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REFERENCE INCIDENCE ANGLES IN CONSTANT STAGGER CASCADES

TURBOMACHINERY
COMPONENTS RESEARCH PROGRAM

Interim Report for National Aeronautics and Space Administration
Grant NGL-16-002-005

ISU-ERI-AMES-99985 Project 626

ENGINEERING RESEARCH INSTITUTE
IOWA STATE UNIVERSITY
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ABSTRACT

The reference incidence angle is an approximation to the minimum-loss incidence angle for a given blade cascade. An empirically derived method of estimating the reference incidence angle for two-dimensional, plane cascades has been available for some time. This method incorporates inlet flow angle as an independent variable and is quite convenient for design applications. For convenience in analysis applications this method has been reformulated with stagger angle replacing inlet flow angle as an independent variable. The new method is presented in graphical form and as a FORTRAN IV computer program.

REFERENCE INCIDENCE ANGLES IN CONSTANT STAGGER CASCADES

M. J. Miller and T. Skånberg

Introduction

The reference incidence angle is an approximation to the minimum-loss incidence angle for a given blade cascade. It has several applications in the design and analysis problems of axial-flow turbomachinery. In design it locates the center of the low-loss incidence angle interval and is useful as a base point in selecting the design point incidence angle although it is not always chosen as the design value because of range requirements or other considerations. It has also been useful in the development of blade-element loss correlations for design (Refs. 1 and 2) and off-design (Ref. 3) performance prediction. The reference incidence angle has also been used as a parameter in deviation angle prediction methods for both design and off-design use (Refs. 2 and 4).

An empirical method of predicting reference incidence angles was first presented by Johnsen *et al.* (Ref. 2), and was developed by correlating the plane cascade data of Emery *et al.* (Ref. 5). Because these cascade data were obtained with fixed inlet flow angles, i.e., the incidence angle was varied by restaggering the blades, the correlation incorporates inlet flow angle as a parameter rather than stagger angle (See Fig. 1 for definition of blade and flow parameters.). This is a particularly convenient formulation in design applications where the inlet flow angle is known while the stagger angle is not. However, in analysis applications the blade row geometry (including stagger angle) is fixed, and the inlet flow angle varies

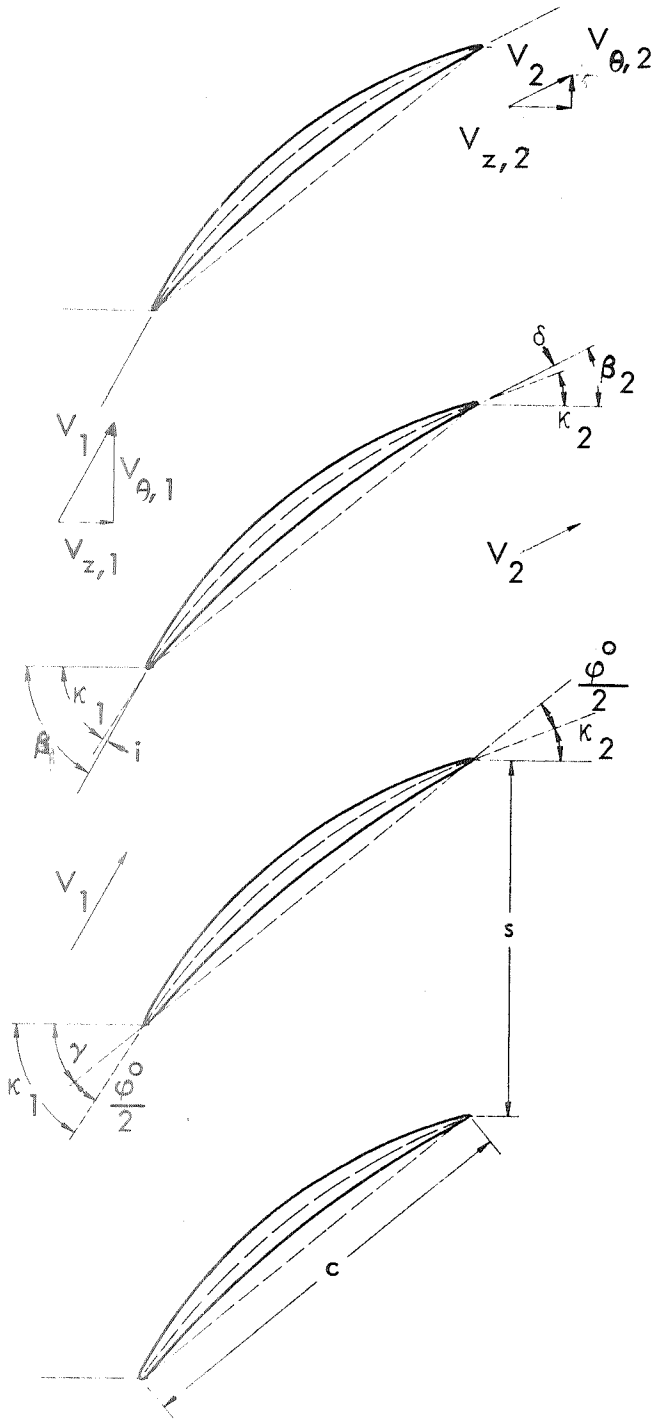

Fig. 1. Typical double-circular-arc blade elements and accompanying velocity diagram notation.

significantly over the useful operating range of the machine. In this case it is desirable to be able to predict the reference incidence angle knowing only the blade row geometry, particularly the stagger angle, rather than the inlet flow angle.

A new correlation has been developed to predict reference incidence angles for constant stagger cascades. This correlation is based on and is similar to the original correlation (Ref. 2) for constant inlet flow angle cascades, but inlet flow angle is replaced by stagger angle as an independent variable. The new method is presented in graphical form and as a FORTRAN IV computer program.

Nomenclature and Definitions

Blade-element geometrical and velocity diagram parameters are defined in Fig. 1. All symbols are defined in Appendix A.

The definition of reference incidence angle given in Reference 2 is repeated here for completeness. Loss coefficient data over a range of incidence angles are required to define the reference incidence angle as illustrated in Fig. 2. Here the reference incidence angle is taken as the midpoint of the incidence angle interval in which the loss coefficient is less than twice the minimum loss coefficient.

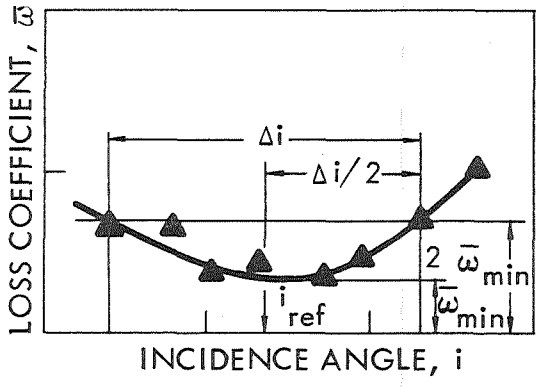

Fig. 2. Blade-element loss coefficient data for which a reference incidence angle may be defined.

This definition was taken as a practical way of approximating the minimum-loss incidence angle, and determines it exactly for a symmetrical loss coefficient curve.

Correlations

Constant Inlet Fluid Angle

The low-speed cascade data for NACA 65-series blades (Ref. 5) formed the basis for the correlation of reference incidence angle presented by Johnsen et al. (Ref. 2). This cascade flow differs from the flow in real machines in at least two important features. First, great pains were taken to maintain two-dimensional flow in the cascades which resulted in an axial velocity ratio (AVR) of 1.0, while generally AVR $\neq$ 1.0 for real machines even at design incidence. Second, the incidence angle was varied in the cascade by fixing the inlet fluid angle, β_1, and varying the stagger angle, γ, while in practice the stagger angle is fixed and the inlet fluid angle varies. The reference incidence angles obtained with constant stagger angle

cascades would be expected to differ somewhat from those obtained with constant inlet fluid angle cascades as noted in Reference 2. This is illustrated in Fig. 3 where loss data for constant β_1 from Reference 5 is compared with loss data for constant γ obtained by crossplotting data from the same source. Based on limited comparisons similar to that in Fig. 3, the difference in $(i_{ref})_\beta$ and $(i_{ref})_\gamma$ was expected to be of the order of 1 degree (Ref. 2). Because of this small difference, the cascade data can be used to approximately determine reference incidence angles for constant stagger blade rows.

To facilitate determination of i_{ref}, the data of Reference 5 were organized into a correlation (Ref. 2) which expresses i_{ref} as a function of β_1, σ, ϕ^o, thickness distribution, and t_{max}/c. Reference incidence

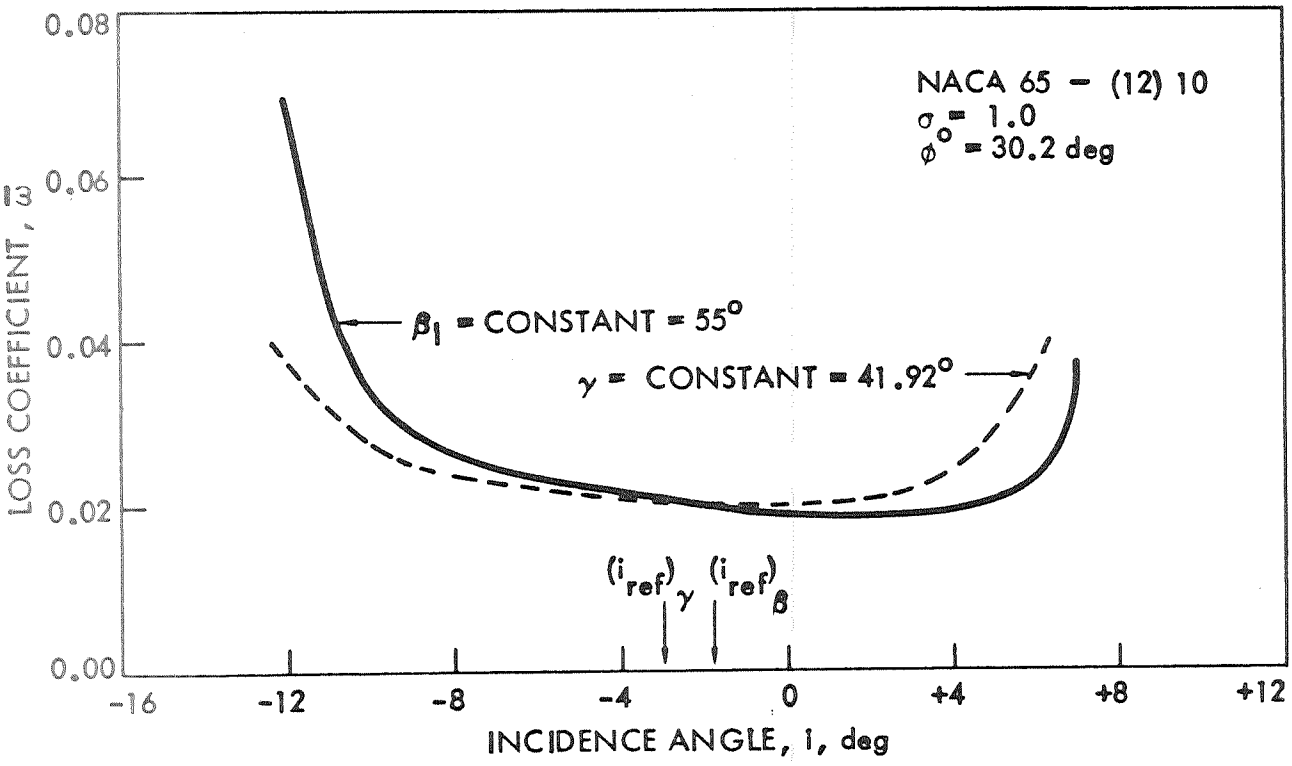

Fig. 3. Variation of loss coefficient with incidence angle at constant inlet flow angle and constant blade stagger angle (data from Ref. 5).

angle is calculated as

$$i_{ref} = (K_i)_{SH}(K_i)_t(i_o)_{10} + n\phi^o \qquad (1)$$

where $(K_i)_{SH}$ is a correction for blade shapes with thickness distributions other than the NACA 65-series, $(K_i)_t$ is a correction for a $t_{max}/c \neq 10\%$, $(i_o)_{10}$ is the reference incidence angle for a zero-camber, 10% thick 65-series profile (function of σ and β_1), and n is the slope of reference incidence angle vs camber plots (function of σ and β_1). Functional relations for $(K_i)_t$, $(i_o)_{10}$, and n are presented graphically in Reference 2. Suggested values (Ref. 2) for $(K_i)_{SH}$ are 1.0: 65-series, 1.1: C-series, and 0.7: double-circular arc blades. This correlation has been especially useful in design work where β_1 is known from given or assumed inlet conditions, and σ, profile shape, t_{max}/c, and ϕ^o are either known or may be computed.

Constant Stagger Angle

Unfortunately, in off-design applications the above method does not directly yield a unique reference incidence angle for a given blade section since β_1 takes on a range of values, stagger being constant. However, a unique reference angle can be obtained (Ref. 6) by an iterative procedure as follows:

1. An initial estimate of i_{ref} is made.
2. From the known blade angle and the estimated i_{ref}, a corresponding inlet relative flow angle is calculated.
3. Using the calculated relative flow angle and the correlations of Ref. 2, a new value of i_{ref} is obtained and compared with the estimated value.

4. If the calculated and estimated values of i_{ref} are different, the estimated value is revised and steps 2, 3 and 4 are repeated until convergence is obtained.

Reference incidence angles obtained this way, although unique, are still approximations to $(i_{ref})_\gamma$ because the original correlation of Reference 2 was based on constant β_1 cascade data as mentioned before. Until sufficient data from constant stagger cascades are produced, this approximation must be accepted.

A FORTRAN IV computer program called IREF1 was written to perform the iterative calculation described above. A listing of the program, sample input, and output is presented in Appendix B.

IREF1 was used to develop a noniterative method of predicting i_{ref} for constant stagger cascades which allows rapid calculation either by hand or by computer. The expression for i_{ref} is

$$i_{ref} = (K_i)_{SH}(K_i)_t(i_o)_{10\gamma} + n_{1\gamma}\phi^o + n_{2\gamma}(\phi^o)^2 \qquad (2)$$

which is quite similar to Equation (1) except for the last term. Also $(i_o)_{10\gamma}$, $n_{1\gamma}$, and $n_{2\gamma}$ are functions of γ and σ while corresponding parameters in Equation (1) depend on β_1 and σ. This expression was developed by the following procedure:

1. Using IREF1, systematic calculations of i_{ref} were made for 10% thick 65-series blade sections with $0 \le \phi^o \le 75^o$, $0 \le \gamma \le 70^o$, $0.4 \le \sigma \le 2.6$. (This required extrapolation of curves in Ref. 2, so caution is advised in cases where $\sigma > 2.0$ or $\beta_1 > 70^o$.)
2. Plots of i_{ref} vs ϕ^o over the range of γ and σ were made (see Fig. 4).

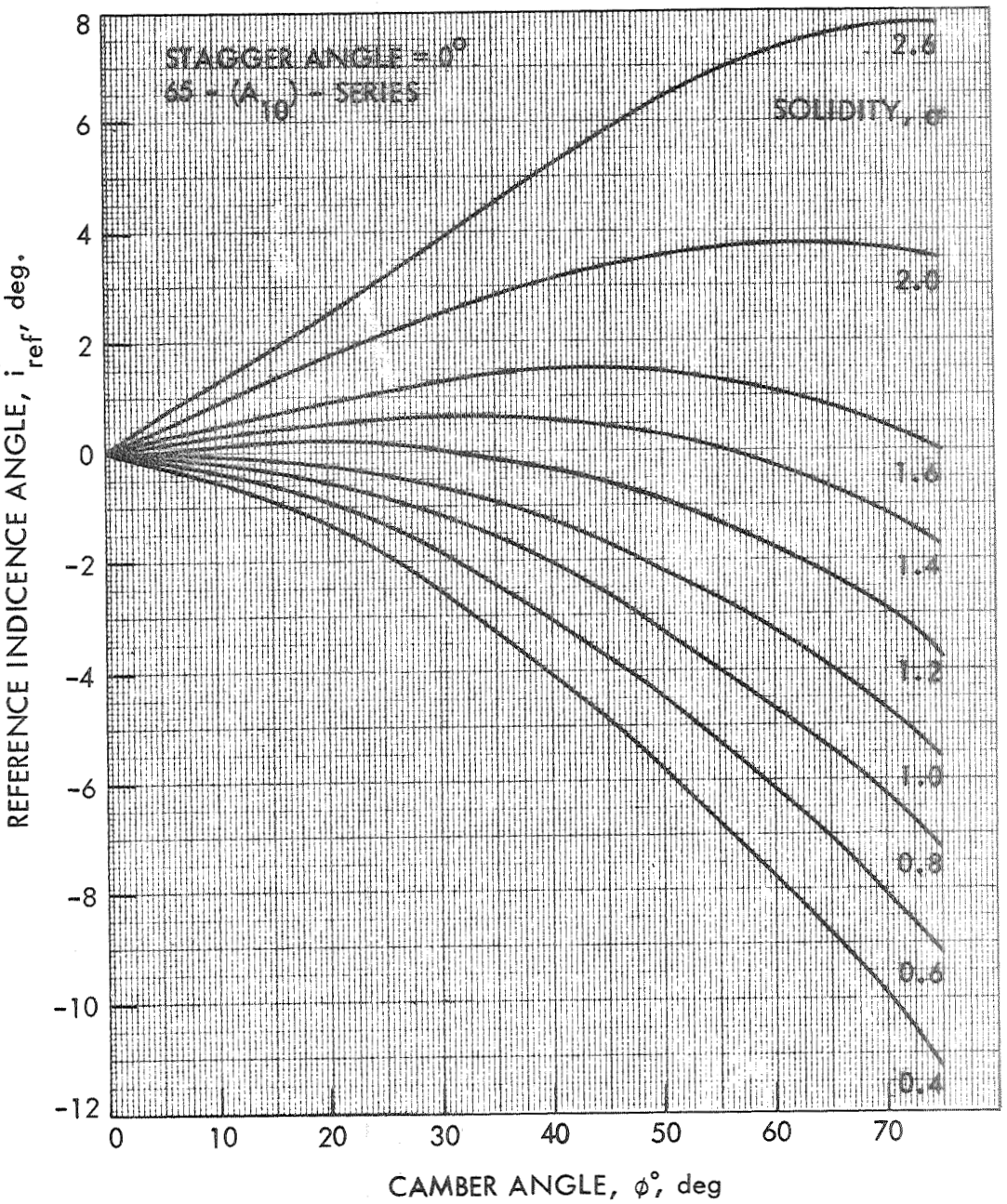

Fig. 4. Reference incidence angle as a function of camber angle and solidity for $\gamma = 0^{\circ}$.

3. Parabolas were fitted to the type of data shown in Fig. 4 by the least squares method to obtain values of $(i_o)_{10\gamma}$, $n_{1\gamma}$, and $n_{2\gamma}$ which depend on γ and σ.

The deduced curves of $(i_o)_{10\gamma}$ are given in Fig. 5 as a function of γ and σ. These curves do not pass exactly through the origin because of the least square curve fit process. Since the $(K_i)_t$ function was considered dependent on t_{max}/c only in Reference 2, it should be equally valid for use in this procedure. For completeness Fig. 142 of Reference 2 is reproduced here as Fig. 6. Also the same set of $(K_i)_{SH}$ values, 1.0 for 65-series, 1.1 for C-series, and 0.7 for double-circular arc are recommended. Curves of $n_{1\gamma}$ and $n_{2\gamma}$ are presented in Figs. 7a, 7b, and 7c. Using Figs. 5-7 and given γ, σ, and t_{max}/c, a unique value of i_{ref} can now be calculated by Equation 2.

The data of Figs. 5-7 and Equation (2) were incorporated into a simple program to compute i_{ref} directly, given γ, σ, t_{max}/c, and $(K_i)_{SH}$. The program, IREF2, is documented in Appendix C. A strong word of caution is in order regarding the use of IREF2 for high stagger, high solidity blade elements. The data of Reference 2 are presented only for $\beta_1 \leq 70^o$ and $\sigma \leq 2.0$; therefore any i_{ref} values calculated for geometries exceeding these values must be used with extreme caution if at all.

To test the closeness and appropriateness of the parabolic fit, values of i_{ref} were calculated using IREF1 and IREF2 for the range of γ,, ϕ^o, and σ considered. These comparisons, together with 12 values of i_{ref} calculated using the curves of Reference 2 and β_1 values from IREF1, are presented in Appendix D. In general the parabolic equation used in IREF2 gives a value for i_{ref} which compares closely with the values from IREF1 and Reference 2.

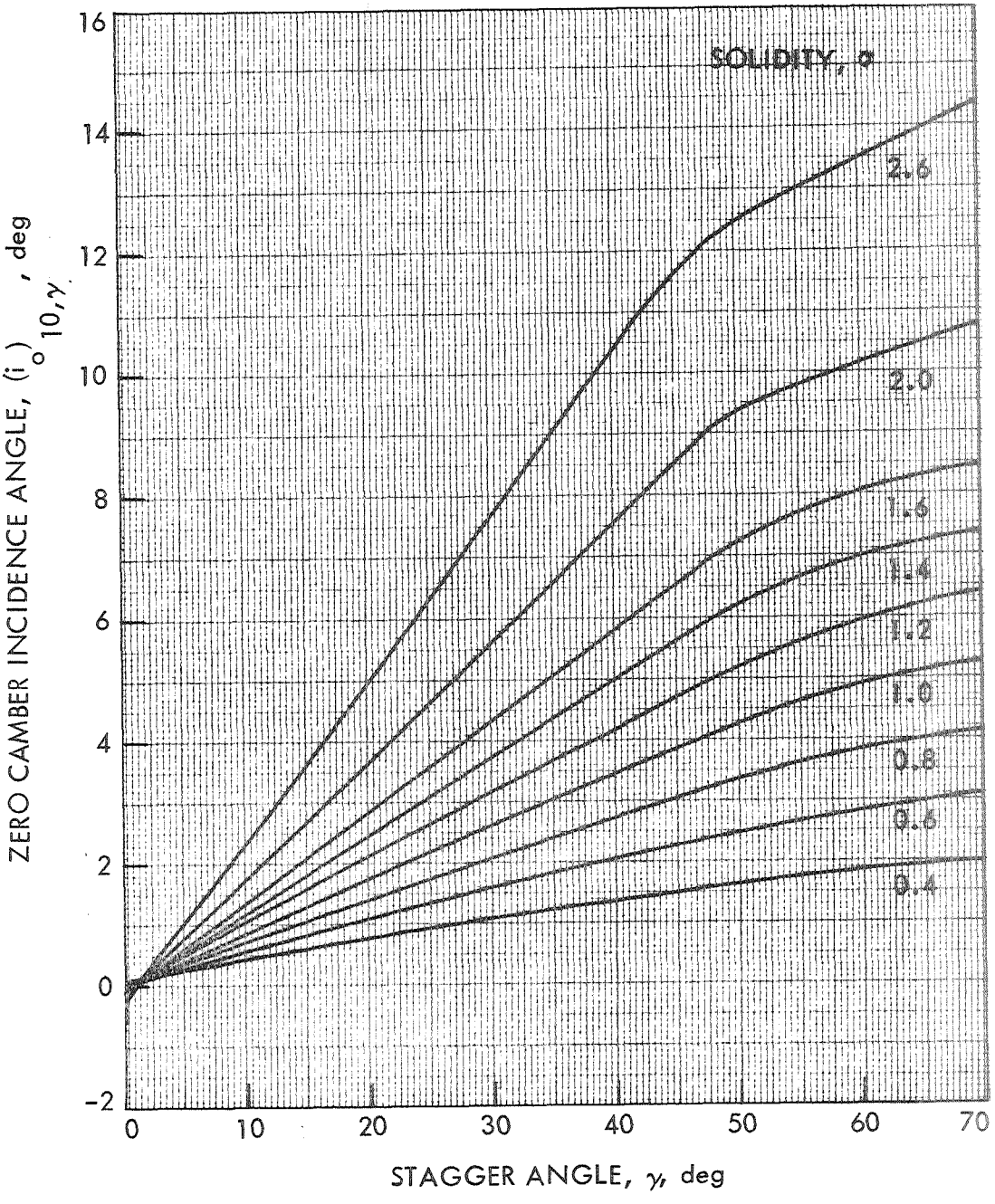

Fig. 5. Zero-camber incidence angle for 10% thick NACA 65-series blade sections in a constant stagger cascade.

