$$K_\varepsilon = \frac{p_{avg} l d c_d^2}{4\eta\pi d n' l^3} \frac{d}{d} = \frac{1}{4\pi}\left[\left(\frac{p_{avg}}{\eta n'}\right)\left(\frac{d}{l}\right)^2\left(\frac{c_d}{d}\right)^2\right] = \frac{1}{4\pi} O_N \tag{11.12b}$$

The term in brackets is the desired dimensionless **load factor** or **Ocvirk number** O_N.

$$O_N = \left(\frac{p_{avg}}{\eta n'}\right)\left(\frac{d}{l}\right)^2\left(\frac{c_d}{d}\right)^2 = 4\pi K_\varepsilon \tag{11.12c}$$

This expression contains the parameters over which the designer has control and shows that any combination of those parameters that yields the same Ocvirk number will have the same eccentricity ratio ε. The eccentricity ratio gives an indication of how close to failure the oil film is, since $h_{min} = c_r(1 - \varepsilon)$. Compare the Ocvirk number to the Sommerfeld number of equation 11.6*e*. The concept is the same.

Figure 11-10 shows a plot of eccentricity ratio ε as a function of Ocvirk number O_N and also shows experimental data from reference 13 for the same parameters. The theoretical curve is defined by combining equations 11.12*c* and 11.8*c*.

$$O_N = \frac{\pi\varepsilon\left[\pi^2\left(1-\varepsilon^2\right)+16\varepsilon^2\right]^{\frac{1}{2}}}{\left(1-\varepsilon^2\right)^2} \tag{11.13a}$$

An empirical curve is fitted through the data which shows that the theory understates the magnitude of the eccentricity ratio. The empirical curve can be approximated by

$$\varepsilon_x \cong 0.21394 + 0.38517 \log O_N - 0.0008\left(O_N - 60\right) \tag{11.13b}$$

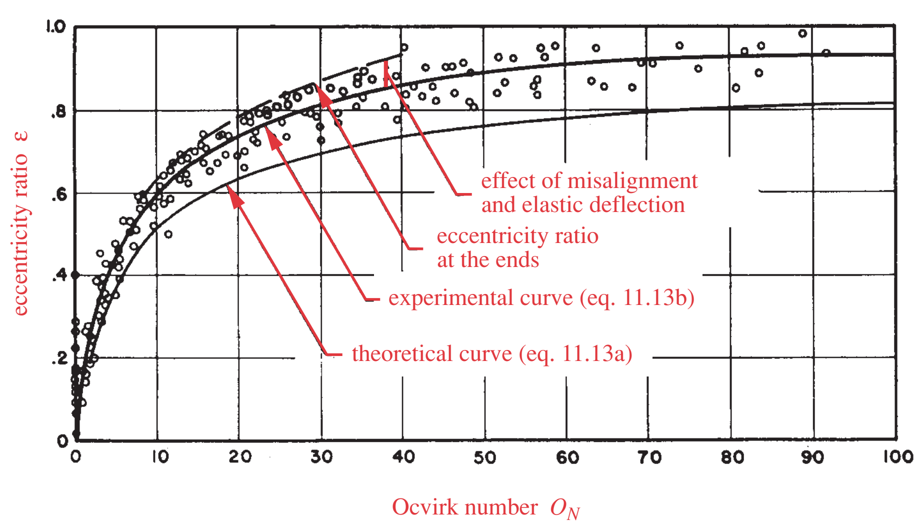

FIGURE 11-10

Analytical and Experimental Relationship Between Eccentricity Ratio ε and Ocvirk Number O_N
Source: G. B. DuBois and F. W. Ocvirk, "The Short Bearing Approximation for Plain Journal Bearings," *Trans. ASME*, vol. 77, pp. 1173–1178, 1955.