of k_1 and r and the camber-line designation were taken from reference 5 and are presented in the following table:

Camber-line designation	m	r	k_1
210	0.05	0.0580	361.400
220	0.10	0.1260	51.640
230	0.15	0.2025	15.957
240	0.20	0.2900	6.643
250	0.25	0.3910	3.230

3-digit reflex. The camber-line designation for the 3-digit-reflex camber line is the same as that for the 3-digit camber line except that the last digit is changed from 0 to 1 to indicate the reflex characteristic, which is the normally negative camber-line curvature, becomes positive in the aft segment.

For some applications, for example, rotorcraft main rotors, to produce an airfoil with a quarter-chord pitching-moment coefficient of zero may be desirable. The 3-digit-reflexed camber line was thus designed to have a theoretical zero pitching moment as described in reference 5. The forward part of the camber line is identical to the 3-digit camber line but the aft portion was changed from a zero curvature segment to a segment with positive curvature. The equation for the aft portion of the camber line is expressed by

$$\frac{d^2y}{dx^2} = k_2\left(\frac{x}{c} - r\right) > 0 \qquad \left(\frac{x}{c} > r\right)$$

By using the same boundary conditions as were used for the 3-digit camber line, the equations for the ordinates are

$$\frac{y}{c} = \frac{k_1}{6}\left[\left(\frac{x}{c} - r\right)^3 - \frac{k_2}{k_1}(1 - r)^3\frac{x}{c} - r^3\frac{x}{c} + r^3\right]$$

from $x/c = 0$ to $x/c = r$ and

$$\frac{y}{c} = \frac{k_1}{6}\left[\frac{k_2}{k_1}\left(\frac{x}{c} - r\right)^3 - \frac{k_2}{k_1}(1 - r)^3\frac{x}{c} - r^3\frac{x}{c} + r^3\right]$$

for $x/c = r$ to $x/c = 1.0$. The ratio k_2/k_1 is expressed as

$$\frac{k_2}{k_1} = \frac{3}{1 - r}(r - m)^2 - r^3$$

Values of k_1, k_2/k_1, and m for several camber-line designations from reference 5 are presented in the following table:

Camber-line designation	m	r	k_1	k_2/k_1
221	0.10	0.1300	51.990	0.000764
231	0.15	0.2170	15.793	0.00677
241	0.20	0.3180	6.520	0.0303
251	0.25	0.4410	3.191	0.1355

6-series. The equations for the 6-series camber lines are presented in reference 9. The camber lines are a function of the design lift coefficient $c_{l,i}$ and the chordwise extent of uniform loading A. The equation for these camber lines is as follows:

$$\frac{y}{c} = \frac{c_{l,i}}{2\pi(A+1)}\left\{\frac{1}{1-A}\left[\frac{1}{2}\left(A - \frac{x}{c}\right)^2 \log_2\left(A - \frac{x}{c}\right) - \frac{1}{2}\left(1 - \frac{x}{c}\right)^2 \log_e\left(1 - \frac{x}{c}\right) + \frac{1}{4}\left(1 - \frac{x}{c}\right)^2 - \frac{1}{4}\left(A - \frac{x}{c}\right)^2\right] - \frac{x}{c}\log_e\frac{x}{c} + g - h\frac{x}{c}\right\}$$

where

$$g = -\frac{1}{1-A}\left[A^2\left(\frac{1}{2}\log_e A - \frac{1}{4}\right) + \frac{1}{4}\right]$$

$$h = \frac{1}{1-A}\left[\frac{1}{2}(1-A)^2\log_e(1-A) - \frac{1}{4}(1-A)^2\right] + g$$

As was true in reference 1, the program is capable of combining (by cumulative addition of y/c) up to 10 camber lines of this series to provide many types of loading.

16-series. The 16-series cambered airfoils, as described in reference 6, are derived by using the 6-series camber-line equation with the mean-line loading A set equal to 1.0, which is

$$\frac{y}{c} = \frac{c_{l,i}}{4\pi}\left(1 - \frac{x}{c}\right)^2 \log_e\left(1 - \frac{x}{c}\right)$$

This equation is the one for the standard mean line for this series.

6A-series. The 6A-series cambered airfoils, as described in reference 12, are derived by using a special form of the 6-series camber-line equation. This special form is designated as "the $A = 0.8$ modified mean line." The modification basically consists of holding the slope of the mean line constant from about the 85-percent-chord station to the trailing edge. As the reference indicates, this mean-line loading should always be used for the 6A-series airfoils. This camber-line equation is given