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WIND LOADS ON FLAT PLATE PHOTOVOLTAIC ARRAY FIELDS

JPL CONTRACT NO. 954833

LOW COST SOLAR ARRAY PROJECT
ENGINEERING AREA

Phase III Final Report

April 1981

Ronald D. Miller
Donald K. Zimmerman

The JPL Low Cost Solar Array Project is sponsored by the U.S.Department of Energy and forms part of the Solar Photovoltaic Conversion Program to initiate a major effort toward the development of low-cost solar arrays. This work was performed for the Jet Propulsion Laboratory, California Institute of Technology by agreement between NASA and DOE.

Prepared for
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California 91103

By the
Boeing Engineering and Construction Company
(A Division of The Boeing Company)
Seattle, Washington 98124

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1.0 SUMMARY

This report presents the results of an experimental analysis (boundary layer wind tunnel test) of the aerodynamic forces resulting from winds acting on flat plate photovoltaic arrays. Local pressure coefficient distributions and normal force coefficients on the arrays are shown and compared to theoretical results. Parameters that were varied when determining the aerodynamic forces included tilt angle, array separation, ground clearance, protective wind barriers, and the effect of the wind velocity profile. Recommended design wind forces and pressures are presented, which envelop the test results for winds perpendicular to the array's longitudinal axis. This wind direction produces the maximum wind loads on the arrays except at the array edge where oblique winds produce larger edge pressure loads.

The arrays located at the outer boundary of an array field have a protective influence on the interior arrays of the field. A significant decrease of the array wind loads were recorded in the wind tunnel test on array panels located behind a fence and/or interior to the array field compared to the arrays on the boundary and unprotected from the wind. The magnitude of this decrease was the same whether caused by a fence or upwind arrays. Figure 1-1 shows typical envelopes of the wind loads on arrays that are presented in this report. This figure is for arrays interior to an array field or on the boundary of a field when a fence exists to protect the front arrays. Since these loads envelop the measured wind tunnel results, they can be used as guideline design steady-state wind loads on photovoltaic arrays with wind protection. Similar guideline wind loads are given in the report for arrays unprotected from the wind.

The wind loads on the arrays within two slant heights from the side edges are considerably different from the remainder of the array field. Vortices are produced by the array corners and at the fence corner if a fence exists. These vortices cause local high pressure loads on or near the array edges. Several methods to reduce the strength of the vortices and resulting pressures were tried with limited success. Endplating the arrays (completely enclosing the ends of the arrays with a 50% porosity plate to simulate shrubs or gates at the array ends) was the most successful in reducing the wind loads on the array side edges, decreasing these loads by approximately 50% . Modifying the fence corner was also successful but to a lesser extent than endplating the arrays.

However, the edge pressures are, at best, several times larger than the pressure several slant heights away from the side edge.

Theoretically calculated steady state wind loads were larger in magnitude than wind tunnel determined wind loads. Wind tunnel determined wind loads using a uniform wind profile and a 1/7 boundary layer wind profile were similar in shape and magnitude. The magnitude of the wind loads for the uniform wind profile, although similar to the boundary layer profile, were not consistently larger or smaller than the boundary layer profile results and thus could not be used reliably for design purposes in preference to the boundary layer results.

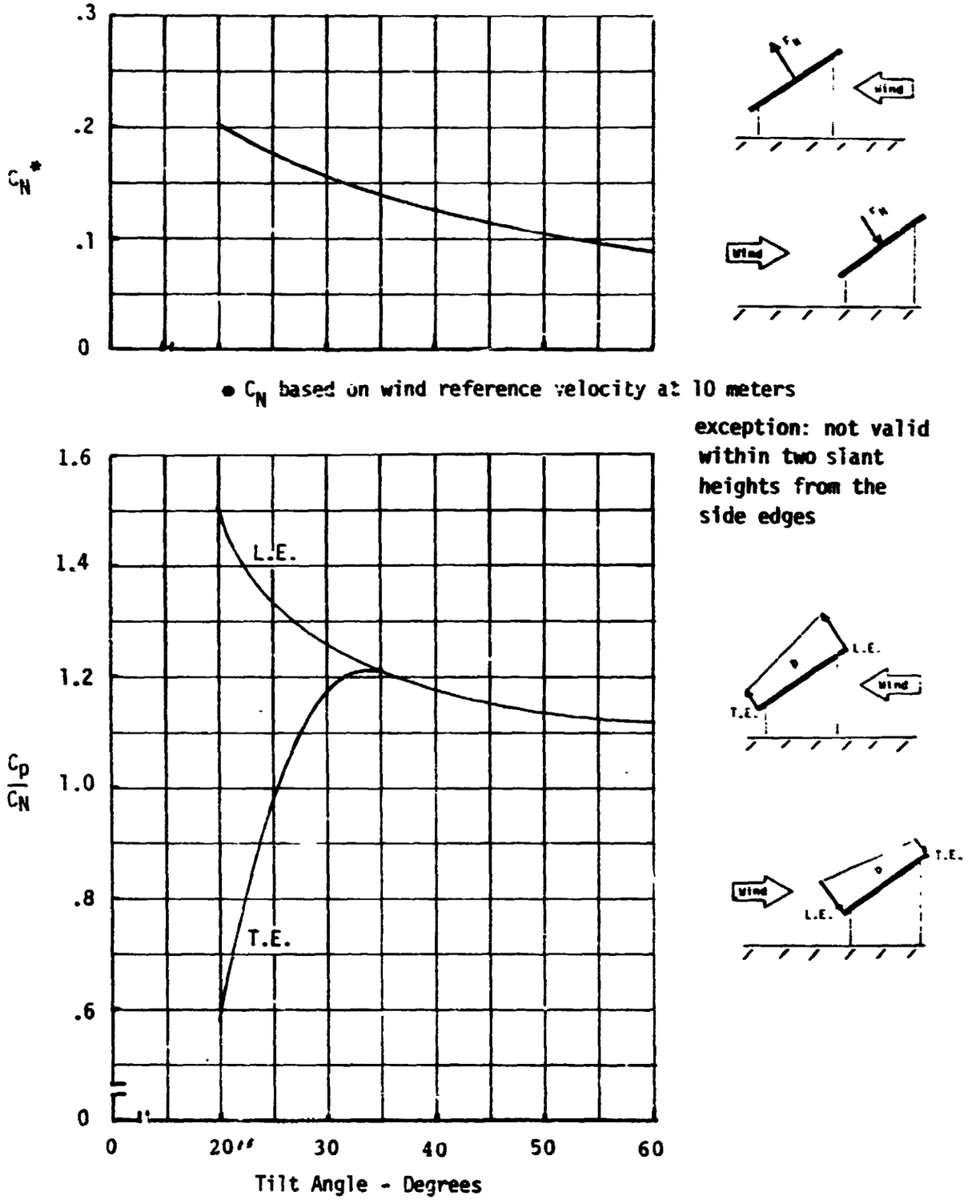


Figure 1-1. Steady State Wind Normal Force and Normalized Pressure Coefficient Envelope for Arrays Behind a Protective Wind Barrier

2.0 INTRODUCTION

This report summarizes an experimental analysis (wind tunnel test) of the aerodynamic loading on long, flat plate photovoltaic arrays resulting from exposure to the wind environments, evaluates and compares test results to theoretical results, and presents guidelines for aerodynamic loads to be used in the design of specific photovoltaic arrays. This report is an extension to the theoretical analysis reported in DOE/JPL 954833-79/2. The study was performed under contract number 954833 to the Jet Propulsion Laboratory as part of the Engineering Area Task of the Low-Cost Solar Array (LSA) Project. This project is being managed by JPL for the Department of Energy, Division of Solar Technology.

2.1 Study Objectives

The Department of Energy (DOE) photovoltaic program[1] has the overall objective to ensure that photovoltaic conversion systems will contribute significantly (50 Gwe) to the nation's energy supply by the year 2000. The cost associated with the design and construction of solar photovoltaic arrays to produce electric energy from sunlight is an important factor in the acceptance and use of solar energy. DOE has established specific price goals to produce energy at 55-92 mills/KW-h by 1986 (expressed in constant 1980 dollars) which are deemed necessary to achieve the desired industry growth and market penetration. Therefore, it is necessary in the trade-off phase of system design to ensure that the design requirements are realistic. The objective of this study was to establish wind load guidelines for flat plate photovoltaic arrays with various configurations in relation to chord lengths, array spacings, height of arrays from the ground, wind direction, array angles of attack, and with and without protective fences used to reduce the wind loading (see Figure 2-1). The guidelines were to be established by theoretical aerodynamic methods and experimental techniques. Wind tunnel testing was to be used to verify the theoretical results reported in reference 5 and to determine steady state wind loads on arrays for conditions that cannot presently be obtained by theoretical methods. These loads are required to ensure realistic design requirements.

2.2 Discussion and Background

The load due to wind on an array and on its support structure strongly influences the design and ultimately the cost of the photovoltaic panels, panel and array support structure and foundations of the arrays. A previous design study of flat plate array support structure showed that the arrays (structural framework and foundation) costs were of the same order of magnitude as the photovoltaic module costs. Furthermore, the array costs were strongly dependent on the assumed wind loading for loading in the range of 35 to 75 psf. Another study, using transparent inflated enclosures to protect the modules[3], predicted wind loadings on the enclosures near the low end of the range compared to those used in reference 2, and showed significant cost savings compared to conventional arrays with similar wind loading criteria. It is, therefore, essential to determine the true maximum wind load that the array will experience during its lifetime in order to minimize the structure cost.

Three factors affect the amount of wind loading on a body: the flow field in which the body is placed, the aerodynamic characteristics of the body itself, and the dynamic response of the body due to the wind loading. Although the structural loads resulting from this latter factor are not totally composed of aerodynamic forces (they also include inertia forces), these structural loads do result from the wind loading, or more precisely, the fluctuations in wind loading.

A flow field of the type that would be found around arrays in an array field situated in an open terrain, as depicted in Figure 2-2, has three aspects: 1) the steady state flow before it encounters any obstacles, 2) atmospheric gusts, and 3) turbulence. The steady state flow consists of a shear layer adjacent to the ground whose shearing effects decrease with elevation above the ground until a uniform flow is attained. The shear layer for most open flatlands can be modeled as a 1/7 power law[4]. Gusting is the result of velocity variations and changes in the direction of the prevailing wind due to atmospheric instabilities. Turbulence may be caused by several factors. Gusting can cause turbulence when adjacent volumes of air are moving at different velocities, thus producing a shearing effect. The roughness of the land causes turbulence because of shearing effects. An obstacle in the path of the flow can also create turbulence by upsetting the flow and thus causing eddies and vortices to

form. In addition, the shape of the body will affect the characteristics of the turbulence. Turbulent flow is highly complex, with varying frequencies and intensities occurring in a random manner.

The body in the case of a photovoltaic array consists of modules assembled on a framework that is mounted on a support structure (Fig. 2-3). The aerodynamic characteristics of an array are the same as those of a flat plate when only steady state flow is considered. When gusting and turbulence are introduced, these characteristics are not as well defined; however, the aerodynamics for a flat plate are a good approximation in lieu of a more detailed structural design. The effect on the array forces due to the flow field are a function of the type of impingement and the resulting pressure distribution over the array. When the flow is turbulent, the pressure distribution and, consequently, the forces exerted on the array are nonuniform in frequency and intensity. These forces may cause vibrations in the structure resulting in additional structural dynamic forces on the array. Since turbulence varies in frequency and intensity, the resulting loading will also vary as a function of the frequency and intensity.

2.3 Study Requirements

The requirements of this study involve analysis and test within five specific areas. They are:

1. Wind tunnel test plan.
2. Wind tunnel test.
3. Test and theoretical results analysis and comparison.
4. Modification of theoretical results to reflect empirical results.
5. Establishment of design guidelines for estimating wind loads on photovoltaic arrays.

The following is a summary of the statement of work for Phase III.

- o Verify the analytic results obtained in Phase II and expand the effort to establish wind load and pressure distributions that can be used

as module and support structure design guidelines by performing the following four tasks.

1) Task 1 - Pre-Test Planning

Review the data requirements from the Phase II work for meeting Phase III objectives and optimize the wind tunnel test conditions and configurations that will meet the data requirements.

2 Task 2 - Wind Tunnel Testing

Based on the requirements determined in Task 1, perform the required wind tunnel tests. Review the preliminary data during the test program and modify the test plan as required to ensure that the data requirements are met.

3) Task 3 - Data Analysis

a) Compare the wind tunnel results with the results of Phase II and determine the validity of the analytically identified key load paremeters. b) Modify the results of Phase II to reflect the empirical results.

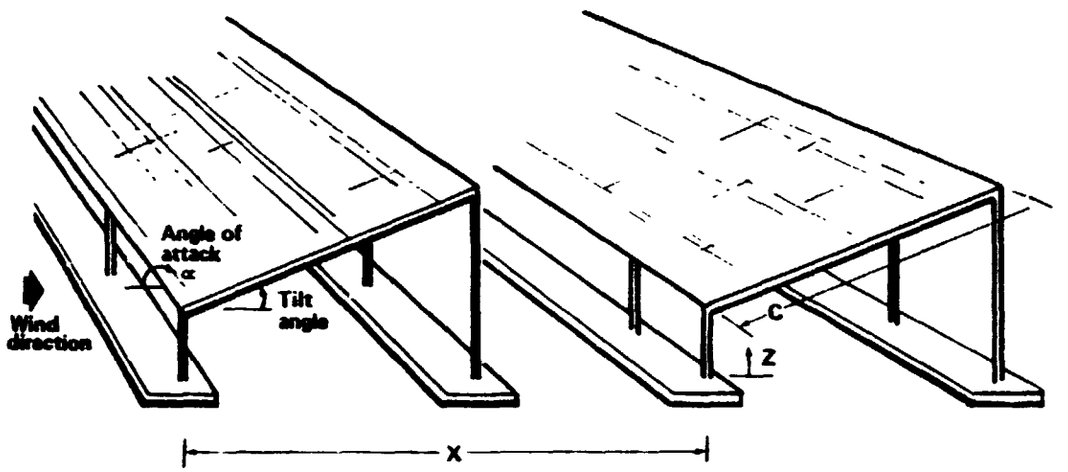
4) Task 4 - Design Guidelines

a) Establish design guidelines for estimating the wind loads on the support structure as a function of the wind velocity and array field configuration.
b) Establish design guidelines for estimating the pressure distribution on flat plate modules for varying wind velocities and array field configurations.