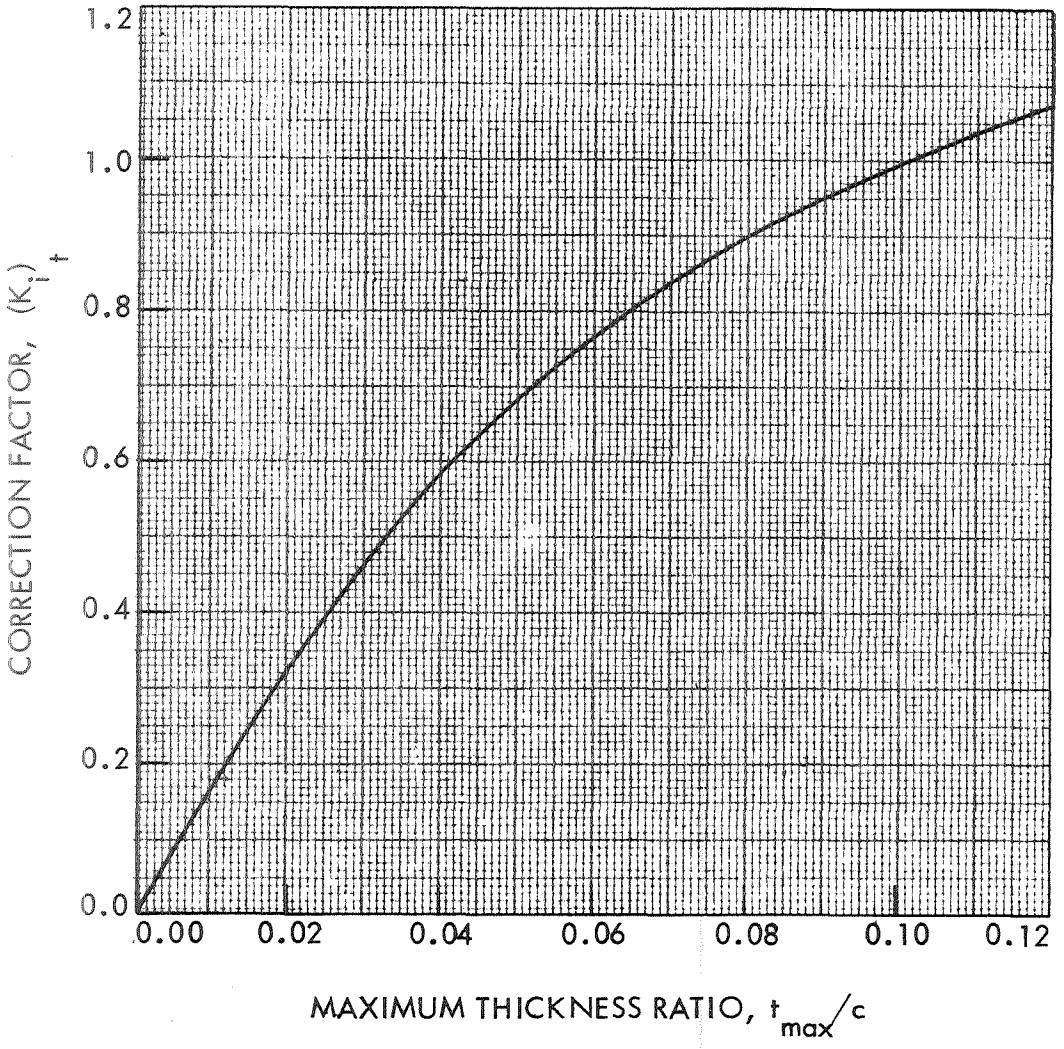

Fig. 6. Deduced blade maximum-thickness correction for zero-camber reference minimum-loss incidence angle from Reference 2.

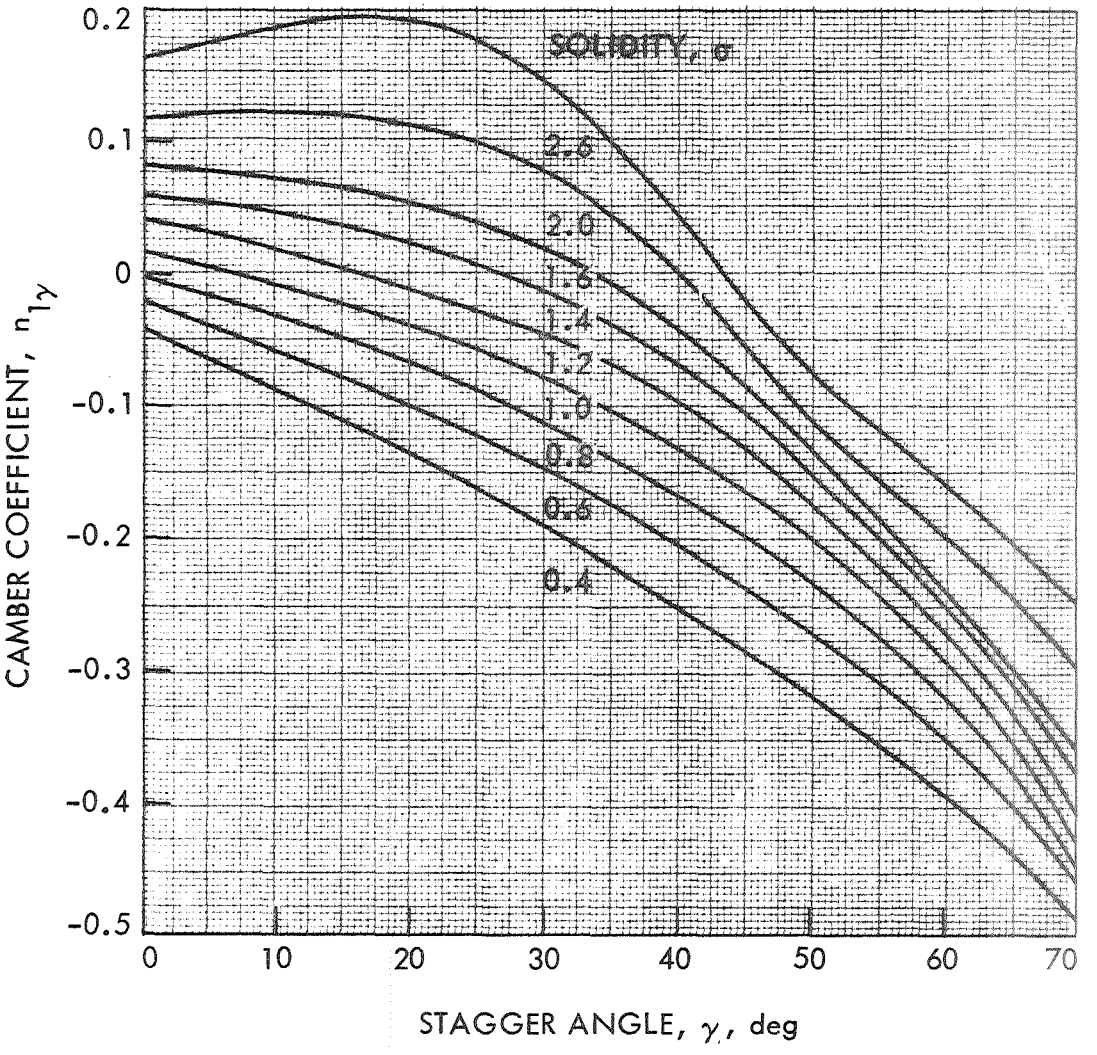

Fig. 7a. Coefficient of linear camber term in expression for reference incidence angle of 10% thick NACA 65-series blade section in constant stagger cascade.

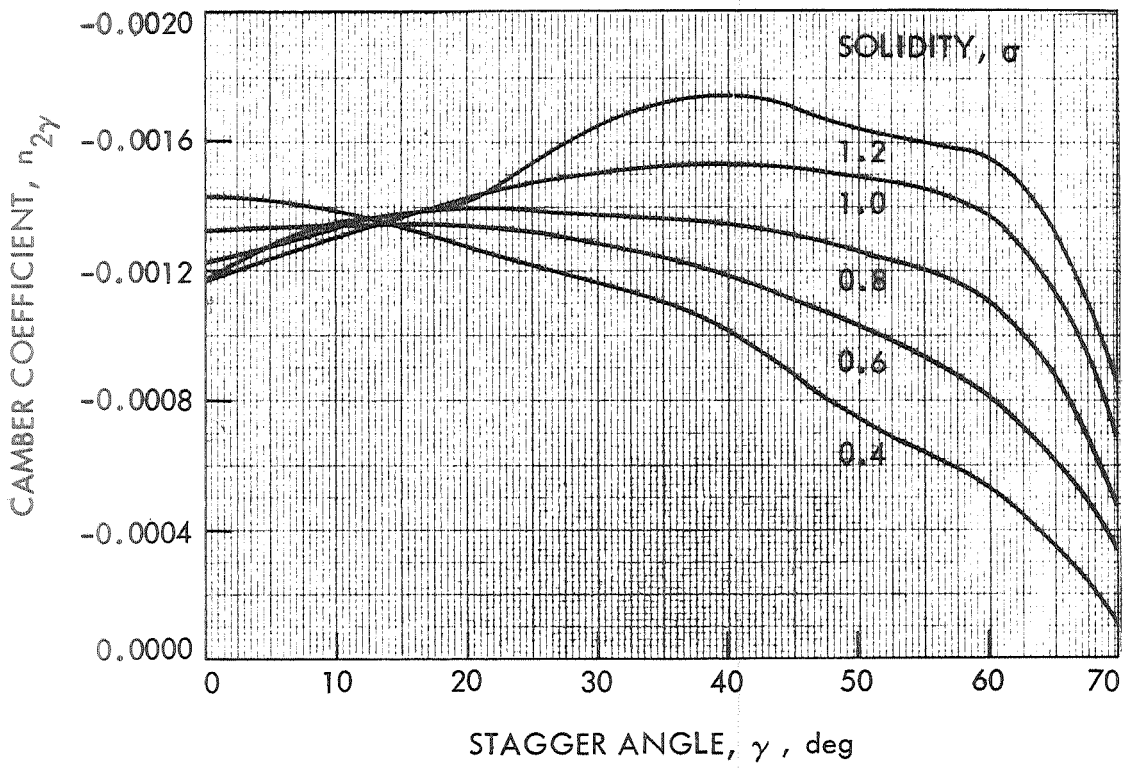

Fig. 7b. Coefficient of second-order camber term, $0.4 \leq \sigma \leq 1.2$.

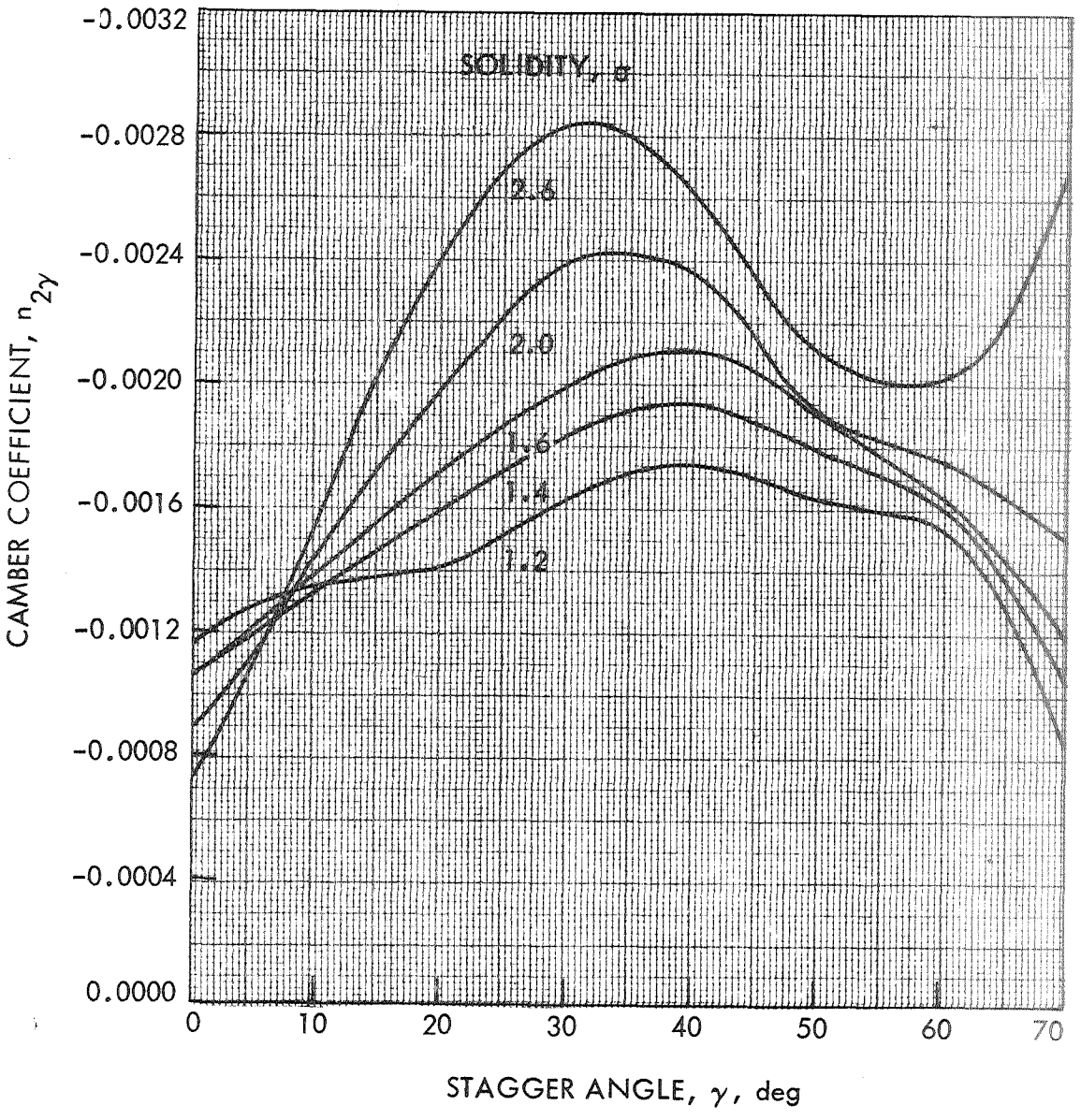

Fig. 7c. Coefficient of second-order camber term, $1.2 \leq \sigma \leq 2.6$.

Acknowledgments

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APPENDIX A

Nomenclature

AVR	Axial velocity ratio, $V_{z,2}/V_{z,1}$
c	Chord length
i	Incidence angle, deg
$(i_o)_{10}$	Reference incidence angle for zero-camber, 10% thick NACA 65-series blades in constant inlet flow angle cascade, deg
$(i_o)_{10\gamma}$	Reference incidence angle for zero-camber, 10% thick NACA 65-series blades in constant stagger cascade, deg
$(K_i)_{SH}$	Blade shape correction factor
$(K_i)_t$	Blade thickness correction factor
n	Reference incidence angle slope factor
n_1	Coefficient of linear camber term in constant stagger reference incidence angle expression
n_2	Coefficient of quadratic camber term in constant stagger reference incidence angle expression
P	Total pressure, psia
p	Static pressure, psia
s	Blade spacing
t	Blade section thickness
V	Fluid velocity
β	Flow angle, angle between flow, and axial direction, deg
γ	Blade stagger angle, angle between blade chord, and axial direction, deg
δ	Deviation angle, deg
κ	Blade angle, angle between tangent to blade mean camber line, and axial direction, deg
σ	Blade solidity, c/s
ϕ^o	Blade camber angle, $\kappa_1 - \kappa_2$, deg
$\bar{\omega}$	Total pressure loss coefficient, $\frac{P_1 - P_2}{P_1 - p_1}$

Subscripts

max	maximum value
min	minimum value
ref	reference value
z	axial direction
β	constant inlet fluid angle
γ	constant stagger angle
θ	tangential direction
1	inlet station
2	outlet station

APPENDIX B

IREF 1 Program

```
C
C       THIS PROGRAM CACULATES CONSTANT STAGGER REFERENCE INCIDENCE
C       ANGLES FOR BLADE SECTIONS WITH GIVEN GEOMETRY.  INPUT DATA
C       CONSISTS OF CAMBER ANGLE, STAGGER ANGLE, SOLIDITY, MAXIMUM
C       THICKNESS TO CHORD RATIO, AND THICKNESS DISTRIBUTION
C       CORRECTION FACTOR.
C
C
C       A0,A1,A2                COEFFICIENTS FOR THE FIREF PARABOLA
C
C       ALF1(K,J)               LEADING EDGE BLADE ELEMENT CAMBERLINE TANGENT ANGLE,
C                               DEG.
C
C       ALF2(K,J)               TRAILING EDGE BLADE ELEMENT CAMBERLINE TANGENT ANGLE,
C                               DEG.
C
C       ANGST(IG)               STAGGER ANGLE, DEG.
C
C       B(J)                    INTERCEPT AND COEFFICIENTS OF LEAST-SQUARE POLYNOMIAL.
C
C       BTP1(J)                 RELATIVE ENTERING FLUID FLOW ANGLE, DEG.
C
C       BTP1B(J)                VALUE OF RELATIVE ENTERING FLUID FLOW ANGLE FOR WHICH
C                               INPUT VALUES OF FI10B(J,K) AND SLOPB(J,K) WERE OBTAINED
C                               FROM FIGURES 137 AND 138 OF NASA SP-36.
C
C       FIREF(IC)               REFERENCE INCIDENCE ANGLE,DEG.
C
C       FI010(J)                ZERO-CAMBER REFERENCE INCIDENCE ANGLE FOR NACA 65-(A10)
C                               -SERIES BLADES WITH 10% MAXIMUM THICKNESS RATIO, DEG.
C
C       FI10B(J,K)              INPUT VALUE OF ZERO-CAMBER REFERENCE INCIDENCE ANGLE,
C                               CORRESPONDING TO THE VALUES OF BTP1B(J) AND SGMBB(K),
C                               OBTAINED FROM FIGURE 137, PAGE 195, NASA SP-36, DEG.
C
C       FKI(J)                  INCIDENCE ANGLE CORRECTION FACTOR FOR MAXIMUM THICKNESS
C                               TO CHORD RATIO AND BLADE THICKNESS DISTRIBUTION.
C       FKIB(K,J)               INPUT VALUES OF THICKNESS CORRECTION FACTOR, FIGURE
C                               142, PAGE 199, NASA SP-36.
C
C       FKSHA(J)                SHAPE CORRECTION FACTOR, 1.0 FOR 65-SERIES,
C                               1.1 FOR C-SERIES, 0.7 FOR DOUBLE-CIRCULAR PROFILES.
C
C       IC                      CAMBER INDEX.
C
C       IER                     ERROR INDICATOR, IER=0, NO ERROR.
C
C       IG                      STAGGER ANGLE INDEX.
C
C       II                      CARD READER REFERENCE NUMBER.
C
C       IIER(IG,IS)             STORAGE ARRAY FOR IER.
C
C       IO                      LINE PRINTER REFERENCE NUMBER.
C
```

```
C       IS                  SOLIDITY INDEX.
C
C       J                   INDEX.
C
C       K                   INDEX.
C
C       KDAMP               ITERATION DAMPING FACTOR.
C
C       KKK                 CAMBER INDEX.
C
C       M                   DEGREE OF LEAST-SQUARE POLYNOMIAL.
C
C       N                   INDEX USED TO SPACE OUTPUT.
C
C       NN                  NUMBER OF POINTS TO BE FITTED WITH A LEAST-
C                           SQUARE POLYNOMIAL.
C
C       NNN                 INDEX USED TO SPACE OUTPUT.
C
C       N1,N2               COEFFICIENTS OF CAMBER TERMS IN POLYNOMIAL
C                           EXPRESSION FOR REFERENCE INCIDENCE ANGLE.
C
C       PHI(IC)             BLADE CAMBER ANGLE, DEG.
C
C       SGMA(IS)            BLADE ROW SOLIDITY.
C
C       SGMBB(K)            SOLIDITY; INPUT VALUES FOR (I0)10 AND N CURVES PAGES
C                           195-196, NASA SP-36.
C
C       SLOP(J)             REFERENCE INCIDENCE ANGLE SLOPE FACTOR, N.
C
C       SLOPB(J,K)          INPUT VALUE OF SLOPE FACTOR, CORRESPONDING TO THE
C                           VALUES OF BTP1B(J) AND SGMBB(K), OBTAINED FROM FIGURE
C                           138, PAGE 196, NASA SP-36.
C
C       STAR(J,K)           TRIAL VALUE OF REFERENCE INCIDENCE ANGLE, DEG.
C
C       STARI(J)            CONSTANT STAGGER REFERENCE INCIDENCE ANGLE, DEG.
C
C       STARO(J)            INCIDENCE ANGLE OF UNCAMBERED BLADE SECTION, DEG.
C
C       TMAXC(K,J)          RATIO OF BLADE SECTION MAXIMUM THICKNESS TO
C                           CHORD.
C
C       TMAXCB(K,J)         INPUT VALUES OF TMAXC CORRESPONDING TO FKIB
C                           VALUES FROM FIGURE 142, PAGE 199 OF NASA SP-36.
C       XMN(J)              ESTIMATE OF MEANS FOR INDEPENDENT VARIABLES IN
C                           LEAST-SQUARE POLYNOMIAL.
C       XX                  A DOUBLE PRECISION WORK VECTOR.
C
C       YSGM(J)             BLADE ROW SOLIDITY.
C
```

```
C
      DIMENSION TMAXC(1,1),SGMA(9),ANGST(9),FKSHA(1)                    0001
      DIMENSION ALF1(1,1),ALF2(1,1)                                     0002
      DIMENSION FKI(1),PHI(10),STARI(1),STARO(1),SLOP(1),SLOPB(10,9)    0003
      DIMENSION TMAXCB(1,7),FKIB(1,7),BTP1(1),FIO1O(1),STAR(100,1)      0004
      DIMENSION BTP1B(10),SGMBB(9),FI1OB(10,9),YSGM(1)                  0005
      DIMENSION B(4),XX(10),XMN(2),FIREF(10),AO(9,9),A1(9,9),A2(9,9)    0006
      DIMENSION IIER(9,9)                                               0007
      COMMON FIREF,PHI,IC,KKK                                           0008
      DOUBLE PRECISION XX                                               0009
C                                                                       0010
C                                                                       0011
      II=5                                                              0012
      IO=6                                                              0013
C                                                                       0014
C     READ AND WRITE INPUT TABLES TAKEN FROM NASA SP-36.                0015
C                                                                       0016
      READ(II,115)(SGMBB(J),J=1,9)                                      0017
      READ(II,401)(BTP1B(J),J=1,10)                                     0018
      READ(II,105)(TMAXCB(1,J),FKIB(1,J),J=1,7)                         0019
      DO 10 J=1,10                                                      0020
   10 READ(II,120)(FI1OB(J,K),SLOPB(J,K),K=1,9)                         0021
      WRITE(IO,700)                                                     0022
      WRITE(IO,820)                                                     0023
      WRITE(IO,105)(TMAXCB(1,J),FKIB(1,J),J=1,7)                        0024
      WRITE(IO,800)                                                     0025
      WRITE(IO,115)(SGMBB(J),J=1,9)                                     0026
      WRITE(IO,810)                                                     0027
      WRITE(IO,125)(BTP1B(J),J=1,10)                                    0028
      WRITE(IO,830)                                                     0029
      DO 40 J=1,10                                                      0030
   40 WRITE(IO,120)(FI1OB(J,K),SLOPB(J,K),K=1,9)                        0031
C                                                                       0032
C     READ GEOMETRY FOR WHICH REFERENCE INCIDENCE ANGLES ARE            0033
C     TO BE CALCULATED.                                                 0034
C                                                                       0035
      READ(II,201)TMAXC(1,1),FKSHA(1)                                   0036
      CALL FIT1D(TMAXC,FKI,TMAXCB,FKIB,1,7,1,1)                         0037
      READ(II,401)(ANGST(J),J=1,9)                                      0038
      READ(II,202)(SGMA(J),J=1,9)                                       0039
      READ(II,402)(PHI(J),J=1,10)                                       0040
      WRITE(IO,700)                                                     0041
      WRITE(IO,130)                                                     0042
      WRITE(IO,140)TMAXC(1,1),FKSHA(1)                                  0043
      DO 300 IG=1,9                                                     0044
      N=0                                                               0045
      NN=0                                                              0046
      NNN=0                                                             0047
      WRITE(IO,700)                                                     0048
      WRITE(IO,720)                                                     0049
      DO 300 IS=1,9                                                     0050
      DO 50  IC=1,10                                                    0051
      ALF1(1,1)=ANGST(IG)+PHI(IC)/2                                     0052
      ALF2(1,1)=ANGST(IG)-PHI(IC)/2                                     0053
      NN=NN+1                                                           0054
      STAR(1,1)=0.                                                      0055
      KDAMP=3                                                           0056
      YSGM(I)=SGMA(IS)                                                  0057
```

```
C                                                                       0058
C     BEGIN ITERATION FOR CONSTANT STAGGER REFERENCE INCIDENCE ANGLE.   0059
C                                                                       0060
      DO 60  J=1,99                                                     0061
      BTP1(1)=ALF1(1,1)+STAR(J,1)                                       0062
      CALL FIT2D (BTP1,FIO1O,YSGM,BTP1B,FI1OB,SGMBB,10,9,1,10,9,9)      0063
      CALL FIT2D (BTP1,SLOP,YSGM,BTP1B,SLOPB,SGMBB,10,9,1,10,9,9)       0064
      STARO(1)=FKSHA(1)*FKI(1)*FIO1O(1)                                 0065
      STARI(1)=STARO(1)+SLOP(1)*PHI(IC)                                 0066
      IF(ABS(STARI(1)-STAR(J,1)).LE.0.02)GO TO 70                       0067
      STAR(J+1,1)=(STAR(J,1)+KDAMP*STARI(1))/(KDAMP+1)                  0068
   60 CONTINUE                                                          0069
      WRITE(IO,840)                                                     0070
   70 CONTINUE                                                          0071
      IF((BTP1(1).LE.87.).AND.(ALF1(1,1).LE.90.))  GO TO 75             0072
      WRITE (IO,710)                                                    0073
      NN=NN-1                                                           0074
      NNN=NNN+1                                                         0075
      N=1                                                               0076
      GO TO 95                                                          0077
   75 N=N+1                                                             0078
C                                                                       0079
C     WRITE OUT GEOMETRY AND CORRESPONDING REFERENCE INCIDENCE ANGLE.   0080
C                                                                       0081
      IF((N.NE.11).AND.(N.NE.21).AND.(N.NE.31).AND.(N.NE.41)            0082
     X   .AND.(N.NE.51).AND.(NNN.NE.5))  GO TO 80                       0083
      WRITE(IO,710)                                                     0084
      NNN=NNN+1                                                         0085
      IF ((N.NE.51).AND.(NNN.NE.6)) GO TO 80                            0086
      N=1                                                               0087
      NNN=1                                                             0088
      WRITE(IO,700)                                                     0089
      WRITE(IO,720)                                                     0090
   80 WRITE(IO,730) STARI(1),ANGST(IG),PHI(IC),SGMA(IS),ALF1(1,1),      0091
     X ALF2(1,1),BTP1(1),FKI(1),FIO1O(1),SLOP(1)                        0092
      FIREF(IC)=STARI(1)                                                0093
   50 CONTINUE                                                          0094
C                                                                       0095
C     FIT M-DEGREE LEAST-SQUARE POLYNOMIAL TO CURVES OF REFERENCE       0096
C     INCIDENCE ANGLE VS CAMBER ANGLE FOR EACH COMBINATION OF STAGGER   0097
C     ANGLE AND SOLIDITY.  ULSQ IS AN ISU LIBRARY SUBPROGRAM WHICH      0098
C     USES THE LEAST-SQUARE METHOD OF FITTING EQUATIONS TO DISCRETE     0099
C     DATA.  IT CAN BE REPLACED BY OTHER SIMILAR STANDARD SUBPROGRAMS.  0100
C                                                                       0101
   95 M=2                                                               0102
      XMN(1)=PHI(NN)/2.                                                 0103
      XMN(2)=PHI(NN)*PHI(NN)/2                                          0104
      KKK=0                                                             0105
      CALL ULSQ(NN,M,B,XMN,XX,-1,.0001,IER)                             0106
      AO(IG,IS)=B(1)                                                    0107
      A1(IG,IS)=B(2)                                                    0108
      A2(IG,IS)=B(3)                                                    0109
      IIER(IG,IS)=IER                                                   0110
      NN=0                                                              0111
  300 CONTINUE                                                          0112
```

```
C                                                                       0113
C     WRITE OUT INTERCEPT AND COEFFICIENTS FOR LEAST-SQUARE             0114
C     POLYNOMIALS.                                                      0115
C                                                                       0116
      WRITE(IO,700)                                                     0117
      WRITE(IO,850)                                                     0118
      N=0                                                               0119
      DO 310 IG=1,9                                                     0120
      DO 310 IS=1,9                                                     0121
      N=N+1                                                             0122
      IF((N.NE.10).AND.(N.NE.19).AND.(N.NE.28).AND.(N.NE.37)            0123
     X  .AND.(N.NE.46)) GO TO 310                                       0124
      WRITE(IO,710)                                                     0125
      IF ((N.NE.46)) GO TO 310                                          0126
      N=1                                                               0127
      WRITE(IO,700)                                                     0128
      WRITE(IO,850)                                                     0129
  310 WRITE(IO,11)IIER(IG,IS),ANGST(IG),SGMA(IS),AO(IG,IS),AI(IG,IS),   0130
     1A2(IG,IS)                                                         0131
   11 FORMAT(I4,2F10.3,3F15.10)                                         0132
  100 FORMAT(5F10.4)                                                    0133
  105 FORMAT(8F10.3)                                                    0134
  115 FORMAT(9F8.3)                                                     0135
  120 FORMAT(8F10.3)                                                    0136
  125 FORMAT(10F6.1)                                                    0137
  130 FORMAT('     TMAXC    FKSHA'/)                                    0138
  140 FORMAT(2F10.4///)                                                 0139
  200 FORMAT(I4)                                                        0140
  201 FORMAT(2F10.2)                                                    0141
  202 FORMAT(9F8.2)                                                     0142
  401 FORMAT(10F8.2)                                                    0143
  402 FORMAT(10F8.2)                                                    0144
  700 FORMAT(1H1)                                                       0145
  710 FORMAT(1H )                                                       0146
  720 FORMAT('   IREF  STAGGER  CAMBER  SOLIDITY   ALF1   ALF2   BTP1  0147
     X FKI  FI010     SLOP'/)                                          0148
  730 FORMAT(F7.1,F9.2,F8.2,F10.2,3F7.2,2F7.3,F9.4)                     0149
  800 FORMAT(/' INPUT DATA: SGMBB(L),L=1,9')                            0150
  810 FORMAT(/' INPUT DATA: BTP1B(K), K=1,10')                          0151
  820 FORMAT(/' INPUT DATA: TMAXC(K),FKIB(K),K=1,7')                    0152
  830 FORMAT(/' INPUT DATA: FI10B(K,L),SLOPB(K,L), K=1,10, L=1,9')      0153
  840 FORMAT(/'      CONVERGED SOLUTION FOR IREF NOT OBTAINED IN 99 ITER0154
     XATIONS'/)                                                         0155
  850 FORMAT(' IER   STAGGER  SOLIDITY         INCO10              N1   0156
     X        N2'/)                                                    0157
      STOP                                                              0158
      END                                                               0159
```

```
      SUBROUTINE SRT(N,M,X)                                              0160
C                                                                        0161
C     SRT IS A SUBPROGRAM REQUIRED BY ULSQ.                              0162
C                                                                        0163
      DIMENSION X(1),FIREF(10),PHI(10)                                   0164
      COMMON FIREF,PHI,IC,KKK                                            0165
C                                                                        0166
C                                                                        0167
      KKK=KKK+1                                                          0168
      IC=KKK                                                             0169
      X(1)=FIREF(IC)                                                     0170
      X(2)=PHI(IC)                                                       0171
      X(3)=X(2)*X(2)                                                     0172
      RETURN                                                             0173
      END                                                                0174
```

```
      SUBROUTINE FIT1D(X,Y,XB,YB,JP,KP,I,K)                                  0175
C                                                                            0176
C        3-POINT LAGRANGIAN INTERPOLATION FOR Y=FCN(X) FROM                  0177
C        DATA TABLES XB,YB. XB-ARRAY VALUES ARE ARBITRARILY                  0178
C        SPACED, MONOTONE NON-DECREASING. JP IS GIVEN NUMBER                 0179
C        OF XB- OR YB-ARRAY ELEMENTS                                         0180
C                                                                            0181
      DIMENSION X(1,1),Y(1),XB(1,7),YB(1,7)                                  0182
C                                                                            0183
C                                                                            0184
      IO=6                                                                   0185
   10 IF(JP-20)11,11,14                                                      0186
   11 IF(KP-3)14,12,12                                                       0187
   12 IF(KP-20)13,13,14                                                      0188
   13 DO 3 J=1,JP                                                            0189
      DO 1 M=3,KP                                                            0190
      L=M                                                                    0191
      IF(X(K,J)-XB(I,L))2,2,1                                                0192
    1 CONTINUE                                                               0193
    2 XO=XB(I,L-2)                                                           0194
      X1=XB(I,L-1)                                                           0195
      X2=XB(I,L)                                                             0196
    3 Y(J)=(X(K,J)-X1)*(X(K,J)-X2)*YB(I,L-2)/((XO-X1)*(XO-X2))               0197
     1+(X(K,J)-X2)*(X(K,J)-XO)*YB(I,L-1)/((X1-X2)*(X1-XO))                   0198
     2+(X(K,J)-XO)*(X(K,J)-X1)*YB(I,L)/((X2-XO)*(X2-X1))                     0199
      RETURN                                                                 0200
   14 WRITE(IO,500)JP,KP                                                     0201
  500 FORMAT(10X,' INCORRECT ARRAY SIZE IN FIT1D, JP=',I2,' KP=',I2)         0202
      STOP                                                                   0203
      END                                                                    0204
```

```
      SUBROUTINE FIT2D(X,Y,Z,XB,YB,ZB,IP,JP,JL,IQ,JQ,KQ)                0205
C                                                                       0206
C        3-POINT LAGRANGIAN INTERPOLATION FOR Y=FCN(X,Z)                0207
C        FROM DATA TABLES XB,YB,ZB. XB-AND ZB-ARRAY VALUES              0208
C        ARE ARBITRARILY SPACED, MONOTONE NON-DECREASING.               0209
C        IP,JP ARE NUMBER OF ELEMENTS IN XB,ZB ARRAYS,RE-               0210
C        SPECTIVELY.                                                    0211
C                                                                       0212
      DIMENSION X(1),Y(1),Z(1),YST(3)                                   0213
      REAL XB(IQ),YB(IQ,JQ),ZB(KQ)                                      0214
C                                                                       0215
C                                                                       0216
      IO=6                                                              0217
      IF(IP-3)15,10,10                                                  0218
   10 IF(IP-20)11,11,15                                                 0219
   11 IF(JP-3)15,12,12                                                  0220
   12 IF(JP-20)13,13,15                                                 0221
   13 IF(JL-20)14,14,15                                                 0222
   14 DO 6 N=1,JL                                                       0223
      DO 1 M=3,IP                                                       0224
      I=M                                                               0225
      IF(X(N)-XB(I))2,2,1                                               0226
    1 CONTINUE                                                          0227
    2 DO 3 M=3,JP                                                       0228
      J=M                                                               0229
      IF(Z(N)-ZB(J))4,4,3                                               0230
    3 CONTINUE                                                          0231
    4 XO=ZB(J-2)                                                        0232
      X1=ZB(J-1)                                                        0233
      X2=ZB(J)                                                          0234
      DO 5 K=1,3                                                        0235
      L=I+K                                                             0236
      YO=YB(L-3,J-2)                                                    0237
      Y1=YB(L-3,J-1)                                                    0238
      Y2=YB(L-3,J)                                                      0239
    5 YST(K)=(Z(N)-X1)*(Z(N)-X2)*YO/((XO-X1)*(XO-X2))                   0240
     1+(Z(N)-X2)*(Z(N)-XO)*Y1/((X1-X2)*(X1-XO))                         0241
     2+(Z(N)-XO)*(Z(N)-X1)*Y2/((X2-XO)*(X2-X1))                         0242
      XO=XB(I-2)                                                        0243
      X1=XB(I-1)                                                        0244
      X2=XB(I)                                                          0245
    6 Y(N)=(X(N)-X1)*(X(N)-X2)*YST(1)/((XO-X1)*(XO-X2))                 0246
     1+(X(N)-X2)*(X(N)-XO)*YST(2)/((X1-X2)*(X1-XO))                     0247
     2+(X(N)-XO)*(X(N)-X1)*YST(3)/((X2-XO)*(X2-X1))                     0248
      RETURN                                                            0249
   15 WRITE(IO,500)IP,JP,JL                                             0250
  500 FORMAT(10X,' INCORRECT ARRAY SIZE IN FIT2D, IP=',I2,' JP=',I2,' JL 0251
     1=',I2)                                                            0252
      STOP                                                              0253
      END                                                               0254
```

