NEWTON'S 2ND LAW

Units 6 & 7

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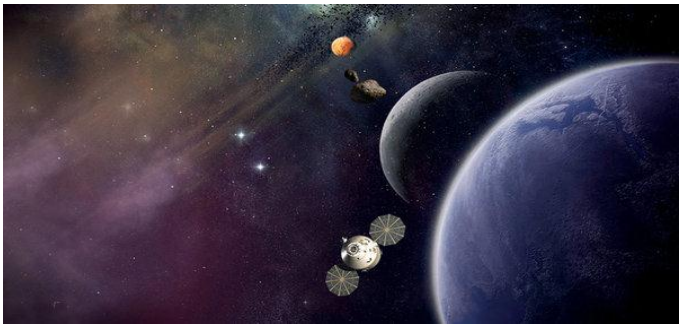
& NYTimes September 15, 2011 by Kenneth Chang

NASA Unveils New Rocket Design: SPACE LAUNCH SYSTEM(SLS)



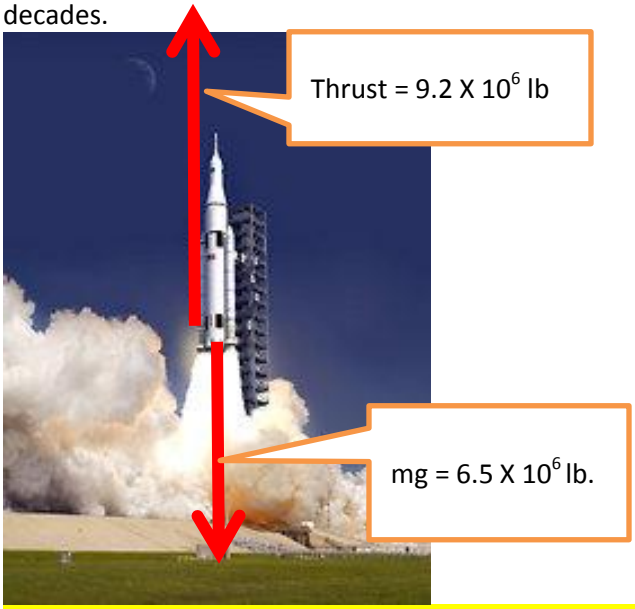
An illustration of NASA's planned Orion Multipurpose Crew Vehicle, showing possible destinations **for future astronauts beyond Earth's orbit, including the moon, an asteroid and Mars.**

INTRODUCTION: NASA states the SLS rocket will weight 6.5 x 10^6 lb. and have a thrust of 9.2 X 10^6 lb.

QUESTIONS: (a) Find the mass of SLS at time of launch? (b) Find the net force on SLS at launch? (c) Find acceleration of SLS at time of launch off? (d) How fast(V in ft/s and mph) will SLS be traveling at end of first 20 s? (e) How far(in ft & miles)did the SLS go in the first 20 s? HINTS: 88 ft/s = 6O mph, 5280 ft = 1 mile , F_{net} = ma (Newton's second law)

ANSWERS: (a) 203,125 slugs (b) 2.7 X 10^6 lb. (c) ~ 13.3 ft/s^2 (d) ~266 ft/s or ~ 181.4 mph (e) ~ 2,660 ft or ~ 0.5 miles

To push farther out into the solar system — to the moon and beyond, to asteroids, eventually to Mars — NASA unveiled plans on Wednesday for a behemoth rocket that would serve as the backbone of its human spaceflight program for decades.



The finished rocket would be the most powerful ever to rise from the gravitational bonds of Earth.

"We're investing in technologies to live and work in space, and it sets the stage for visiting asteroids and Mars," the NASA administrator, Maj. Gen. Charles F. Bolden Jr., said at a news conference in Washington.

The megarocket, blandly named the Space Launch System, embodies the space agency's enduring desire to aim far and dream bigWilliam H. Gerstenmaier, the agency's associate administrator for human exploration, said NASA expected to devote $3 billion a year to the effort, or a total of about $18 billion over the next six years.

That would be enough to finish a rocket capable of lifting 70 metric tons into orbit; the largest unmanned rockets currently available can lift about one-third that much. The first unmanned test flight is scheduled for 2017.

The design would evolve to larger versions that **could lift up to 130 metric tons**. (The Saturn V rocket that powered the Apollo Moon exploration program could lift 120 metric tons.)

NASA also announced plans for a competition to **design more powerful boosters(2), each providing 3.9 million to 5 million pounds of thrust,** for the more powerful version of the rocket.