indicated horsepower gives no indication of how much actual power is delivered to the propeller shaft for doing useful work. However, it is related to actual pressures that occur in the cylinder and can be used as a measure of these pressures.

To compute the friction loss and net power output, the indicated horsepower of a cylinder may be thought of as two separate powers, each producing a different effect. The first power overcomes internal friction, and the horsepower thus consumed is known as friction horsepower. The second power, known as brake horsepower, produces useful work at the propeller. That portion of IMEP that produces brake horsepower is called brake mean effective pressure (BMEP). The remaining pressure used to overcome internal friction is called friction mean effective pressure (FMEP). *[Figure 1-41]* IMEP is a useful expression of total cylinder power output, but is not a real physical quantity; likewise, FMEP and BMEP are theoretical but useful expressions of friction losses and net power output.

Although BMEP and FMEP have no real existence in the cylinder, they provide a convenient means of representing pressure limits or rating engine performance throughout its entire operating range. There is an operating relationship between IMEP, BMEP, and FMEP.

One of the basic limitations placed on engine operation is the pressure developed in the cylinder during combustion. In the discussion of compression ratios and indicated mean effective pressure, it was found that, within limits, increased pressure resulted in increased power. It was also noted that if the cylinder pressure were not controlled within close limits, it would impose dangerous internal loads that might result in engine failure. Therefore, it is important to have a means of determining these cylinder pressures as a protective measure and for efficient application of power.

If the bhp is known, the BMEP can be computed by means of the following equation:

$$BMEP = \frac{bhp \times 33{,}000}{LANK}$$

Given:

bhp = 1,000

Stroke = 6 in

Bore = 5.5 in

rpm = 3,000

Number of cycles = 12

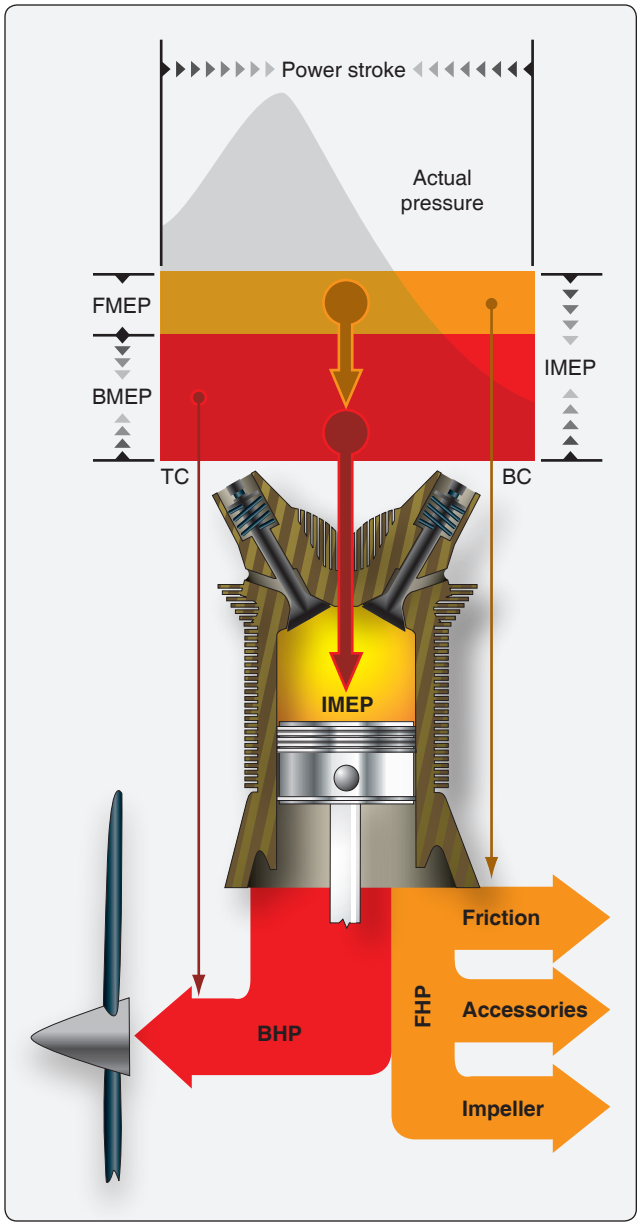

Figure 1-41. *Power and pressure.*

Find BMEP:

Find length of stroke (in ft):

L = 6 in = .5 ft

Find area of cylinder bore:

$A = \frac{1}{4}\pi rD^2$

$A = \frac{1}{4} \times 3.1416 \times 5.5 \text{ in} \times 5.5 \text{ in}$

$A = 23.76 \text{ in}^2$