Input Data

Input consists of tables derived from Figs. 137, 138, and 142 of Reference 2, t_{max}/c, $(K_i)_{SH}$, ϕ^o, γ, and σ. A listing of data cards used to develop Fig. 4 are listed on the following page.

```
 .400     .600     .800    1.      1.200   1.400   1.600   2.000   2.600                  SGMBB(J)
.0000 10.      20.      30.      40.      50.      55.      60.      70.      75.        BTP1B(J)
  0.0      0.0      .020     .334     .040     .589     .06      .772                    TMAXCB(1, J)
  .08      .903     .100    1.000     .120    1.080                                     FK1B(1, J)
  0.0    -0.050     0.0    -0.045     0.0    -0.040     0.0    -0.036
  0.0    -0.030     0.0    -0.025     0.0    -0.020     0.0    -0.010
  0.0     0.0
  .35    -0.088      .50   -0.073      .68   -0.061      .80   -0.051
 1.00    -0.040     1.13   -0.030     1.30   -0.022     1.64   -0.010
 2.05     0.0
  .65    -0.130     1.00   -0.107     1.30   -0.088     1.60   -0.072
 1.95    -0.055     2.25   -0.041     2.55   -0.028     3.20   -0.012
 4.10     0.0
  .95    -0.180     1.45   -0.146     1.93   -0.120     2.40   -0.100
 2.85    -0.079     3.35   -0.060     3.82   -0.045     4.78   -0.020
 6.20     0.0
 1.26    -0.235     1.90   -0.193     2.55   -0.162     3.20   -0.135                  FI10B(J, K)
 3.80    -0.112     4.45   -0.087     5.07   -0.069     6.34   -0.037
 8.20    -0.010
 1.55    -0.298     2.32   -0.250     3.12   -0.212     3.90   -0.180                  SLOPB(J, K)
 4.70    -0.151     5.50   -0.125     6.28   -0.106     7.86   -0.069
10.20    -0.030
 1.69    -0.335     2.52   -0.283     3.40   -0.242     4.25   -0.208
 5.10    -0.178     6.00   -0.152     6.86   -0.131     8.61   -0.090
11.20    -0.050
 1.80    -0.372     2.70   -0.320     3.63   -0.277     4.58   -0.241
 5.50    -0.210     6.43   -0.182     7.42   -0.161     9.32   -0.120
12.05    -0.075
 2.0     -0.460     3.0    -0.416     4.02   -0.375     5.10   -0.339
 6.08    -0.300     7.10   -0.268     8.10   -0.242    10.10   -0.190
13.10    -0.135
 2.10    -0.520     3.15   -0.482     4.15   -0.458     5.25   -0.420
 6.30    -0.375     7.30   -0.331     8.35   -0.300    10.45   -0.235
13.60    -0.175
   .1       1.                                                                          TMAXC(1, 1) FKSHA(1)
0.       5.      10.      20.      30.      40.      50.      60.      70.              ANGST(J)
 .4       .6       .8       1.       1.2      1.4      1.6      2.0      2.6           SGMA(J)
0.       5.      10.      20.      30.      40.      50.      60.      70.      75.     PHI(J)
```

Output

Output corresponding to the input data given on the previous page is presented on pages 29-50. The first group of output is simply the input tables of $(K_i)_t$, t_{max}/c, $(i_o)_{10}$, n, β_1, and σ. Next i_{ref} is given for specified γ, ϕ^o, and $t_{max}/c = 0.1$. The last group of output gives a table of $(i_o)_{10\gamma}$, $n_{1\gamma}$, and $n_{2\gamma}$ for the indicated γ and σ values.

```
INPUT DATA: TMAXC(K),FKIB(K),K=1,7
    0.000     0.000     0.020     0.334     0.040     0.589     0.060     0.772
    0.080     0.903     0.100     1.000     0.120     1.080

INPUT DATA: SGMBB(L),L=1,9
  0.400   0.600   0.800   1.000   1.200   1.400   1.600   2.000   2.600

INPUT DATA: BTP18(K), K=1,10
  0.0  10.0  20.0  30.0  40.0  50.0  55.0  60.0  70.0  75.0

INPUT DATA: FI10B(K,L),SLOPB(K,L), K=1,10, L=1,9
    0.000    -0.050     0.000    -0.045     0.000    -0.040     0.000    -0.036
    0.000    -0.030     0.000    -0.025     0.000    -0.020     0.000    -0.010
    0.000     0.000
    0.350    -0.088     0.500    -0.073     0.680    -0.061     0.800    -0.051
    1.000    -0.040     1.130    -0.030     1.300    -0.022     1.640    -0.010
    2.050     0.000
    0.650    -0.130     1.000    -0.107     1.300    -0.088     1.600    -0.072
    1.950    -0.055     2.250    -0.041     2.550    -0.028     3.200    -0.012
    4.100     0.000
    0.950    -0.180     1.450    -0.146     1.930    -0.120     2.400    -0.100
    2.850    -0.079     3.350    -0.060     3.820    -0.045     4.780    -0.020
    6.200     0.000
    1.260    -0.235     1.900    -0.193     2.550    -0.162     3.200    -0.135
    3.800    -0.112     4.450    -0.087     5.070    -0.069     6.340    -0.037
    8.200    -0.010
    1.550    -0.298     2.320    -0.250     3.120    -0.212     3.900    -0.180
    4.700    -0.151     5.500    -0.125     6.280    -0.106     7.860    -0.069
   10.200    -0.030
    1.690    -0.335     2.520    -0.283     3.400    -0.242     4.250    -0.208
    5.100    -0.178     6.000    -0.152     6.860    -0.131     8.610    -0.090
   11.200    -0.050
    1.800    -0.372     2.700    -0.320     3.630    -0.277     4.580    -0.241
    5.500    -0.210     6.430    -0.182     7.420    -0.161     9.320    -0.120
   12.050    -0.075
    2.000    -0.460     3.000    -0.416     4.020    -0.375     5.100    -0.339
    6.080    -0.300     7.100    -0.268     8.100    -0.242    10.100    -0.190
   13.100    -0.135
    2.100    -0.520     3.150    -0.482     4.150    -0.458     5.250    -0.420
    6.300    -0.375     7.300    -0.331     8.350    -0.300    10.450    -0.235
   13.600    -0.175
```

TMAXC	FKSHA
0.1000	1.0000

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	F1010	SLOP
0.0	0.00	0.00	0.40	0.00	-0.00	0.00	1.000	0.000	-0.0500
-0.2	0.00	5.00	0.40	2.50	-2.50	2.31	1.000	0.085	-0.0584
-0.5	0.00	10.00	0.40	5.00	-5.00	4.51	1.000	0.164	-0.0666
-1.3	0.00	20.00	0.40	10.00	-10.00	8.67	1.000	0.306	-0.0827
-2.5	0.00	30.00	0.40	15.00	-15.00	12.50	1.000	0.430	-0.0981
-4.0	0.00	40.00	0.40	20.00	-20.00	16.04	1.000	0.537	-0.1129
-5.7	0.00	50.00	0.40	25.00	-25.00	19.29	1.000	0.630	-0.1269
-7.7	0.00	60.00	0.40	30.00	-30.00	22.28	1.000	0.718	-0.1407
-10.0	0.00	70.00	0.40	35.00	-35.00	25.01	1.000	0.800	-0.1541
-11.2	0.00	75.00	0.40	37.50	-37.50	26.30	1.000	0.839	-0.1606
0.0	0.00	0.00	0.60	0.00	-0.00	0.00	1.000	0.000	-0.0450
-0.1	0.00	5.00	0.60	2.50	-2.50	2.37	1.000	0.119	-0.0511
-0.3	0.00	10.00	0.60	5.00	-5.00	4.67	1.000	0.233	-0.0573
-0.9	0.00	20.00	0.60	10.00	-10.00	9.06	1.000	0.453	-0.0701
-1.8	0.00	30.00	0.60	15.00	-15.00	13.18	1.000	0.659	-0.0832
-3.0	0.00	40.00	0.60	20.00	-20.00	17.02	1.000	0.851	-0.0962
-4.4	0.00	50.00	0.60	25.00	-25.00	20.59	1.000	1.028	-0.1091
-6.1	0.00	60.00	0.60	30.00	-30.00	23.89	1.000	1.181	-0.1216
-8.0	0.00	70.00	0.60	35.00	-35.00	26.97	1.000	1.319	-0.1336
-9.1	0.00	75.00	0.60	37.50	-37.50	28.43	1.000	1.383	-0.1396
0.0	0.00	0.00	0.80	0.00	-0.00	0.00	1.000	0.000	-0.0400
-0.0	0.00	5.00	0.80	2.50	-2.50	2.46	1.000	0.173	-0.0446
-0.2	0.00	10.00	0.80	5.00	-5.00	4.86	1.000	0.338	-0.0494
-0.5	0.00	20.00	0.80	10.00	-10.00	9.46	1.000	0.645	-0.0597
-1.2	0.00	30.00	0.80	15.00	-15.00	13.82	1.000	0.924	-0.0706
-2.1	0.00	40.00	0.80	20.00	-20.00	17.92	1.000	1.176	-0.0819
-3.3	0.00	50.00	0.80	25.00	-25.00	21.75	1.000	1.410	-0.0932
-4.6	0.00	60.00	0.80	30.00	-30.00	25.38	1.000	1.638	-0.1046
-6.3	0.00	70.00	0.80	35.00	-35.00	28.76	1.000	1.851	-0.1158
-7.1	0.00	75.00	0.80	37.50	-37.50	30.36	1.000	1.952	-0.1213
0.0	0.00	0.00	1.00	0.00	-0.00	0.00	1.000	0.000	-0.0360
0.0	0.00	5.00	1.00	2.50	-2.50	2.50	1.000	0.200	-0.0392
-0.0	0.00	10.00	1.00	5.00	-5.00	4.98	1.000	0.398	-0.0427
-0.2	0.00	20.00	1.00	10.00	-10.00	9.79	1.000	0.783	-0.0506
-0.6	0.00	30.00	1.00	15.00	-15.00	14.38	1.000	1.150	-0.0595
-1.3	0.00	40.00	1.00	20.00	-20.00	18.76	1.000	1.500	-0.0691
-2.1	0.00	50.00	1.00	25.00	-25.00	22.87	1.000	1.829	-0.0793
-3.3	0.00	60.00	1.00	30.00	-30.00	26.75	1.000	2.140	-0.0901
-4.7	0.00	70.00	1.00	35.00	-35.00	30.36	1.000	2.429	-0.1011
-5.4	0.00	75.00	1.00	37.50	-37.50	32.08	1.000	2.566	-0.1067
0.0	0.00	0.00	1.20	0.00	-0.00	0.00	1.000	0.000	-0.0300
0.1	0.00	5.00	1.20	2.50	-2.50	2.59	1.000	0.264	-0.0321
0.2	0.00	10.00	1.20	5.00	-5.00	5.16	1.000	0.522	-0.0345
0.2	0.00	20.00	1.20	10.00	-10.00	10.20	1.000	1.019	-0.0402
0.1	0.00	30.00	1.20	15.00	-15.00	15.07	1.000	1.488	-0.0470
-0.3	0.00	40.00	1.20	20.00	-20.00	19.76	1.000	1.928	-0.0546
-0.9	0.00	50.00	1.20	25.00	-25.00	24.15	1.000	2.329	-0.0639
-1.8	0.00	60.00	1.20	30.00	-30.00	28.26	1.000	2.697	-0.0742
-2.9	0.00	70.00	1.20	35.00	-35.00	32.10	1.000	3.045	-0.0852
-3.6	0.00	75.00	1.20	37.50	-37.50	33.91	1.000	3.216	-0.0908

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
0.0	0.00	0.00	1.40	0.00	-0.00	0.00	1.000	0.000	-0.0250
0.2	0.00	5.00	1.40	2.50	-2.50	2.66	1.000	0.301	-0.0257
0.3	0.00	10.00	1.40	5.00	-5.00	5.32	1.000	0.603	-0.0269
0.6	0.00	20.00	1.40	10.00	-10.00	10.57	1.000	1.194	-0.0305
0.7	0.00	30.00	1.40	15.00	-15.00	15.68	1.000	1.768	-0.0355
0.6	0.00	40.00	1.40	20.00	-20.00	20.63	1.000	2.320	-0.0420
0.3	0.00	50.00	1.40	25.00	-25.00	25.33	1.000	2.838	-0.0501
-0.2	0.00	60.00	1.40	30.00	-30.00	29.77	1.000	3.325	-0.0595
-1.1	0.00	70.00	1.40	35.00	-35.00	33.92	1.000	3.781	-0.0696
-1.6	0.00	75.00	1.40	37.50	-37.50	35.89	1.000	3.998	-0.0749
0.0	0.00	0.00	1.60	0.00	-0.00	0.00	1.000	0.000	-0.0200
0.3	0.00	5.00	1.60	2.50	-2.50	2.75	1.000	0.363	-0.0202
0.5	0.00	10.00	1.60	5.00	-5.00	5.50	1.000	0.721	-0.0206
1.0	0.00	20.00	1.60	10.00	-10.00	10.96	1.000	1.423	-0.0224
1.3	0.00	30.00	1.60	15.00	-15.00	16.32	1.000	2.096	-0.0253
1.5	0.00	40.00	1.60	20.00	-20.00	21.54	1.000	2.744	-0.0299
1.5	0.00	50.00	1.60	25.00	-25.00	26.47	1.000	3.370	-0.0378
1.1	0.00	60.00	1.60	30.00	-30.00	31.10	1.000	3.959	-0.0473
0.5	0.00	70.00	1.60	35.00	-35.00	35.49	1.000	4.509	-0.0573
0.1	0.00	75.00	1.60	37.50	-37.50	37.56	1.000	4.767	-0.0625
0.0	0.00	0.00	2.00	0.00	-0.00	0.00	1.000	0.000	-0.0100
0.4	0.00	5.00	2.00	2.50	-2.50	2.92	1.000	0.487	-0.0098
0.9	0.00	10.00	2.00	5.00	-5.00	5.86	1.000	0.971	-0.0098
1.7	0.00	20.00	2.00	10.00	-10.00	11.70	1.000	1.910	-0.0102
2.5	0.00	30.00	2.00	15.00	-15.00	17.46	1.000	2.811	-0.0113
3.1	0.00	40.00	2.00	20.00	-20.00	23.12	1.000	3.691	-0.0139
3.6	0.00	50.00	2.00	25.00	-25.00	28.62	1.000	4.561	-0.0185
3.9	0.00	60.00	2.00	30.00	-30.00	33.85	1.000	5.382	-0.0255
3.7	0.00	70.00	2.00	35.00	-35.00	38.72	1.000	6.142	-0.0343
3.5	0.00	75.00	2.00	37.50	-37.50	41.02	1.000	6.497	-0.0396
0.0	0.00	0.00	2.60	0.00	-0.00	0.00	1.000	0.000	0.0000
0.6	0.00	5.00	2.60	2.50	-2.50	3.13	1.000	0.641	0.0000
1.3	0.00	10.00	2.60	5.00	-5.00	6.28	1.000	1.286	0.0000
2.6	0.00	20.00	2.60	10.00	-10.00	12.57	1.000	2.576	0.0000
3.9	0.00	30.00	2.60	15.00	-15.00	18.85	1.000	3.864	0.0000
5.2	0.00	40.00	2.60	20.00	-20.00	25.16	1.000	5.177	0.0000
6.5	0.00	50.00	2.60	25.00	-25.00	31.43	1.000	6.493	-0.0008
7.3	0.00	60.00	2.60	30.00	-30.00	37.28	1.000	7.665	-0.0063
7.7	0.00	70.00	2.60	35.00	-35.00	42.73	1.000	8.745	-0.0145
7.8	0.00	75.00	2.60	37.50	-37.50	45.29	1.000	9.258	-0.0193

