AMES 40 x 80/80 x 120 FOOT WIND TUNNEL

TURNING VANES DESIGN

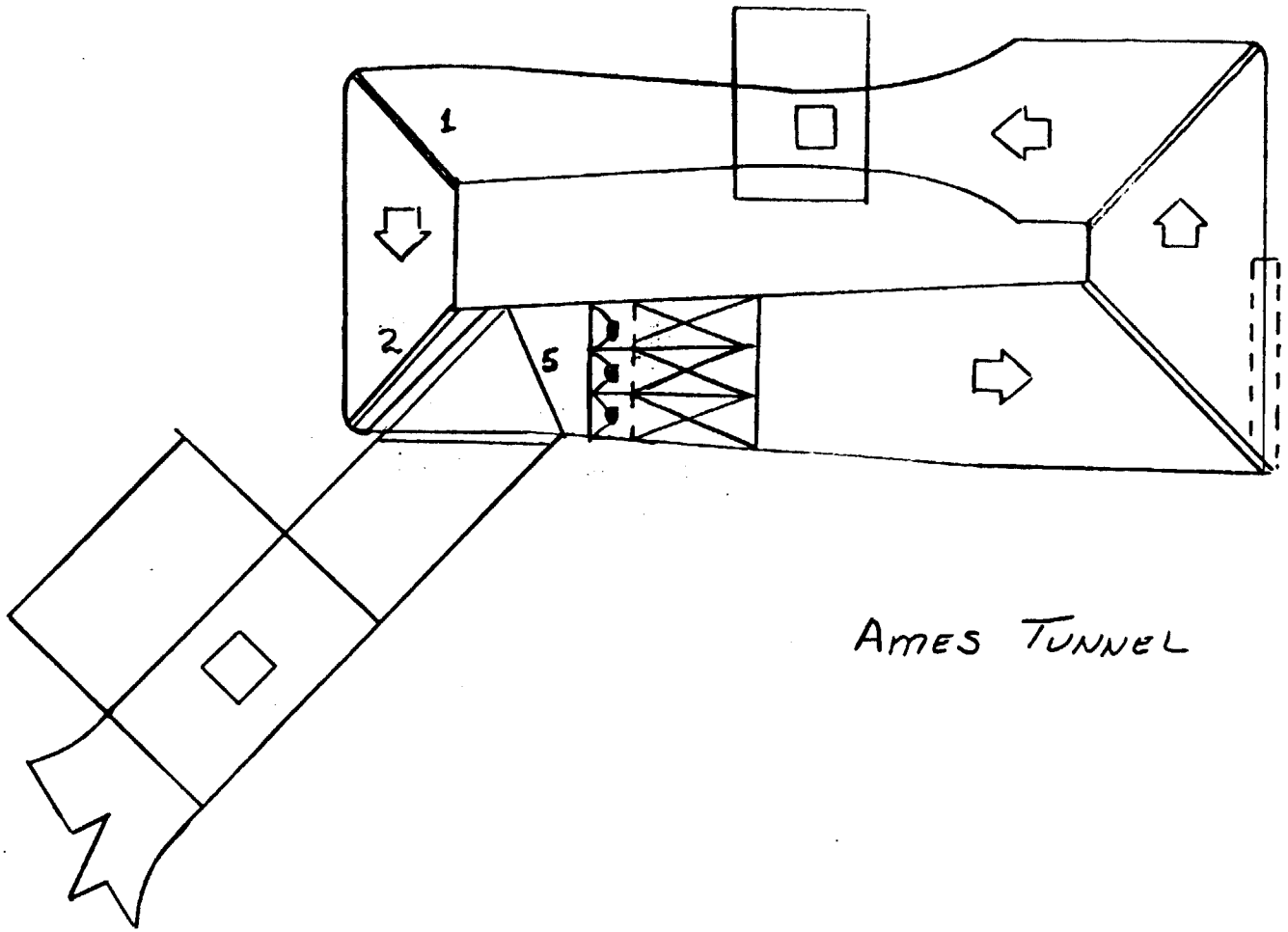
J. SANZ

E. McFARLAND

N. SANGER

T. GELDER

R. CAVICCHI



AMES TUNNEL

COMPUTATIONAL DESIGN TOOLS