2.4 Report Organization

The remainder of this report presents the results of the wind tunnel test and its comparison to the theoretical results presented in reference 5 and the proposed design wind loads and conclusions. Section 3.0 presents basic

aerodynamic equations, definitions, and nomenclature for use in understanding the results. Section 4.0 presents the wind tunnel program and results. A comparison of theoretical results to experimental results is presented in Section 5.0. A discussion of the results of Sections 4.0 and 5.0 is included in Section 6.0 together with conclusions obtained from the results. Section 7.0 presents array wind load envelopes that may be used for design guidelines. New technology and References are outlined in Sections 8.0 and 9.0, respectively. The wind tunnel test report which includes test description and data from the tests conducted at Colorado State University in their Meterological Wind Tunnel Facility is presented in the Appendix.



Ground clearance (Z)

Array spacing (X)

Tilt angle

Wind direction

Figure 2-1. Array Variables Used to Study Aerodynamic Loads

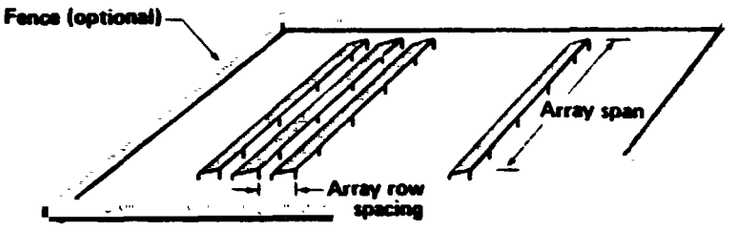


Figure 2-2. Photovoltaic Array Field

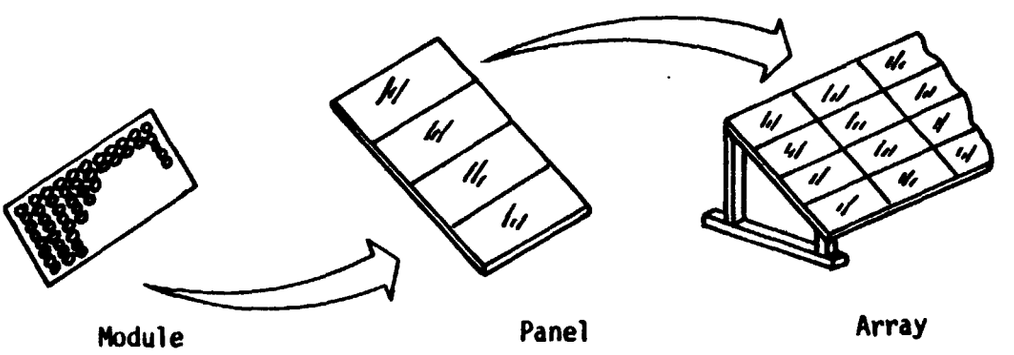


Figure 2-3. Definition of an Array

3.0 BASIC AERODYNAMIC EQUATIONS AND DEFINITIONS

The analyses used in this report required the use of aerodynamic results that were calculated in aerodynamic terms. Since these terms may be unfamiliar to designers of photovoltaic arrays, this section explains the basic aerodynamic terms and nomenclature and defines basic aerodynamic equations to assist those without an aerodynamic background to understand the results. In addition, synonyms between aerodynamic and solar energy terms are given where applicable.

3.1 Analysis Definitions and Nomenclature

Aerodynamic coefficients:	non-dimensional coefficients.
pressure coefficient (C_p):	relates lifing surface pressure to reference freestream dynamic pressure, $C_p = p/q$.
$C_{p\alpha}$	slope of the pressure coefficient curve; relates pressure coefficient to angle of attack, $C_p = C_{p\alpha}\alpha$.
ΔC_p	net pressure coefficient on lifting surface = windward face pressure coefficient minus base pressure coefficient.
normal force (F_n,F_N):	force normal to the lifting surface (positive out of base pressure face).
normal force coefficient (C_n, C_N):	relates lifting surface normal force to reference freestream dynamic pressure and reference area, $C_N = F_n/qA$.
$C_{N\alpha}$	slope of the normal force coefficient curve, relates normal force coefficient to angle of attack, $C_N = C_{N\alpha}\alpha$.

lift (L)	force on the lifting surface perpendicular to the freestream velocity (positive up).
lift coefficient (C_L)	relates lift to reference freestream dynamic pressure and reference area, $C_L = L/qA$.
drag (D)	force on the lifting surface parallel to the freestream velocity (positive in the wind direction).
drag coefficient (C_D)	relates drag to reference freestream dynamic pressure and reference area, $C_D = D/qA$.
center of pressure (X)	location of total force on lifting surface measured from the leading edge.
Angle of attack:	angle measured from the wind vector to the plane of the lifting surface.
Array:	a mechanically integrated assembly of panels together with support structure (including foundations).
Array field:	the aggregate of all arrays.
Array spacing:	horizontal distance measured from one array to the identical location on the next array.
Aspect ratio (AR):	aerodynamic geometric parameter (span/chord for a rectangular array).
Base pressure face:	downwind side of lifting surface.

Bluff body:	a nonstreamline body that causes airflow about itself to become separated and turbulent.
Chord (C):	distance of array between leading and trailing edges and perpendicular to the edges, i.e.: slant height of array.
Dynamic pressure (q):	pressure due to freestream velocity at a reference height ($q = .5\rho V^2$).
Ground clearance (Z):	distance between the ground and the lowest point on the panels forming the array.
Inviscid:	frictionless flow.
Leading edge (L.E.):	windward edge of the array.
Module:	the smallest complete environmentally protected assembly of solar cells.
Normal wash, downwash:	flow of air perpendicular to the lifting surface plane.
Panel:	a collection of one or more modules fastened together forming a field installable unit.
Plate:	thin rectangular shaped structure that acts as a lifting surfce.
Pressure (p):	force per unit area.
Span (b):	distance of an array between the two side edges i.e.: length of array.

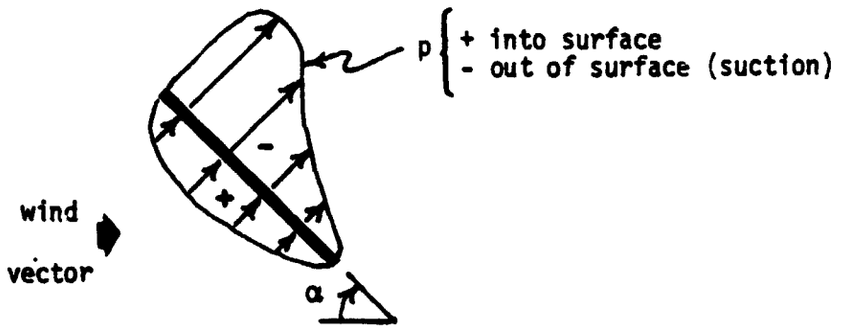
Tilt Angle:	angle measured from the horizontal to the plane of the array panels.
Trailing Edge (TE):	downwind edge of the array
Viscous:	flow that has friction.
Windward face:	windward side of lifting surface.
Yaw angle:	angle measured from wind direction to the normal of the array leading edge.
A:	reference area of array or portion of the array
ℓ:	length
V:	velocity.
ρ:	air density.
μ:	coefficient of viscosity.
$\mathcal{S}$:	area of lifting surface.
S:	distance measured along the chord from a reference point.

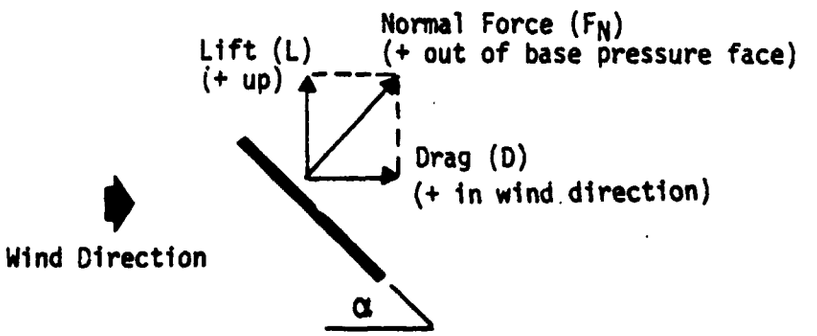
3.2 Solar Energy - Aerodynamic Synonyms

Solar Energy	Aerodynamics	Comments
Tilt angle and wind direction	Angle of attack, symbol is α	Restricted to horizontal winds
Slant height	Chord	
Wind angle	Yaw angle	

3.3 Aerodynamic Sign Convention and Basic Equations

Sign Convention:





Aerodynamic Equations:

1. Pressures and pressure coefficients are related by:

$$p = q C_p$$

2. Normal forces and normal force coefficients are related by:

$$F_N = q S C_n$$

3. When the pressure coefficients and normal force coefficients are linear with respect to angle of attack, the above expressions can be changed to:

$$p = q C_{p_\alpha} \cdot \alpha$$

$$F_n = q S C_{n_\alpha} \cdot \alpha$$

4. Normal force coefficient for chordwise strips can be obtained from the pressure coefficients by integrating the pressure coefficient along the chord and is expressed by:

$$C_n = \frac{1}{C} \oint_c C_p$$

or for a surface as:

$$C_n = \frac{1}{S} \oint_s C_p$$

5. Lift and drag coefficients are related to the normal force coefficient by the angle of attack as:

$$C_L = C_n \cos \alpha$$

$$C_D = C_n \sin \alpha$$

6. Lift and drag forces are given by:

$$L = q S C_L$$

$$D = q S C_D$$

4.0 WIND TUNNEL TEST PROGRAM AND RESULTS

A wind tunnel test program was developed to verify the theoretical results in reference 5 and to obtain test data for conditions not presently suitable for theoretical analysis. The test plan included the testing of wind loads on single arrays, arrays within an array field, the effect of fences on arrays in an array field, and the effect of wind velocity profiles (uniform and 1/7 power law). The emphasis of the program was the testing of arrays in an array field with a boundary layer wind having a 1/7 power law velocity profile referenced at 10 meters. This wind profile was used to represent the winds found in nature in open flat terrain. The array parameters varied using this wind profile were: (1) array separation (1.5, 2.0, and 3.0C), (2) tilt angle (20°, 35°, 60°, and 90°), (3) wind direction (front, rear, and oblique winds of 45° and 135° from the front), (4) fence (with and without), (5) fence porosity (0% and 30%), and (6) fence-array separation (1.25, 2.5, and 5.0C). The array parameters not varied were the slant height (C) and the array ground clearance of .25C. Several modifications to the fence corner and array edges were tested with oblique winds in an attempt to reduce the array edge loads. A complete list of the test configurations is listed in Table 18, Appendix A. The fence corner modifications are detailed in Table 17, Appendix A, and the array edge modifications are shown in Figure 24, Appendix A.

A number of test runs were conducted utilizing a uniform velocity profile. These tests did not include any fence effects or effects of oblique winds. The tests included variations of tilt angle and array separation in an array field. Single arrays were also tested varying the tilt angle and the array ground clearance. Corresponding single array tests were performed with a 1/7 power law velocity profile for comparison to the uniform velocity profile results.

The wind tunnel testing was conducted in the Meteorological Wind Tunnel at Colorado State University (see Figure 1, Appendix A). This tunnel is characterized by a long (96 ft.) test section that is 6 ft. 8 in. wide by 6 ft. high. The long test section is required to properly develop and stabilize the boundary layer velocity profile used in the tests. Testing in a boundary layer wind profile is performed at the rear of the test section whereas testing in a uniform wind velocity profile is performed at the front of the test section.

The array model tested was a 1:24 scale of an eight ft. chord full size array. Pressure taps were located at the mid-span and edge locations as shown in Figure 10, Appendix A. Ten pressure taps were located on each of the front and rear faces of the array and at each span location. The spacing of the taps were varied such as to have more taps near the leading and trailing edges of the array. Pressures at each tap were recorded digitally for 16 seconds by means of a pressure switch to a Setra differential transducer which was sampled at 250 times per second. The test data acquisition, data reduction as well as the testing procedures are detailed in Appendix A. The recorded test data in its entirety is presented in Appendix B and the computer plotted test data in Appendix C.

The following sections present significant findings from the test results. Section 4.1 details the results from the uniform wind velocity profile for an array field. Section 4.2 presents the results from the 1/7 power law wind profile and section 4.3 shows the comparison of the wind loads on a single array due to a uniform and a boundary layer wind. Section 4.4 summmarizes the significant test results.

4.1 Uniform Wind Velocity Profile

Figures 4-1a through 4-1g, show the net or delta pressure coefficient distribution (the windward face pressure coefficient minus the base pressure coefficient) along the chord for an array field positioned at four tilt angles and with a uniform velocity profile wind from both front and rearward directions. In all of these cases, the arrays are .25 slant heights above the ground and separated by a distance of two slant heights. Other array separation distances (1.5 and 3.0 slant heights) were tested. Since the results from the three array separations are similar, only the results of the 2.0 slant height separation tests are used to discuss significant findings. The pressures on the arrays, each recorded in the test for sixteen seconds, were used to calculate average and rms pressure coefficients. The rms pressures are an indication of the pressures to be expected from the turbulence generated by the arrays. However, the rms pressures do not reveal any characteristics of the flow such as the phase angle of the pressure between locations or the frequency content of the pressures. These parameters are very important to predict dynamic pressures and forces on the structure and will be reported in a future report.

