost was saved? (Savings ÷ original cost × 100)