- DESIGN CODE - SANZ

  HODOGRAPH SOLUTION

  BOUNDARY LAYER CORRECTION

- ANALYSIS CODE - McFARLAND

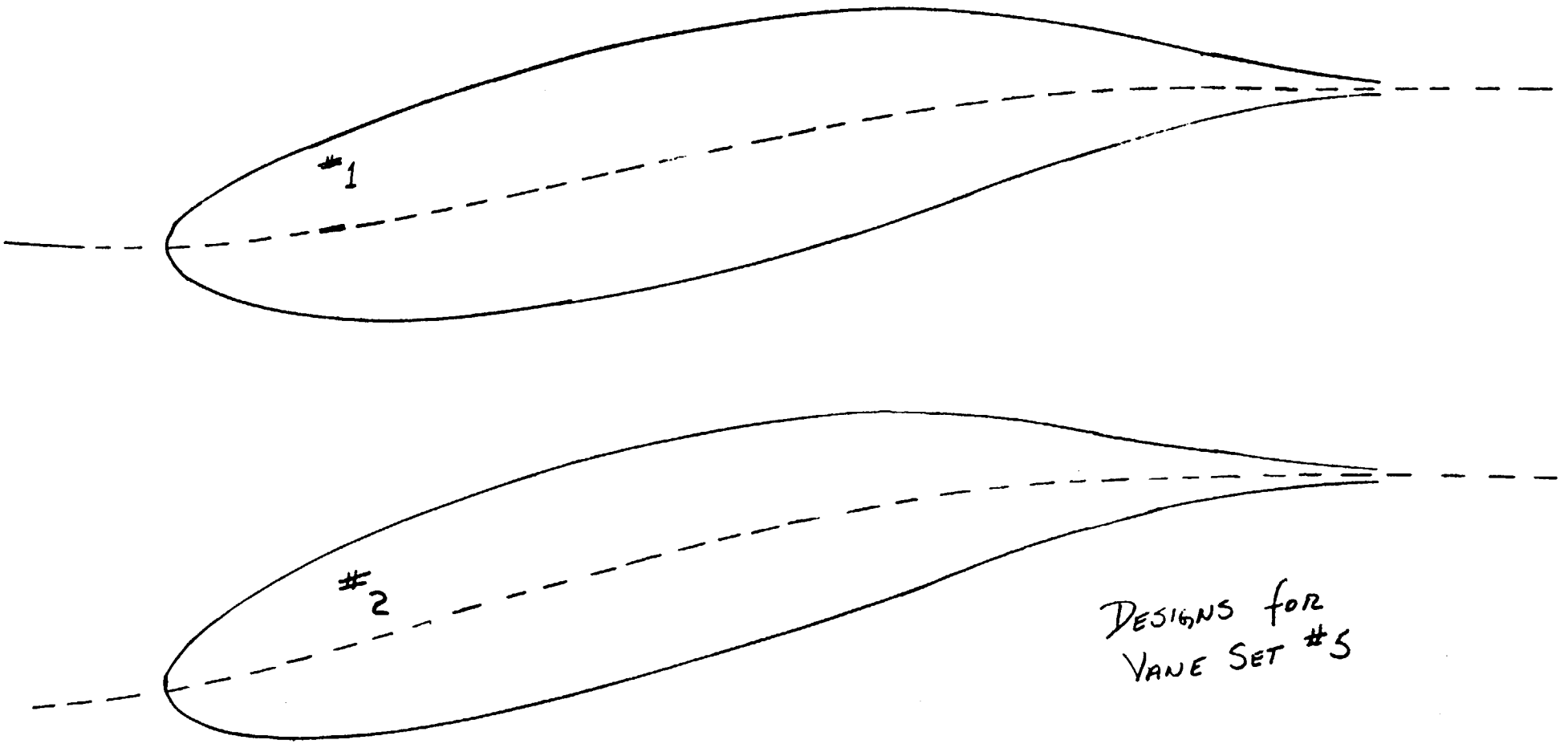
  PANEL METHOD

- BOUNDARY LAYER - McNALLY

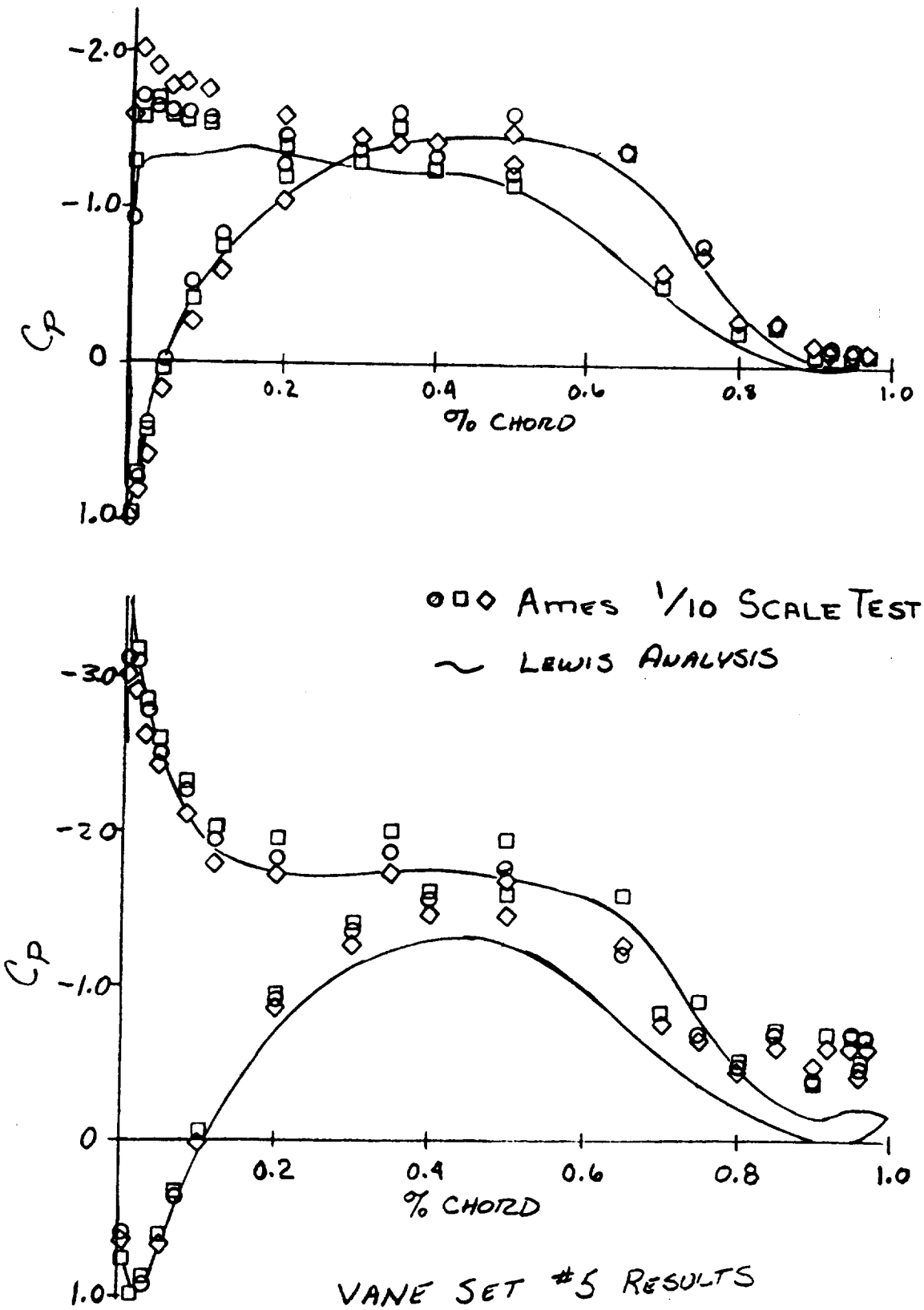