The first windward array in the array field experiences by far the highest mean pressure coefficients and resulting normal forces for all tilt angles. In contrast to the mean pressures, the rms values of the unsteady pressure coefficients caused by the array induced wind turbulence is the smallest on the first windward array. The turbulence in the wind tunnel for the free stream wind prior to the array field is essentially zero.

The first array behind the windward array (2nd array) experiences considerably lower mean pressures than the first array but the rms pressures caused by the array induced wind turbulence are greatly increased. This is caused primarily by the turbulence created in the wind by the first array. In addition, the pressure distribution on the second array is significantly changed by the effects from the first array, especially when the wind is from the front. For this wind condition, the pressures on the windward array face become negative over a portion of the chord for several tilt angles, and ΔC_p may be negative over part of the chord for several tilt angles as shown for the 35° tilt angle case. In this condition, if only normal forces were recorded on the array, they would indicate essentially zero force. From the pressure coefficient distribution shown in Figure 4-1c to 4-1f, it can be seen that there are varying pressures on the array and a significant pitching moment is felt by the array.

The loads on the fifth array downwind from the edge of the array field experience larger fluctuating pressure coefficients than the first array, but smaller than the second array. Although the fluctuating pressure coefficients are of the same order as the steady state pressures on the fifth array, the total of these pressures is much smaller than only the steady state pressures on the first array. Another noteworthy aspect of the loads on the fifth array is the flatness of the pressure distribution along the chord. The pressure distribution is essentially constant over the chord for each tilt angle considered. An exception is the 20° tilt angle configuration with the wind approaching the array from the back, where the pressure distribution along the chord linearly increases from the trailing edge to the leading edge.

4.2 1/7 Power Law Wind Velocity Profile

The major portion of the wind tunnel test program was devoted to the wind loading on the arrays in a boundary layer wind of 1/7 power law velocity profile shown in Figure 4-2. This section presents and discusses the significant findings of the wind tunnel test results performed in the boundary layer wind. The array test configuration, pressure measurement locations and wind direction are given in Table 4.1.

Table 4-1. Array Test Conditions

Array Configuration (Tilt Angle)	Fence	Pressure Measurement Location	Wind Direction
20^0, 35^0, 60^0, 90^0	No	Center of Span	0^0 (Head-On), 180^0
20^0, 35^0, 60^0, 90^0	Yes	Center of Span	0^0 (Head-On), 180^0
35^0	No	Edge of Span	0^0 (Head-On), 180^0
35^0	Yes	Edge of Span	0^0 (Head-On), 180^0
35^0	No	Edge of Span	45^0, 225^0
35^0	Yes	Edge of Span	45^0, 225^0

4.2.1 Array Mid-Span Wind Loads Without a Protective Wind Barrier (Fence)

Figure 4-3 presents the mean and rms delta pressure coefficient distributions on the arrays in an array field with an identical configuration as in Figure 4-1, except for the wind profile. The pressure coefficients are based on the freestream reference velocity located at a height of ten meters. The results for the mean and rms ΔC_p chordwise distributions are very similar in shape to those from the uniform wind profile test results presented in Section 4.1. Because the magnitude of the coefficients are a function of the reference velocity that varies with elevation above the ground in a boundary layer wind, a direct magnitude comparison with the uniform flow results cannot be made with the boundary layer results referenced to the freestream velocity at 10 meters. The trends of the results plotted in Figure 4-3 are the same as those for the uniform velocity profile results shown in Figure 4-1. That is, the highest

steady state or mean pressures are on the first array. The downwind arrays have lower steady state pressure than the front array because of the protection afforded by the upwind arrays, but the rms pressures are slightly higher within the array field than for the front array. In addition, with increasing tilt angle, the greater the amount of protection from the wind is received by the downwind arrays from the upwind arrays.

The effect that the upwind arrays have on reducing the resulting forces on downwind arrays is shown by examining the normal force coefficients presented in Figure 4-4. The normal force coefficients were obtained by integrating the delta pressure coefficients along the chord for each array and array configuration for the steady state wind. The maximum normal force coefficient on the array is due to a wind from the rear and on the first windward array for all tilt angles. Regardless of the wind direction, the first windward array acts as a barrier to the wind for the downwind arrays and removes most of the wind energy. Consequently, the steady state wind load on the second array is significantly reduced, and the steady state wind load on succeeding arrays beyond the second array are only slightly reduced from that of the second array.

4.2.2 Array Mid-Span Loads with a Protective Wind Barrier (Fence)

The protective influence on the high aspect ratio photovoltaic arrays by a fence is presented in Figure 4-5 and 4-6. Figure 4-5 shows the ΔC_p on the first array behind a six foot fence (.75C). The corresponding normal force coefficients for the first, second and fifth arrays are shown in Figure 4-6, with the results without a fence for comparison. With a fence to protect the arrays from the wind, the wind-caused normal force coefficients are approximately the same on the first and succeeding arrays except for the arrays with tilt angles of 60°. The top of the array at a tilt angle of 60° is approximately .375 chord lengths above the top of the fence, so the upper portion of the first array is exposed to the freestream velocity resulting in increased loads. Of significant conclusion from Figure 4-6 is that the normal force on arrays several rows into the array field are the same with or without a fence. Thus, the fence only protects the first couple of rows of arrays and the remaining arrays are protected by the windward arrays.

4.2.3 Array Edge Wind Loads for Straight-On Winds

Figure 4-7 and 4-8 presents the pressure distribution at a location .15 chord lengths from the side edge for arrays having a tilt angle of 35° and for an array field without and with a protective fence respectively. Figures 4-9 and 4-10 show the normal force coefficients for the same conditions and compare the normal force coefficients at the array edge location to the mid-span location. Figure 10 of the Appendix A shows the location of the edge and center of span pressure taps on the model used in the test.) Without a fence to protect the arrays, the first windward array pressure distribution at the edge is essentially the same as at the center of the array (compare Figure 4-7 to Figure 4-3c and d). The arrays downwind from the first array have an edge pressure coefficient distribution whose magnitude is reduced from the first array but not nearly as much as for the mid-span pressure coefficients at similar conditions. The edge pressures are affected by the formation of vortices resulting from the array corners. This can be seen by the significant increase in the rms pressure coefficient levels between mid-span and edge locations and by the increased steady state pressure coefficient at the array corners, especially for winds approaching from the rear. The normal force coefficients shown in Figure 4-9 also show this trend.

The fence reduces the wind by such an amount that no large differences occur in pressure coefficient distributions at the edges compared to the mid-span pressure locations as seen by comparing Figure 4-8 to Figure 4-5 for identical array positions. One aspect of Figure 4-8 that is important is that the pressure coefficients for the fifth array downwind are larger than the first array. It is conceivable that the array edge pressures behind a protective fence will approach those without a protective fence for downward arrays when the wind is straight-on to the arrays. This results because the side fence has no effect on the straight-on wind and the fence perpendicular to the wind has a decreasing effect on the wind with increasing distance downwind from the fence. Extrapolating the normal force coefficients in Figure 4-10 further downwind supports this conclusion and suggests that loads on the arrays with a fence will approach those without a fence further downstream than five arrays.

4.2.4 Array Edge Wind Loads for Oblique Winds

Downwind effects of vortices formed at the array corners can cause large pressure coefficients near the array edges when the winds are at an angle to the arrays, because of increased vortex strength. Several wind tunnel test runs were performed with oblique winds at 45° approaching the arrays from the front and the rear directions. The array configurations were: tilt angle of 35°, array separation = 2C and array ground clearance = .25C. Large local pressures on the array edges due to oblique winds were measured as shown by the pressure coefficient distributions located .15 chord lengths from the array edge in Figures 4-11, a through d, for an array field without and with a protective fence.

The leading edge pressure coefficients, especially for unobstructed winds approaching from the front, were very large and can result in pressures at the leading edge approaching 45 psf for a 90 mph wind, based on the pressure coefficients in Figures 4-11a and 4-11b. When no fence exists, the array edges for arrays downwind from the first array do not receive any protection from the upwind arrays; therefore, their edge pressure distribution is essentially the same as the first array, as shown in Figures 4-11a and b. Figure 4-11a also shows the pressure distribution located .9 chord lengths from the edge on the first array. The trend implies that the magnitude of the pressure coefficients are decreasing with distance away from the side edge.

Even when the arrays are protected by a fence, the edge pressure coefficients due to an oblique wind are much larger than for straight-on winds as shown by comparing Figures 4-11c and d to Figure 4-8. The fence does give some protection to the arrays because the overall array edge pressure coefficient distribution is somewhat lower in magnitude than the corresponding conditions without a fence. This can be seen more easily by comparing the normal force coefficients at the edge with and without a fence as shown in Figure 4-12. Figure 4-12 also shows the reduction in normal force coefficients from .15 chord lengths to .9 chord lengths from the edge with and without a fence. The combination of a fence corner and an oblique wind causes a strong vortex to be generated at the fence corner which sweeps downwind and causes localized high pressure loadings. The high pressure loading caused by this vortex can be seen by the twin large humps in the pressure coefficient distribution shown on the first array in Figure 4-11c and by the large pressure coefficients at the

leading edge in Figure 4-11d. Figures 4-12 and 4-13 also show the effect of the vortex. Although the normal force coefficient for an array behind a fence is lower than without a fence (Figure 4-12), the corresponding maximum pressure coefficient is higher (Figure 4-13) on the first windward array when the wind approaches from the rear. This maximum pressure coefficient is at the leading edge which is directly downwind and in the vortex from the fence.

Because of the high edge pressures on the arrays, several modified configurations were tested in the wind tunnel in an attempt to reduce these pressures. The modifications (described in more detail in the Appendix) are as follows:

1) A short fence of the same porosity and height as the protective fence placed in front of the corner of the protective fence and at 45° to each side. This short fence would be perpendicular to a oblique wind that is at 45° to the protective fence and array field (See Figure 4-16, Configuration 1)
2) Three short fences overlapping each other and placed in front of the corner of the protective fence as in (1) (see Figure 4-16, Configuration 2)
3) Additional eight foot length added to the array with the added length having 50% porosity (See Figure 4-16, Configuration 3)
4) Endplating of the array ends completely closing the rows of the arrays with a 50% porosity end plate. This is to simulate shrubs etc., at the ends of the arrays (see Figure 4-16, Configuration 4)
5) Addition of a 50% porosity extension to the top of the array at the corner of the existing protective fence (see Figure 4-16, Configuration 5 and Figure 4-11g).

The data from the wind tunnel test for all of these configurations is given in Appendix B, and plots of the data are presented in Appendix C. The results from the configurations in (1) through (3) are not presented in the main body of the report for the following reasons. Configuration (3) did not produce any reduction in edge pressures. Configurations (1) and (2) did show reductions in the pressure coefficient distributions for the pressure taps on the model. However, this configuration would require more pressure readings over the total

array area near the edge to adequately define this reduction. It is believed, and somewhat supported by the data, that the vortex caused by the main fence corner is significantly reduced, but that other vortices are being generated at the corners of the smaller fences, thus pushing the location of the high pressure loading points inwards from the array side edge.

Configuration (4), endplating of the arrays, produced the smallest edge pressure coefficients of the configurations tested. The edge pressure coefficient distributions for the endplating effect is shown in Figures 4-11e and f. Unfortunately, this method of reducing the loads may be impractical for several reasons: (1) the endplating would cause varying amounts of shadowing on the arrays depending upon the time of day, (2) if mechanized equipment is required to be moved down each row of the arrays, a gate would be required at the end of each row.

The addition of a 50% porosity extension to the fence corner is shown with the results in Figures 4-11g and h. This extension does significantly reduce the edge pressure coefficient distributions from those of just a regular protective fence. It appears that the increased porosity and height at the corner reduces the tightness and strength of the corner vortex. Additional benefits may be realized by increased porosity and/or height of this corner addition. However, these parameters were not varied to optimize the reduction in the array edge pressure loadings.

In summary, the array and fence corners produce vortices whose strength is increased from a straight on wind to an oblique wind. The wind loads on the areas affected by the corner vortices are considerably larger than the loads at the non-affected areas. In order to reduce the corner vortex induced loads, it is necessary to reduce the strength of the corner vortex. This is best accomplished by lowering the wind velocity prior to reaching the arrays by utilizing a fence and by modifying the fence corner to reduce the vortex generated by it. From the modifications investigated in the test, the most practical modification is that of increasing the height of the fence at the corner and by varying the local fence porosity in this area as shown by the figure insert in Figure 4-11g.

4.3 Comparison of Wind Tunnel Test Results for Uniform Wind Profile and 1/7 Power Law Wind Profile

In order to compare the test results between the uniform wind profile and the 1/7 power law wind profile, it is necessary to select a reference height above the ground for defining the reference velocity in the 1/7 power law wind profile. In Phase II, reference 5, the velocity at the highest edge of the array was recommended as the reference velocity when using data obtained by a uniform velocity profile because the base pressure (the major contribution to total pressure in most cases) is affected predominately by the velocity at the array edge. The mean ΔC_p was calculated with this reference velocity for the 1/7 power law wind profile results and compared in Figure 4-14 to the ΔC_p obtained by the uniform wind profile test. The comparison of the shape of the ΔC_p distribution from the two wind profile tests is very close, the magnitude is also close except for a few configurations, such as the windward array with the wind from the rear for the 20° tilt angle configuration and the wind from the front for the 60° tilt angle configuration, where the magnitudes differ by as much as .25. The second array with a tilt angle of 35° and the wind from the rear also compares poorly; the loads from the 1/7 power law wind profile are approximately half the loads from the uniform wind profile.

