55. (a) We use $q = CV = \varepsilon_0 AV/d$ to solve for A:

$$A = \frac{Cd}{\varepsilon_0} = \frac{(10 \times 10^{-12}\,\text{F})(1.0 \times 10^{-3}\,\text{m})}{\left(8.85 \times 10^{-12}\,\frac{\text{C}^2}{\text{N}\cdot\text{m}^2}\right)} = 1.1 \times 10^{-3}\,\text{m}^2 \ .$$

(b) Now,

$$C' = C\left(\frac{d}{d'}\right) = (10\,\text{pF})\left(\frac{1.0\,\text{mm}}{0.9\,\text{mm}}\right) = 11\,\text{pF} \ .$$

(c) The new potential difference is $V' = q/C' = CV/C'$. Thus,

$$\Delta V = V' - V = \frac{(10\,\text{pF})(12\,\text{V})}{11\,\text{pF}} - 12\,\text{V} = 1.2\ \text{V} \ .$$

In a microphone, mechanical pressure applied to the aluminum foil as a result of sound can cause the capacitance of the foil to change, thereby inducing a variable ΔV in response to the sound signal.