  INTEGRAL METHOD

VANE SET 5 DESIGN CONSTRAINTS

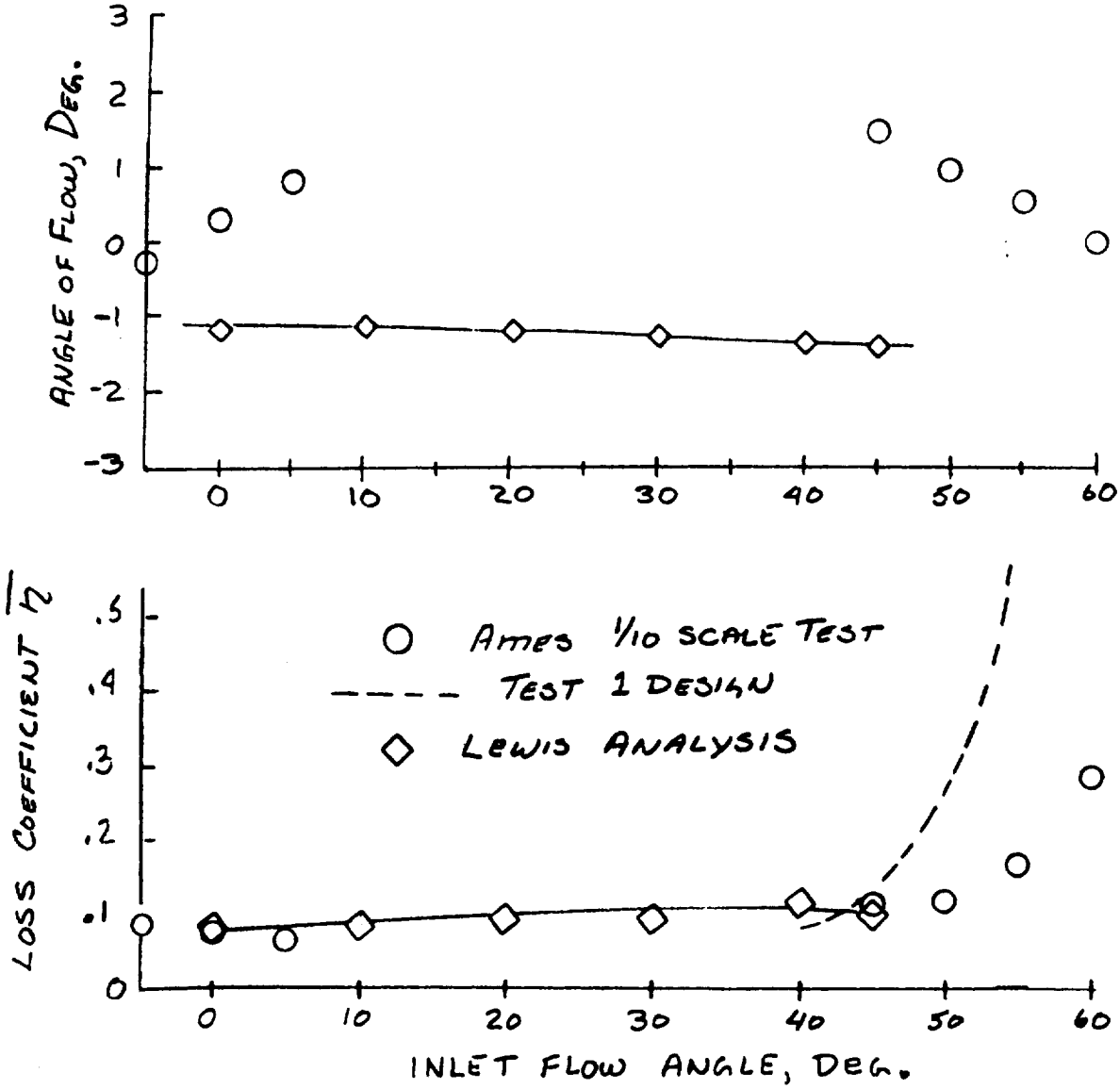
- TWO MODES OF OPERATION
- LOW LOSS - ZERO TURNING
- 45 DEGREES TURNING - HIGHER LOSS ACCEPTABLE