Integration of the ΔC_p values over the chord to obtain normal force coefficients produced the results presented in Figure 4-15. The comparison of the normal force coefficients between the uniform wind profile and the 1/7 power law wind profile is much closer than the pressure distribution, primarily because the integration of large pressure differences over a small fraction of the total area does not have a pronounced effect on the total normal force coefficient.

From the results shown in Figure 4-14 and 4-15, the uniform velocity profile normal force coefficients results would be satisfactory for use in performing preliminary design studies and in most cases for use in the final design of array structural supports. The pressure coefficient distribution results are not as definitive; the uniform velocity profile results would be satisfactory for use in preliminary design studies but are probably not accurate enough for final design of the photovoltaic panels. However, from the results, it is certainly apparent that a uniform velocity wind tunnel can be used to evaluate parameter studies for photovoltaic arrays such as load alleviation devices.

Since environmental wind tunnels (required to model the boundary layer wind) are few in number, and sometimes difficult to obtain time in their use, the close comparison in the results between the two wind profiles is important in allowing more flexibility in the testing of array models and configuration changes.

4.4 Test Results Summary

The use of a fence to protect the arrays from the wind significantly reduces the mid-span loads on the first windward array compared to the loads on an unprotected first array. The arrays located downwind from the first array are protected by the upwind arrays and the mid-span loads are approximately the same as the first array when protected by a fence. Localized array edge loads, caused by corner vortices, are considerably larger than the array mid-span loads. These edge loads can be reduced by using a fence to protect the arrays and by appropriate modifications to the fence corners shown previously in this section. To optimize the fence corner modifications or other modifications to the arrays for minimum wind loads would require an extensive test program. Since the large wind loads are a localized effect caused by the corner vortices, the arrays could be designed for higher strength in the edge areas to withstand the high vortex induced loads.

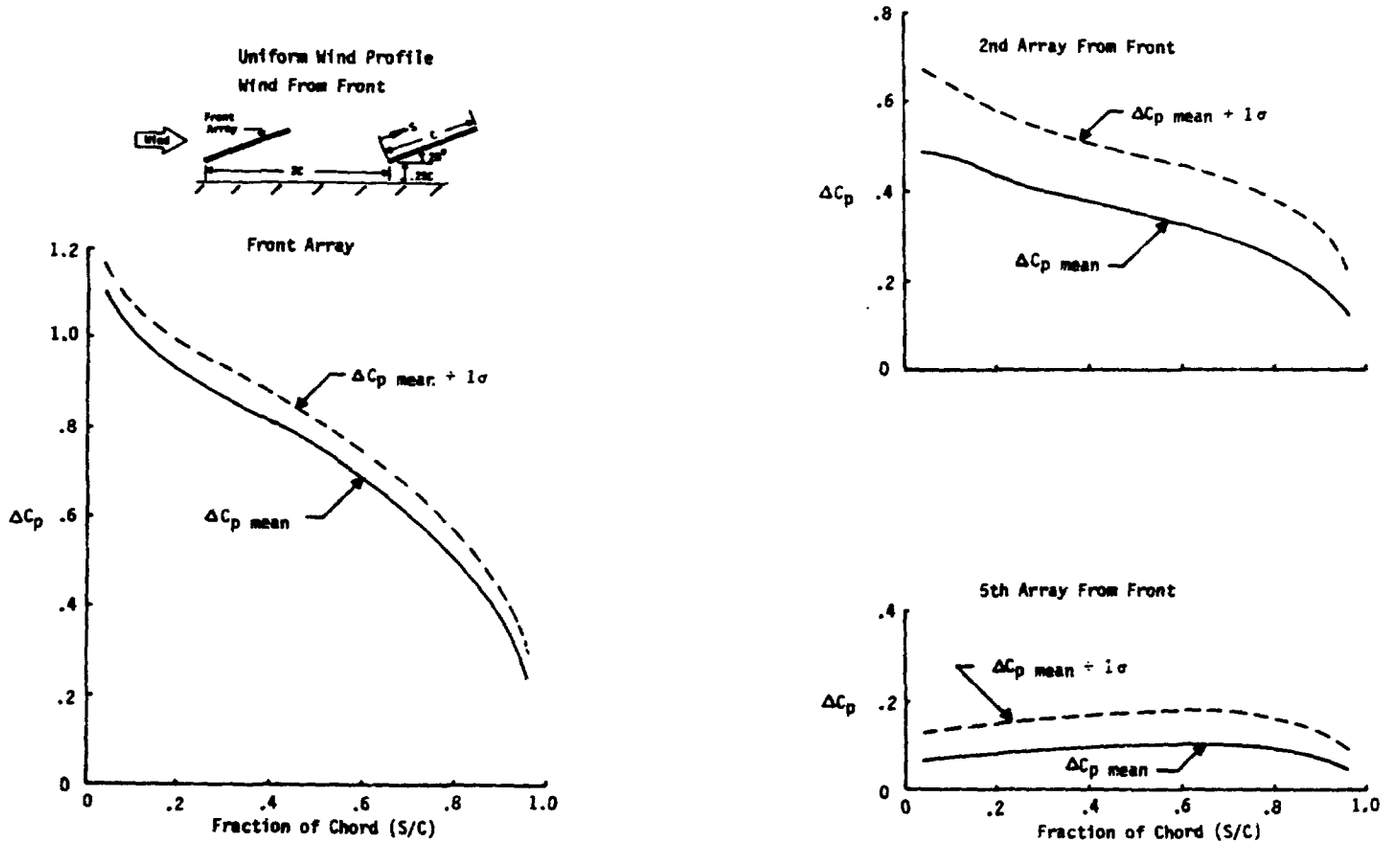


Figure 4-1a. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 20°, Wind from Front).

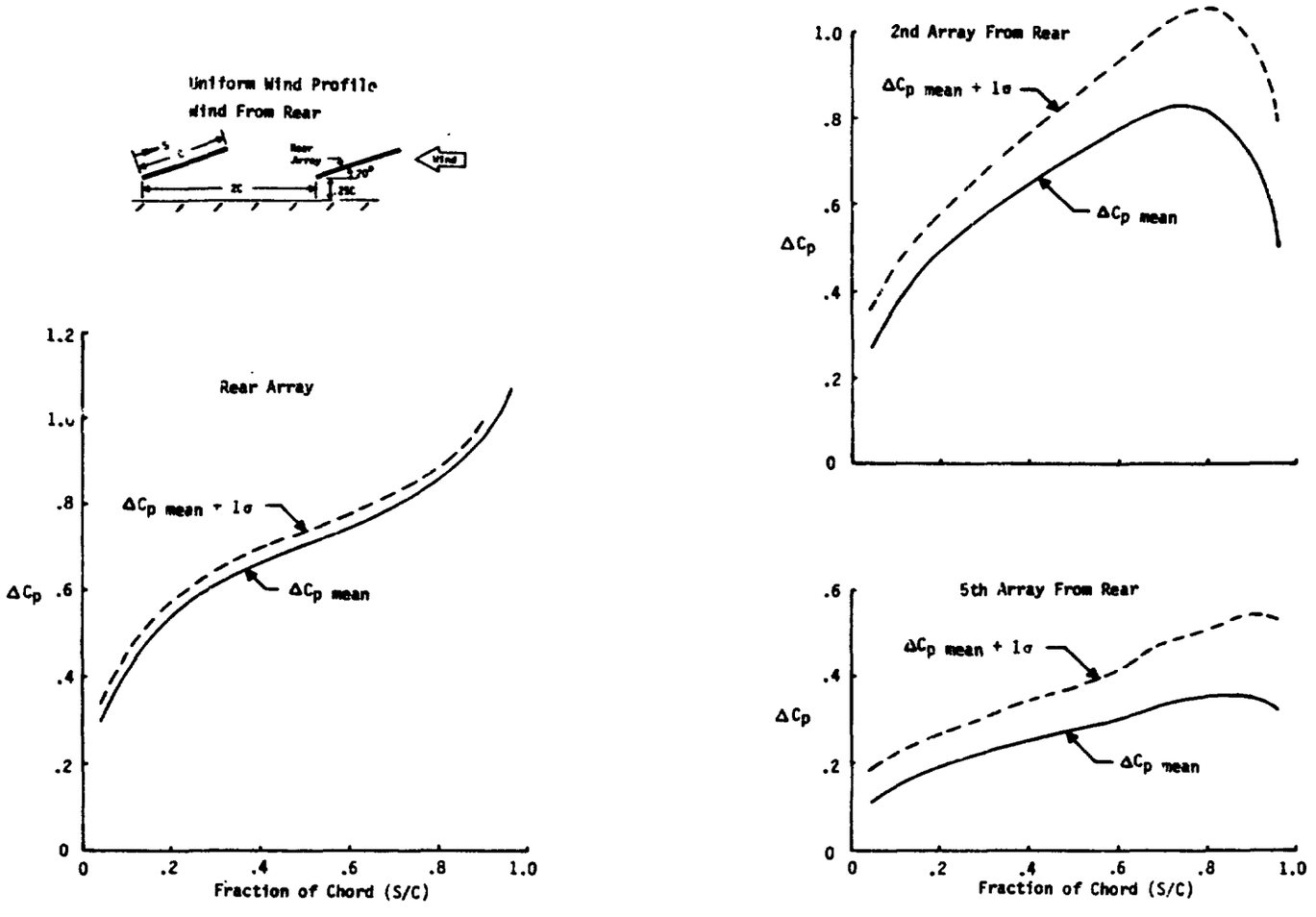


Figure 4-1b. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 20°, Wind from Rear)

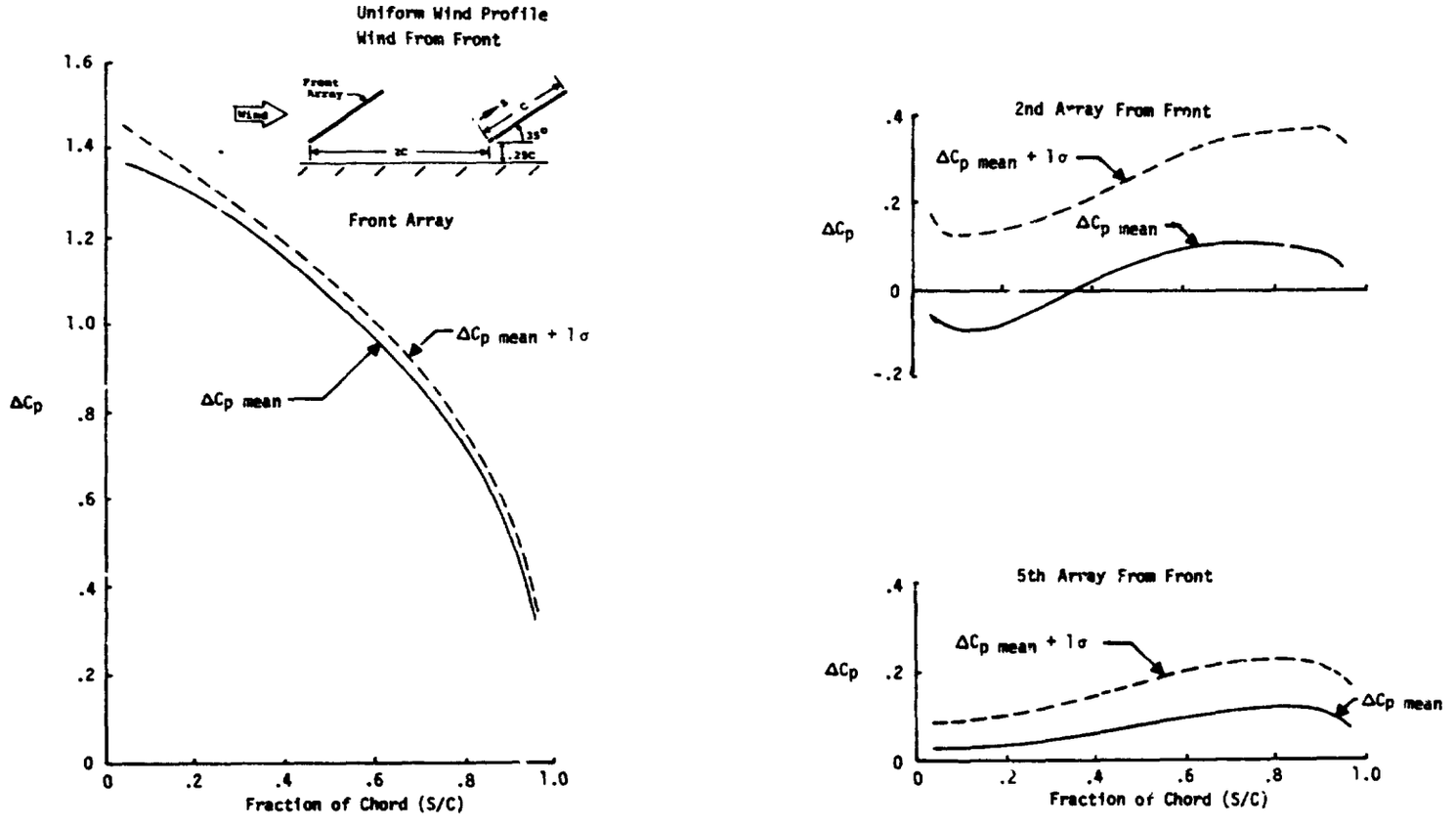


Figure 4-1c. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 35°, Wind from Front)

