

# POWER = F v,

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**COMMENT #2 by author:** For takeoff and landing, 12 smaller 9-kilowatt motors powering two-foot-wide propellers will kick in to blow extra air over the skinny wings to generate the necessary lift. For the X-57, the NASA researchers are designing narrower wings that are efficient during cruise flight. Thus, for sufficient lift on takeoff 12 smaller 9 Kw ...2 ft. diameter props are turned on to produce blowing air over narrow wings

**INTRODUCTION:** Purpose of this application is to find the force forward the two 60 KW electric propeller motors cause when plane is cruising at 175 mph.

**QUESTIONS:** (a) Convert 60 KW to horsepower? (b) Convert HP of 60 KW to ft. lb./s.? (c) Convert 175 mph to ft./s.? (d) Find total force (in lb.) combined Engines produce ON plane? (e) Find frictional force on plane when cruising at 175 mph?

**HINTS:** 746 Watts/HP, 550 ft. lb./s. = 1 HP  
60 mph = 88 ft./s.

**ANSWERS:** (a) 80.4 HP , (b) 44,220 ft. lb./s.  
(c) 256.7 ft./s., (d) 344.53 lb., (e) 344.53 lb.

**COMMENT #1 by author:** Note going at constant velocity implies acceleration is zero and thus the horizontal forces on plane in flight must add up to zero. Thus, the force forward by two electric motors on wing tips is balanced by air friction back on plane.

An artist's concept of NASA's X-57 Maxwell aircraft showing the plane's specially designed wings and 14 electric motors. A new experimental airplane being built by [NASA](#) could help push electric-powered aviation from a technical curiosity and pipe dream into something that might become commercially viable for small aircraft. At a conference on Friday of the [American Institute of Aeronautics and Astronautics](#) in Washington, Charles F. Bolden Jr., the NASA administrator, announced plans for **an all-electric airplane designated as X-57, part of the agency's efforts to make aviation more efficient and less of a polluter.**

"The X-57 will take the first giant step in opening a new era of aviation," Mr. Bolden declared. The steps taken by NASA will not translate into all-electric cross-country jetliners. But the agency hopes the technology can be incorporated into smaller, general aviation and commuter aircraft some years from now. The X-57 will look more like a Cessna, unlike some of NASA's earlier sleek, futuristic X-planes. Its cruising **(((speed might hit 175 miles per hour)))**. **Its wings, however, will be unique — far skinnier than usual and embedded with 14 motors.**

"The **problem with traditional aircraft design is you have to size the wings so that you have safe takeoff and landing speeds, and so the wing tends to end up bigger than you need for cruise flight,**" For the X-57, the NASA researchers are designing narrower wings that are efficient during cruise flight, **(((powered by two 60-kilowatt electric motors at the wingtips)))** that spin five-foot-wide propellers. **For takeoff and landing, 12 smaller 9-kilowatt motors powering two-foot-wide propellers will kick in to blow extra air over the skinny wings to generate the necessary lift. In flight, the smaller propellers are folded away.** The NASA researchers have nicknamed the new plane "Maxwell," after James Clerk Maxwell, a 19th-century Scottish physicist who came up with the basic equations underlying electromagnetism.