DESIGNS FOR
VANE SET #5



VANE SET #5 RESULTS



LOSS AND TURNING VANE SET #5

VANE SETS 1 AND 2 DESIGN CONSTRAINTS

- SINGLE MODE OF OPERATION

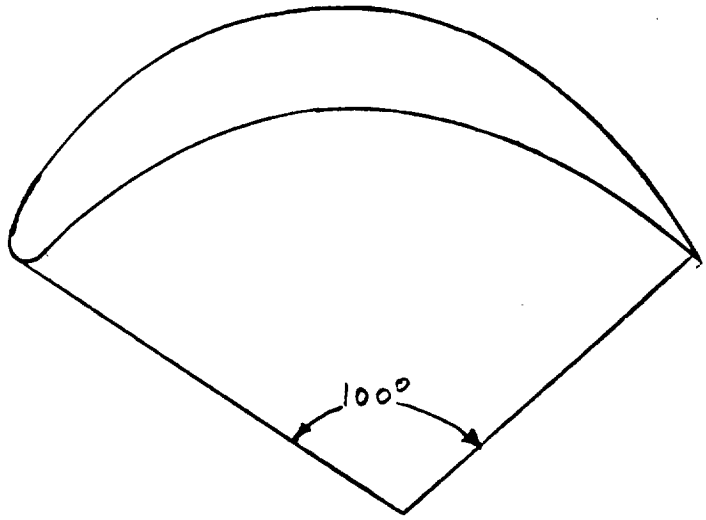
  90 DEGREES OF TURNING - LOW LOSS