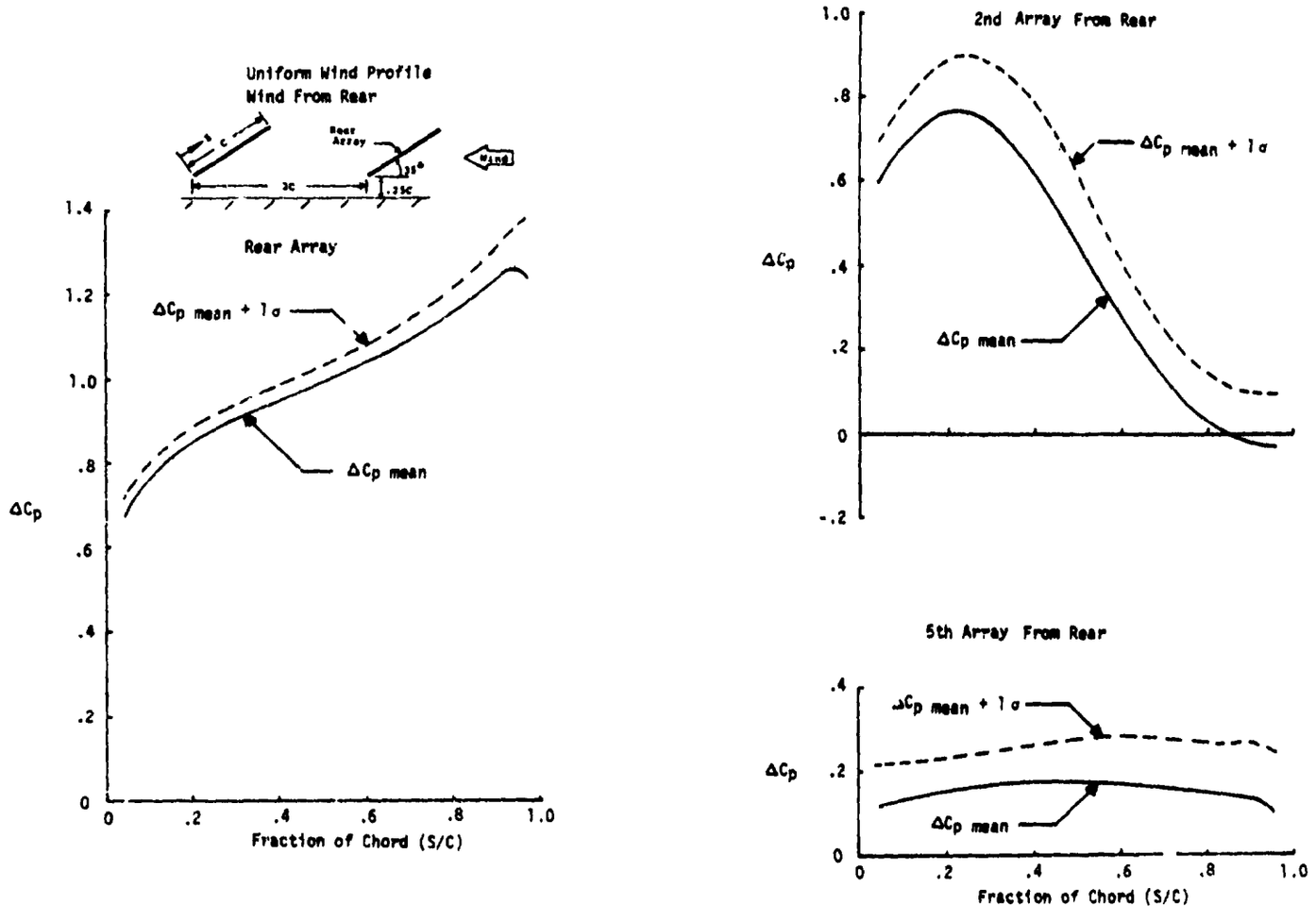


Figure 4-1d. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 35°, Wind from Rear)

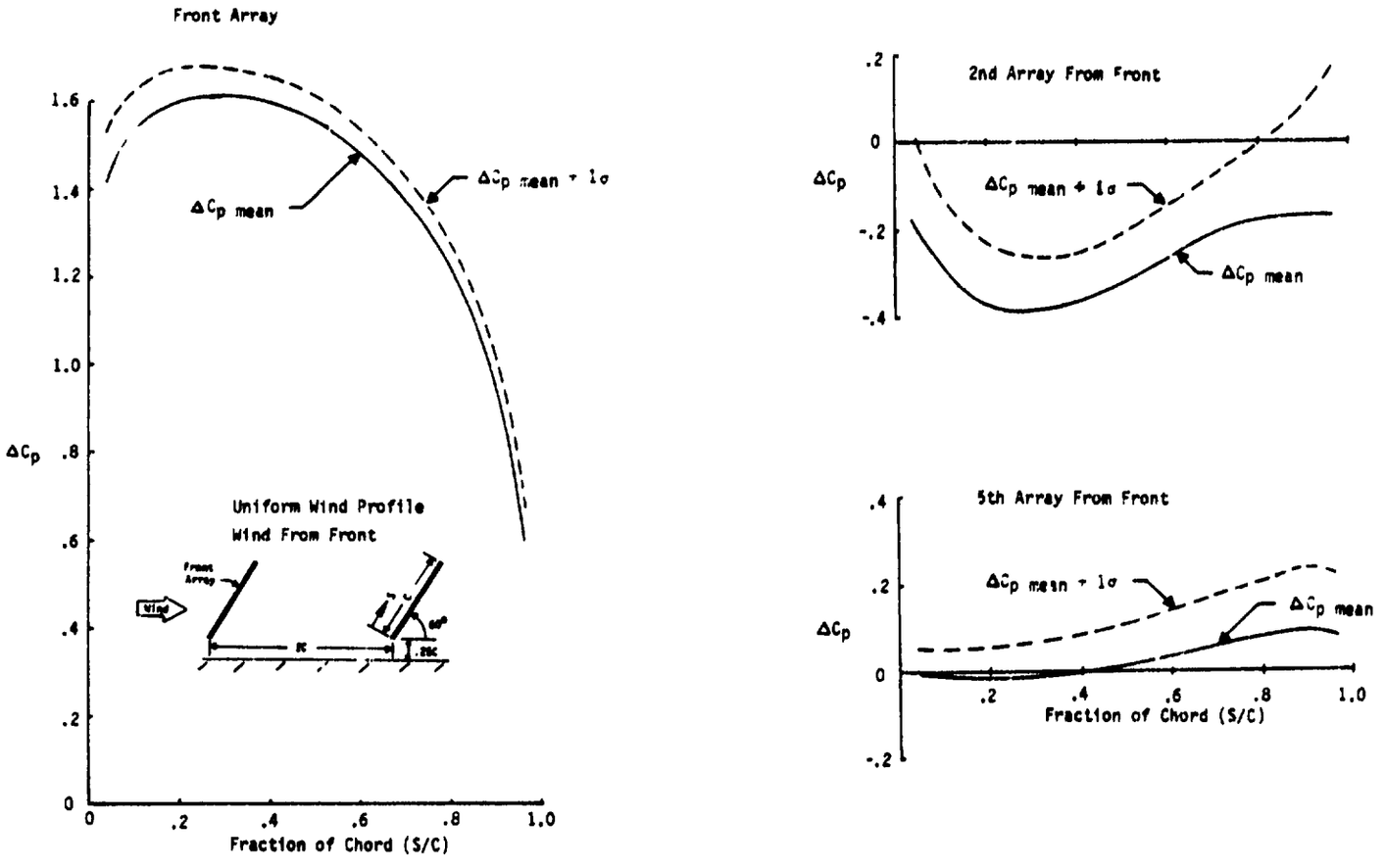


Figure 4-1e. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 60°, Wind from Front)

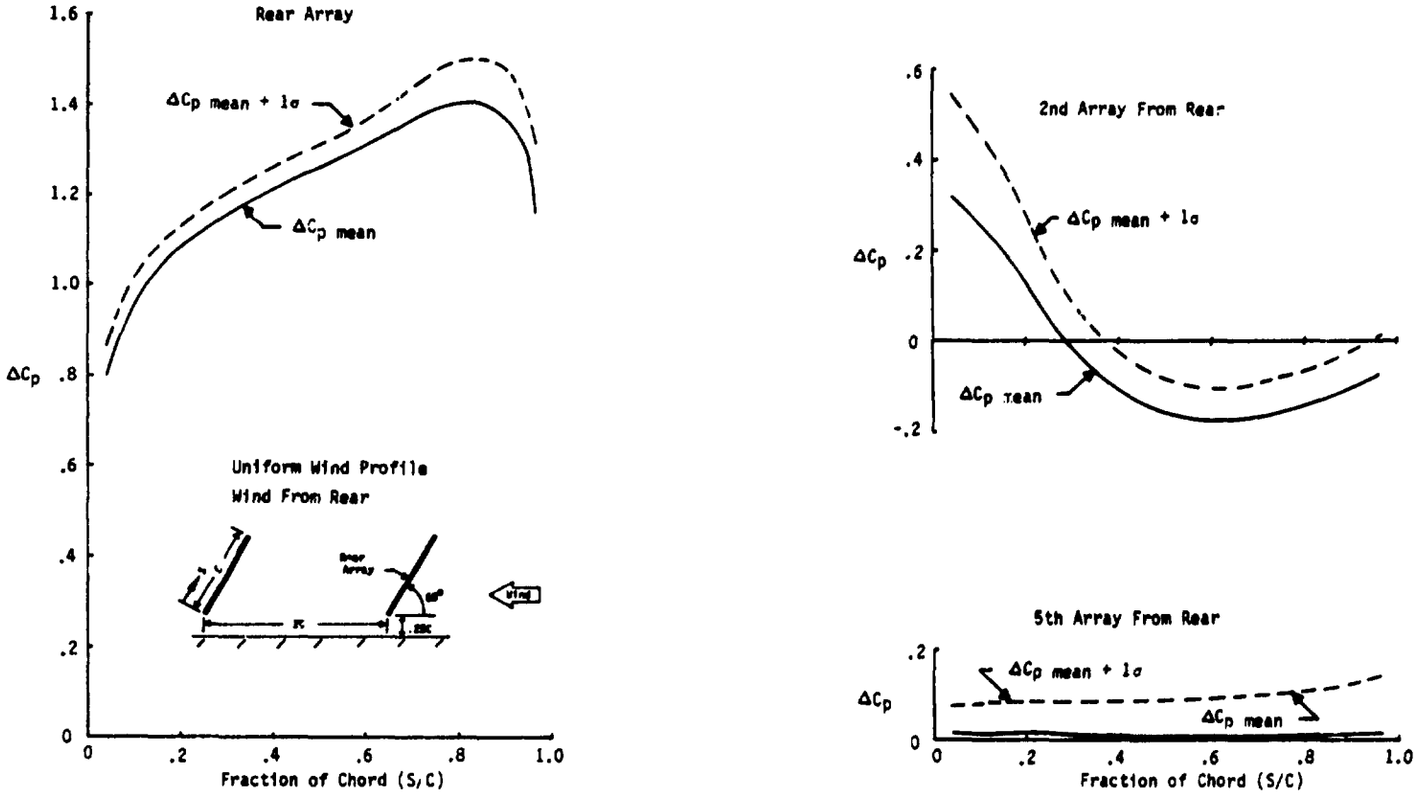


Figure 4-1f. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 60°, Wind from Rear)

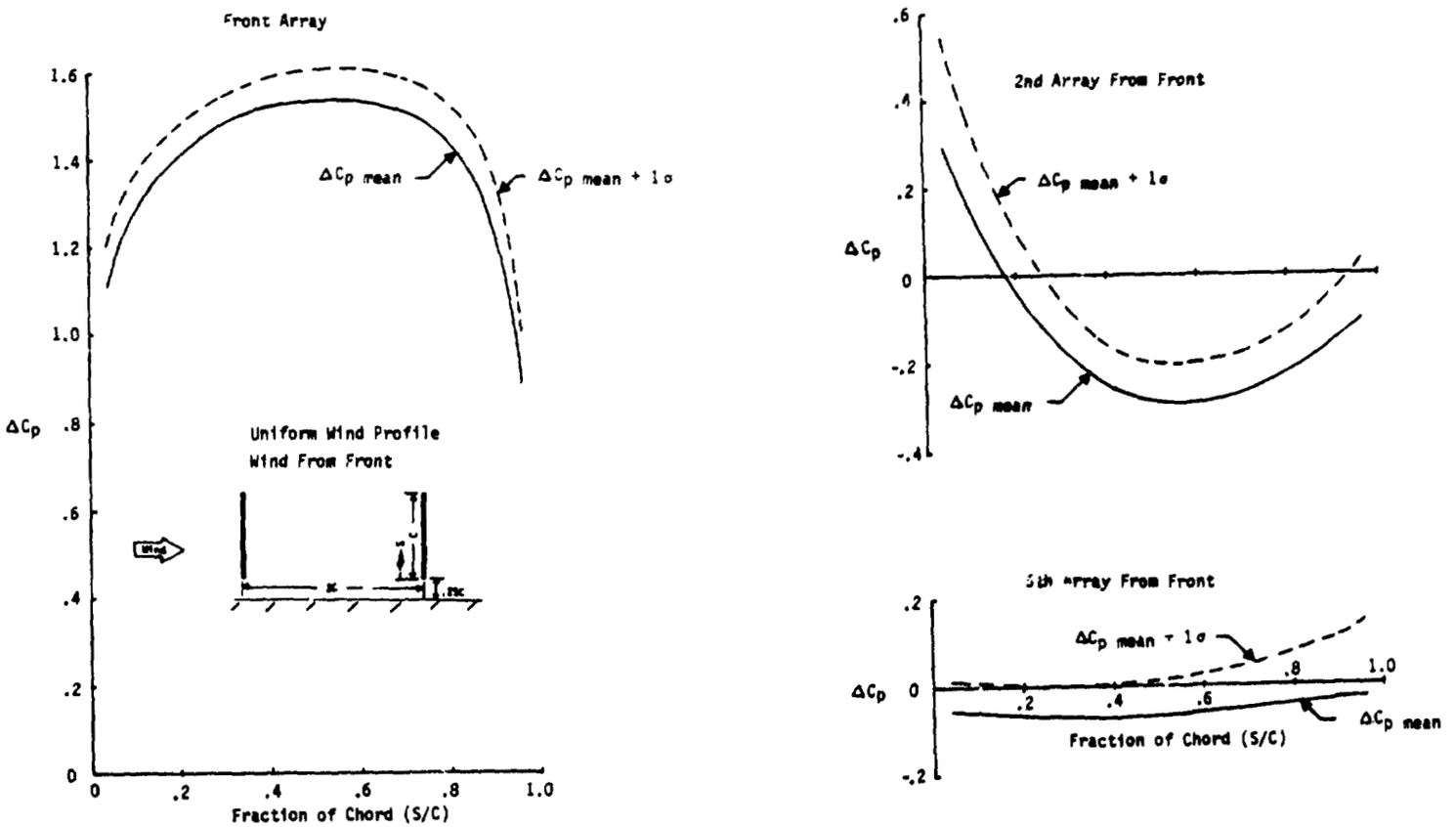


Figure 4-1g. Array Chordwise Pressure Coefficient Distribution in Uniform Wind Velocity Profile (Tilt Angle = 90°)