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FI010	SLOP
0.2	5.00	0.00	0.40	5.00	5.00	5.17	1.000	0.187	-0.0692
-0.1	5.00	5.00	0.40	7.50	2.50	7.38	1.000	0.263	-0.0777
-0.5	5.00	10.00	0.40	10.00	-0.00	9.48	1.000	0.333	-0.0859
-1.6	5.00	20.00	0.40	15.00	-5.00	13.43	1.000	0.459	-0.1020
-3.0	5.00	30.00	0.40	20.00	-10.00	17.07	1.000	0.567	-0.1173
-4.6	5.00	40.00	0.40	25.00	-15.00	20.40	1.000	0.662	-0.1318
-6.6	5.00	50.00	0.40	30.00	-20.00	23.44	1.000	0.753	-0.1463
-8.8	5.00	60.00	0.40	35.00	-25.00	26.24	1.000	0.837	-0.1603
-11.2	5.00	70.00	0.40	40.00	-30.00	28.77	1.000	0.913	-0.1734
-12.5	5.00	75.00	0.40	42.50	-32.50	29.96	1.000	0.949	-0.1798
0.3	5.00	0.00	0.60	5.00	5.00	5.26	1.000	0.263	-0.0590
0.0	5.00	5.00	0.60	7.50	2.50	7.54	1.000	0.377	-0.0655
-0.2	5.00	10.00	0.60	10.00	-0.00	9.78	1.000	0.489	-0.0723
-1.0	5.00	20.00	0.60	15.00	-5.00	14.00	1.000	0.700	-0.0859
-2.1	5.00	30.00	0.60	20.00	-10.00	17.93	1.000	0.897	-0.0995
-3.4	5.00	40.00	0.60	25.00	-15.00	21.58	1.000	1.074	-0.1128
-5.1	5.00	50.00	0.60	30.00	-20.00	24.96	1.000	1.229	-0.1257
-6.9	5.00	60.00	0.60	35.00	-25.00	28.09	1.000	1.368	-0.1381
-9.0	5.00	70.00	0.60	40.00	-30.00	30.98	1.000	1.494	-0.1502
-10.2	5.00	75.00	0.60	42.50	-32.50	32.34	1.000	1.555	-0.1563
0.4	5.00	0.00	0.80	5.00	5.00	5.36	1.000	0.372	-0.0505
0.3	5.00	5.00	0.80	7.50	2.50	7.75	1.000	0.532	-0.0557
0.1	5.00	10.00	0.80	10.00	-0.00	10.05	1.000	0.683	-0.0611
-0.5	5.00	20.00	0.80	15.00	-5.00	14.53	1.000	0.968	-0.0725
-1.3	5.00	30.00	0.80	20.00	-10.00	18.71	1.000	1.224	-0.0842
-2.4	5.00	40.00	0.80	25.00	-15.00	22.63	1.000	1.465	-0.0959
-3.7	5.00	50.00	0.80	30.00	-20.00	26.32	1.000	1.697	-0.1076
-5.2	5.00	60.00	0.80	35.00	-25.00	29.78	1.000	1.916	-0.1192
-7.1	5.00	70.00	0.80	40.00	-30.00	32.93	1.000	2.113	-0.1313
-8.1	5.00	75.00	0.80	42.50	-32.50	34.41	1.000	2.205	-0.1373
0.4	5.00	0.00	1.00	5.00	5.00	5.42	1.000	0.434	-0.0434
0.4	5.00	5.00	1.00	7.50	2.50	7.88	1.000	0.631	-0.0473
0.3	5.00	10.00	1.00	10.00	-0.00	10.30	1.000	0.824	-0.0515
-0.0	5.00	20.00	1.00	15.00	-5.00	15.00	1.000	1.200	-0.0607
-0.6	5.00	30.00	1.00	20.00	-10.00	19.44	1.000	1.556	-0.0707
-1.4	5.00	40.00	1.00	25.00	-15.00	23.65	1.000	1.892	-0.0814
-2.4	5.00	50.00	1.00	30.00	-20.00	27.60	1.000	2.208	-0.0926
-3.7	5.00	60.00	1.00	35.00	-25.00	31.28	1.000	2.502	-0.1041
-5.3	5.00	70.00	1.00	40.00	-30.00	34.70	1.000	2.776	-0.1156
-6.2	5.00	75.00	1.00	42.50	-32.50	36.32	1.000	2.905	-0.1213
0.6	5.00	0.00	1.20	5.00	5.00	5.54	1.000	0.560	-0.0349
0.6	5.00	5.00	1.20	7.50	2.50	8.11	1.000	0.815	-0.0377
0.7	5.00	10.00	1.20	10.00	-0.00	10.64	1.000	1.062	-0.0408
0.6	5.00	20.00	1.20	15.00	-5.00	15.57	1.000	1.535	-0.0477
0.3	5.00	30.00	1.20	20.00	-10.00	20.30	1.000	1.978	-0.0556
-0.2	5.00	40.00	1.20	25.00	-15.00	24.79	1.000	2.387	-0.0654
-1.0	5.00	50.00	1.20	30.00	-20.00	28.96	1.000	2.759	-0.0761
-2.1	5.00	60.00	1.20	35.00	-25.00	32.88	1.000	3.118	-0.0876
-3.5	5.00	70.00	1.20	40.00	-30.00	36.51	1.000	3.463	-0.0995
-4.3	5.00	75.00	1.20	42.50	-32.50	38.22	1.000	3.628	-0.1055

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO1P	SLOP
0.6	5.00	0.00	1.40	5.00	5.00	5.63	1.000	0.637	-0.0271
0.8	5.00	5.00	1.40	7.50	2.50	8.28	1.000	0.937	-0.0287
0.9	5.00	10.00	1.40	10.00	-0.00	10.92	1.000	1.233	-0.0308
1.1	5.00	20.00	1.40	15.00	-5.00	16.08	1.000	1.812	-0.0360
1.1	5.00	30.00	1.40	20.00	-10.00	21.08	1.000	2.370	-0.0427
0.8	5.00	40.00	1.40	25.00	-15.00	25.83	1.000	2.894	-0.0511
0.3	5.00	50.00	1.40	30.00	-20.00	30.34	1.000	3.388	-0.0608
-0.4	5.00	60.00	1.40	35.00	-25.00	34.58	1.000	3.853	-0.0714
-1.5	5.00	70.00	1.40	40.00	-30.00	38.52	1.000	4.287	-0.0825
-2.1	5.00	75.00	1.40	42.50	-32.50	40.38	1.000	4.491	-0.0882
0.8	5.00	0.00	1.60	5.00	5.00	5.74	1.000	0.753	-0.0207
1.0	5.00	5.00	1.60	7.50	2.50	8.49	1.000	1.107	-0.0214
1.2	5.00	10.00	1.60	10.00	-0.00	11.21	1.000	1.454	-0.0225
1.6	5.00	20.00	1.60	15.00	-5.00	16.60	1.000	2.131	-0.0255
1.9	5.00	30.00	1.60	20.00	-10.00	21.86	1.000	2.784	-0.0303
1.9	5.00	40.00	1.60	25.00	-15.00	26.87	1.000	3.420	-0.0385
1.6	5.00	50.00	1.60	30.00	-20.00	31.60	1.000	4.021	-0.0484
1.1	5.00	60.00	1.60	35.00	-25.00	36.04	1.000	4.578	-0.0587
0.2	5.00	70.00	1.60	40.00	-30.00	40.21	1.000	5.096	-0.0697
-0.4	5.00	75.00	1.60	42.50	-32.50	42.15	1.000	5.334	-0.0759
1.0	5.00	0.00	2.00	5.00	5.00	5.97	1.000	0.989	-0.0098
1.4	5.00	5.00	2.00	7.50	2.50	8.91	1.000	1.465	-0.0099
1.8	5.00	10.00	2.00	10.00	-0.00	11.82	1.000	1.929	-0.0102
2.6	5.00	20.00	2.00	15.00	-5.00	17.59	1.000	2.832	-0.0113
3.3	5.00	30.00	2.00	20.00	-10.00	23.28	1.000	3.716	-0.0140
3.8	5.00	40.00	2.00	25.00	-15.00	28.83	1.000	4.594	-0.0188
4.1	5.00	50.00	2.00	30.00	-20.00	34.12	1.000	5.425	-0.0259
4.1	5.00	60.00	2.00	35.00	-25.00	39.09	1.000	6.198	-0.0351
3.6	5.00	70.00	2.00	40.00	-30.00	43.61	1.000	6.893	-0.0468
3.2	5.00	75.00	2.00	42.50	-32.50	45.70	1.000	7.212	-0.0534
1.3	5.00	0.00	2.60	5.00	5.00	6.28	1.000	1.286	0.0000
1.9	5.00	5.00	2.60	7.50	2.50	9.41	1.000	1.930	0.0000
2.6	5.00	10.00	2.60	10.00	-0.00	12.57	1.000	2.576	0.0000
3.9	5.00	20.00	2.60	15.00	-5.00	18.85	1.000	3.864	0.0000
5.2	5.00	30.00	2.60	20.00	-10.00	25.16	1.000	5.177	0.0000
6.5	5.00	40.00	2.60	25.00	-15.00	31.44	1.000	6.495	-0.0008
7.4	5.00	50.00	2.60	30.00	-20.00	37.35	1.000	7.679	-0.0064
7.9	5.00	60.00	2.60	35.00	-25.00	42.88	1.000	8.777	-0.0147
8.0	5.00	70.00	2.60	40.00	-30.00	48.02	1.000	9.804	-0.0253
7.9	5.00	75.00	2.60	42.50	-32.50	50.42	1.000	10.284	-0.0314

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
0.4	10.00	0.00	0.40	10.00	10.00	10.35	1.000	0.361	-0.0894
-0.1	10.00	5.00	0.40	12.50	7.50	12.45	1.000	0.428	-0.0979
-0.6	10.00	10.00	0.40	15.00	5.00	14.44	1.000	0.489	-0.1061
-1.8	10.00	20.00	0.40	20.00	-0.00	18.18	1.000	0.599	-0.1220
-3.4	10.00	30.00	0.40	25.00	-5.00	21.59	1.000	0.698	-0.1374
-5.3	10.00	40.00	0.40	30.00	-10.00	24.70	1.000	0.791	-0.1525
-7.5	10.00	50.00	0.40	35.00	-15.00	27.53	1.000	0.876	-0.1669
-9.9	10.00	60.00	0.40	40.00	-20.00	30.13	1.000	0.954	-0.1807
-12.5	10.00	70.00	0.40	45.00	-25.00	32.50	1.000	1.027	-0.1933
-13.9	10.00	75.00	0.40	47.50	-27.50	33.61	1.000	1.061	-0.1993
0.5	10.00	0.00	0.60	10.00	10.00	10.51	1.000	0.526	-0.0746
0.2	10.00	5.00	0.60	12.50	7.50	12.71	1.000	0.636	-0.0816
-0.1	10.00	10.00	0.60	15.00	5.00	14.87	1.000	0.743	-0.0888
-1.1	10.00	20.00	0.60	20.00	-0.00	18.90	1.000	0.945	-0.1030
-2.4	10.00	30.00	0.60	25.00	-5.00	22.64	1.000	1.124	-0.1168
-3.9	10.00	40.00	0.60	30.00	-10.00	26.09	1.000	1.280	-0.1302
-5.7	10.00	50.00	0.60	35.00	-15.00	29.28	1.000	1.419	-0.1430
-7.8	10.00	60.00	0.60	40.00	-20.00	32.21	1.000	1.550	-0.1557
-10.1	10.00	70.00	0.60	45.00	-25.00	34.91	1.000	1.671	-0.1681
-11.3	10.00	75.00	0.60	47.50	-27.50	36.17	1.000	1.728	-0.1741
0.7	10.00	0.00	0.80	10.00	10.00	10.71	1.000	0.726	-0.0627
0.5	10.00	5.00	0.80	12.50	7.50	13.02	1.000	0.873	-0.0685
0.3	10.00	10.00	0.80	15.00	5.00	15.25	1.000	1.013	-0.0744
-0.5	10.00	20.00	0.80	20.00	-0.00	19.55	1.000	1.273	-0.0866
-1.4	10.00	30.00	0.80	25.00	-5.00	23.58	1.000	1.524	-0.0989
-2.7	10.00	40.00	0.80	30.00	-10.00	27.33	1.000	1.761	-0.1110
-4.2	10.00	50.00	0.80	35.00	-15.00	30.84	1.000	1.983	-0.1231
-6.0	10.00	60.00	0.80	40.00	-20.00	34.04	1.000	2.182	-0.1358
-8.0	10.00	70.00	0.80	45.00	-25.00	36.99	1.000	2.364	-0.1483
-9.1	10.00	75.00	0.80	47.50	-27.50	38.37	1.000	2.450	-0.1545
0.9	10.00	0.00	1.00	10.00	10.00	10.86	1.000	0.869	-0.0526
0.8	10.00	5.00	1.00	12.50	7.50	13.25	1.000	1.060	-0.0572
0.6	10.00	10.00	1.00	15.00	5.00	15.61	1.000	1.249	-0.0620
0.2	10.00	20.00	1.00	20.00	-0.00	20.15	1.000	1.612	-0.0724
-0.6	10.00	30.00	1.00	25.00	-5.00	24.46	1.000	1.957	-0.0836
-1.5	10.00	40.00	1.00	30.00	-10.00	28.48	1.000	2.279	-0.0953
-2.8	10.00	50.00	1.00	35.00	-15.00	32.24	1.000	2.579	-0.1072
-4.3	10.00	60.00	1.00	40.00	-20.00	35.72	1.000	2.858	-0.1192
-6.1	10.00	70.00	1.00	45.00	-25.00	38.95	1.000	3.116	-0.1310
-7.0	10.00	75.00	1.00	47.50	-27.50	40.47	1.000	3.235	-0.1369
1.1	10.00	0.00	1.20	10.00	10.00	11.10	1.000	1.107	-0.0414
1.1	10.00	5.00	1.20	12.50	7.50	13.61	1.000	1.349	-0.0448
1.1	10.00	10.00	1.20	15.00	5.00	16.09	1.000	1.584	-0.0485
0.9	10.00	20.00	1.20	20.00	-0.00	20.89	1.000	2.032	-0.0568
0.4	10.00	30.00	1.20	25.00	-5.00	25.43	1.000	2.445	-0.0669
-0.3	10.00	40.00	1.20	30.00	-10.00	29.71	1.000	2.825	-0.0782
-1.3	10.00	50.00	1.20	35.00	-15.00	33.70	1.000	3.196	-0.0902
-2.6	10.00	60.00	1.20	40.00	-20.00	37.41	1.000	3.549	-0.1026
-4.2	10.00	70.00	1.20	45.00	-25.00	40.83	1.000	3.877	-0.1150
-5.1	10.00	75.00	1.20	47.50	-27.50	42.46	1.000	4.026	-0.1210

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
1.3	10.00	0.00	1.40	10.00	10.00	11.26	1.000	1.271	-0.0311
1.4	10.00	5.00	1.40	12.50	7.50	13.88	1.000	1.566	-0.0336
1.5	10.00	10.00	1.40	15.00	5.00	16.48	1.000	1.857	-0.0364
1.6	10.00	20.00	1.40	20.00	-0.00	21.54	1.000	2.421	-0.0434
1.4	10.00	30.00	1.40	25.00	-5.00	26.38	1.000	2.954	-0.0522
1.0	10.00	40.00	1.40	30.00	-10.00	30.95	1.000	3.454	-0.0622
0.3	10.00	50.00	1.40	35.00	-15.00	35.25	1.000	3.928	-0.0732
-0.7	10.00	60.00	1.40	40.00	-20.00	39.29	1.000	4.372	-0.0848
-2.0	10.00	70.00	1.40	45.00	-25.00	42.97	1.000	4.767	-0.0971
-2.8	10.00	75.00	1.40	47.50	-27.50	44.69	1.000	4.949	-0.1035
1.5	10.00	0.00	1.60	10.00	10.00	11.47	1.000	1.487	-0.0226
1.7	10.00	5.00	1.60	12.50	7.50	14.20	1.000	1.832	-0.0240
1.9	10.00	10.00	1.60	15.00	5.00	16.90	1.000	2.168	-0.0257
2.2	10.00	20.00	1.60	20.00	-0.00	22.21	1.000	2.828	-0.0308
2.3	10.00	30.00	1.60	25.00	-5.00	27.28	1.000	3.472	-0.0393
2.1	10.00	40.00	1.60	30.00	-10.00	32.09	1.000	4.083	-0.0494
1.6	10.00	50.00	1.60	35.00	-15.00	36.64	1.000	4.652	-0.0602
0.9	10.00	60.00	1.60	40.00	-20.00	40.87	1.000	5.177	-0.0717
-0.3	10.00	70.00	1.60	45.00	-25.00	44.71	1.000	5.645	-0.0848
-1.0	10.00	75.00	1.60	47.50	-27.50	46.51	1.000	5.862	-0.0916
1.9	10.00	0.00	2.00	10.00	10.00	11.94	1.000	1.948	-0.0102
2.4	10.00	5.00	2.00	12.50	7.50	14.84	1.000	2.405	-0.0107
2.7	10.00	10.00	2.00	15.00	5.00	17.72	1.000	2.852	-0.0114
3.5	10.00	20.00	2.00	20.00	-0.00	23.44	1.000	3.742	-0.0141
4.1	10.00	30.00	2.00	25.00	-5.00	29.04	1.000	4.628	-0.0190
4.4	10.00	40.00	2.00	30.00	-10.00	34.40	1.000	5.469	-0.0264
4.5	10.00	50.00	2.00	35.00	-15.00	39.45	1.000	6.255	-0.0358
4.1	10.00	60.00	2.00	40.00	-20.00	44.06	1.000	6.962	-0.0482
3.2	10.00	70.00	2.00	45.00	-25.00	48.22	1.000	7.592	-0.0622
2.7	10.00	75.00	2.00	47.50	-27.50	50.15	1.000	7.883	-0.0696
2.6	10.00	0.00	2.60	10.00	10.00	12.57	1.000	2.576	0.0000
3.2	10.00	5.00	2.60	12.50	7.50	15.71	1.000	3.220	0.0000
3.9	10.00	10.00	2.60	15.00	5.00	18.85	1.000	3.864	0.0000
5.2	10.00	20.00	2.60	20.00	-0.00	25.16	1.000	5.177	0.0000
6.5	10.00	30.00	2.60	25.00	-5.00	31.45	1.000	6.497	-0.0008
7.4	10.00	40.00	2.60	30.00	-10.00	37.42	1.000	7.694	-0.0065
8.1	10.00	50.00	2.60	35.00	-15.00	43.05	1.000	8.809	-0.0150
8.3	10.00	60.00	2.60	40.00	-20.00	48.29	1.000	9.857	-0.0259
7.9	10.00	70.00	2.60	45.00	-25.00	52.91	1.000	10.782	-0.0408
7.5	10.00	75.00	2.60	47.50	-27.50	54.95	1.000	11.190	-0.0498

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
0.7	20.00	0.00	0.40	20.00	20.00	20.66	1.000	0.670	-0.1330
0.0	20.00	5.00	0.40	22.50	17.50	22.50	1.000	0.725	-0.1417
-0.7	20.00	10.00	0.40	25.00	15.00	24.28	1.000	0.779	-0.1504
-2.5	20.00	20.00	0.40	30.00	10.00	27.56	1.000	0.877	-0.1670
-4.5	20.00	30.00	0.40	35.00	5.00	30.50	1.000	0.965	-0.1827
-6.8	20.00	40.00	0.40	40.00	-0.00	33.18	1.000	1.047	-0.1969
-9.4	20.00	50.00	0.40	45.00	-5.00	35.61	1.000	1.123	-0.2103
-12.2	20.00	60.00	0.40	50.00	-10.00	37.83	1.000	1.192	-0.2226
-15.1	20.00	70.00	0.40	55.00	-15.00	39.86	1.000	1.256	-0.2342
-16.7	20.00	75.00	0.40	57.50	-17.50	40.80	1.000	1.284	-0.2397
1.0	20.00	0.00	0.60	20.00	20.00	21.04	1.000	1.049	-0.1108
0.6	20.00	5.00	0.60	22.50	17.50	23.04	1.000	1.142	-0.1183
-0.0	20.00	10.00	0.60	25.00	15.00	24.98	1.000	1.230	-0.1258
-1.4	20.00	20.00	0.60	30.00	10.00	28.60	1.000	1.390	-0.1402
-3.1	20.00	30.00	0.60	35.00	5.00	31.91	1.000	1.536	-0.1544
-5.1	20.00	40.00	0.60	40.00	-0.00	34.96	1.000	1.673	-0.1683
-7.3	20.00	50.00	0.60	45.00	-5.00	37.72	1.000	1.798	-0.1816
-9.8	20.00	60.00	0.60	50.00	-10.00	40.26	1.000	1.911	-0.1944
-12.5	20.00	70.00	0.60	55.00	-15.00	42.55	1.000	2.010	-0.2066
-13.9	20.00	75.00	0.60	57.50	-17.50	43.62	1.000	2.055	-0.2125
1.4	20.00	0.00	0.80	20.00	20.00	21.38	1.000	1.386	-0.0921
1.0	20.00	5.00	0.80	22.50	17.50	23.52	1.000	1.521	-0.0987
0.6	20.00	10.00	0.80	25.00	15.00	25.59	1.000	1.651	-0.1053
-0.5	20.00	20.00	0.80	30.00	10.00	29.54	1.000	1.901	-0.1184
-1.8	20.00	30.00	0.80	35.00	5.00	33.18	1.000	2.128	-0.1323
-3.5	20.00	40.00	0.80	40.00	-0.00	36.50	1.000	2.334	-0.1462
-5.5	20.00	50.00	0.80	45.00	-5.00	39.54	1.000	2.522	-0.1598
-7.7	20.00	60.00	0.80	50.00	-10.00	42.32	1.000	2.687	-0.1729
-10.1	20.00	70.00	0.80	55.00	-15.00	44.86	1.000	2.833	-0.1853
-11.4	20.00	75.00	0.80	57.50	-17.50	46.05	1.000	2.901	-0.1913
1.7	20.00	0.00	1.00	20.00	20.00	21.72	1.000	1.738	-0.0763
1.5	20.00	5.00	1.00	22.50	17.50	24.00	1.000	1.920	-0.0824
1.2	20.00	10.00	1.00	25.00	15.00	26.20	1.000	2.096	-0.0885
0.4	20.00	20.00	1.00	30.00	10.00	30.40	1.000	2.432	-0.1013
-0.7	20.00	30.00	1.00	35.00	5.00	34.33	1.000	2.746	-0.1143
-2.1	20.00	40.00	1.00	40.00	-0.00	37.96	1.000	3.037	-0.1273
-3.7	20.00	50.00	1.00	45.00	-5.00	41.30	1.000	3.296	-0.1403
-5.7	20.00	60.00	1.00	50.00	-10.00	44.33	1.000	3.515	-0.1532
-7.9	20.00	70.00	1.00	55.00	-15.00	47.10	1.000	3.708	-0.1659
-9.1	20.00	75.00	1.00	57.50	-17.50	48.38	1.000	3.794	-0.1720
2.1	20.00	0.00	1.20	20.00	20.00	22.14	1.000	2.147	-0.0594
2.0	20.00	5.00	1.20	22.50	17.50	24.52	1.000	2.363	-0.0647
1.9	20.00	10.00	1.20	25.00	15.00	26.85	1.000	2.572	-0.0705
1.3	20.00	20.00	1.20	30.00	10.00	31.31	1.000	2.971	-0.0828
0.5	20.00	30.00	1.20	35.00	5.00	35.48	1.000	3.364	-0.0960
-0.6	20.00	40.00	1.20	40.00	-0.00	39.36	1.000	3.738	-0.1096
-2.1	20.00	50.00	1.20	45.00	-5.00	42.94	1.000	4.070	-0.1228
-3.8	20.00	60.00	1.20	50.00	-10.00	46.24	1.000	4.367	-0.1356
-5.7	20.00	70.00	1.20	55.00	-15.00	49.28	1.000	4.637	-0.1480
-6.8	20.00	75.00	1.20	57.50	-17.50	50.68	1.000	4.756	-0.1544