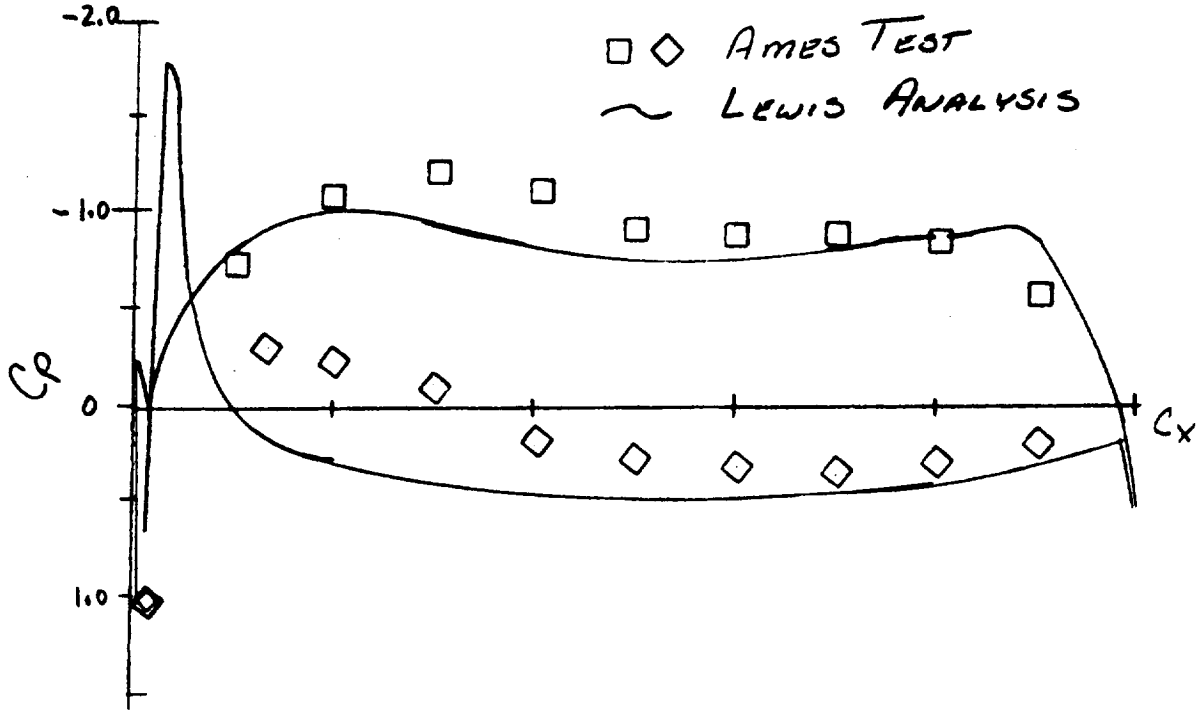
- CONSTRUCTION

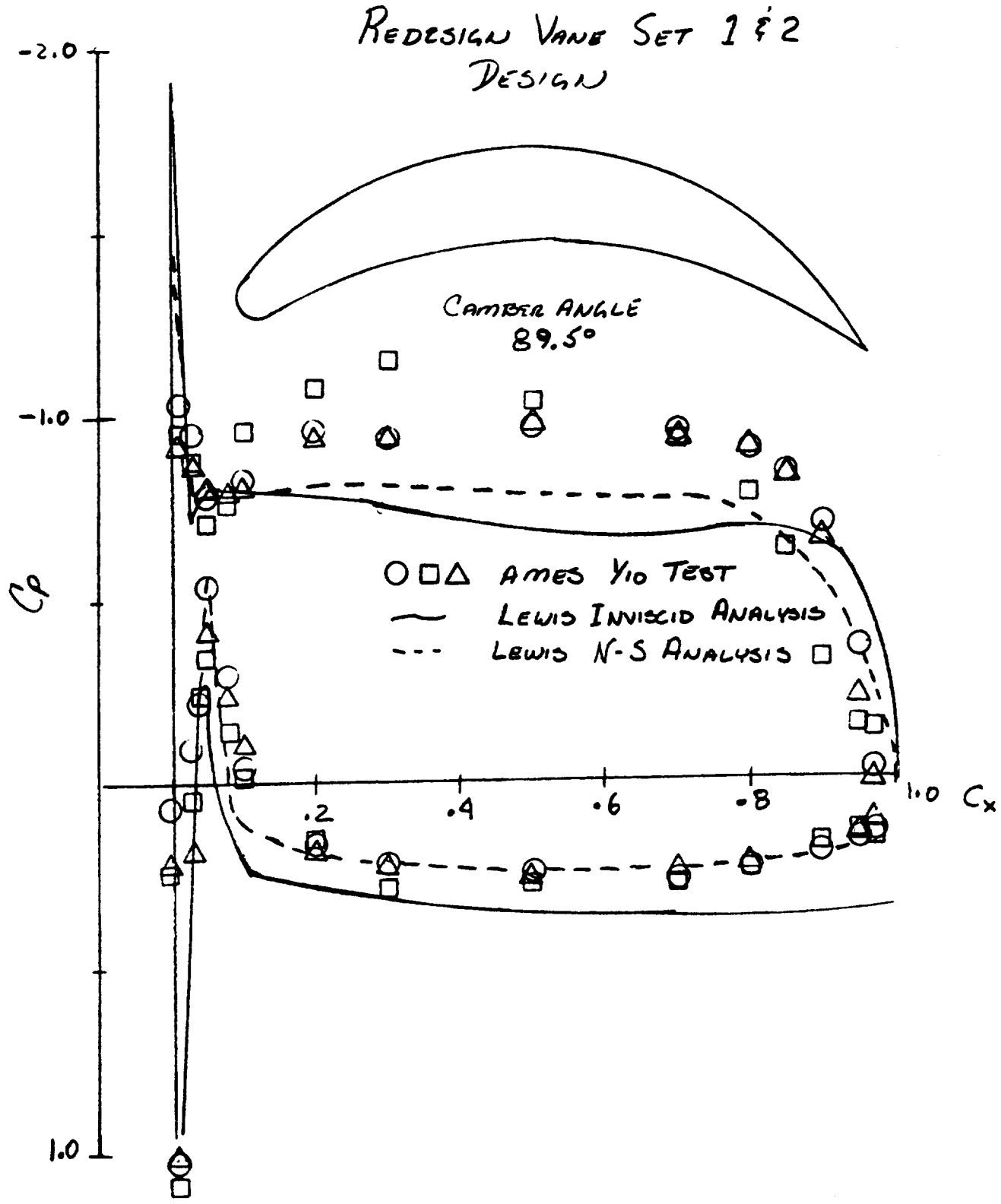
  CIRCULAR TUBE FOR LEADING EDGE

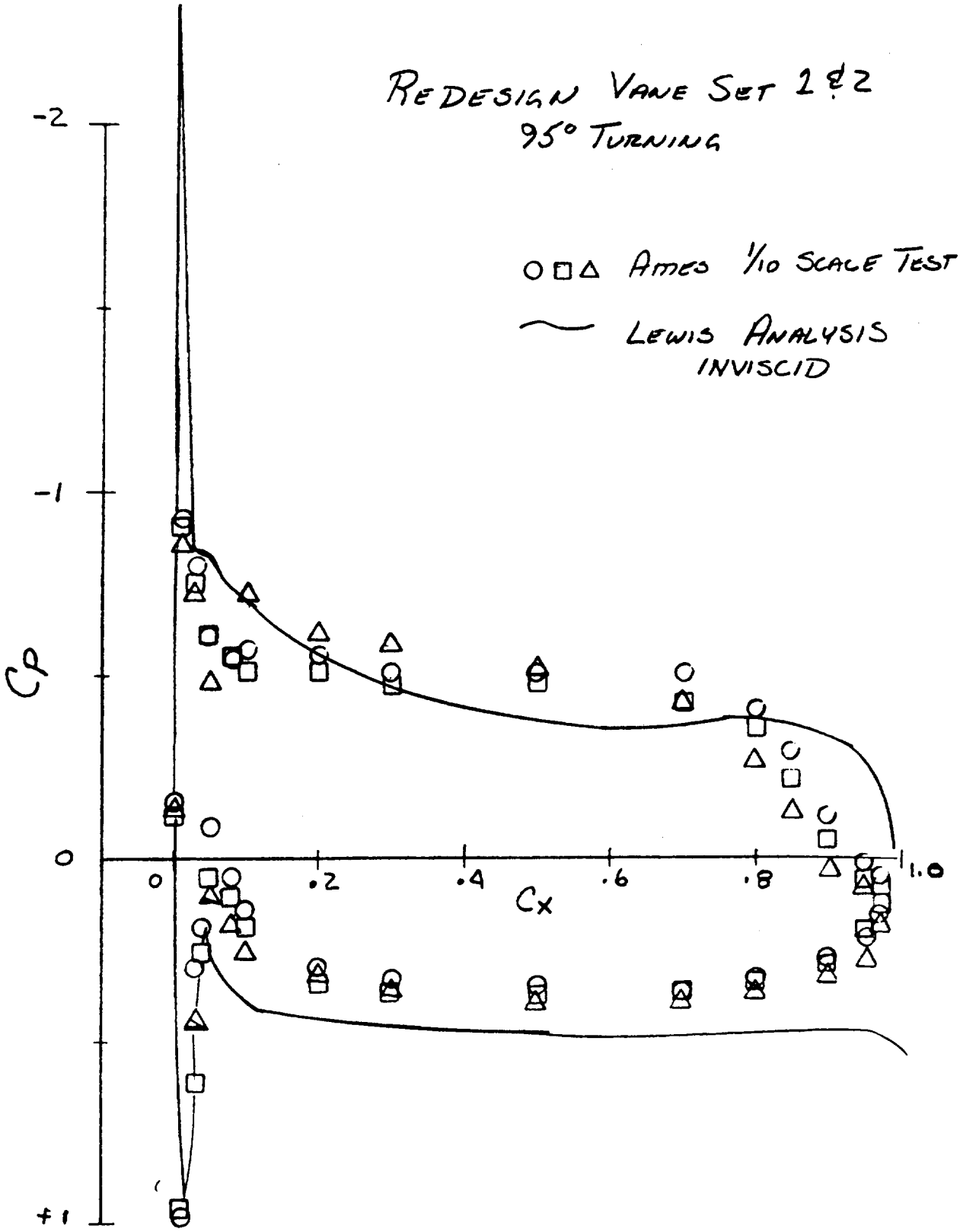
  CIRCULAR ARCS FOR THE SUCTION AND PRESSURE SURFACES

ORIGINAL VANE SET 1 & 2