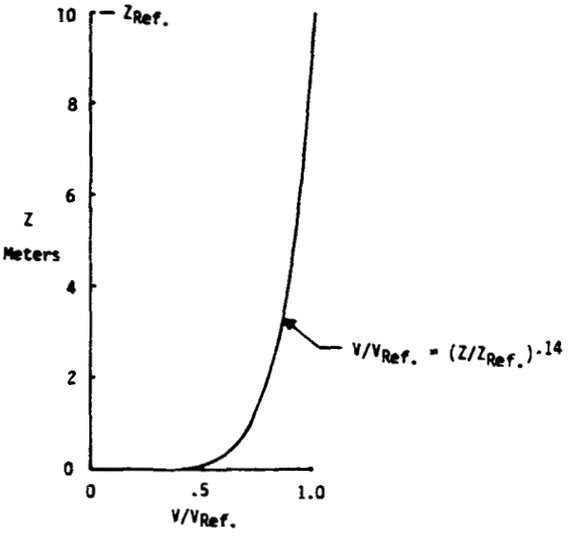


Figure 4-2. 1/7 Power Law Wind Velocity Profile

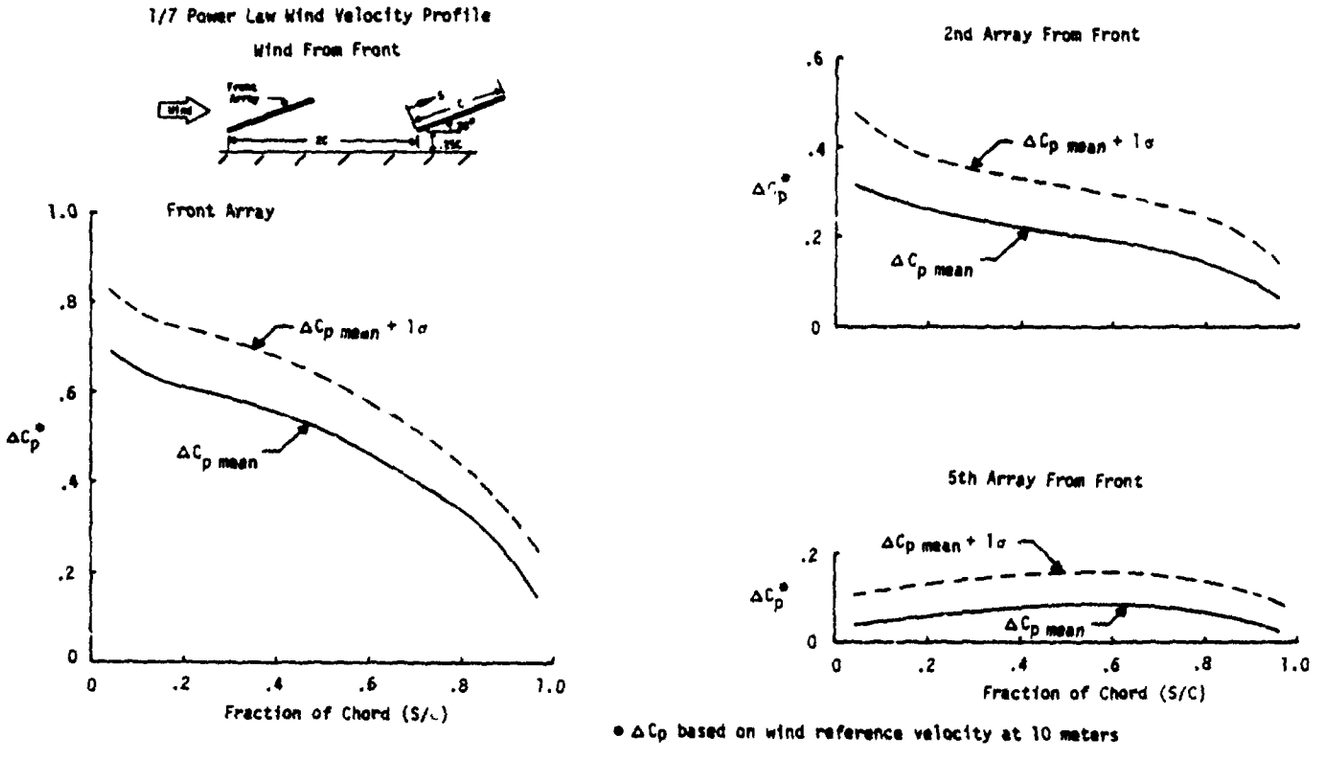
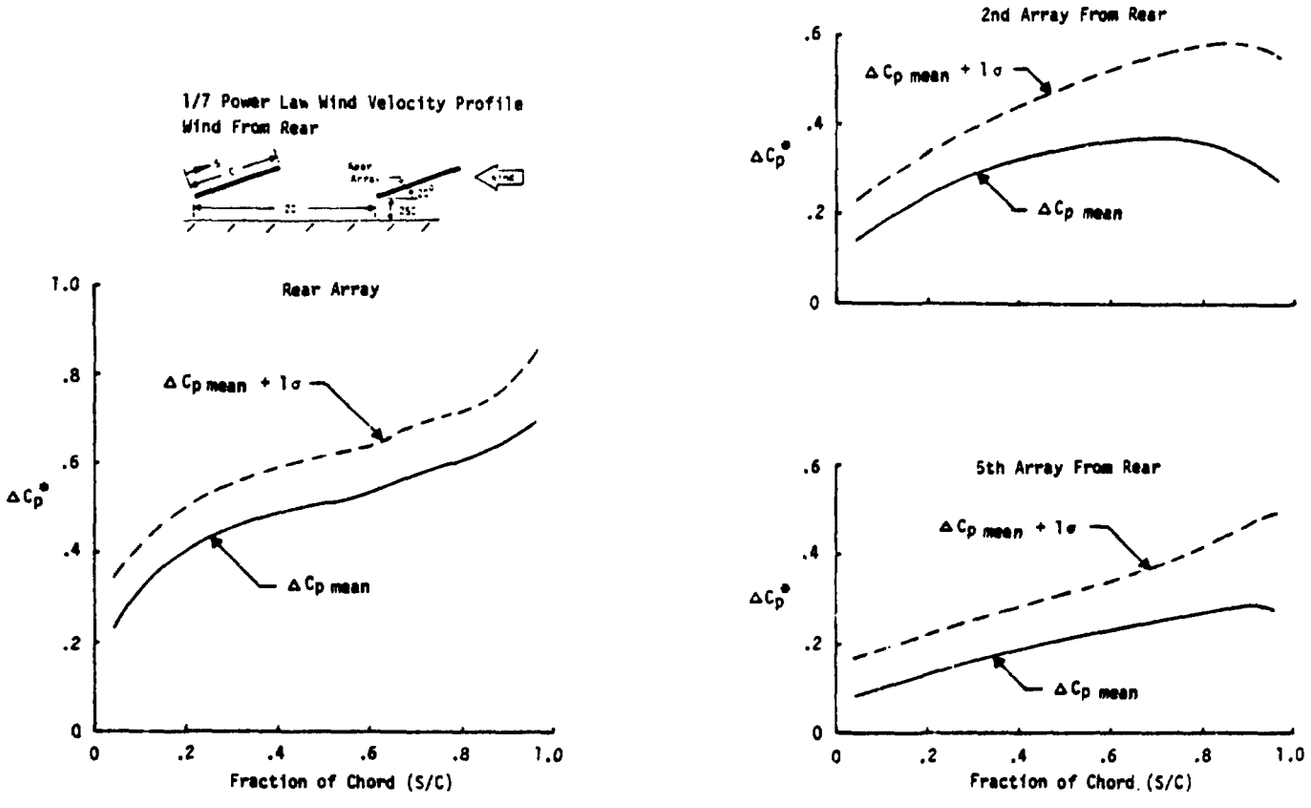
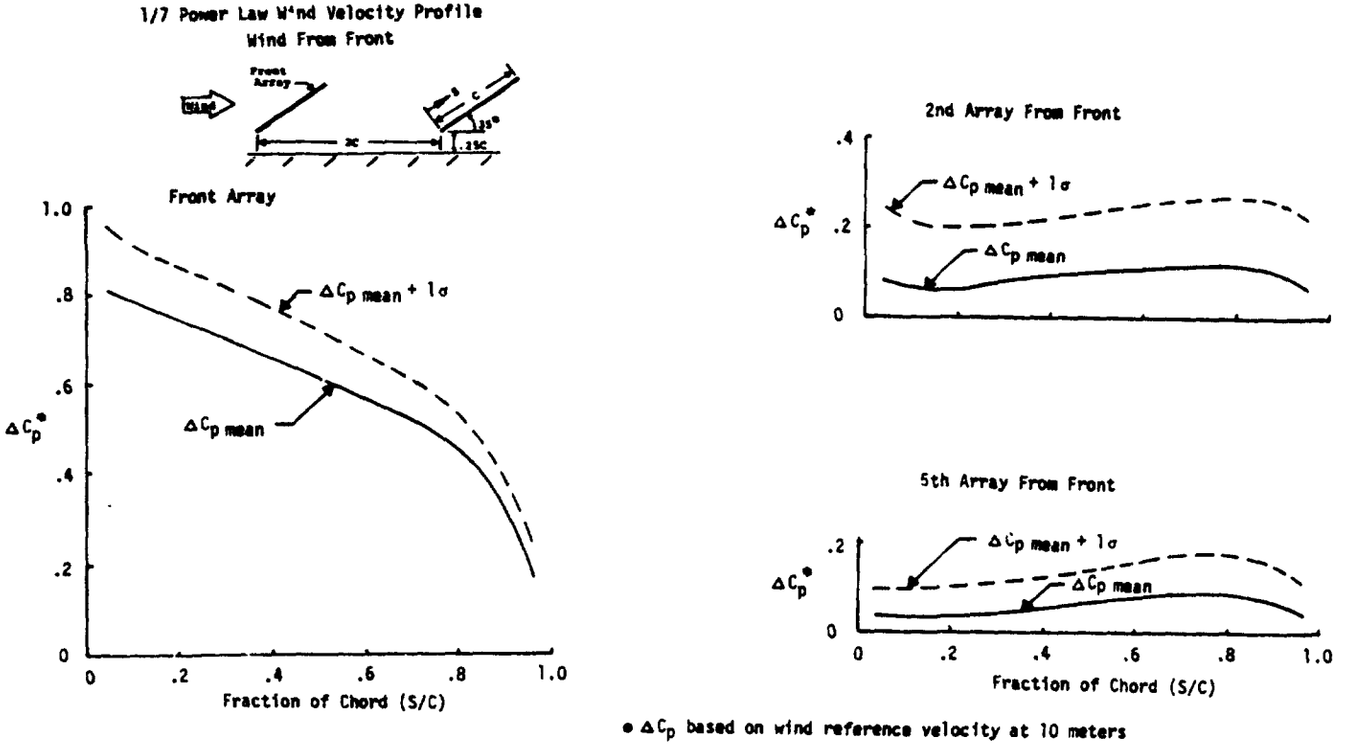


Figure 4-3a. Array Chordwise Pressure Coefficient Distribution in Boundary Layer Wind (Tilt Angle = 20°, Wind from Front)



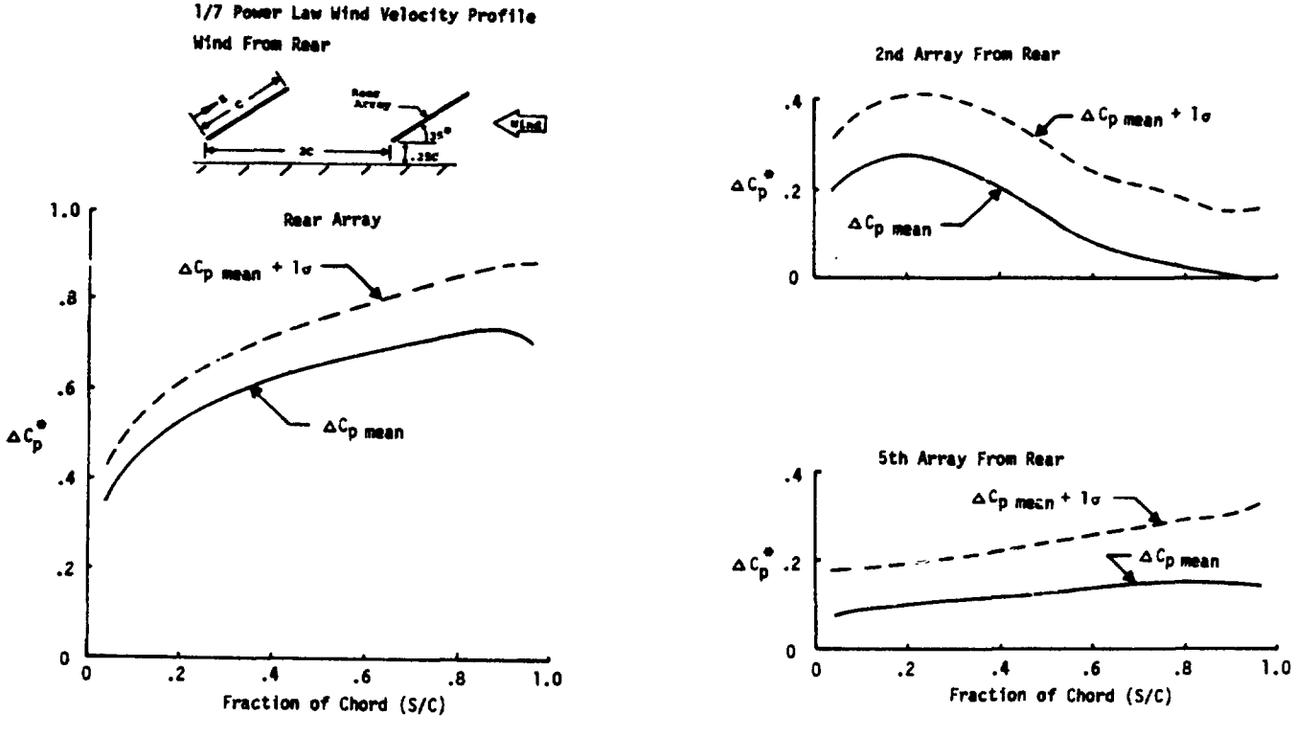
* ΔC_p based on wind reference velocity at 10 meters

