

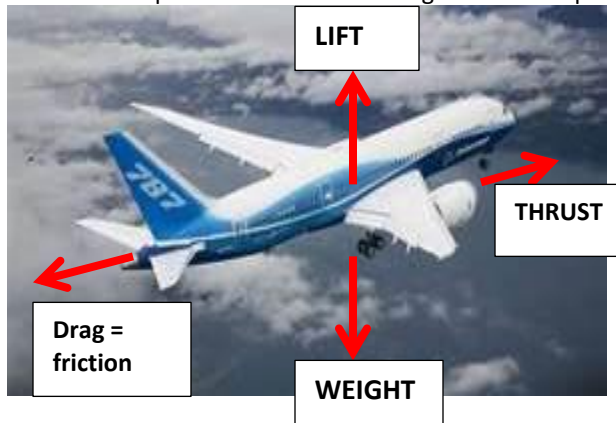
WORK-ENERGY

Dr. John P. Cise, Professor of Physics, Austin Community College, 1212 Rio

Grande St., Austin Tx 78701 jpcise@austincc.edu & NYTimes Dec. 5,2012 by Christopher Drew & Jad Mouawad

United 787 Loses Speed and Lands Early

A new [Boeing 787 Dreamliner](#) flown by [United Airlines](#) was diverted in midflight to New Orleans on Tuesday because of concern about a possible mechanical problem. **(((The plane was headed to Newark from Houston when it descended over a 10-minute span to 31,000 feet from 41,000 feet and slowed to 480 miles an hour from 655, according to [FlightAware.com](#), a data provider)))** The plane, which carried 174 passengers and 10 crew members, then rapidly recovered its speed and turned sharply to the south over Mississippi, according to the Web site's flight log. After the incident, United, the first North American carrier to fly the new planes, was examining one of the jet's generators, units that provide electrical power to the plane's engines, according to a person with knowledge of the situation. United and [Boeing](#) both said it was too early to determine the cause of the incident. Boeing introduced the 787, the first passenger jet made substantially of lightweight carbon composites to save fuel, with fanfare just over a year ago. Production problems delayed work on the planes for several years, so aviation experts have been watching to see if the planes live up to their billing.



INTRODUCTION: 787 Dreamliner's weight = 500,000 lb.

QUESTIONS: (a) Convert 655 mph and 480 mph to Ft./s.? (b) Find the 787's kinetic (K) and potential energy(U) at 41,000 ft.? (c) Find this Dreamliner's K and U at 31,000 ft.? (d) Find total energy at 41,000 ft. and 31,000 ft. (e) Find total energy difference between 41,000 ft. and 31,000 ft.? (f) Where did this energy loss go? (g) Find plane's ave. speed(mph) descending from 41,000 ft. to 31,000 ft.?(h) Find linear distance (miles) traveled descending 41,000 ft. to 31,000 ft.over 10 minutes ? (i) Convert linear distance in (g) to ft.?(j) Find friction Drag force on 787 descending 41,000 to 31,000 ft?

HINTS:W(weight)=mg , g = 32 ft/s² , 88 ft/s. = 60 mph 1 mi. = 5280 ft. Work = F X , W(work) = (delta)K + (delta)U

ANSWERS: (a) 655 mph = 960.67 ft/s. , 480 mph = 704 ft./s. (b) K = 7.21 X 10⁹ ft. lb., U=20.5 X 10⁹ ft.lb. (c) K=3.872 X 10⁹ ft.lb., U= 15.5 X 10⁹ ft.lb. (d) E (41,000 ft.) = 27.71 X 10⁹ ft.lb. E(31,000 ft.)=19.37 X 10⁹ ft.lb. (e) - 8.34 X 10⁹ ft.lb. (f) _____ (g) 567.5 mph ,(h) 94.6 mi. (i) 499,488 ft. (j) ~ 16,700 lb.