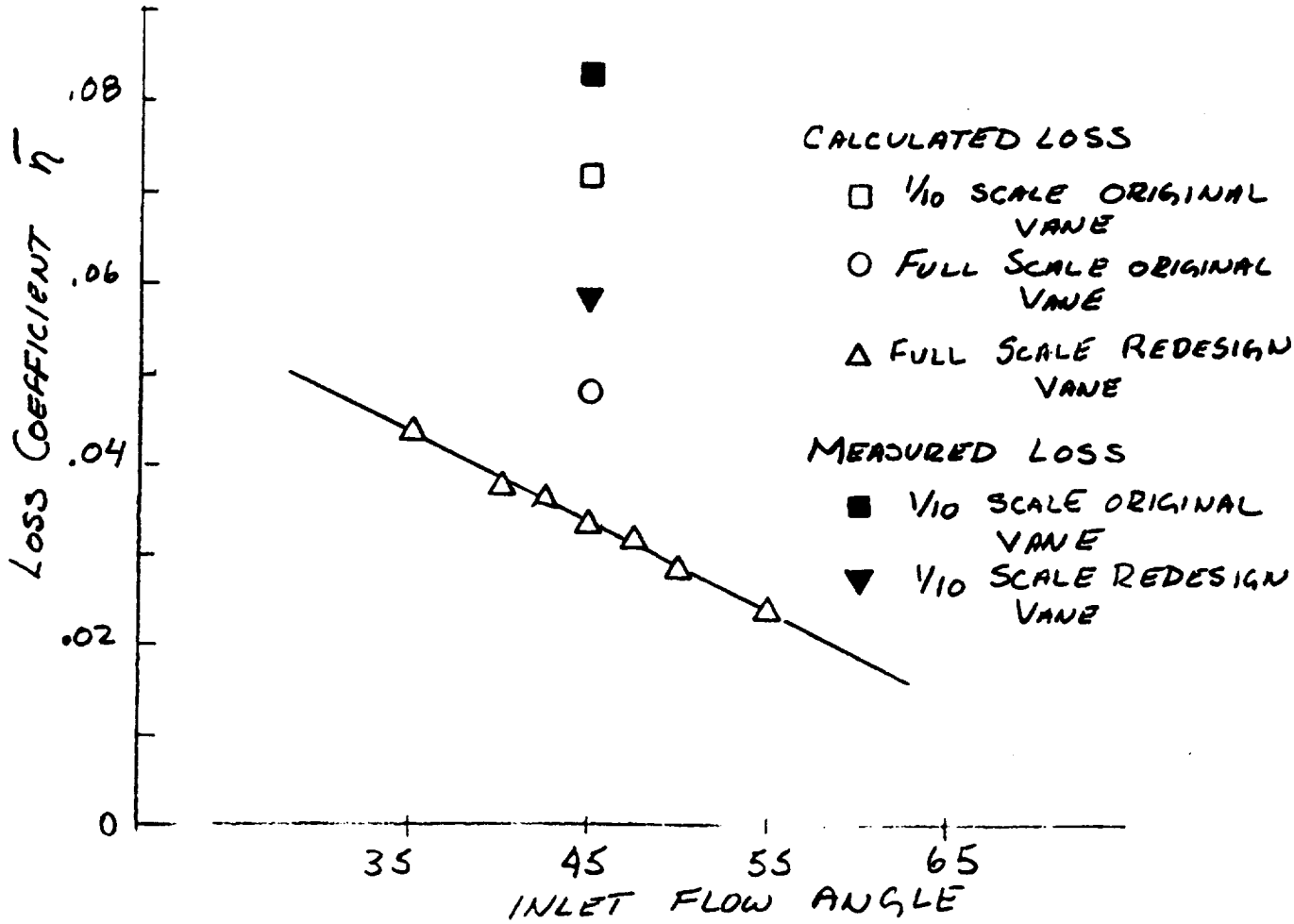


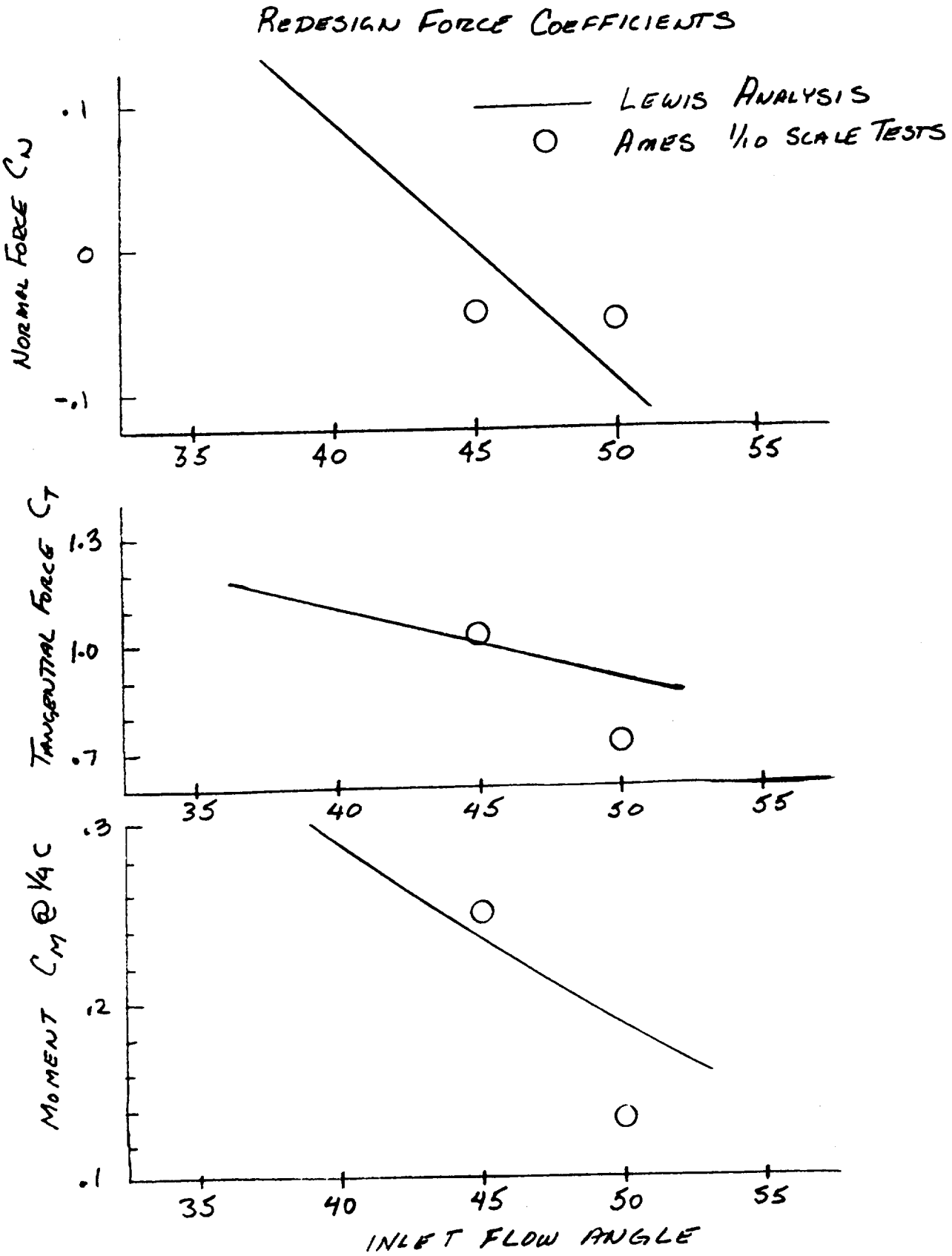


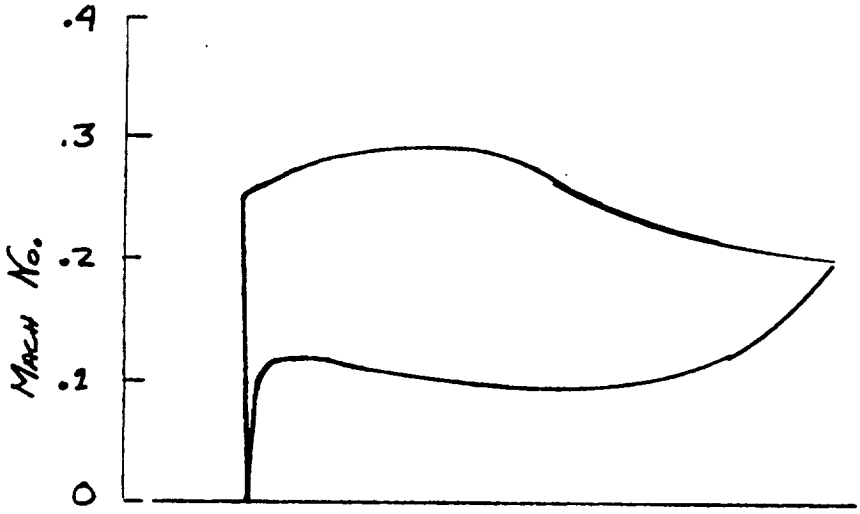

REDESIGN VANE SET 1 & 2
DESIGN
-2.0
-1.0
1.0
Cp
CAMBER ANGLE
89.5°
AMES Y10 TEST
LEWIS INVISCID ANALYSIS