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
2.5	20.00	0.00	1.40	20.00	20.00	22.52	1.000	2.529	-0.0450
2.6	20.00	5.00	1.40	22.50	17.50	25.05	1.000	2.808	-0.0496
2.5	20.00	10.00	1.40	25.00	15.00	27.53	1.000	3.080	-0.0546
2.3	20.00	20.00	1.40	30.00	10.00	32.27	1.000	3.609	-0.0654
1.8	20.00	30.00	1.40	35.00	5.00	36.76	1.000	4.094	-0.0774
0.9	20.00	40.00	1.40	40.00	-0.00	40.93	1.000	4.550	-0.0901
-0.2	20.00	50.00	1.40	45.00	-5.00	44.78	1.000	4.958	-0.1038
-1.7	20.00	60.00	1.40	50.00	-10.00	48.27	1.000	5.322	-0.1176
-3.6	20.00	70.00	1.40	55.00	-15.00	51.41	1.000	5.642	-0.1321
-4.7	20.00	75.00	1.40	57.50	-17.50	52.82	1.000	5.784	-0.1396
2.9	20.00	0.00	1.60	20.00	20.00	22.90	1.000	2.917	-0.0318
3.1	20.00	5.00	1.60	22.50	17.50	25.56	1.000	3.254	-0.0361
3.2	20.00	10.00	1.60	25.00	15.00	28.16	1.000	3.585	-0.0411
3.2	20.00	20.00	1.60	30.00	10.00	33.17	1.000	4.219	-0.0519
2.9	20.00	30.00	1.60	35.00	5.00	37.89	1.000	4.808	-0.0634
2.3	20.00	40.00	1.60	40.00	-0.00	42.29	1.000	5.351	-0.0763
1.3	20.00	50.00	1.60	45.00	-5.00	46.29	1.000	5.835	-0.0907
-0.1	20.00	60.00	1.60	50.00	-10.00	49.94	1.000	6.273	-0.1057
-1.8	20.00	70.00	1.60	55.00	-15.00	53.17	1.000	6.649	-0.1213
-2.9	20.00	75.00	1.60	57.50	-17.50	54.64	1.000	6.819	-0.1291
3.8	20.00	0.00	2.00	20.00	20.00	23.79	1.000	3.796	-0.0143
4.2	20.00	5.00	2.00	22.50	17.50	26.66	1.000	4.250	-0.0167
4.5	20.00	10.00	2.00	25.00	15.00	29.50	1.000	4.700	-0.0195
5.0	20.00	20.00	2.00	30.00	10.00	35.01	1.000	5.564	-0.0274
5.2	20.00	30.00	2.00	35.00	5.00	40.23	1.000	6.376	-0.0376
5.1	20.00	40.00	2.00	40.00	-0.00	45.05	1.000	7.113	-0.0513
4.4	20.00	50.00	2.00	45.00	-5.00	49.42	1.000	7.774	-0.0668
3.4	20.00	60.00	2.00	50.00	-10.00	53.38	1.000	8.368	-0.0828
1.9	20.00	70.00	2.00	55.00	-15.00	56.86	1.000	8.879	-0.1001
0.9	20.00	75.00	2.00	57.50	-17.50	58.38	1.000	9.095	-0.1093
5.2	20.00	0.00	2.60	20.00	20.00	25.16	1.000	5.177	0.0000
5.8	20.00	5.00	2.60	22.50	17.50	28.34	1.000	5.848	0.0000
6.5	20.00	10.00	2.60	25.00	15.00	31.49	1.000	6.504	-0.0009
7.6	20.00	20.00	2.60	30.00	10.00	37.57	1.000	7.723	-0.0067
8.4	20.00	30.00	2.60	35.00	5.00	43.39	1.000	8.879	-0.0157
8.9	20.00	40.00	2.60	40.00	-0.00	48.87	1.000	9.975	-0.0272
8.7	20.00	50.00	2.60	45.00	-5.00	53.72	1.000	10.945	-0.0443
7.9	20.00	60.00	2.60	50.00	-10.00	57.87	1.000	11.707	-0.0638
6.5	20.00	70.00	2.60	55.00	-15.00	61.45	1.000	12.256	-0.0829
5.6	20.00	75.00	2.60	57.50	-17.50	63.06	1.000	12.463	-0.0919

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FI010	SLOP
1.0	30.00	0.00	0.40	30.00	30.00	30.96	1.000	0.979	-0.1851
0.1	30.00	5.00	0.40	32.50	27.50	32.55	1.000	1.028	-0.1935
-0.9	30.00	10.00	0.40	35.00	25.00	34.07	1.000	1.075	-0.2018
-3.2	30.00	20.00	0.40	40.00	20.00	36.82	1.000	1.160	-0.2170
-5.7	30.00	30.00	0.40	45.00	15.00	39.32	1.000	1.239	-0.2311
-8.5	30.00	40.00	0.40	50.00	10.00	41.54	1.000	1.306	-0.2442
-11.5	30.00	50.00	0.40	55.00	5.00	43.55	1.000	1.365	-0.2565
-14.6	30.00	60.00	0.40	60.00	-0.00	45.36	1.000	1.418	-0.2678
-18.0	30.00	70.00	0.40	65.00	-5.00	46.98	1.000	1.465	-0.2781
-19.7	30.00	75.00	0.40	67.50	-7.50	47.75	1.000	1.487	-0.2832
1.5	30.00	0.00	0.60	30.00	30.00	31.51	1.000	1.518	-0.1526
0.8	30.00	5.00	0.60	32.50	27.50	33.28	1.000	1.598	-0.1605
-0.0	30.00	10.00	0.60	35.00	25.00	35.00	1.000	1.675	-0.1685
-1.9	30.00	20.00	0.60	40.00	20.00	38.16	1.000	1.817	-0.1838
-4.0	30.00	30.00	0.60	45.00	15.00	41.01	1.000	1.944	-0.1983
-6.4	30.00	40.00	0.60	50.00	10.00	43.57	1.000	2.054	-0.2122
-9.1	30.00	50.00	0.60	55.00	5.00	45.89	1.000	2.151	-0.2253
-12.0	30.00	60.00	0.60	60.00	-0.00	47.97	1.000	2.237	-0.2376
-15.1	30.00	70.00	0.60	65.00	-5.00	49.87	1.000	2.315	-0.2492
-16.8	30.00	75.00	0.60	67.50	-7.50	50.75	1.000	2.350	-0.2547
2.1	30.00	0.00	0.80	30.00	30.00	32.04	1.000	2.057	-0.1278
1.5	30.00	5.00	0.80	32.50	27.50	33.99	1.000	2.179	-0.1356
0.9	30.00	10.00	0.80	35.00	25.00	35.84	1.000	2.294	-0.1433
-0.7	30.00	20.00	0.80	40.00	20.00	39.34	1.000	2.509	-0.1589
-2.5	30.00	30.00	0.80	45.00	15.00	42.50	1.000	2.697	-0.1738
-4.7	30.00	40.00	0.80	50.00	10.00	45.36	1.000	2.862	-0.1878
-7.0	30.00	50.00	0.80	55.00	5.00	47.96	1.000	3.008	-0.2011
-9.7	30.00	60.00	0.80	60.00	-0.00	50.31	1.000	3.137	-0.2138
-12.6	30.00	70.00	0.80	65.00	-5.00	52.43	1.000	3.256	-0.2261
-14.1	30.00	75.00	0.80	67.50	-7.50	53.40	1.000	3.311	-0.2320
2.6	30.00	0.00	1.00	30.00	30.00	32.60	1.000	2.608	-0.1084
2.2	30.00	5.00	1.00	32.50	27.50	34.68	1.000	2.774	-0.1155
1.7	30.00	10.00	1.00	35.00	25.00	36.70	1.000	2.936	-0.1227
0.5	30.00	20.00	1.00	40.00	20.00	40.49	1.000	3.237	-0.1370
-1.1	30.00	30.00	1.00	45.00	15.00	43.95	1.000	3.488	-0.1516
-2.9	30.00	40.00	1.00	50.00	10.00	47.09	1.000	3.706	-0.1659
-5.1	30.00	50.00	1.00	55.00	5.00	49.92	1.000	3.895	-0.1796
-7.5	30.00	60.00	1.00	60.00	-0.00	52.48	1.000	4.073	-0.1934
-10.2	30.00	70.00	1.00	65.00	-5.00	54.77	1.000	4.234	-0.2067
-11.7	30.00	75.00	1.00	67.50	-7.50	55.82	1.000	4.305	-0.2131
3.1	30.00	0.00	1.20	30.00	30.00	33.13	1.000	3.142	-0.0884
2.9	30.00	5.00	1.20	32.50	27.50	35.37	1.000	3.354	-0.0956
2.5	30.00	10.00	1.20	35.00	25.00	37.51	1.000	3.559	-0.1029
1.6	30.00	20.00	1.20	40.00	20.00	41.58	1.000	3.946	-0.1178
0.3	30.00	30.00	1.20	45.00	15.00	45.31	1.000	4.284	-0.1320
-1.2	30.00	40.00	1.20	50.00	10.00	48.77	1.000	4.592	-0.1459
-3.2	30.00	50.00	1.20	55.00	5.00	51.84	1.000	4.851	-0.1603
-5.5	30.00	60.00	1.20	60.00	-0.00	54.55	1.000	5.065	-0.1754
-8.0	30.00	70.00	1.20	65.00	-5.00	56.97	1.000	5.258	-0.1900
-9.4	30.00	75.00	1.20	67.50	-7.50	58.06	1.000	5.345	-0.1970

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FI010	SLOP
3.8	30.00	0.00	1.40	30.00	30.00	33.75	1.000	3.762	-0.0692
3.6	30.00	5.00	1.40	32.50	27.50	36.14	1.000	4.025	-0.0756
3.5	30.00	10.00	1.40	35.00	25.00	38.45	1.000	4.279	-0.0823
2.8	30.00	20.00	1.40	40.00	20.00	42.80	1.000	4.749	-0.0965
1.8	30.00	30.00	1.40	45.00	15.00	46.81	1.000	5.171	-0.1117
0.5	30.00	40.00	1.40	50.00	10.00	50.44	1.000	5.545	-0.1272
-1.3	30.00	50.00	1.40	55.00	5.00	53.67	1.000	5.869	-0.1443
-3.5	30.00	60.00	1.40	60.00	-0.00	56.50	1.000	6.137	-0.1607
-6.0	30.00	70.00	1.40	65.00	-5.00	59.04	1.000	6.353	-0.1760
-7.3	30.00	75.00	1.40	67.50	-7.50	60.19	1.000	6.445	-0.1833
4.4	30.00	0.00	1.60	30.00	30.00	34.35	1.000	4.366	-0.0546
4.4	30.00	5.00	1.60	32.50	27.50	36.86	1.000	4.680	-0.0607
4.3	30.00	10.00	1.60	35.00	25.00	39.30	1.000	4.983	-0.0671
3.9	30.00	20.00	1.60	40.00	20.00	43.90	1.000	5.547	-0.0819
3.1	30.00	30.00	1.60	45.00	15.00	48.10	1.000	6.053	-0.0980
1.9	30.00	40.00	1.60	50.00	10.00	51.89	1.000	6.501	-0.1149
0.3	30.00	50.00	1.60	55.00	5.00	55.26	1.000	6.890	-0.1324
-1.8	30.00	60.00	1.60	60.00	-0.00	58.24	1.000	7.225	-0.1499
-4.2	30.00	70.00	1.60	65.00	-5.00	60.83	1.000	7.499	-0.1667
-5.5	30.00	75.00	1.60	67.50	-7.50	61.98	1.000	7.601	-0.1748
5.7	30.00	0.00	2.00	30.00	30.00	35.65	1.000	5.664	-0.0285
5.9	30.00	5.00	2.00	32.50	27.50	38.41	1.000	6.094	-0.0337
6.1	30.00	10.00	2.00	35.00	25.00	41.10	1.000	6.509	-0.0398
6.2	30.00	20.00	2.00	40.00	20.00	46.17	1.000	7.282	-0.0550
5.8	30.00	30.00	2.00	45.00	15.00	50.81	1.000	7.982	-0.0722
5.0	30.00	40.00	2.00	50.00	10.00	55.00	1.000	8.609	-0.0900
3.6	30.00	50.00	2.00	55.00	5.00	58.58	1.000	9.123	-0.1106
1.7	30.00	60.00	2.00	60.00	-0.00	61.66	1.000	9.509	-0.1307
-0.7	30.00	70.00	2.00	65.00	-5.00	64.35	1.000	9.764	-0.1488
-1.9	30.00	75.00	2.00	67.50	-7.50	65.56	1.000	9.859	-0.1573
7.8	30.00	0.00	2.60	30.00	30.00	37.75	1.000	7.758	-0.0069
8.3	30.00	5.00	2.60	32.50	27.50	40.79	1.000	8.358	-0.0112
8.8	30.00	10.00	2.60	35.00	25.00	43.78	1.000	8.957	-0.0164
9.5	30.00	20.00	2.60	40.00	20.00	49.51	1.000	10.101	-0.0288
9.7	30.00	30.00	2.60	45.00	15.00	54.67	1.000	11.135	-0.0485
9.1	30.00	40.00	2.60	50.00	10.00	59.10	1.000	11.908	-0.0701
7.9	30.00	50.00	2.60	55.00	5.00	62.89	1.000	12.443	-0.0910
6.2	30.00	60.00	2.60	60.00	-0.00	66.17	1.000	12.800	-0.1105
4.0	30.00	70.00	2.60	65.00	-5.00	69.03	1.000	13.036	-0.1286
2.8	30.00	75.00	2.60	67.50	-7.50	70.33	1.000	13.133	-0.1374

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FI010	SLOP
1.3	40.00	0.00	0.40	40.00	40.00	41.29	1.000	1.299	-0.2427
0.1	40.00	5.00	0.40	42.50	37.50	42.58	1.000	1.337	-0.2505
-1.2	40.00	10.00	0.40	45.00	35.00	43.81	1.000	1.373	-0.2580
-4.0	40.00	20.00	0.40	50.00	30.00	46.00	1.000	1.436	-0.2719
-7.0	40.00	30.00	0.40	55.00	25.00	47.97	1.000	1.493	-0.2846
-10.3	40.00	40.00	0.40	60.00	20.00	49.70	1.000	1.542	-0.2960
-13.8	40.00	50.00	0.40	65.00	15.00	51.24	1.000	1.585	-0.3068
-17.4	40.00	60.00	0.40	70.00	10.00	52.61	1.000	1.623	-0.3168
-21.2	40.00	70.00	0.40	75.00	5.00	53.84	1.000	1.658	-0.3261
-23.1	40.00	75.00	0.40	77.50	2.50	54.39	1.000	1.673	-0.3303
2.0	40.00	0.00	0.60	40.00	40.00	41.97	1.000	1.985	-0.2035
1.0	40.00	5.00	0.60	42.50	37.50	43.47	1.000	2.049	-0.2117
-0.1	40.00	10.00	0.60	45.00	35.00	44.92	1.000	2.110	-0.2198
-2.5	40.00	20.00	0.60	50.00	30.00	47.54	1.000	2.219	-0.2350
-5.2	40.00	30.00	0.60	55.00	25.00	49.86	1.000	2.314	-0.2491
-8.1	40.00	40.00	0.60	60.00	20.00	51.91	1.000	2.397	-0.2623
-11.3	40.00	50.00	0.60	65.00	15.00	53.74	1.000	2.470	-0.2744
-14.6	40.00	60.00	0.60	70.00	10.00	55.39	1.000	2.535	-0.2857
-18.1	40.00	70.00	0.60	75.00	5.00	56.86	1.000	2.589	-0.2963
-20.0	40.00	75.00	0.60	77.50	2.50	57.52	1.000	2.613	-0.3012
2.7	40.00	0.00	0.80	40.00	40.00	42.69	1.000	2.708	-0.1747
1.9	40.00	5.00	0.80	42.50	37.50	44.38	1.000	2.806	-0.1829
1.0	40.00	10.00	0.80	45.00	35.00	45.97	1.000	2.896	-0.1909
-1.1	40.00	20.00	0.80	50.00	30.00	48.95	1.000	3.062	-0.2064
-3.4	40.00	30.00	0.80	55.00	25.00	51.59	1.000	3.209	-0.2212
-6.1	40.00	40.00	0.80	60.00	20.00	53.93	1.000	3.341	-0.2353
-9.0	40.00	50.00	0.80	65.00	15.00	56.01	1.000	3.450	-0.2487
-12.1	40.00	60.00	0.80	70.00	10.00	57.85	1.000	3.537	-0.2614
-15.5	40.00	70.00	0.80	75.00	5.00	59.49	1.000	3.609	-0.2732
-17.3	40.00	75.00	0.80	77.50	2.50	60.22	1.000	3.640	-0.2788
3.5	40.00	0.00	1.00	40.00	40.00	43.44	1.000	3.452	-0.1494
2.8	40.00	5.00	1.00	42.50	37.50	45.28	1.000	3.582	-0.1575
2.0	40.00	10.00	1.00	45.00	35.00	47.04	1.000	3.703	-0.1656
0.3	40.00	20.00	1.00	50.00	30.00	50.28	1.000	3.919	-0.1814
-1.8	40.00	30.00	1.00	55.00	25.00	53.21	1.000	4.125	-0.1975
-4.2	40.00	40.00	1.00	60.00	20.00	55.79	1.000	4.304	-0.2129
-6.9	40.00	50.00	1.00	65.00	15.00	58.07	1.000	4.455	-0.2276
-9.9	40.00	60.00	1.00	70.00	10.00	60.08	1.000	4.585	-0.2416
-13.2	40.00	70.00	1.00	75.00	5.00	61.81	1.000	4.688	-0.2556
-14.9	40.00	75.00	1.00	77.50	2.50	62.57	1.000	4.731	-0.2621
4.2	40.00	0.00	1.20	40.00	40.00	44.17	1.000	4.181	-0.1275
3.7	40.00	5.00	1.20	42.50	37.50	46.18	1.000	4.362	-0.1354
3.1	40.00	10.00	1.20	45.00	35.00	48.08	1.000	4.531	-0.1430
1.6	40.00	20.00	1.20	50.00	30.00	51.64	1.000	4.835	-0.1593
-0.2	40.00	30.00	1.20	55.00	25.00	54.79	1.000	5.084	-0.1768
-2.4	40.00	40.00	1.20	60.00	20.00	57.56	1.000	5.305	-0.1938
-5.0	40.00	50.00	1.20	65.00	15.00	60.00	1.000	5.500	-0.2100
-7.9	40.00	60.00	1.20	70.00	10.00	62.09	1.000	5.645	-0.2259
-11.1	40.00	70.00	1.20	75.00	5.00	63.91	1.000	5.761	-0.2410
-12.8	40.00	75.00	1.20	77.50	2.50	64.70	1.000	5.809	-0.2480

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
5.0	40.00	0.00	1.40	40.00	40.00	44.96	1.000	4.977	-0.1045
4.6	40.00	5.00	1.40	42.50	37.50	47.13	1.000	5.203	-0.1130
4.2	40.00	10.00	1.40	45.00	35.00	49.19	1.000	5.417	-0.1215
3.0	40.00	20.00	1.40	50.00	30.00	52.98	1.000	5.800	-0.1405
1.3	40.00	30.00	1.40	55.00	25.00	56.32	1.000	6.120	-0.1596
-0.7	40.00	40.00	1.40	60.00	20.00	59.28	1.000	6.373	-0.1775
-3.2	40.00	50.00	1.40	65.00	15.00	61.82	1.000	6.571	-0.1951
-6.0	40.00	60.00	1.40	70.00	10.00	63.99	1.000	6.728	-0.2122
-9.1	40.00	70.00	1.40	75.00	5.00	65.88	1.000	6.855	-0.2284
-10.8	40.00	75.00	1.40	77.50	2.50	66.71	1.000	6.907	-0.2358
5.8	40.00	0.00	1.60	40.00	40.00	45.76	1.000	5.772	-0.0887
5.6	40.00	5.00	1.60	42.50	37.50	48.04	1.000	6.046	-0.0977
5.2	40.00	10.00	1.60	45.00	35.00	50.22	1.000	6.306	-0.1070
4.2	40.00	20.00	1.60	50.00	30.00	54.22	1.000	6.770	-0.1268
2.8	40.00	30.00	1.60	55.00	25.00	57.76	1.000	7.171	-0.1469
0.8	40.00	40.00	1.60	60.00	20.00	60.82	1.000	7.498	-0.1666
-1.6	40.00	50.00	1.60	65.00	15.00	63.45	1.000	7.721	-0.1858
-4.3	40.00	60.00	1.60	70.00	10.00	65.67	1.000	7.877	-0.2035
-7.4	40.00	70.00	1.60	75.00	5.00	67.60	1.000	7.990	-0.2200
-9.0	40.00	75.00	1.60	77.50	2.50	68.45	1.000	8.033	-0.2276
7.5	40.00	0.00	2.00	40.00	40.00	47.46	1.000	7.478	-0.0595
7.5	40.00	5.00	2.00	42.50	37.50	50.00	1.000	7.861	-0.0690
7.4	40.00	10.00	2.00	45.00	35.00	52.43	1.000	8.225	-0.0788
6.9	40.00	20.00	2.00	50.00	30.00	56.87	1.000	8.880	-0.1001
5.7	40.00	30.00	2.00	55.00	25.00	60.66	1.000	9.398	-0.1242
3.9	40.00	40.00	2.00	60.00	20.00	63.89	1.000	9.725	-0.1457
1.7	40.00	50.00	2.00	65.00	15.00	66.67	1.000	9.935	-0.1652
-0.9	40.00	60.00	2.00	70.00	10.00	69.09	1.000	10.064	-0.1830
-3.8	40.00	70.00	2.00	75.00	5.00	71.18	1.000	10.185	-0.2001
-5.4	40.00	75.00	2.00	77.50	2.50	72.14	1.000	10.253	-0.2084
10.2	40.00	0.00	2.60	40.00	40.00	50.23	1.000	10.247	-0.0308
10.6	40.00	5.00	2.60	42.50	37.50	53.10	1.000	10.820	-0.0416
10.8	40.00	10.00	2.60	45.00	35.00	55.79	1.000	11.344	-0.0536
10.6	40.00	20.00	2.60	50.00	30.00	60.57	1.000	12.133	-0.0780
9.6	40.00	30.00	2.60	55.00	25.00	64.61	1.000	12.641	-0.1010
8.1	40.00	40.00	2.60	60.00	20.00	68.07	1.000	12.965	-0.1224
6.1	40.00	50.00	2.60	65.00	15.00	71.06	1.000	13.207	-0.1429
3.7	40.00	60.00	2.60	70.00	10.00	73.65	1.000	13.466	-0.1635
0.9	40.00	70.00	2.60	75.00	5.00	75.89	1.000	13.687	-0.1828
-0.6	40.00	75.00	2.60	77.50	2.50	76.89	1.000	13.785	-0.1918

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FI010	SLOP
1.6	50.00	0.00	0.40	50.00	50.00	51.59	1.000	1.595	-0.3093
0.0	50.00	5.00	0.40	52.50	47.50	52.53	1.000	1.621	-0.3163
-1.6	50.00	10.00	0.40	55.00	45.00	53.43	1.000	1.646	-0.3230
-5.0	50.00	20.00	0.40	60.00	40.00	54.99	1.000	1.690	-0.3350
-8.6	50.00	30.00	0.40	65.00	35.00	56.38	1.000	1.723	-0.3452
-12.4	50.00	40.00	0.40	70.00	30.00	57.59	1.000	1.751	-0.3542
-16.3	50.00	50.00	0.40	75.00	25.00	58.67	1.000	1.774	-0.3621
-20.4	50.00	60.00	0.40	80.00	20.00	59.64	1.000	1.793	-0.3693
-24.5	50.00	70.00	0.40	85.00	15.00	60.49	1.000	1.810	-0.3759
-26.6	50.00	75.00	0.40	87.50	12.50	60.88	1.000	1.819	-0.3790
2.4	50.00	0.00	0.60	50.00	50.00	52.40	1.000	2.417	-0.2655
1.1	50.00	5.00	0.60	52.50	47.50	53.58	1.000	2.464	-0.2733
-0.3	50.00	10.00	0.60	55.00	45.00	54.71	1.000	2.509	-0.2810
-3.3	50.00	20.00	0.60	60.00	40.00	56.70	1.000	2.583	-0.2951
-6.6	50.00	30.00	0.60	65.00	35.00	58.42	1.000	2.645	-0.3079
-10.1	50.00	40.00	0.60	70.00	30.00	59.92	1.000	2.697	-0.3193
-13.8	50.00	50.00	0.60	75.00	25.00	61.23	1.000	2.741	-0.3302
-17.6	50.00	60.00	0.60	80.00	20.00	62.38	1.000	2.779	-0.3402
-21.6	50.00	70.00	0.60	85.00	15.00	63.36	1.000	2.810	-0.3490
-23.7	50.00	75.00	0.60	87.50	12.50	63.84	1.000	2.825	-0.3534
3.3	50.00	0.00	0.80	50.00	50.00	53.30	1.000	3.305	-0.2314
2.2	50.00	5.00	0.80	52.50	47.50	54.67	1.000	3.382	-0.2399
1.0	50.00	10.00	0.80	55.00	45.00	55.95	1.000	3.448	-0.2483
-1.7	50.00	20.00	0.80	60.00	40.00	58.28	1.000	3.556	-0.2644
-4.7	50.00	30.00	0.80	65.00	35.00	60.27	1.000	3.642	-0.2792
-8.0	50.00	40.00	0.80	70.00	30.00	61.97	1.000	3.714	-0.2934
-11.5	50.00	50.00	0.80	75.00	25.00	63.44	1.000	3.775	-0.3065
-15.3	50.00	60.00	0.80	80.00	20.00	64.71	1.000	3.825	-0.3185
-19.2	50.00	70.00	0.80	85.00	15.00	65.82	1.000	3.868	-0.3295
-21.2	50.00	75.00	0.80	87.50	12.50	66.30	1.000	3.887	-0.3344
4.2	50.00	0.00	1.00	50.00	50.00	54.18	1.000	4.193	-0.2032
3.2	50.00	5.00	1.00	52.50	47.50	55.72	1.000	4.299	-0.2124
2.2	50.00	10.00	1.00	55.00	45.00	57.17	1.000	4.396	-0.2217
-0.2	50.00	20.00	1.00	60.00	40.00	59.79	1.000	4.566	-0.2395
-3.0	50.00	30.00	1.00	65.00	35.00	61.99	1.000	4.698	-0.2571
-6.1	50.00	40.00	1.00	70.00	30.00	63.85	1.000	4.802	-0.2737
-9.6	50.00	50.00	1.00	75.00	25.00	65.42	1.000	4.885	-0.2889
-13.2	50.00	60.00	1.00	80.00	20.00	66.78	1.000	4.953	-0.3028
-17.1	50.00	70.00	1.00	85.00	15.00	67.93	1.000	5.008	-0.3152
-19.1	50.00	75.00	1.00	87.50	12.50	68.46	1.000	5.032	-0.3211
5.1	50.00	0.00	1.20	50.00	50.00	55.09	1.000	5.108	-0.1786
4.3	50.00	5.00	1.20	52.50	47.50	56.79	1.000	5.243	-0.1889
3.4	50.00	10.00	1.20	55.00	45.00	58.36	1.000	5.369	-0.1990
1.2	50.00	20.00	1.20	60.00	40.00	61.20	1.000	5.585	-0.2189
-1.4	50.00	30.00	1.20	65.00	35.00	63.61	1.000	5.743	-0.2385
-4.4	50.00	40.00	1.20	70.00	30.00	65.61	1.000	5.862	-0.2562
-7.7	50.00	50.00	1.20	75.00	25.00	67.32	1.000	5.953	-0.2725
-11.2	50.00	60.00	1.20	80.00	20.00	68.79	1.000	6.025	-0.2872
-15.0	50.00	70.00	1.20	85.00	15.00	70.05	1.000	6.082	-0.3006
-16.9	50.00	75.00	1.20	87.50	12.50	70.56	1.000	6.107	-0.3074