Figure 4-3b. Array Chordwise Pressure Coefficient Distribution In Boundary Layer Wind (Tilt Angle = 20°, Wind from Rear)



• ΔC_p based on wind reference velocity at 10 meters

Figure 4-3c. Array Chordwise Pressure Coefficient Distribution in Boundary Layer Wind (Tilt Angle = 35°, Wind from Front)



* ΔC_p based on wind reference velocity at 10 meters

Figure 4-3d. Array Chordwise Pressure Coefficient Distribution in Boundary Layer Wind (Tilt Angle = 35°, Wind from Rear)

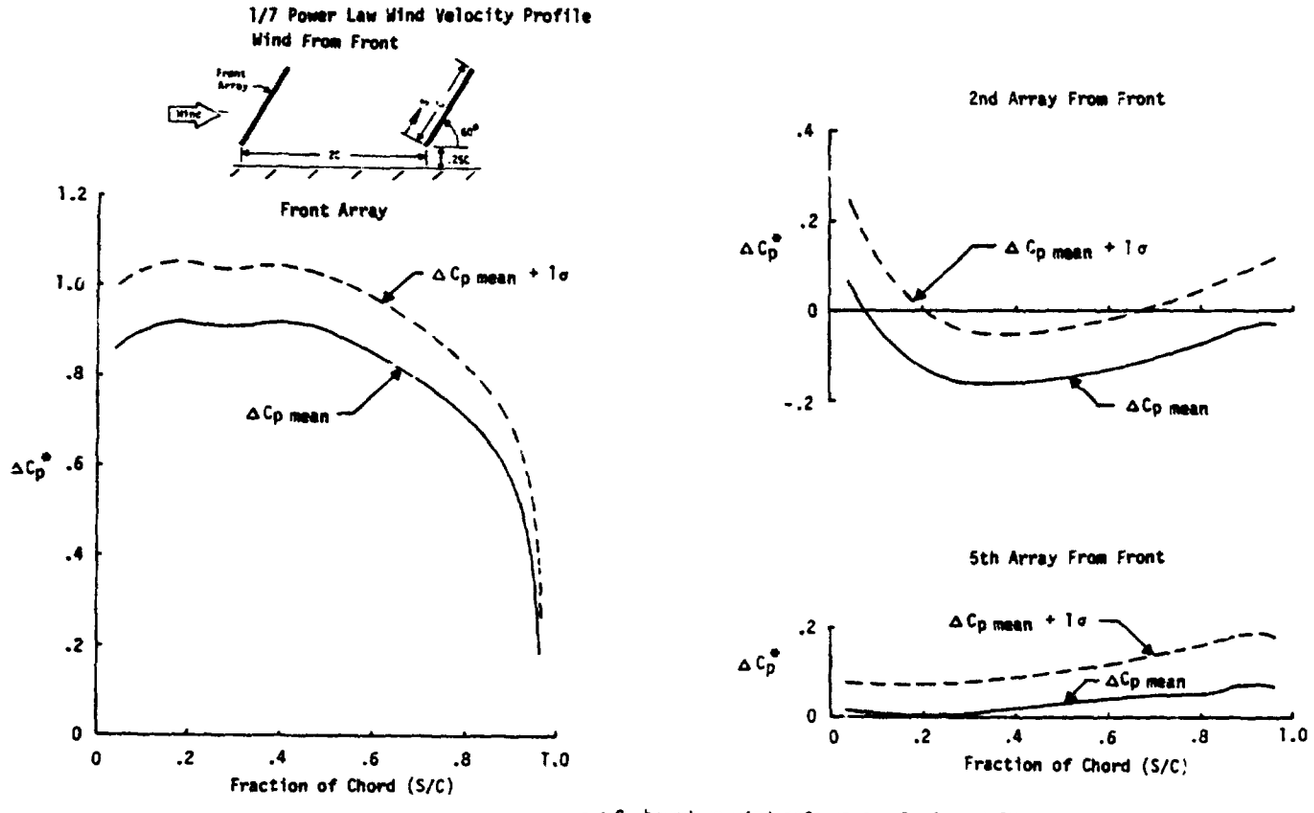
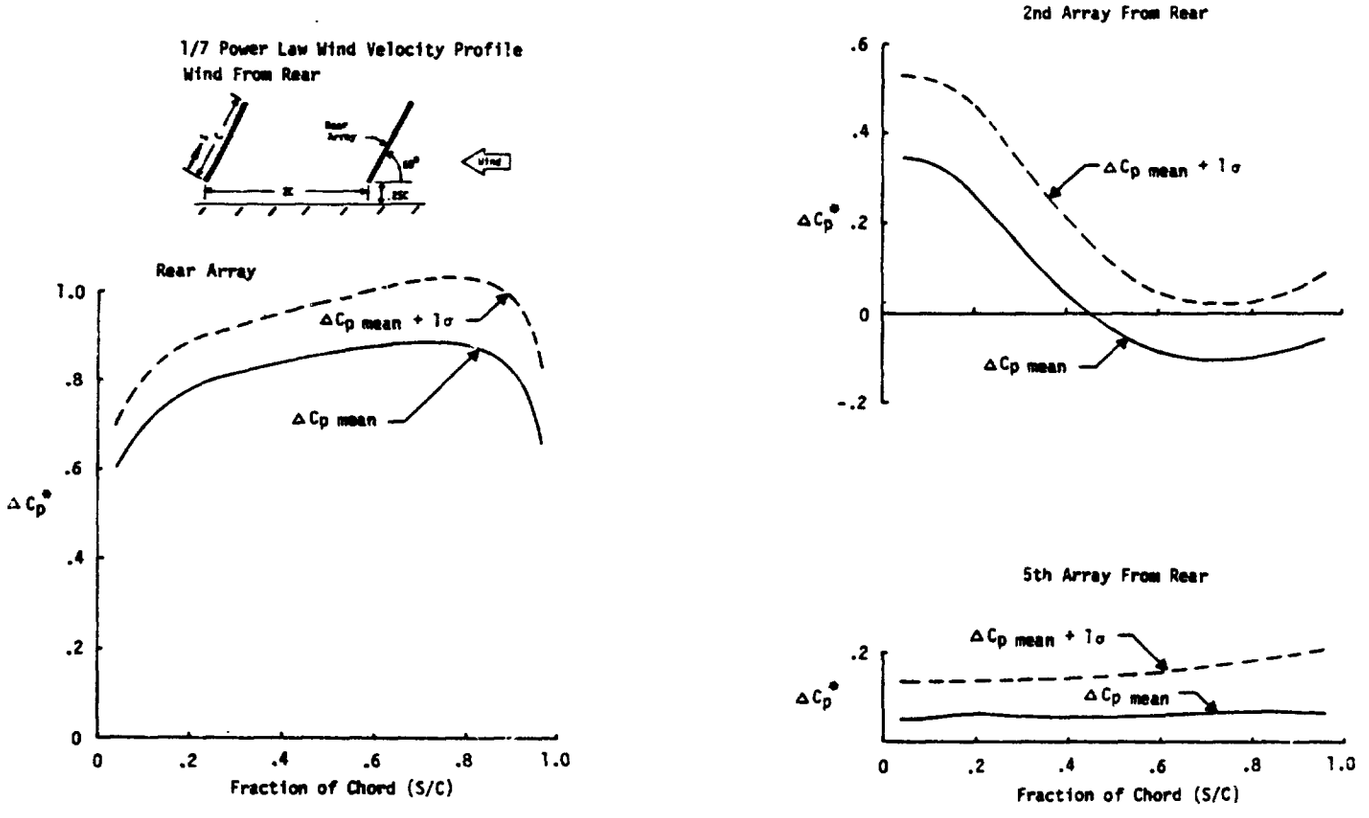


Figure 4-3e. Array Chordwise Pressure Coefficient Distribution in Boundary Layer Wind (Tilt Angle = 60°, Wind from Front)



* ΔC_p based on wind reference velocity at 10 meters

Figure 4-3f. Array Chordwise Pressure Coefficient Distribution in Boundary Layer Wind (Tilt Angle = 60°, Wind from Rear)

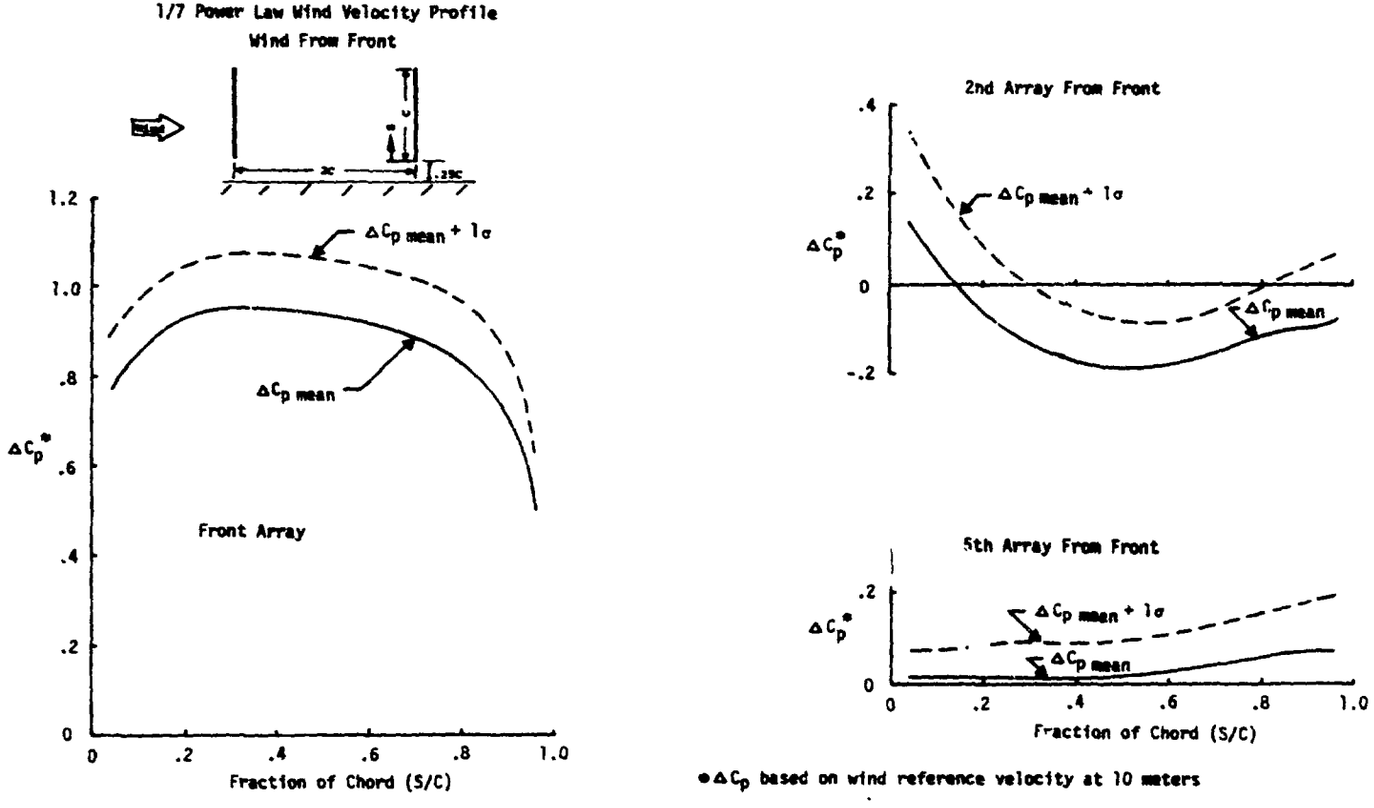


Figure 4-3g. Array Chordwise Pressure Coefficient Distribution in Boundary Layer Wind (Tilt Angle = 90°)

