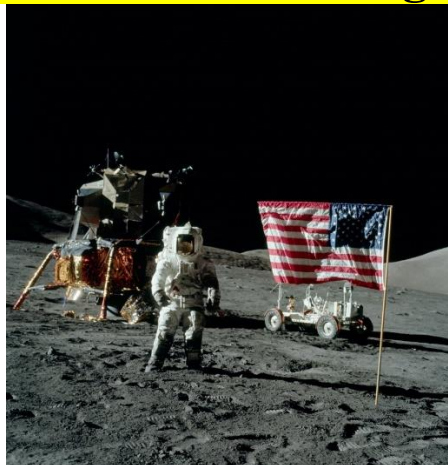


# PROJECTILES

Unit 9 Dr. John P. Cise, Professor of Physics, Austin Com.

College, 1212 Rio Grande St., Austin Tx 78701 [jpcise@austincc.edu](mailto:jpcise@austincc.edu) & NYTimes Feb. 5, 2016 by Richard Goldstein

## Edgar D. Mitchell, Sixth Moonwalking Astronaut, Dies at 85



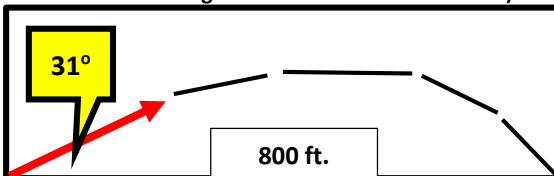
Commander Mitchell moving across the moon in February 1971.

Edgar D. Mitchell, who became the sixth man to walk on the [moon](#) as a member of [NASA](#)'s first lunar mission devoted exclusively to scientific research, died Thursday at a hospice in West Palm Beach, Fla. He was 85.

**The Apollo 14 flight, launched on Jan. 31, 1971, took Commander Mitchell and his fellow Navy officer, Capt. Alan B. Shepard Jr.,** to the moon's Fra Mauro highlands. Captain Shepard had been America's first man in space 10 years earlier. Maj. Stuart A. Roosa of the Air Force remained in orbit snapping photographs of potential sites for future missions while awaiting his colleagues' return in the lunar module.

The first two flights to the moon — the epic Apollo 11 of July 1969 with Neil Armstrong and Buzz Aldrin, and Apollo 12 four months later — were largely devoted to testing whether men could survive there, albeit it for a brief period. Apollo 13's scheduled moon landing had been aborted by a near-disastrous oxygen tank explosion.

**Another Apollo 14 moment having nothing to do with rocks was provided by Captain Shepard, who took three golf balls with him to the moon. (((Wielding a makeshift 6-iron, he hit a shot))),** televised back to Earth, that traveled "miles and miles and miles," as he put it, in **(((lunar gravity only one-sixth that of the Earth. (The shot was presumed to have gone more than 800 feet,)))** more than six times his normal range with a 6-iron back on Earth.)



**INTRODUCTION:** Moon gravity, as said above, about 1/6 earth gravity =  $5.33 \text{ ft./s}^2$ . 6 irons have a loft angle of  $31^\circ$  to horizontal. The speed of golf ball is 1.5 the speed of the golf club due to momentum conservation. This application purpose is to find speed of Ball off makeshift club face on moon and speed at which the astronaut's makeshift 6 iron hit the ball. Actually, he hit it with one arm swing.

### QUESTIONS:

- Find initial speed of this golf ball on the moon?
- Find this ball's flight time on the moon?
- Find speed of 6 iron as it hits the golf ball on moon ?

**HINTS:** Break solution into horizontal and vertical parts.  $X = v t$   
 $X = v_0 t + \frac{1}{2} g t^2$ ,  $g_{\text{EARTH}} = 32 \text{ ft./s}^2$ ,  $60 \text{ mph} = 88 \text{ ft./s}$ .

**ANSWERS:** (a)  $\sim 69.6 \text{ ft./s}$ ,  $47.43 \text{ mph}$ , (b)  $\sim 13.4 \text{ s}$ ,  
(c)  $46.4 \text{ ft./s}$  or  $\sim 31.6 \text{ mph}$