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
6.1	50.00	0.00	1.40	50.00	50.00	56.08	1.000	6.099	-0.1582
5.4	50.00	5.00	1.40	52.50	47.50	57.90	1.000	6.258	-0.1690
4.6	50.00	10.00	1.40	55.00	45.00	59.60	1.000	6.398	-0.1795
2.6	50.00	20.00	1.40	60.00	40.00	62.59	1.000	6.628	-0.2009
0.2	50.00	30.00	1.40	65.00	35.00	65.13	1.000	6.806	-0.2218
-2.7	50.00	40.00	1.40	70.00	30.00	67.29	1.000	6.943	-0.2412
-5.9	50.00	50.00	1.40	75.00	25.00	69.10	1.000	7.050	-0.2588
-9.4	50.00	60.00	1.40	80.00	20.00	70.62	1.000	7.129	-0.2750
-13.1	50.00	70.00	1.40	85.00	15.00	71.88	1.000	7.186	-0.2902
-15.1	50.00	75.00	1.40	87.50	12.50	72.43	1.000	7.208	-0.2969
7.1	50.00	0.00	1.60	50.00	50.00	57.09	1.000	7.096	-0.1429
6.5	50.00	5.00	1.60	52.50	47.50	59.02	1.000	7.312	-0.1547
5.8	50.00	10.00	1.60	55.00	45.00	60.82	1.000	7.498	-0.1666
4.0	50.00	20.00	1.60	60.00	40.00	63.96	1.000	7.759	-0.1897
1.6	50.00	30.00	1.60	65.00	35.00	66.59	1.000	7.934	-0.2113
-1.2	50.00	40.00	1.60	70.00	30.00	68.82	1.000	8.050	-0.2309
-4.3	50.00	50.00	1.60	75.00	25.00	70.67	1.000	8.137	-0.2491
-7.8	50.00	60.00	1.60	80.00	20.00	72.23	1.000	8.219	-0.2664
-11.4	50.00	70.00	1.60	85.00	15.00	73.54	1.000	8.283	-0.2818
-13.4	50.00	75.00	1.60	87.50	12.50	74.13	1.000	8.311	-0.2890
9.2	50.00	0.00	2.00	50.00	50.00	59.19	1.000	9.208	-0.1145
8.8	50.00	5.00	2.00	52.50	47.50	61.32	1.000	9.472	-0.1285
8.3	50.00	10.00	2.00	55.00	45.00	63.24	1.000	9.666	-0.1412
6.6	50.00	20.00	2.00	60.00	40.00	66.62	1.000	9.932	-0.1649
4.5	50.00	30.00	2.00	65.00	35.00	69.49	1.000	10.081	-0.1861
2.0	50.00	40.00	2.00	70.00	30.00	71.96	1.000	10.240	-0.2069
-0.9	50.00	50.00	2.00	75.00	25.00	74.08	1.000	10.388	-0.2262
-4.1	50.00	60.00	2.00	80.00	20.00	75.89	1.000	10.510	-0.2437
-7.5	50.00	70.00	2.00	85.00	15.00	77.44	1.000	10.611	-0.2594
-9.4	50.00	75.00	2.00	87.50	12.50	78.16	1.000	10.657	-0.2668
12.4	50.00	0.00	2.60	50.00	50.00	62.37	1.000	12.377	-0.0880
12.1	50.00	5.00	2.60	52.50	47.50	64.63	1.000	12.643	-0.1011
11.7	50.00	10.00	2.60	55.00	45.00	66.71	1.000	12.850	-0.1138
10.4	50.00	20.00	2.60	60.00	40.00	70.38	1.000	13.138	-0.1378
8.6	50.00	30.00	2.60	65.00	35.00	73.57	1.000	13.459	-0.1629
6.3	50.00	40.00	2.60	70.00	30.00	76.27	1.000	13.725	-0.1862
3.6	50.00	50.00	2.60	75.00	25.00	78.56	1.000	13.946	-0.2076
0.5	50.00	60.00	2.60	80.00	20.00	80.51	1.000	14.132	-0.2268
-2.8	50.00	70.00	2.60	85.00	15.00	82.20	1.000	14.291	-0.2443
-4.6	50.00	75.00	2.60	87.50	12.50	82.93	1.000	14.359	-0.2521

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
1.8	60.00	0.00	0.40	60.00	60.00	61.83	1.000	1.839	-0.3867
-0.1	60.00	5.00	0.40	62.50	57.50	62.40	1.000	1.850	-0.3914
-2.1	60.00	10.00	0.40	65.00	55.00	62.92	1.000	1.861	-0.3958
-6.2	60.00	20.00	0.40	70.00	50.00	63.83	1.000	1.880	-0.4035
-10.4	60.00	30.00	0.40	75.00	45.00	64.59	1.000	1.895	-0.4101
-14.7	60.00	40.00	0.40	80.00	40.00	65.26	1.000	1.909	-0.4160
-19.1	60.00	50.00	0.40	85.00	35.00	65.86	1.000	1.920	-0.4213
-23.6	60.00	60.00	0.40	90.00	30.00	66.37	1.000	1.931	-0.4259
2.8	60.00	0.00	0.60	60.00	60.00	62.78	1.000	2.791	-0.3437
1.1	60.00	5.00	0.60	62.50	57.50	63.55	1.000	2.816	-0.3507
-0.7	60.00	10.00	0.60	65.00	55.00	64.27	1.000	2.838	-0.3574
-4.5	60.00	20.00	0.60	70.00	50.00	65.50	1.000	2.875	-0.3692
-8.5	60.00	30.00	0.60	75.00	45.00	66.52	1.000	2.905	-0.3792
-12.6	60.00	40.00	0.60	80.00	40.00	67.40	1.000	2.930	-0.3882
-16.9	60.00	50.00	0.60	85.00	35.00	68.16	1.000	2.951	-0.3961
-21.2	60.00	60.00	0.60	90.00	30.00	68.80	1.000	2.968	-0.4029
3.8	60.00	0.00	0.80	60.00	60.00	63.78	1.000	3.788	-0.3097
2.2	60.00	5.00	0.80	62.50	57.50	64.72	1.000	3.826	-0.3186
0.6	60.00	10.00	0.80	65.00	55.00	65.58	1.000	3.859	-0.3271
-2.9	60.00	20.00	0.80	70.00	50.00	67.07	1.000	3.915	-0.3424
-6.7	60.00	30.00	0.80	75.00	45.00	68.28	1.000	3.959	-0.3554
-10.7	60.00	40.00	0.80	80.00	40.00	69.30	1.000	3.996	-0.3670
-14.8	60.00	50.00	0.80	85.00	35.00	70.16	1.000	4.025	-0.3774
-19.2	60.00	60.00	0.80	90.00	30.00	70.83	1.000	4.045	-0.3872
4.9	60.00	0.00	1.00	60.00	60.00	64.85	1.000	4.855	-0.2832
3.4	60.00	5.00	1.00	62.50	57.50	65.93	1.000	4.911	-0.2939
1.9	60.00	10.00	1.00	65.00	55.00	66.90	1.000	4.959	-0.3041
-1.4	60.00	20.00	1.00	70.00	50.00	68.59	1.000	5.038	-0.3226
-5.1	60.00	30.00	1.00	75.00	45.00	69.94	1.000	5.097	-0.3383
-9.0	60.00	40.00	1.00	80.00	40.00	71.01	1.000	5.136	-0.3536
-13.2	60.00	50.00	1.00	85.00	35.00	71.84	1.000	5.164	-0.3663
-17.5	60.00	60.00	1.00	90.00	30.00	72.54	1.000	5.185	-0.3775
5.9	60.00	0.00	1.20	60.00	60.00	65.86	1.000	5.876	-0.2586
4.6	60.00	5.00	1.20	62.50	57.50	67.07	1.000	5.940	-0.2700
3.2	60.00	10.00	1.20	65.00	55.00	68.18	1.000	5.996	-0.2810
0.1	60.00	20.00	1.20	70.00	50.00	70.06	1.000	6.083	-0.3008
-3.5	60.00	30.00	1.20	75.00	45.00	71.54	1.000	6.153	-0.3209
-7.3	60.00	40.00	1.20	80.00	40.00	72.70	1.000	6.205	-0.3380
-11.4	60.00	50.00	1.20	85.00	35.00	73.62	1.000	6.244	-0.3523
-15.6	60.00	60.00	1.20	90.00	30.00	74.40	1.000	6.276	-0.3649

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIC10	SLOP
6.9	60.00	0.00	1.40	60.00	60.00	66.90	1.000	6.920	-0.2377
5.7	60.00	5.00	1.40	62.50	57.50	68.24	1.000	7.001	-0.2504
4.4	60.00	10.00	1.40	65.00	55.00	69.44	1.000	7.069	-0.2622
1.5	60.00	20.00	1.40	70.00	50.00	71.45	1.000	7.167	-0.2849
-1.9	60.00	30.00	1.40	75.00	45.00	73.08	1.000	7.234	-0.3052
-5.6	60.00	40.00	1.40	80.00	40.00	74.38	1.000	7.280	-0.3225
-9.6	60.00	50.00	1.40	85.00	35.00	75.45	1.000	7.314	-0.3374
-13.7	60.00	60.00	1.40	90.00	30.00	76.34	1.000	7.338	-0.3502
8.0	60.00	0.00	1.60	60.00	60.00	67.99	1.000	8.011	-0.2235
6.9	60.00	5.00	1.60	62.50	57.50	69.39	1.000	8.075	-0.2362
5.6	60.00	10.00	1.60	65.00	55.00	70.64	1.000	8.135	-0.2487
2.8	60.00	20.00	1.60	70.00	50.00	72.78	1.000	8.247	-0.2729
-0.5	60.00	30.00	1.60	75.00	45.00	74.51	1.000	8.328	-0.2938
-4.1	60.00	40.00	1.60	80.00	40.00	75.91	1.000	8.389	-0.3118
-7.9	60.00	50.00	1.60	85.00	35.00	77.06	1.000	8.436	-0.3273
-12.0	60.00	60.00	1.60	90.00	30.00	78.02	1.000	8.472	-0.3406
10.1	60.00	0.00	2.00	60.00	60.00	70.10	1.000	10.107	-0.1908
9.2	60.00	5.00	2.00	62.50	57.50	71.69	1.000	10.221	-0.2044
8.1	60.00	10.00	2.00	65.00	55.00	73.14	1.000	10.323	-0.2175
5.7	60.00	20.00	2.00	70.00	50.00	75.66	1.000	10.494	-0.2415
2.8	60.00	30.00	2.00	75.00	45.00	77.74	1.000	10.630	-0.2625
-0.5	60.00	40.00	2.00	80.00	40.00	79.50	1.000	10.742	-0.2812
-4.0	60.00	50.00	2.00	85.00	35.00	80.95	1.000	10.832	-0.2973
-7.8	60.00	60.00	2.00	90.00	30.00	82.20	1.000	10.907	-0.3116
13.4	60.00	0.00	2.60	60.00	60.00	73.43	1.000	13.445	-0.1617
12.7	60.00	5.00	2.60	62.50	57.50	75.23	1.000	13.623	-0.1770
11.9	60.00	10.00	2.60	65.00	55.00	76.85	1.000	13.781	-0.1915
9.7	60.00	20.00	2.60	70.00	50.00	79.67	1.000	14.052	-0.2184
7.0	60.00	30.00	2.60	75.00	45.00	82.00	1.000	14.272	-0.2422
3.9	60.00	40.00	2.60	80.00	40.00	83.93	1.000	14.452	-0.2630
0.5	60.00	50.00	2.60	85.00	35.00	85.53	1.000	14.599	-0.2811
-3.1	60.00	60.00	2.60	90.00	30.00	86.91	1.000	14.724	-0.2971

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
2.0	70.00	0.00	0.40	70.00	70.00	72.03	1.000	2.041	-0.4831
-0.4	70.00	5.00	0.40	72.50	67.50	72.14	1.000	2.043	-0.4844
-2.8	70.00	10.00	0.40	75.00	65.00	72.21	1.000	2.044	-0.4852
-7.7	70.00	20.00	0.40	80.00	60.00	72.32	1.000	2.046	-0.4865
-12.6	70.00	30.00	0.40	85.00	55.00	72.42	1.000	2.048	-0.4877
-17.5	70.00	40.00	0.40	90.00	50.00	72.50	1.000	2.050	-0.4887
3.1	70.00	0.00	0.60	70.00	70.00	73.08	1.000	3.092	-0.4552
0.8	70.00	5.00	0.60	72.50	67.50	73.30	1.000	3.099	-0.4582
-1.5	70.00	10.00	0.60	75.00	65.00	73.50	1.000	3.105	-0.4610
-6.2	70.00	20.00	0.60	80.00	60.00	73.81	1.000	3.114	-0.4652
-10.9	70.00	30.00	0.60	85.00	55.00	74.06	1.000	3.122	-0.4687
-15.7	70.00	40.00	0.60	90.00	50.00	74.28	1.000	3.128	-0.4717
4.1	70.00	0.00	0.80	70.00	70.00	74.12	1.000	4.130	-0.4418
1.9	70.00	5.00	0.80	72.50	67.50	74.39	1.000	4.136	-0.4466
-0.4	70.00	10.00	0.80	75.00	65.00	74.64	1.000	4.142	-0.4512
-5.0	70.00	20.00	0.80	80.00	60.00	75.00	1.000	4.150	-0.4579
-9.7	70.00	30.00	0.80	85.00	55.00	75.27	1.000	4.156	-0.4632
-14.5	70.00	40.00	0.80	90.00	50.00	75.47	1.000	4.160	-0.4670
5.3	70.00	0.00	1.00	70.00	70.00	75.25	1.000	5.256	-0.4246
3.1	70.00	5.00	1.00	72.50	67.50	75.60	1.000	5.263	-0.4312
0.9	70.00	10.00	1.00	75.00	65.00	75.89	1.000	5.269	-0.4366
-3.6	70.00	20.00	1.00	80.00	60.00	76.37	1.000	5.278	-0.4459
-8.3	70.00	30.00	1.00	85.00	55.00	76.72	1.000	5.285	-0.4528
-13.0	70.00	40.00	1.00	90.00	50.00	76.97	1.000	5.289	-0.4577
6.4	70.00	0.00	1.20	70.00	70.00	76.34	1.000	6.351	-0.3985
4.3	70.00	5.00	1.20	72.50	67.50	76.82	1.000	6.369	-0.4073
2.2	70.00	10.00	1.20	75.00	65.00	77.23	1.000	6.383	-0.4149
-2.1	70.00	20.00	1.20	80.00	60.00	77.87	1.000	6.405	-0.4270
-6.7	70.00	30.00	1.20	85.00	55.00	78.34	1.000	6.421	-0.4363
-11.3	70.00	40.00	1.20	90.00	50.00	78.69	1.000	6.433	-0.4432

IREF	STAGGER	CAMBER	SOLIDITY	ALF1	ALF2	BTP1	FKI	FIO10	SLOP
7.4	70.00	0.00	1.40	70.00	70.00	77.35	1.000	7.363	-0.3653
5.5	70.00	5.00	1.40	72.50	67.50	77.99	1.000	7.377	-0.3750
3.6	70.00	10.00	1.40	75.00	65.00	78.54	1.000	7.387	-0.3836
-0.6	70.00	20.00	1.40	80.00	60.00	79.45	1.000	7.402	-0.3982
-4.9	70.00	30.00	1.40	85.00	55.00	80.12	1.000	7.411	-0.4093
-9.3	70.00	40.00	1.40	90.00	50.00	80.66	1.000	7.418	-0.4184
8.5	70.00	0.00	1.60	70.00	70.00	78.47	1.000	8.488	-0.3472
6.7	70.00	5.00	1.60	72.50	67.50	79.21	1.000	8.514	-0.3578
4.9	70.00	10.00	1.60	75.00	65.00	79.86	1.000	8.535	-0.3675
0.9	70.00	20.00	1.60	80.00	60.00	80.90	1.000	8.568	-0.3834
-3.3	70.00	30.00	1.60	85.00	55.00	81.70	1.000	8.591	-0.3961
-7.6	70.00	40.00	1.60	90.00	50.00	82.35	1.000	8.608	-0.4064
10.8	70.00	0.00	2.00	70.00	70.00	80.82	1.000	10.824	-0.2957
9.3	70.00	5.00	2.00	72.50	67.50	81.84	1.000	10.886	-0.3073
7.8	70.00	10.00	2.00	75.00	65.00	82.74	1.000	10.939	-0.3179
4.3	70.00	20.00	2.00	80.00	60.00	84.29	1.000	11.030	-0.3364
0.5	70.00	30.00	2.00	85.00	55.00	85.54	1.000	11.100	-0.3517
-3.4	70.00	40.00	2.00	90.00	50.00	86.57	1.000	11.157	-0.3647
14.5	70.00	0.00	2.60	70.00	70.00	84.49	1.000	14.503	-0.2692
13.2	70.00	5.00	2.60	72.50	67.50	85.69	1.000	14.613	-0.2829
11.8	70.00	10.00	2.60	75.00	65.00	86.75	1.000	14.709	-0.2952

TER	STAGGER	SOLIDITY	INCOIC	N1	N2
0	0.000	0.400	0.0416902900	-0.0427583000	-0.0014350800
0	0.000	0.600	0.0120052100	-0.0224471500	-0.0013213330
0	0.000	0.800	0.0033277190	-0.0036197210	-0.0012249160
0	0.000	1.000	-0.0412259200	0.0156554300	-0.0011635870
0	0.000	1.200	-0.0736750300	0.0414940100	-0.0011712410
0	0.000	1.400	-0.0973271700	0.0599010200	-0.0010576630
0	0.000	1.600	-0.1235253000	0.0821846700	-0.0010451220
0	0.000	2.000	-0.1316787000	0.1163592000	-0.0008748404
0	0.000	2.600	-0.1858187000	0.1628771000	-0.0007099751
0	5.000	0.400	0.2297837000	-0.0640125200	-0.0014231350
0	5.000	0.600	0.2842988000	-0.0396976200	-0.0013324960
0	5.000	0.800	0.3739323000	-0.0177345800	-0.0012673920
0	5.000	1.000	0.4049863000	0.0048778050	-0.0012358980
0	5.000	1.200	0.5032458000	0.0319819400	-0.0012726660
0	5.000	1.400	0.5569412000	0.0543362400	-0.0011927410
0	5.000	1.600	0.6445162000	0.0780658700	-0.0012044250
0	5.000	2.000	0.8256406000	0.1210635000	-0.0011611520
0	5.000	2.600	1.0552710000	0.1758870000	-0.0010869910
0	10.000	0.400	0.4126161000	-0.0875344800	-0.0013846100
0	10.000	0.600	0.5538513000	-0.0581258300	-0.0013420850
0	10.000	0.800	0.7211202000	-0.0319995700	-0.0013250670
0	10.000	1.000	0.8530855000	-0.0081632840	-0.0012927040
0	10.000	1.200	1.0720830000	0.0190007000	-0.0013405990
0	10.000	1.400	1.2028930000	0.0468891800	-0.0013299450
0	10.000	1.600	1.3868070000	0.0730901900	-0.0013863100
0	10.000	2.000	1.7638680000	0.1236189000	-0.0014623570
0	10.000	2.600	2.3032050000	0.1894074000	-0.0015638340
0	20.000	0.400	0.7376582000	-0.1380430000	-0.0012681910
0	20.000	0.600	1.0853300000	-0.1001535000	-0.0013312470
0	20.000	0.800	1.4048630000	-0.0672025600	-0.0013946710
0	20.000	1.000	1.7354430000	-0.0379282200	-0.0014243780
0	20.000	1.200	2.1455200000	-0.0132385200	-0.0014182240
0	20.000	1.400	2.4758310000	0.0253755600	-0.0016036250
0	20.000	1.600	2.8444100000	0.0552779400	-0.0017440390
0	20.000	2.000	3.6626240000	0.1133674000	-0.0019869590
0	20.000	2.600	4.9443780000	0.1934199000	-0.0024445860
0	30.000	0.400	1.0429590000	-0.1909008000	-0.0011606470
0	30.000	0.600	1.5706100000	-0.1483116000	-0.0012890710
0	30.000	0.800	2.1047840000	-0.1137223000	-0.0013703430
0	30.000	1.000	2.6359450000	-0.0790304500	-0.0014965470
0	30.000	1.200	3.1358840000	-0.0437543100	-0.0016531880
0	30.000	1.400	3.7512950000	-0.0095858830	-0.0018434300
0	30.000	1.600	4.3458020000	0.0185054800	-0.0020008320
0	30.000	2.000	5.6058840000	0.0792661900	-0.0024027510
0	30.000	2.600	7.6935130000	0.1477140000	-0.0028510140

IER	STAGGER	SOLIDITY	INCOID	N1	N2
0	40.000	0.400	1.3596850000	-0.2504424000	-0.0010188180
0	40.000	0.600	2.0498990000	-0.2060588000	-0.0011779050
0	40.000	0.800	2.7585630000	-0.1666613000	-0.0013473710
0	40.000	1.000	3.4878150000	-0.1309638000	-0.0015333350
0	40.000	1.200	4.2194570000	-0.0963556100	-0.0017488190
0	40.000	1.400	5.0288170000	-0.0662726100	-0.0019399010
0	40.000	1.600	5.8268590000	-0.0404719300	-0.0021195640
0	40.000	2.000	7.5907050000	0.0034571700	-0.0023773840
0	40.000	2.600	10.4583700000	0.0468881600	-0.0026230370
0	50.000	0.400	1.6624880000	-0.3216925000	-0.0007443703
0	50.000	0.600	2.4853590000	-0.2728887000	-0.0010221160
0	50.000	0.800	3.3862920000	-0.2345634000	-0.0012556970
0	50.000	1.000	4.2834930000	-0.2006316000	-0.0014892760
0	50.000	1.200	5.2151870000	-0.1737083000	-0.0016393060
0	50.000	1.400	6.2137850000	-0.1502695000	-0.0017974680
0	50.000	1.600	7.2545690000	-0.1338569000	-0.0019038560
0	50.000	2.000	9.3978750000	-0.1078427000	-0.0019187790
0	50.000	2.600	12.5352900000	-0.0715401100	-0.0021075800
0	60.000	0.400	1.8643060000	-0.3928702000	-0.0005379459
0	60.000	0.600	2.8335840000	-0.3523778000	-0.0008143338
0	60.000	0.800	3.8351140000	-0.3177559000	-0.0011074280
0	60.000	1.000	4.9188610000	-0.2914840000	-0.0013762940
0	60.000	1.200	5.9551110000	-0.2676403000	-0.0015514960
0	60.000	1.400	7.0160680000	-0.2491214000	-0.0016166670
0	60.000	1.600	8.1002690000	-0.2363350000	-0.0016559400
0	60.000	2.000	10.1970500000	-0.1948113000	-0.0017687140
0	60.000	2.600	13.5489100000	-0.1567400000	-0.0020364330
0	70.000	0.400	2.0424290000	-0.4840408000	-0.0001128001
0	70.000	0.600	3.0989080000	-0.4576027000	-0.0003365912
0	70.000	0.800	4.1454450000	-0.4483525000	-0.0004633025
0	70.000	1.000	5.2759590000	-0.4334465000	-0.0006069876
0	70.000	1.200	6.3768570000	-0.4084233000	-0.0008461114
0	70.000	1.400	7.3895730000	-0.3762198000	-0.0010475440
0	70.000	1.600	8.5167980000	-0.3565449000	-0.0011996070
0	70.000	2.000	10.8515400000	-0.2968715000	-0.0015144750
0	70.000	2.600	14.5029900000	-0.2470979000	-0.0027492520