LEWIS N-S ANALYSIS
.2
.4
.6
.8
1.0 Cx

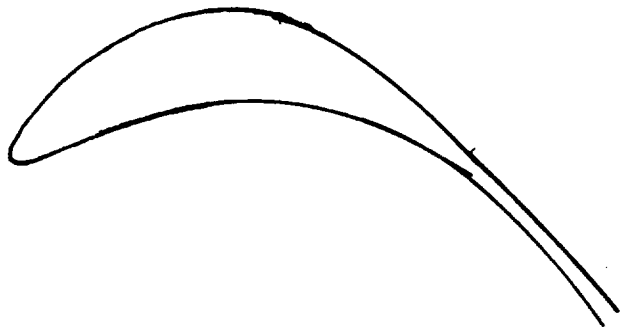

REDESIGN VANE SET 1 & 2
95° TURNING
Ames 1/10 SCALE TEST
LEWIS ANALYSIS
INVISCID
-2
-1
0
+1
Cp
0
.2
.4
.6
.8
1.0
Cx

VANE SET 1 & 2 LOSS




REDESIGN FORCE COEFFICIENTS
LEWIS ANALYSIS
AMES 1/10 SCALE TESTS
NORMAL FORCE C_N
.1
0
-.1
35
40
45
50
55
TANGENTIAL FORCE C_T
1.3
1.0
.7
35
40
45
50
55
MOMENT C_M @ ¼ c
.3
.2
.1
35
40
45
50
55
INLET FLOW ANGLE





CONTROLLED DIFFUSION 90° TURNING VANE