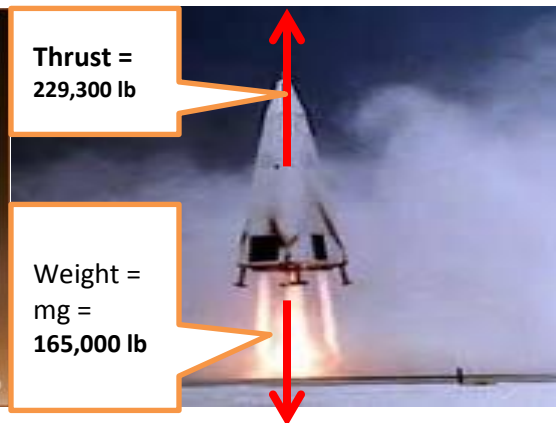
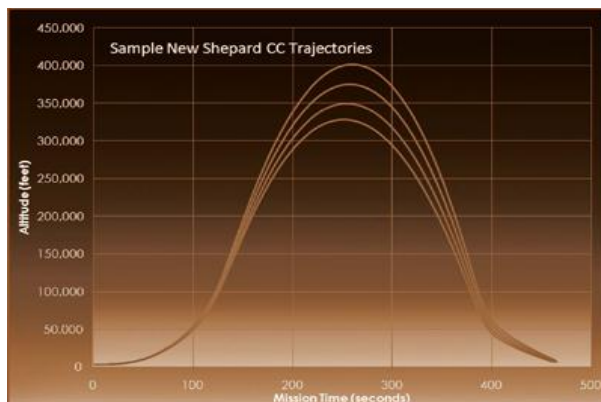


NEWTON'S 2ND LAW & KINEMATICS Units 7,5

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& NYTimes September 3, 2011 by Kenneth Chang

Rocket Financed by Amazon Founder Crashes in Test A spacecraft financed by Jeffrey P. Bezos, the billionaire chief executive of Amazon.com, crashed during a test **flight in West Texas.**



QUESTIONS: (a) Find the mass in slugs of the spacecraft? (b) What is the net force on spacecraft at blastoff? (c) What is the acceleration of the spacecraft (use characteristic data below) at launch time as seen in picture at right? (c) The attempt at flight on August 24, 2011, was not successful as reported below. It went from rest to 1.2 times speed of sound (1126 ft/s) to 45,000 ft. Find the spacecraft's acceleration with this data in the first 45,000 feet? (d) Why might the answer to (c) be different than the answer in (d)?

ANSWERS: (a) 5156.25 slugs, (b) 64,300 lbs. , (c) $\sim 12.5 \text{ ft./s}^2$ (d) $\sim 14.1 \text{ ft./s}^2$ (e) Note mass at start vs mass unfueled. Maybe this mass differential has some cause for the slight difference in the accelerations????? You may another reason.

Characteristics of New Shepard Spacecraft

Crew Size: 4.

Gross mass: 75,000 kg (165,000 lb) .

Unfuelled mass: 20,569 kg (45,346 lb) .

Height: 15.00 m (49.00 ft) .

Diameter: 7.00 m (22.90 ft) .

Thrust: 1,020.00 kN (229,300 lb) .

Specific impulse: 260 s.

First Launch: 2006.11.13.

No one was on board for the flight, and no one on the ground was injured when the spaceship went out of control on Aug. 24, 2011. After the crash was [reported Friday afternoon](#) on The Wall Street Journal's Web site, [Mr. Bezos](#)

[acknowledged the failure](#) on the Web site of his space company, Blue Origin. **The vehicle reached an altitude of 45,000 feet and a speed of 1.2 times the speed of sound** before a "flight instability" occurred. "Not the outcome any of us wanted," Mr. Bezos wrote, "but we're signed up for this to be hard, and the Blue Origin team is doing an outstanding job. We're already working on our next development vehicle." The company released a photograph of the stubby cylindrical rocket in flight before the malfunction.

Blue Origin, based in Kent, Wash., is developing **a suborbital spaceship called New Shepard**, which is to take off and land vertically for carrying people to the near edge of space. Blue Origin is one of several companies aiming to **fly tourists above the 62-mile altitude that is typically considered the edge of outer space, offering a few minutes of weightlessness.** The company also has a contract with [NASA](#) as part of its so-called commercial crew program to develop a system that can take astronauts to orbit. The crash was not related to the NASA work.