APPENDIX C

IREF 2: Program to Calculate Reference Incidence Angle for a Constant Stagger Cascade

```
C
C     THIS PROGRAM COMPUTES REFERENCE INCIDENCE ANGLE FOR
C     CONSTANT STAGGER CASCADES.  REQUIRED INPUT DATA ARE
C     CAMBER ANGLE, STAGGER ANGLE, MAXIMUM THICKNESS TO
C     CHORD RATIO, SOLIDITY, AND A CORRECTION FACTOR FOR
C     THICKNESS DISTRIBUTION.  SEE REPORT ISU-ERI-AMES-99985
C     FOR FURTHER DESCRIPTION.
C
C
C                DEFINITION OF VARIABLES
C
C
C     ALF1              LEADING EDGE BLADE ELEMENT CAMBER-
C                       LINE TANGENT ANGLE, DEG.
C
C     ANGST(IG)         STAGGER ANGLE, DEG.
C
C     ANGSTB(K)         VALUE  OF STAGGER ANGLE, DEG.
C                       FOR WHICH INPUT VALUES OF FI10GB(K,L),
C                       SLP1GB(K,L), AND SLP2GB(K,L) WERE
C                       OBTAINED FROM FIGURES 5 AND 7
C                       ISU-ERI-AMES-99985
C
C     BTP1              RELATIVE ENTERING FLUID FLOW ANGLE, DEG.
C
C     FI010G(J)         CONSTANT STAGGER, ZERO-CAMBER REFERENCE
C                       INCIDENCE ANGLE FOR NACA 65-(A10)-SERIES
C                       BLADES WITH 10% MAXIMUM THICKNESS
C                       RATIO, DEG.
C
C     FI101G(J)         ZERO-CAMBER, CONSTANT-STAGGER REF-
C                       ERENCE INCIDENCE ANGLE, FOR NACA
C                       65-(A10)-SERIES BLADES WITH 10% MAX-
C                       IMUM THICKNESS RATIO, DEG.
C
C     FI10GB(K,L)       INPUT VALUE OF ZERO-CAMBER, CONSTANT-
C                       STAGGER REFERENCE INCIDENCE ANGLE,
C                       CORRESPONDING TO THE VALUES OF
C                       ANGSTB(K) AND SGMGBB(L), OBTAINED
C                       FROM FIGURE 5,  ISU-ERI-AMES-99985, DEG.
C
C     FI10I1(M),        VARIABLE USED TO INITIALIZE THE
C     FI10I2(M)         FI10GB(K,L) ARRAY.
C
C     FKI(J)            INCIDENCE ANGLE CORRECTION FACTOR FOR
C                       MAXIMUM THICKNESS TO CHORD RATIO AND
C                       BLADE THICKNESS DISTRIBUTION.
C
C     FKIB(K,J)         INPUT VALUES OF THICKNESS CORRECTION
C                       FACTOR, FIGURE 142, PAGE 199, NASA SP-36.
C
C     FKSHA(J)          SHAPE CORRECTION FACTOR, 1.0 FOR
C                       65-SERIES, 1.1 FOR C-SERIES, 0.7 FOR
C                       DOUBLE-CIRCULAR-ARC PROFILES.
C
C     IC                CAMBER INDEX.
```

```
C     IG                  STAGGER ANGLE INDEX.
C
C     II                  CARD READER REFERENCE NUMBER.
C
C     IO                  LINE PRINTER REFERENCE NUMBER.
C
C     IS                  SOLIDITY INDEX.
C
C     J                   INDEX.
C
C     K                   INDEX.
C
C     L                   INDEX.
C
C     M                   INDEX.
C
C     N                   INDEX USED TO SPACE OUTPUT.
C
C     NNN                 INDEX USED TO SPACE OUTPUT.
C
C     PHI(IC)             BLADE CAMBER ANGLE, DEG.
C
C     SGMA(IS)            BLADE ROW SOLIDITY.
C
C     SGMGBB(L)           SOLIDITY; INPUT VALUES FOR (IO)10G,
C                         N1G, AND N2G CURVES FIGURE 7,
C                         ISU-ERI-AMES-99985.
C
C     SLOP1G(J)           COEFFICIENT OF LINEAR CAMBER TERM
C                         IN EXPRESSION FOR CONSTANT STAGGER
C                         REFERENCE INCIDENCE ANGLE.
C
C     SLOP2G(J)           COEFFICIENT OF SECOND DEGREE CAMBER
C                         TERM IN EXPRESSION FOR CONSTANT STAGGER
C                         REFERENCE INCIDENCE ANGLE.
C
C     SLP1GB(K,L)         INPUT VALUE OF LINEAR CAMBER COEFF-
C                         IENT IN CONSTANT-STAGGER REFERENCE
C                         INCIDENCE ANGLE RELATION CORRESPOND-
C                         ING TO VALUES OF ANGSTB(K) AND
C                         SGMGBB(L), OBTAINED FROM FIGURE 7,
C                         ISU-ERI-AMES-99985
C
C     SLP1I1,SLP1I2,      VARIABLES USED TO INIALIZE THE
C     SLP1I3,SLP1I4,      SLP1GB(K,L) ARRAY.
C     SLP1I5
C
C     SLP2GB(K,L)         INPUT VALUE OF QUADRATIC CAMBER
C                         COEFFICIENT IN CONSTANT-STAGGER REF-
C                         ERENCE ANGLE RELATION, CORRESPONDING
C                         TO VALUES OF ANGSTB(K) AND SGMGBB(L),
C                         OBTAINED FROM FIGURE 7,
C                         ISU-ERI-AMES-99985.
C
C     SLP2I1,SLP2I2,      VARIABLES USED TO INITIALIZE THE
C     SLP2I3,SLP2I4,      SLP2GB(K,L) ARRAY.
C     SLP2I5
C
C     STARI(J)            CONSTANT STAGGER REFERENCE INCIDENCE
C                         ANGLE, DEG.
```

```
C      TMAXC(K,J)          RATIO OF BLADE SECTION MAXIMUM
C                          THICKNESS TO CHORD.
C
C      TMAXCB(K,J)         INPUT VALUES OF TMAXC CORRESPONDING
C                          TO FKIB VALUES FROM FIGURE 142,
C                          PAGE 199 OF NASA SP-36.
C
C      YANGS(J)            STAGGER ANGLE, DEG.
C
C      YSGM(J)             BLADE ROW SOLIDITY.
C
C
      COMMON/BLOCKI/ ANGSTB(8),FI10I1(40),FI10I2(32),FKIB(1,7),                 001
     X SGMGBB(9),SLP1I1(16),SLP1I2(16),SLP1I3(16),SLP1I4(16),                   002
     X SLP1I5(8),SLP2I1(16),SLP2I2(16),SLP2I3(16),SLP2I4(16),                   003
     X SLP2I5(8),TMAXCB(1,7)                                                    004
      DIMENSION ANGST(9),FI10G(1),FI10GB(8,9),FKSHA(1),FKI(1),                  005
     X PHI(10),SGMA(9),SLOP1G(1),SLOP2G(1),SLP1GB(8,9),SLP2GB(8,9),             006
     X STARI(1),TMAXC(1,1),YANGS(1),YSGM(1)                                     007
C                                                                               008
C                                                                               009
      II=5                                                                      010
      IO=6                                                                      011
      M=0                                                                       012
      DO 30 L=1,5                                                               013
      DO 30 K=1,8                                                               014
      M=M+1                                                                     015
   30 FI10GB(K,L)=FI10I1(M)                                                     016
      M=0                                                                       017
      DO 35 L=6,9                                                               018
      DO 35 K=1,8                                                               019
      M=M+1                                                                     020
   35 FI10GB(K,L)=FI10I2(M)                                                     021
      M=0                                                                       022
      DO 40 L=1,2                                                               023
      DO 40 K=1,8                                                               024
      M=M+1                                                                     025
      SLP1GB(K,L)=SLP1I1(M)                                                     026
      SLP2GB(K,L)=SLP2I1(M)                                                     027
      SLP1GB(K,L+2)=SLP1I2(M)                                                   028
      SLP2GB(K,L+2)=SLP2I2(M)                                                   029
      SLP1GB(K,L+4)=SLP1I3(M)                                                   030
      SLP2GB(K,L+4)=SLP2I3(M)                                                   031
      SLP1GB(K,L+6)=SLP1I4(M)                                                   032
   40 SLP2GB(K,L+6)=SLP2I4(M)                                                   033
      M=0                                                                       034
      DO 45 K=1,8                                                               035
      M=M+1                                                                     036
      SLP1GB(K,9)=SLP1I5(M)                                                     037
   45 SLP2GB(K,9)=SLP2I5(M)                                                     038
C                                                                               039
C     READ GEOMETRY FOR WHICH REFERENCE INCIDENCE ANGLES                        040
C     ARE TO BE COMPUTED.                                                       041
C                                                                               042
      READ(II,201)TMAXC(1,1),FKSHA(1)                                           043
      READ(II,401)(ANGST(J),J=1,9)                                              044
      READ(II,202)(SGMA(J),J=1,9)                                               045
      READ(II,402)(PHI(J),J=1,10)                                               046
      WRITE(IO,700)                                                             047
      WRITE(IO,130)                                                             048
```

```
      WRITE(IO,140)TMAXC(1,1),FKSHA(1)                                  049
      CALL FIT1D(TMAXC,FKI,TMAXCB,FKIB,1,7,1,1)                         050
C                                                                       051
C     BEGIN LOOP ON STAGGER ANGLE                                       052
C                                                                       053
      DO 110 IG=1,9                                                     054
      N=0                                                               055
      NNN=0                                                             056
      YANGS(1)=ANGST(IG)                                                057
      WRITE(IO,700)                                                     058
      WRITE (IO,510)                                                    059
C                                                                       060
C     BEGIN LOOP ON SOLIDITY                                            061
C                                                                       062
      DO 110 IS=1,9                                                     063
      YSGM(1)=SGMA(IS)                                                  064
      CALL FIT2D(YANGS,FIO1OG,YSGM,ANGSTB,FI1OGB,SGMGBB,8,9,            065
     X1,8,9,9)                                                          066
      CALL FIT2D(YANGS,SLOP1G,YSGM,ANGSTB,SLP1GB,SGMGBB,8,9,            067
     X1,8,9,9)                                                          068
      CALL FIT2D(YANGS,SLOP2G,YSGM,ANGSTB,SLP2GB,SGMGBB,8,9,            069
     X1,8,9,9)                                                          070
C                                                                       071
C     BEGIN LOOP ON CAMBER ANGLE                                        072
C                                                                       073
      DO 100 IC=1,10                                                    074
      STARI(1)=FKSHA(1)*FKI(1)*FIO1OG(1)+SLOP1G(1)*PHI(IC)              075
     X +SLOP2G(1)*PHI(IC)*PHI(IC)                                       076
      ALF1=YANGS(1)+.5*PHI(IC)                                          077
      BTP1=ALF1+STARI(1)                                                078
      IF((BTP1.LE.75.).OR.(ALF1.LE.90.))  GO TO 60                      079
      WRITE(IO,710)                                                     080
      NNN=NNN+1                                                         081
      N=1                                                               082
      GO TO 110                                                         083
   60 N=N+1                                                             084
      IF((N.NE.11).AND.(N.NE.21).AND.(N.NE.31).AND.(N.NE.41)            085
     X  .AND.(N.NE.51).AND.(NNN.NE.5))  GO TO 100                       086
      WRITE(IO,710)                                                     087
      IF((N.NE.51).AND.(NNN.NE.5))  GO TO 100                           088
      N=1                                                               089
      NNN=1                                                             090
      WRITE(IO,700)                                                     091
      WRITE(IO,510)                                                     092
  100 WRITE (IO,530) STARI,PHI(IC),YANGS,YSGM,TMAXC,FKSHA,FKI,          093
     X FIO1OG,SLOP1G,SLOP2G                                             094
  110 CONTINUE                                                          095
C                                                                       096
C        IF A MACHINE OTHER THAN AN IBM 360 IS USED, THIS               097
C        FORMAT STATEMENT MAY NEED TO BE CHANGED TO A                   098
C        STANDARD HOLLERITH FORM.                                       099
C                                                                       100
  130 FORMAT('      TMAXC     FKSHA'/)                                  101
  140 FORMAT(2F10.4///)                                                 102
  201 FORMAT(2F10.2)                                                    103
  202 FORMAT(9F8.2)                                                     104
  401 FORMAT(10F8.2)                                                    105
  402 FORMAT(10F8.2)                                                    106
  500 FORMAT(I4)                                                        107
```

```
C                                                                       108
C       IF A MACHINE OTHER THAN AN IBM 360 IS USED, THIS                109
C       FORMAT STATEMENT MAY NEED TO BE CHANGED TO A                    110
C       STANDARD HOLLERITH FORM.                                        111
C                                                                       112
  510 FORMAT(' REF INC CAMBER STAGGER SOLID. TM/C FKSHA',               113
     X'   FKI FIO10G   SLOP1G   SLOP2G '/)                             114
  520 FORMAT(5F10.5)                                                    115
  530 FORMAT(1F8.1,1F7.2,1F8.2,1F7.2,1F5.2,2F6.2,F7.2,                  116
     X 2F9.4)                                                           117
  700 FORMAT(1H1)                                                       118
  710 FORMAT(1H )                                                       119
      STOP                                                              120
      END                                                               121
```

```
      BLOCK DATA                                                        122
C                                                                       123
      COMMON/BLOCKI/ ANGSTB(8),FI1OI1(40),FI1OI2(32),FKIB(1,7),         124
     X SGMGBB(9),SLP1I1(16),SLP1I2(16),SLP1I3(16),SLP1I4(16),           125
     X SLP1I5(8),SLP2I1(16),SLP2I2(16),SLP2I3(16),SLP2I4(16),           126
     X SLP2I5(8),TMAXCB(1,7)                                            127
C                                                                       128
C                                                                       129
      DATA ANGSTB   /0.0,10.,20.,30.,40.,50.,60.,70./                   130
      DATA SGMGBB   /0.4,0.6,0.8,1.0,1.2,1.4,1.6,2.0,2.6/               131
      DATA TMAXCB     /0.0,0.02,0.04,0.06,0.08,0.10,0.12/               132
      DATA FKIB   /0.0,0.334,0.589,0.772,0.903,1.0,1.08/                133
      DATA FI1OI1   /    0.042,0.413,0.738,1.043,1.360 ,1.662,          134
     X 1.864,2.042,0.012,0.554,1.085,1.571,2.050,2.485,                 135
     X 2.834,3.099,0.003,0.721,1.405,2.105,2.759,3.386,                 136
     X 3.835,4.145,-.041,0.853,1.735,2.636,3.488,4.283,                 137
     X 4.919,5.276,-.074,1.072,2.146,3.136,4.219,5.215,                 138
     X 5.955,6.377/                                                     139
      DATA FI1OI2  /     -.097,1.203,2.476,3.751,5.029,6.214,           140
     X 7.016,7.390,-.124,1.387,2.844,4.346,5.827,7.255,                 141
     X 8.100,8.517,-.132,1.764,3.663,5.606,7.591,9.398,                 142
     X 10.20,10.85,-.186,2.303,4.944,7.694,10.46,12.54,                 143
     X 13.55,14.50/                                                     144
      DATA SLP1I1     /  -.042758,-.087534,-.138043,-.190901,           145
     X -.250442,-.321693,-.392870,-.484041,-.022447,                    146
     X -.058126,-.100154,-.148312,-.206059,-.272889,-.352378,           147
     X -.457603/                                                        148
      DATA SLP1I2     /  -.003620,-.032000,-.067203,-.113722,           149
     X -.166661,-.234563,-.317756,-.448353,0.015655,                    150
     X -.008163,-.037928,-.079030,-.130964,-.200632,-.291484,           151
     X -.433447/                                                        152
      DATA SLP1I3     /  0.041494,0.019001,-.013239,-.043754,           153
     X -.096356,-.173708,-.267640,-.408423,0.059901,                    154
     X 0.046889,0.025376,-.009586,-.066273,-.150270,                    155
     X -.249121,-.376220/                                               156
      DATA SLP1I4     /  0.082185,0.073090,0.055278,0.018505,           157
     X -.040472,-.133857,-.236335,-.356545,0.116359,                    158
     X 0.123619,0.113367,0.079266,0.003457,-.107843,-.194811,           159
     X -.296872/                                                        160
      DATA SLP1I5     /  0.162877,0.189407,0.193420,0.147714,           161
     X 0.046888,-.071540,-.156740,-.247098/                             162
      DATA SLP2I1     /  -.001435,-.001385,-.001268,-.001161,           163
     X -.001019,-.000744,-.000538,-.000113,-.001321,                    164
     X -.001342,-.001331,-.001289,-.001178,-.001022,-.000814,           165
     X -.000337/                                                        166
      DATA SLP2I2     /  -.001225,-.001325,-.001395,-.001370,           167
     X -.001347,-.001256,-.001107,-.000463,-.001164,                    168
     X -.001293,-.001424,-.001497,-.001533,-.001489,-.001376,           169
     X -.000607/                                                        170
      DATA SLP2I3     /  -.001171,-.001341,-.001418,-.001653,           171
     X -.001749,-.001639,-.001551,-.000846,-.001058,                    172
     X -.001330,-.001604,-.001843,-.001940,-.001797,-.001617,           173
     X -.001048/                                                        174
      DATA SLP2I4     /  -.001045,-.001386,-.001744,-.002001,           175
     X -.002120,-.001904,-.001656,-.001200,-.000875,                    176
     X -.001462,-.001987,-.002403,-.002377,-.001919,-.001769,           177
     X -.001514/                                                        178
      DATA SLP2I5     /  -.000710,-.001564,-.002445,-.002851,           179
     X -.002623,-.002108,-.002036,-.002749/                             180
      END                                                               181
```

```
      SUBROUTINE FIT1D(X,Y,XB,YB,JP,KP,I,K)                              182
C                                                                        183
C        3-POINT LAGRANGIAN INTERPOLATION FOR Y=FCN(X) FROM              184
C        DATA TABLES XB,YB. XB-ARRAY VALUES ARE ARBITRARILY              185
C        SPACED, MONOTONE NON-DECREASING. JP IS GIVEN NUMBER             186
C        OF XB- OR YB-ARRAY ELEMENTS                                     187
C                                                                        188
      DIMENSION X(1,1),Y(1),XB(1,7),YB(1,7)                              189
C                                                                        190
C                                                                        191
      IO=6                                                               192
   10 IF(JP-20)11,11,14                                                  193
   11 IF(KP-3)14,12,12                                                   194
   12 IF(KP-20)13,13,14                                                  195
   13 DO 3 J=1,JP                                                        196
      DO 1 M=3,KP                                                        197
      L=M                                                                198
      IF(X(K,J)-XB(I,L))2,2,1                                            199
    1 CONTINUE                                                           200
    2 XO=XB(I,L-2)                                                       201
      X1=XB(I,L-1)                                                       202
      X2=XB(I,L)                                                         203
    3 Y(J)=(X(K,J)-X1)*(X(K,J)-X2)*YB(I,L-2)/((XO-X1)*(XO-X2))           204
     1+(X(K,J)-X2)*(X(K,J)-XO)*YB(I,L-1)/((X1-X2)*(X1-XO))               205
     2+(X(K,J)-XO)*(X(K,J)-X1)*YB(I,L)/((X2-XO)*(X2-X1))                 206
      RETURN                                                             207
   14 WRITE(IO,500)JP,KP                                                 208
  500 FORMAT(10X,' INCORRECT ARRAY SIZE IN FIT1D, JP=',I2,' KP=',I2)     209
      STOP                                                               210
      END                                                                211
```

```
      SUBROUTINE FIT2D(X,Y,Z,XB,YB,ZB,IP,JP,JL,IQ,JQ,KQ)                212
C                                                                       213
C        3-POINT LAGRANGIAN INTERPOLATION FOR Y=FCN(X,Z)                214
C        FROM DATA TABLES XB,YB,ZB. XB-AND ZB-ARRAY VALUES              215
C        APE ARBITRARILY SPACED, MONOTONE NON-DECREASING.               216
C        IP,JP ARE NUMBER OF ELEMENTS IN XB,ZB ARRAYS,RE-               217
C        SPECTIVELY.                                                    218
C                                                                       219
      DIMENSION X(1),Y(1),Z(1),YST(3)                                   220
      REAL XB(IQ),YB(IQ,JQ),ZB(KQ)                                      221
C                                                                       222
C                                                                       223
      IO=6                                                              224
      IF(IP-3)15,10,10                                                  225
   10 IF(IP-20)11,11,15                                                 226
   11 IF(JP-3)15,12,12                                                  227
   12 IF(JP-20)13,13,15                                                 228
   13 IF(JL-20)14,14,15                                                 229
   14 DO 6 N=1,JL                                                       230
      DO 1 M=3,IP                                                       231
      I=M                                                               232
      IF(X(N)-XB(I))2,2,1                                               233
    1 CONTINUE                                                          234
    2 DO 3 M=3,JP                                                       235
      J=M                                                               236
      IF(Z(N)-ZB(J))4,4,3                                               237
    3 CONTINUE                                                          238
    4 XO=ZB(J-2)                                                        239
      X1=ZB(J-1)                                                        240
      X2=ZB(J)                                                          241
      DO 5 K=1,3                                                        242
      L=I+K                                                             243
      YO=YB(L-3,J-2)                                                    244
      Y1=YB(L-3,J-1)                                                    245
      Y2=YB(L-3,J)                                                      246
    5 YST(K)=(Z(N)-X1)*(Z(N)-X2)*YO/((XO-X1)*(XO-X2))                   247
     1+(Z(N)-X2)*(Z(N)-XO)*Y1/((X1-X2)*(X1-XO))                         248
     2+(Z(N)-XO)*(Z(N)-X1)*Y2/((X2-XO)*(X2-X1))                         249
      XO=XB(I-2)                                                        250
      X1=XB(I-1)                                                        251
      X2=XB(I)                                                          252
    6 Y(N)=(X(N)-X1)*(X(N)-X2)*YST(1)/((XO-X1)*(XO-X2))                 253
     1+(X(N)-X2)*(X(N)-XO)*YST(2)/((X1-X2)*(X1-XO))                     254
     2+(X(N)-XO)*(X(N)-X1)*YST(3)/((X2-XO)*(X2-X1))                     255
      RETURN                                                            256
   15 WRITE(IO,500)IP,JP,JL                                             257
  500 FORMAT(10X,' INCORRECT ARRAY SIZE IN FIT2D, IP=',I2,' JP=',I2,' JL 258
     1=',I2)                                                            259
      STOP                                                              260
      END                                                               261
```

INPUT DATA CARDS

```
   .1      1.
  0.    5.    10.    20.    30.    40.    50.    60.    70.
   .4    .6     .8     1.     1.2    1.4    1.6    2.0    2.6
  0.    5.    10.    20.    30.    40.    50.    60.    70.    75.
```

Reference incidence angles which were computed are presented in APPENDIX D. The first page of output is given below as an example of the output format.

REF INC	CAMBER	STAGGER	SOLID.	TM/C	FKSHA	FKI	FIO10G	SLOP1G	SLOP2G
0.0	0.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-0.2	5.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-0.5	10.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-1.4	20.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-2.5	30.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-4.0	40.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-5.7	50.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-7.7	60.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-10.0	70.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
-11.2	75.00	0.00	0.40	0.10	1.00	1.00	0.04	-0.0428	-0.0014
0.0	0.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-0.1	5.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-0.3	10.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-1.0	20.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-1.9	30.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-3.0	40.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-4.4	50.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-6.1	60.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-8.0	70.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
-9.1	75.00	0.00	0.60	0.10	1.00	1.00	0.01	-0.0224	-0.0013
0.0	0.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-0.0	5.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-0.2	10.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-0.6	20.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-1.2	30.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-2.1	40.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-3.2	50.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-4.6	60.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-6.3	70.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-7.2	75.00	0.00	0.80	0.10	1.00	1.00	0.00	-0.0036	-0.0012
-0.0	0.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
0.0	5.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-0.0	10.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-0.2	20.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-0.6	30.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-1.3	40.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-2.2	50.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-3.3	60.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-4.6	70.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-5.4	75.00	0.00	1.00	0.10	1.00	1.00	-0.04	0.0157	-0.0012
-0.1	0.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
0.1	5.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
0.2	10.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
0.3	20.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
0.1	30.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
-0.3	40.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
-0.9	50.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
-1.8	60.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
-2.9	70.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012
-3.5	75.00	0.00	1.20	0.10	1.00	1.00	-0.07	0.0415	-0.0012

APPENDIX D

COMPARISON OF VALUES OF REFERENCE INCIDENCE ANGLE FROM NONITERATIVE METHOD WITH THOSE FROM PROGRAM IREF1 AND THOSE HAND CALCULATED FROM REFERENCE 2.

			REFERENCE INCIDENCE ANGLE, DEG.		
STAGGER ANG., DEG.	CAMBER ANG., DEG.	SOLIDITY	FROM IREF1	FROM IREF2	HAND CALCULATED
0.0	0.0	0.40	0.0	0.0	
0.0	5.0	0.40	-0.2	-0.2	
0.0	10.0	0.40	-0.5	-0.5	
0.0	20.0	0.40	-1.3	-1.4	
0.0	30.0	0.40	-2.5	-2.5	
0.0	40.0	0.40	-4.0	-4.0	
0.0	50.0	0.40	-5.7	-5.7	
0.0	60.0	0.40	-7.7	-7.7	
0.0	70.0	0.40	-10.0	-10.0	-10.0
0.0	75.0	0.40	-11.2	-11.2	
0.0	0.0	0.60	0.0	0.0	
0.0	5.0	0.60	-0.1	-0.1	
0.0	10.0	0.60	-0.3	-0.3	
0.0	20.0	0.60	-0.9	-1.0	
0.0	30.0	0.60	-1.8	-1.9	
0.0	40.0	0.60	-3.0	-3.0	
0.0	50.0	0.60	-4.4	-4.4	
0.0	60.0	0.60	-6.1	-6.1	
0.0	70.0	0.60	-8.0	-8.0	
0.0	75.0	0.60	-9.1	-9.1	
0.0	0.0	0.80	0.0	0.0	
0.0	5.0	0.80	-0.1	-0.0	
0.0	10.0	0.80	-0.2	-0.2	
0.0	20.0	0.80	-0.5	-0.6	
0.0	30.0	0.80	-1.2	-1.2	
0.0	40.0	0.80	-2.1	-2.1	
0.0	50.0	0.80	-3.3	-3.2	
0.0	60.0	0.80	-4.6	-4.6	
0.0	70.0	0.80	-6.3	-6.3	
0.0	75.0	0.80	-7.1	-7.2	
0.0	0.0	1.00	0.0	-0.0	
0.0	5.0	1.00	0.0	0.0	
0.0	10.0	1.00	-0.0	-0.0	
0.0	20.0	1.00	-0.2	-0.2	
0.0	30.0	1.00	-0.6	-0.6	
0.0	40.0	1.00	-1.3	-1.3	
0.0	50.0	1.00	-2.1	-2.2	
0.0	60.0	1.00	-3.3	-3.3	
0.0	70.0	1.00	-4.7	-4.6	
0.0	75.0	1.00	-5.4	-5.4	

STAGGER ANG., DEG.	CAMBER ANG., DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
0.0	0.0	1.20	0.0	-0.1	
0.0	5.0	1.20	0.1	0.1	
0.0	10.0	1.20	0.2	0.2	
0.0	20.0	1.20	0.2	0.3	
0.0	30.0	1.20	0.1	0.1	
0.0	40.0	1.20	-0.3	-0.3	
0.0	50.0	1.20	-0.9	-0.9	
0.0	60.0	1.20	-1.8	-1.8	
0.0	70.0	1.20	-2.9	-2.9	
0.0	75.0	1.20	-3.6	-3.5	
0.0	0.0	1.40	0.0	-0.1	
0.0	5.0	1.40	0.2	0.2	
0.0	10.0	1.40	0.3	0.4	
0.0	20.0	1.40	0.6	0.7	
0.0	30.0	1.40	0.7	0.7	0.7
0.0	40.0	1.40	0.6	0.6	
0.0	50.0	1.40	0.3	0.3	
0.0	60.0	1.40	-0.2	-0.3	
0.0	70.0	1.40	-1.1	-1.1	
0.0	75.0	1.40	-1.6	-1.6	
0.0	0.0	1.60	0.0	-0.1	
0.0	5.0	1.60	0.3	0.3	
0.0	10.0	1.60	0.5	0.6	
0.0	20.0	1.60	1.0	1.1	
0.0	30.0	1.60	1.3	1.4	
0.0	40.0	1.60	1.5	1.5	
0.0	50.0	1.60	1.5	1.4	
0.0	60.0	1.60	1.1	1.0	
0.0	70.0	1.60	0.5	0.5	
0.0	75.0	1.60	0.1	0.2	
0.0	0.0	2.00	0.0	-0.1	
0.0	5.0	2.00	0.4	0.4	
0.0	10.0	2.00	0.9	0.9	
0.0	20.0	2.00	1.7	1.8	
0.0	30.0	2.00	2.5	2.6	
0.0	40.0	2.00	3.1	3.1	
0.0	50.0	2.00	3.6	3.5	
0.0	60.0	2.00	3.9	3.7	
0.0	70.0	2.00	3.7	3.7	
0.0	75.0	2.00	3.5	3.7	
0.0	0.0	2.60	0.0	-0.2	
0.0	5.0	2.60	0.6	0.6	
0.0	10.0	2.60	1.3	1.4	
0.0	20.0	2.60	2.6	2.8	
0.0	30.0	2.60	3.9	4.1	
0.0	40.0	2.60	5.2	5.2	
0.0	50.0	2.60	6.5	6.2	
0.0	60.0	2.60	7.3	7.0	
0.0	70.0	2.60	7.7	7.7	
0.0	75.0	2.60	7.8	8.0	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
10.0	0.0	0.40	0.4	0.4	
10.0	5.0	0.40	-0.1	-0.1	
10.0	10.0	0.40	-0.6	-0.6	
10.0	20.0	0.40	-1.8	-1.9	
10.0	30.0	0.40	-3.4	-3.5	
10.0	40.0	0.40	-5.3	-5.3	
10.0	50.0	0.40	-7.5	-7.4	
10.0	60.0	0.40	-9.9	-9.8	
10.0	70.0	0.40	-12.5	-12.5	
10.0	75.0	0.40	-13.9	-13.9	
10.0	0.0	0.60	0.5	0.6	
10.0	5.0	0.60	0.2	0.2	
10.0	10.0	0.60	-0.1	-0.2	
10.0	20.0	0.60	-1.1	-1.1	
10.0	30.0	0.60	-2.4	-2.4	
10.0	40.0	0.60	-3.9	-3.9	
10.0	50.0	0.60	-5.7	-5.7	
10.0	60.0	0.60	-7.8	-7.8	-7.8
10.0	70.0	0.60	-10.1	-10.1	
10.0	75.0	0.60	-11.3	-11.4	
10.0	0.0	0.80	0.7	0.7	
10.0	5.0	0.80	0.5	0.5	
10.0	10.0	0.80	0.3	0.3	
10.0	20.0	0.80	-0.5	-0.4	
10.0	30.0	0.80	-1.4	-1.4	
10.0	40.0	0.80	-2.7	-2.7	
10.0	50.0	0.80	-4.2	-4.2	
10.0	60.0	0.80	-6.0	-6.0	
10.0	70.0	0.80	-8.0	-8.0	
10.0	75.0	0.80	-9.1	-9.1	
10.0	0.0	1.00	0.9	0.9	
10.0	5.0	1.00	0.8	0.8	
10.0	10.0	1.00	0.6	0.6	
10.0	20.0	1.00	0.2	0.2	
10.0	30.0	1.00	-0.6	-0.6	
10.0	40.0	1.00	-1.5	-1.5	
10.0	50.0	1.00	-2.8	-2.8	
10.0	60.0	1.00	-4.3	-4.3	
10.0	70.0	1.00	-6.1	-6.1	
10.0	75.0	1.00	-7.0	-7.0	
10.0	0.0	1.20	1.1	1.1	
10.0	5.0	1.20	1.1	1.1	
10.0	10.0	1.20	1.1	1.1	
10.0	20.0	1.20	0.9	0.9	
10.0	30.0	1.20	0.4	0.4	
10.0	40.0	1.20	-0.3	-0.3	
10.0	50.0	1.20	-1.3	-1.3	
10.0	60.0	1.20	-2.6	-2.6	
10.0	70.0	1.20	-4.2	-4.2	
10.0	75.0	1.20	-5.1	-5.0	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
10.0	0.0	1.40	1.3	1.2	
10.0	5.0	1.40	1.4	1.4	
10.0	10.0	1.40	1.5	1.5	
10.0	20.0	1.40	1.6	1.6	
10.0	30.0	1.40	1.4	1.4	
10.0	40.0	1.40	1.0	1.0	
10.0	50.0	1.40	0.3	0.2	
10.0	60.0	1.40	-0.7	-0.8	
10.0	70.0	1.40	-2.0	-2.0	
10.0	75.0	1.40	-2.8	-2.8	
10.0	0.0	1.60	1.5	1.4	
10.0	5.0	1.60	1.7	1.7	
10.0	10.0	1.60	1.9	2.0	1.9
10.0	20.0	1.60	2.2	2.3	
10.0	30.0	1.60	2.3	2.3	
10.0	40.0	1.60	2.1	2.1	
10.0	50.0	1.60	1.6	1.6	
10.0	60.0	1.60	0.9	0.8	
10.0	70.0	1.60	-0.3	-0.3	
10.0	75.0	1.60	-1.0	-0.9	
10.0	0.0	2.00	1.9	1.8	
10.0	5.0	2.00	2.4	2.3	
10.0	10.0	2.00	2.7	2.9	
10.0	20.0	2.00	3.5	3.7	
10.0	30.0	2.00	4.1	4.2	
10.0	40.0	2.00	4.4	4.4	
10.0	50.0	2.00	4.5	4.3	
10.0	60.0	2.00	4.1	3.9	
10.0	70.0	2.00	3.2	3.3	
10.0	75.0	2.00	2.7	2.8	
10.0	0.0	2.60	2.6	2.3	
10.0	5.0	2.60	3.2	3.2	
10.0	10.0	2.60	3.9	4.0	
10.0	20.0	2.60	5.2	5.5	
10.0	30.0	2.60	6.5	6.6	
10.0	40.0	2.60	7.4	7.4	
10.0	50.0	2.60	8.1	7.9	
10.0	60.0	2.60	8.3	8.0	
10.0	70.0	2.60	7.9	7.9	
10.0	75.0	2.60	7.5	7.7	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
20.0	0.0	0.40	0.7	0.7	
20.0	5.0	0.40	0.0	0.0	
20.0	10.0	0.40	-0.7	-0.8	
20.0	20.0	0.40	-2.5	-2.5	
20.0	30.0	0.40	-4.5	-4.5	
20.0	40.0	0.40	-6.8	-6.8	
20.0	50.0	0.40	-9.4	-9.3	
20.0	60.0	0.40	-12.2	-12.1	
20.0	70.0	0.40	-15.1	-15.1	
20.0	75.0	0.40	-16.7	-16.7	
20.0	0.0	0.60	1.0	1.1	
20.0	5.0	0.60	0.6	0.6	
20.0	10.0	0.60	-0.0	-0.0	
20.0	20.0	0.60	-1.4	-1.5	
20.0	30.0	0.60	-3.1	-3.1	
20.0	40.0	0.60	-5.1	-5.1	
20.0	50.0	0.60	-7.3	-7.3	
20.0	60.0	0.60	-9.8	-9.7	
20.0	70.0	0.60	-12.5	-12.4	
20.0	75.0	0.60	-13.9	-13.9	
20.0	0.0	0.80	1.4	1.4	
20.0	5.0	0.80	1.0	1.0	
20.0	10.0	0.80	0.6	0.6	
20.0	20.0	0.80	-0.5	-0.5	
20.0	30.0	0.80	-1.8	-1.9	
20.0	40.0	0.80	-3.5	-3.5	
20.0	50.0	0.80	-5.5	-5.4	-5.5
20.0	60.0	0.80	-7.7	-7.6	
20.0	70.0	0.80	-10.1	-10.1	
20.0	75.0	0.80	-11.4	-11.5	
20.0	0.0	1.00	1.7	1.7	
20.0	5.0	1.00	1.5	1.5	
20.0	10.0	1.00	1.2	1.2	
20.0	20.0	1.00	0.4	0.4	
20.0	30.0	1.00	-0.7	-0.7	
20.0	40.0	1.00	-2.1	-2.1	
20.0	50.0	1.00	-3.7	-3.7	
20.0	60.0	1.00	-5.7	-5.7	
20.0	70.0	1.00	-7.9	-7.9	
20.0	75.0	1.00	-9.1	-9.1	
20.0	0.0	1.20	2.1	2.1	
20.0	5.0	1.20	2.0	2.0	
20.0	10.0	1.20	1.9	1.9	
20.0	20.0	1.20	1.3	1.3	
20.0	30.0	1.20	0.5	0.5	
20.0	40.0	1.20	-0.6	-0.7	
20.0	50.0	1.20	-2.1	-2.1	
20.0	60.0	1.20	-3.8	-3.8	
20.0	70.0	1.20	-5.7	-5.7	
20.0	75.0	1.20	-6.8	-6.8	

STAGGER ANG., DEG.	CAMBER ANG., DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
20.0	0.0	1.40	2.5	2.5	
20.0	5.0	1.40	2.6	2.6	
20.0	10.0	1.40	2.5	2.6	
20.0	20.0	1.40	2.3	2.3	
20.0	30.0	1.40	1.8	1.8	
20.0	40.0	1.40	0.9	0.9	
20.0	50.0	1.40	-0.2	-0.3	
20.0	60.0	1.40	-1.7	-1.8	
20.0	70.0	1.40	-3.6	-3.6	
20.0	75.0	1.40	-4.7	-4.6	
20.0	0.0	1.60	2.9	2.8	
20.0	5.0	1.60	3.1	3.1	
20.0	10.0	1.60	3.2	3.2	
20.0	20.0	1.60	3.2	3.3	
20.0	30.0	1.60	2.9	2.9	
20.0	40.0	1.60	2.3	2.3	
20.0	50.0	1.60	1.3	1.2	
20.0	60.0	1.60	-0.1	-0.1	
20.0	70.0	1.60	-1.8	-1.8	
20.0	75.0	1.60	-2.9	-2.8	
20.0	0.0	2.00	3.8	3.7	
20.0	5.0	2.00	4.2	4.2	
20.0	10.0	2.00	4.5	4.6	
20.0	20.0	2.00	5.0	5.1	5.1
20.0	30.0	2.00	5.2	5.3	
20.0	40.0	2.00	5.1	5.0	
20.0	50.0	2.00	4.4	4.4	
20.0	60.0	2.00	3.4	3.3	
20.0	70.0	2.00	1.9	1.9	
20.0	75.0	2.00	0.9	1.0	
20.0	0.0	2.60	5.2	4.9	
20.0	5.0	2.60	5.8	5.9	
20.0	10.0	2.60	6.5	6.6	
20.0	20.0	2.60	7.6	7.8	
20.0	30.0	2.60	8.4	8.5	
20.0	40.0	2.60	8.9	8.8	
20.0	50.0	2.60	8.7	8.5	
20.0	60.0	2.60	7.9	7.7	
20.0	70.0	2.60	6.5	6.5	
20.0	75.0	2.60	5.6	5.7	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
30.0	0.0	0.40	1.0	1.0	
30.0	5.0	0.40	0.1	0.1	
30.0	10.0	0.40	-0.9	-1.0	
30.0	20.0	0.40	-3.2	-3.2	
30.0	30.0	0.40	-5.7	-5.7	
30.0	40.0	0.40	-8.5	-8.5	
30.0	50.0	0.40	-11.5	-11.4	
30.0	60.0	0.40	-14.6	-14.6	
30.0	70.0	0.40	-18.0	-18.0	
30.0	75.0	0.40	-19.7	-19.8	
30.0	0.0	0.60	1.5	1.6	
30.0	5.0	0.60	0.8	0.8	
30.0	10.0	0.60	-0.0	-0.0	
30.0	20.0	0.60	-1.9	-1.9	
30.0	30.0	0.60	-4.0	-4.0	
30.0	40.0	0.60	-6.4	-6.4	
30.0	50.0	0.60	-9.1	-9.1	
30.0	60.0	0.60	-12.0	-12.0	
30.0	70.0	0.60	-15.1	-15.1	
30.0	75.0	0.60	-16.8	-16.8	
30.0	0.0	0.80	2.1	2.1	
30.0	5.0	0.80	1.5	1.5	
30.0	10.0	0.80	0.9	0.8	
30.0	20.0	0.80	-0.7	-0.7	
30.0	30.0	0.80	-2.5	-2.5	
30.0	40.0	0.80	-4.7	-4.6	
30.0	50.0	0.80	-7.0	-7.0	
30.0	60.0	0.80	-9.7	-9.7	
30.0	70.0	0.80	-12.6	-12.6	
30.0	75.0	0.80	-14.1	-14.1	
30.0	0.0	1.00	2.6	2.6	
30.0	5.0	1.00	2.2	2.2	
30.0	10.0	1.00	1.7	1.7	
30.0	20.0	1.00	0.5	0.5	
30.0	30.0	1.00	-1.1	-1.1	
30.0	40.0	1.00	-2.9	-2.9	-2.9
30.0	50.0	1.00	-5.1	-5.1	
30.0	60.0	1.00	-7.5	-7.5	
30.0	70.0	1.00	-10.2	-10.2	
30.0	75.0	1.00	-11.7	-11.7	
30.0	0.0	1.20	3.1	3.1	
30.0	5.0	1.20	2.9	2.9	
30.0	10.0	1.20	2.5	2.5	2.6
30.0	20.0	1.20	1.6	1.6	
30.0	30.0	1.20	0.3	0.3	
30.0	40.0	1.20	-1.2	-1.3	
30.0	50.0	1.20	-3.2	-3.2	
30.0	60.0	1.20	-5.5	-5.4	
30.0	70.0	1.20	-8.0	-8.0	
30.0	75.0	1.20	-9.4	-9.4	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
30.0	0.0	1.40	3.8	3.8	
30.0	5.0	1.40	3.6	3.7	
30.0	10.0	1.40	3.5	3.5	
30.0	20.0	1.40	2.8	2.8	
30.0	30.0	1.40	1.8	1.8	
30.0	40.0	1.40	0.5	0.4	
30.0	50.0	1.40	-1.3	-1.3	
30.0	60.0	1.40	-3.5	-3.5	
30.0	70.0	1.40	-6.0	-6.0	
30.0	75.0	1.40	-7.3	-7.3	
30.0	0.0	1.60	4.4	4.3	
30.0	5.0	1.60	4.4	4.4	
30.0	10.0	1.60	4.3	4.3	
30.0	20.0	1.60	3.9	3.9	
30.0	30.0	1.60	3.1	3.1	
30.0	40.0	1.60	1.9	1.9	
30.0	50.0	1.60	0.3	0.3	
30.0	60.0	1.60	-1.8	-1.7	
30.0	70.0	1.60	-4.2	-4.2	
30.0	75.0	1.60	-5.5	-5.5	
30.0	0.0	2.00	5.7	5.6	
30.0	5.0	2.00	5.9	5.9	
30.0	10.0	2.00	6.1	6.2	
30.0	20.0	2.00	6.2	6.2	
30.0	30.0	2.00	5.8	5.8	
30.0	40.0	2.00	5.0	4.9	
30.0	50.0	2.00	3.6	3.6	
30.0	60.0	2.00	1.7	1.7	
30.0	70.0	2.00	-0.7	-0.6	
30.0	75.0	2.00	-1.9	-2.0	
30.0	0.0	2.60	7.8	7.7	
30.0	5.0	2.60	8.3	8.4	
30.0	10.0	2.60	8.8	8.9	
30.0	20.0	2.60	9.5	9.5	
30.0	30.0	2.60	9.7	9.6	
30.0	40.0	2.60	9.1	9.0	
30.0	50.0	2.60	7.9	8.0	
30.0	60.0	2.60	6.2	6.3	
30.0	70.0	2.60	4.0	4.1	
30.0	75.0	2.60	2.8	2.7	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
40.0	0.0	0.40	1.3	1.4	
40.0	5.0	0.40	0.1	0.1	
40.0	10.0	0.40	-1.2	-1.2	
40.0	20.0	0.40	-4.0	-4.1	
40.0	30.0	0.40	-7.0	-7.1	
40.0	40.0	0.40	-10.3	-10.3	
40.0	50.0	0.40	-13.8	-13.7	
40.0	60.0	0.40	-17.4	-17.3	
40.0	70.0	0.40	-21.2	-21.2	
40.0	75.0	0.40	-23.1	-23.2	
40.0	0.0	0.60	2.0	2.1	
40.0	5.0	0.60	1.0	1.0	
40.0	10.0	0.60	-0.1	-0.1	
40.0	20.0	0.60	-2.5	-2.5	
40.0	30.0	0.60	-5.2	-5.2	
40.0	40.0	0.60	-8.1	-8.1	
40.0	50.0	0.60	-11.3	-11.2	
40.0	60.0	0.60	-14.6	-14.6	
40.0	70.0	0.60	-18.1	-18.1	
40.0	75.0	0.60	-20.0	-20.0	
40.0	0.0	0.80	2.7	2.8	
40.0	5.0	0.80	1.9	1.9	
40.0	10.0	0.80	1.0	1.0	
40.0	20.0	0.80	-1.1	-1.1	
40.0	30.0	0.80	-3.4	-3.5	
40.0	40.0	0.80	-6.1	-6.1	
40.0	50.0	0.80	-9.0	-8.9	
40.0	60.0	0.80	-12.1	-12.1	
40.0	70.0	0.80	-15.5	-15.5	
40.0	75.0	0.80	-17.3	-17.3	
40.0	0.0	1.00	3.5	3.5	
40.0	5.0	1.00	2.8	2.8	
40.0	10.0	1.00	2.0	2.0	
40.0	20.0	1.00	0.3	0.3	
40.0	30.0	1.00	-1.8	-1.8	
40.0	40.0	1.00	-4.2	-4.2	
40.0	50.0	1.00	-6.9	-6.9	
40.0	60.0	1.00	-9.9	-9.9	
40.0	70.0	1.00	-13.2	-13.2	
40.0	75.0	1.00	-14.9	-15.0	
40.0	0.0	1.20	4.2	4.2	
40.0	5.0	1.20	3.7	3.7	
40.0	10.0	1.20	3.1	3.1	
40.0	20.0	1.20	1.6	1.6	
40.0	30.0	1.20	-0.2	-0.2	-0.2
40.0	40.0	1.20	-2.4	-2.4	
40.0	50.0	1.20	-5.0	-5.0	
40.0	60.0	1.20	-7.9	-7.9	
40.0	70.0	1.20	-11.1	-11.1	
40.0	75.0	1.20	-12.8	-12.8	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
40.0	0.0	1.40	5.0	5.0	
40.0	5.0	1.40	4.6	4.6	
40.0	10.0	1.40	4.2	4.2	
40.0	20.0	1.40	3.0	2.9	
40.0	30.0	1.40	1.3	1.3	
40.0	40.0	1.40	-0.7	-0.7	
40.0	50.0	1.40	-3.2	-3.1	
40.0	60.0	1.40	-6.0	-5.9	
40.0	70.0	1.40	-9.1	-9.1	
40.0	75.0	1.40	-10.8	-10.9	
40.0	0.0	1.60	5.8	5.8	
40.0	5.0	1.60	5.6	5.6	
40.0	10.0	1.60	5.2	5.2	
40.0	20.0	1.60	4.2	4.2	
40.0	30.0	1.60	2.8	2.7	
40.0	40.0	1.60	0.8	0.8	
40.0	50.0	1.60	-1.6	-1.5	
40.0	60.0	1.60	-4.3	-4.2	
40.0	70.0	1.60	-7.4	-7.4	
40.0	75.0	1.60	-9.0	-9.1	
40.0	0.0	2.00	7.5	7.6	
40.0	5.0	2.00	7.5	7.5	
40.0	10.0	2.00	7.4	7.4	
40.0	20.0	2.00	6.9	6.7	
40.0	30.0	2.00	5.7	5.6	
40.0	40.0	2.00	3.9	3.9	
40.0	50.0	2.00	1.7	1.8	
40.0	60.0	2.00	-0.9	-0.8	
40.0	0.0	2.60	10.2	10.5	
40.0	5.0	2.60	10.6	10.6	
40.0	10.0	2.60	10.8	10.7	
40.0	20.0	2.60	10.6	10.3	
40.0	30.0	2.60	9.6	9.5	
40.0	40.0	2.60	8.1	8.1	

STAGGER ANG.,DEG.	CAMBER ANG.,DEG.	SOLIDITY	REFERENCE INCIDENCE ANGLE, DEG. FROM IREF1	FROM IREF2	HAND CALCULATED
50.0	0.0	0.40	1.6	1.7	
50.0	5.0	0.40	0.0	0.0	
50.0	10.0	0.40	-1.6	-1.6	
50.0	20.0	0.40	-5.0	-5.1	
50.0	30.0	0.40	-8.6	-8.7	
50.0	40.0	0.40	-12.4	-12.4	
50.0	50.0	0.40	-16.3	-16.3	
50.0	60.0	0.40	-20.4	-20.3	
50.0	70.0	0.40	-24.5	-24.5	
50.0	75.0	0.40	-26.6	-26.6	
50.0	0.0	0.60	2.4	2.5	
50.0	5.0	0.60	1.1	1.1	
50.0	10.0	0.60	-0.3	-0.3	
50.0	20.0	0.60	-3.3	-3.4	
50.0	30.0	0.60	-6.6	-6.6	
50.0	40.0	0.60	-10.1	-10.1	
50.0	50.0	0.60	-13.8	-13.7	
50.0	60.0	0.60	-17.6	-17.6	
50.0	70.0	0.60	-21.6	-21.6	
50.0	75.0	0.60	-23.7	-23.7	
50.0	0.0	0.80	3.3	3.4	
50.0	5.0	0.80	2.2	2.2	
50.0	10.0	0.80	1.0	0.9	
50.0	20.0	0.80	-1.7	-1.8	
50.0	30.0	0.80	-4.7	-4.8	
50.0	40.0	0.80	-8.0	-8.0	
50.0	50.0	0.80	-11.5	-11.5	
50.0	60.0	0.80	-15.3	-15.2	
50.0	70.0	0.80	-19.2	-19.2	
50.0	75.0	0.80	-21.2	-21.3	
50.0	0.0	1.00	4.2	4.3	
50.0	5.0	1.00	3.2	3.2	
50.0	10.0	1.00	2.2	2.1	
50.0	20.0	1.00	-0.2	-0.3	
50.0	30.0	1.00	-3.0	-3.1	
50.0	40.0	1.00	-6.1	-6.1	
50.0	50.0	1.00	-9.6	-9.5	
50.0	60.0	1.00	-13.2	-13.1	-13.2
50.0	70.0	1.00	-17.1	-17.1	
50.0	75.0	1.00	-19.1	-19.1	
50.0	0.0	1.20	5.1	5.2	
50.0	5.0	1.20	4.3	4.3	
50.0	10.0	1.20	3.4	3.3	
50.0	20.0	1.20	1.2	1.1	
50.0	30.0	1.20	-1.4	-1.5	
50.0	40.0	1.20	-4.4	-4.4	
50.0	50.0	1.20	-7.7	-7.6	
50.0	60.0	1.20	-11.2	-11.1	
50.0	70.0	1.20	-15.0	-15.0	
50.0	75.0	1.20	-16.9	-17.0	