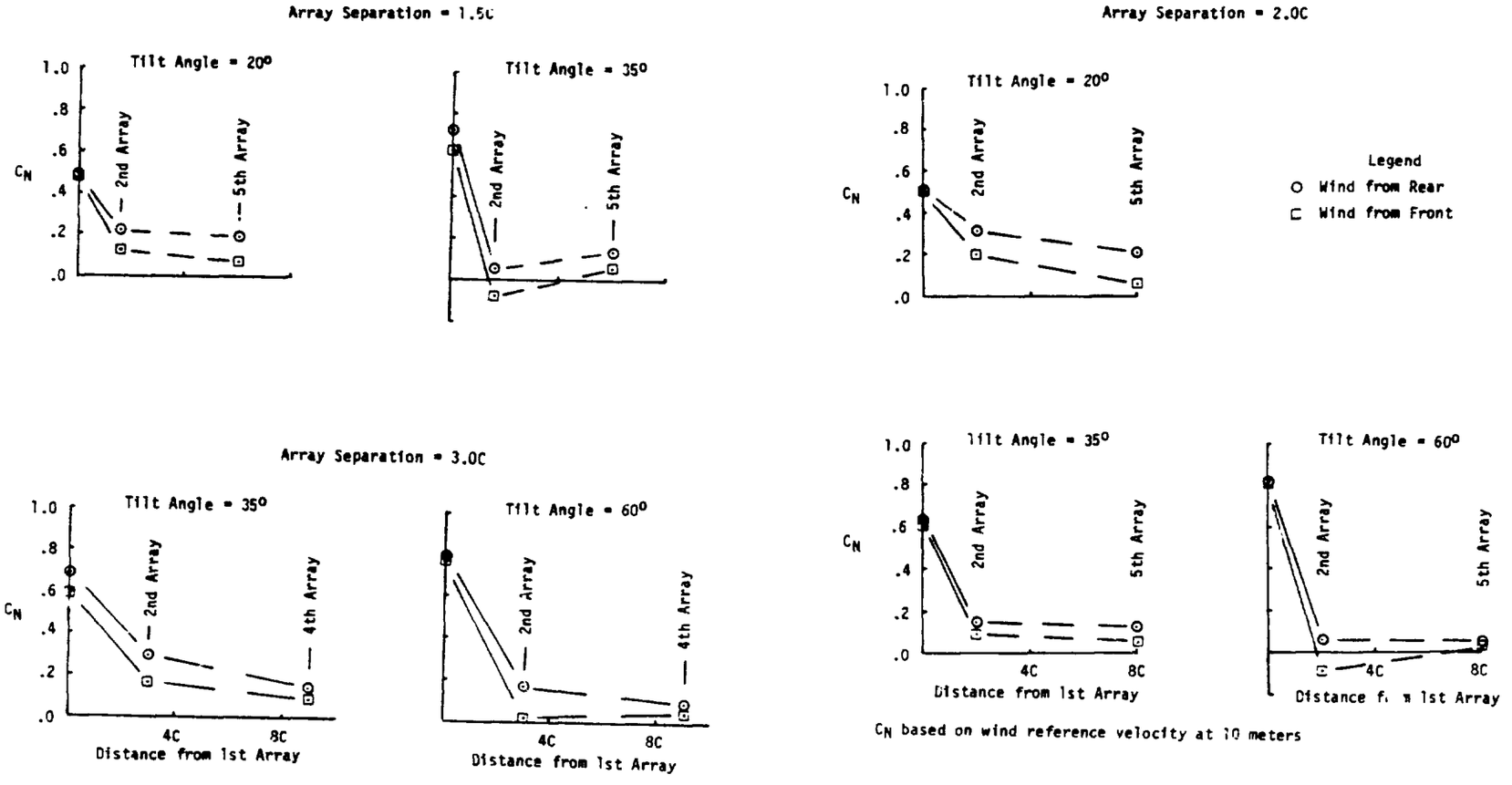


Figure 4-4. Effect of Head-On and Rearward Winds on Array Normal Force Coefficients (No Fence)

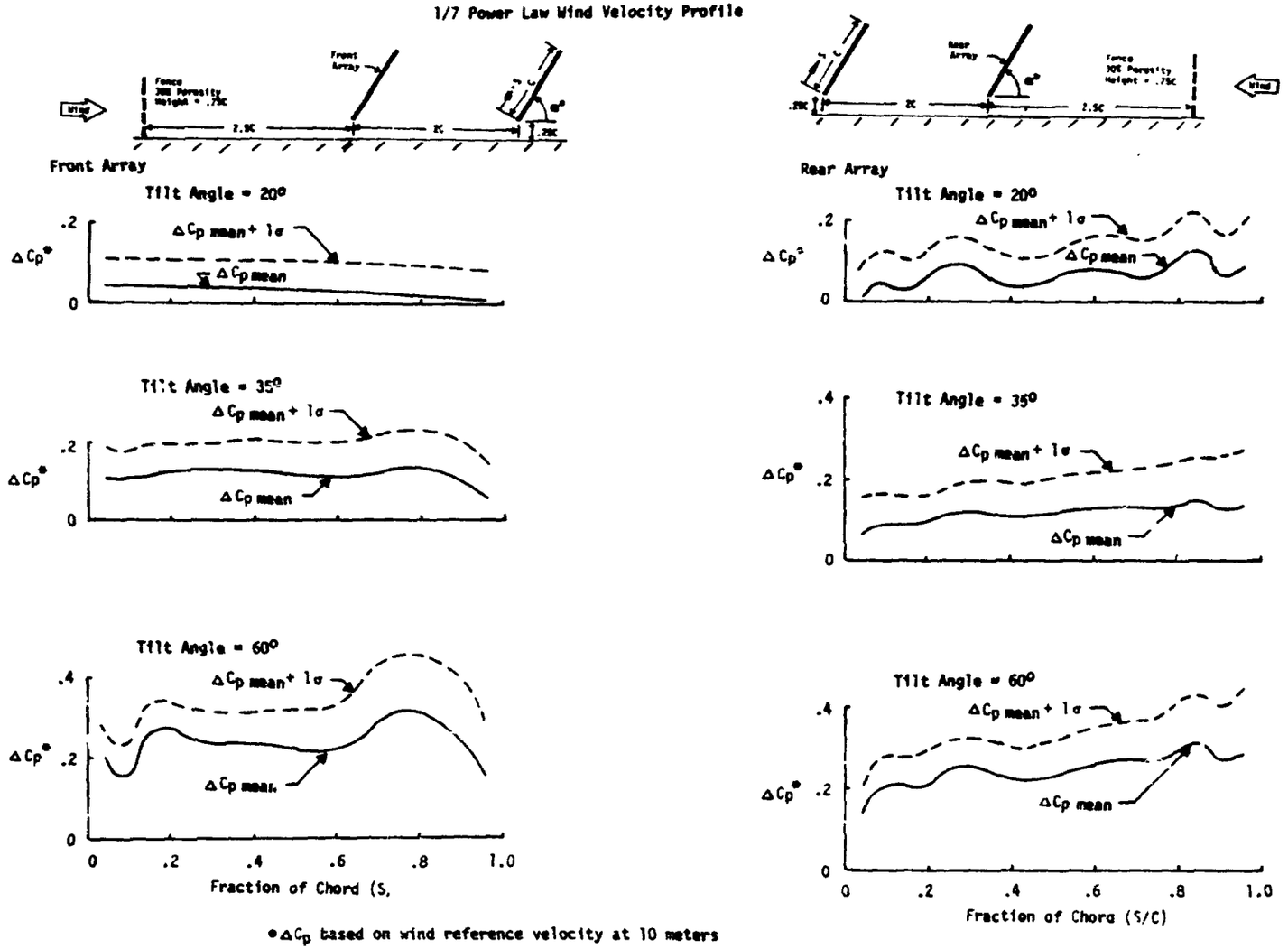


Figure 4-5. Effect of a Fence on Array Chordwise Pressure Coefficient Distribution for Head-On and Rearward Winds.

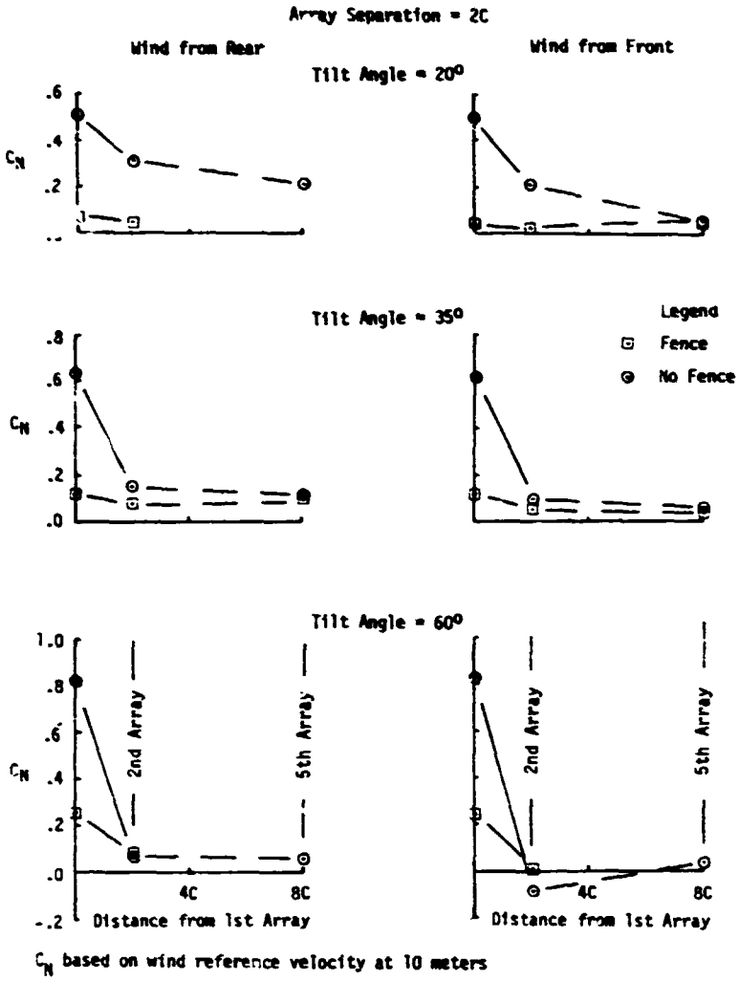


Figure 4-6. Effect of a Fence on Array Normal Force Coefficients for Head-On and Rearward Winds.

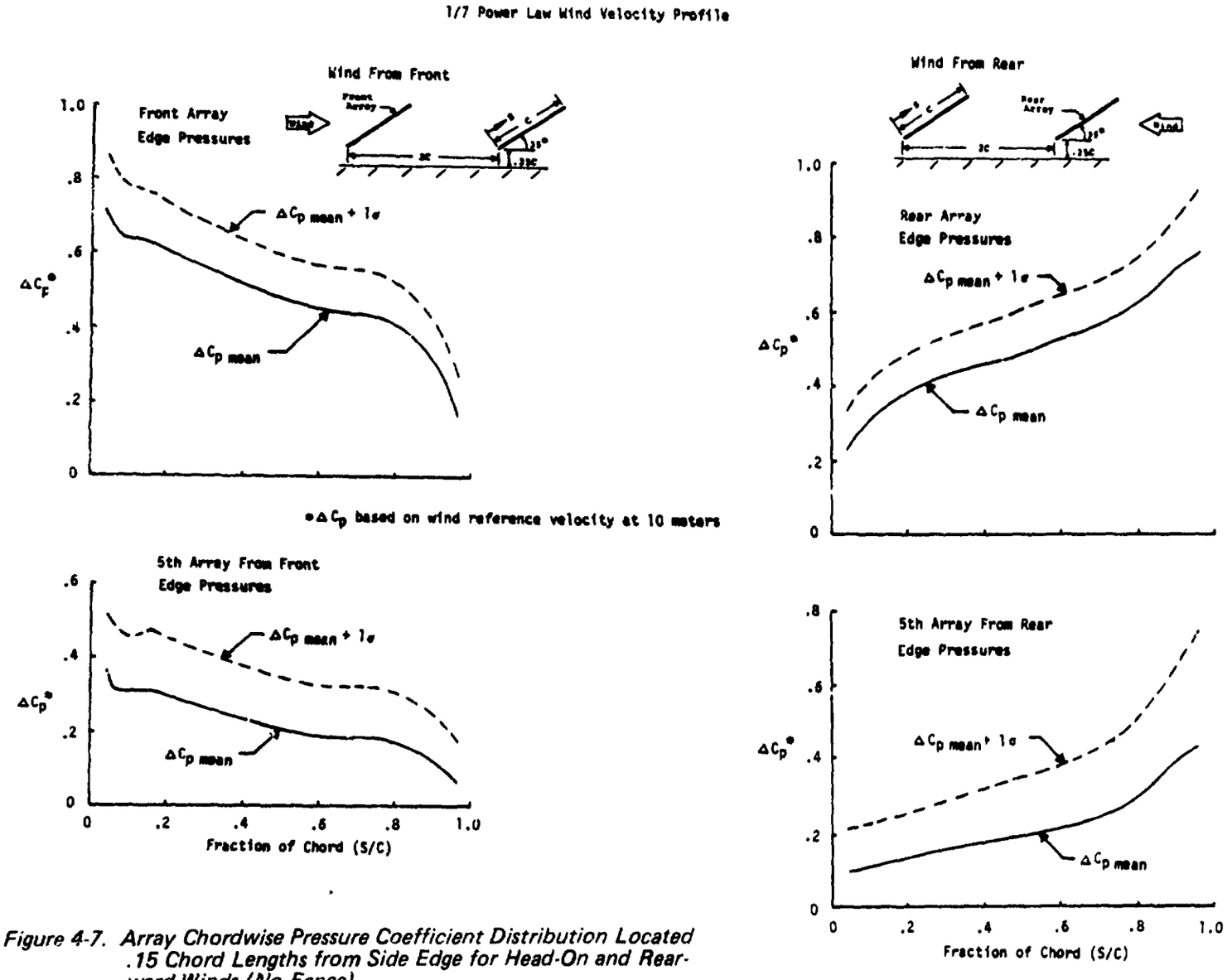


Figure 4-7. Array Chordwise Pressure Coefficient Distribution Located .15 Chord Lengths from Side Edge for Head-On and Rearward Winds (No Fence)

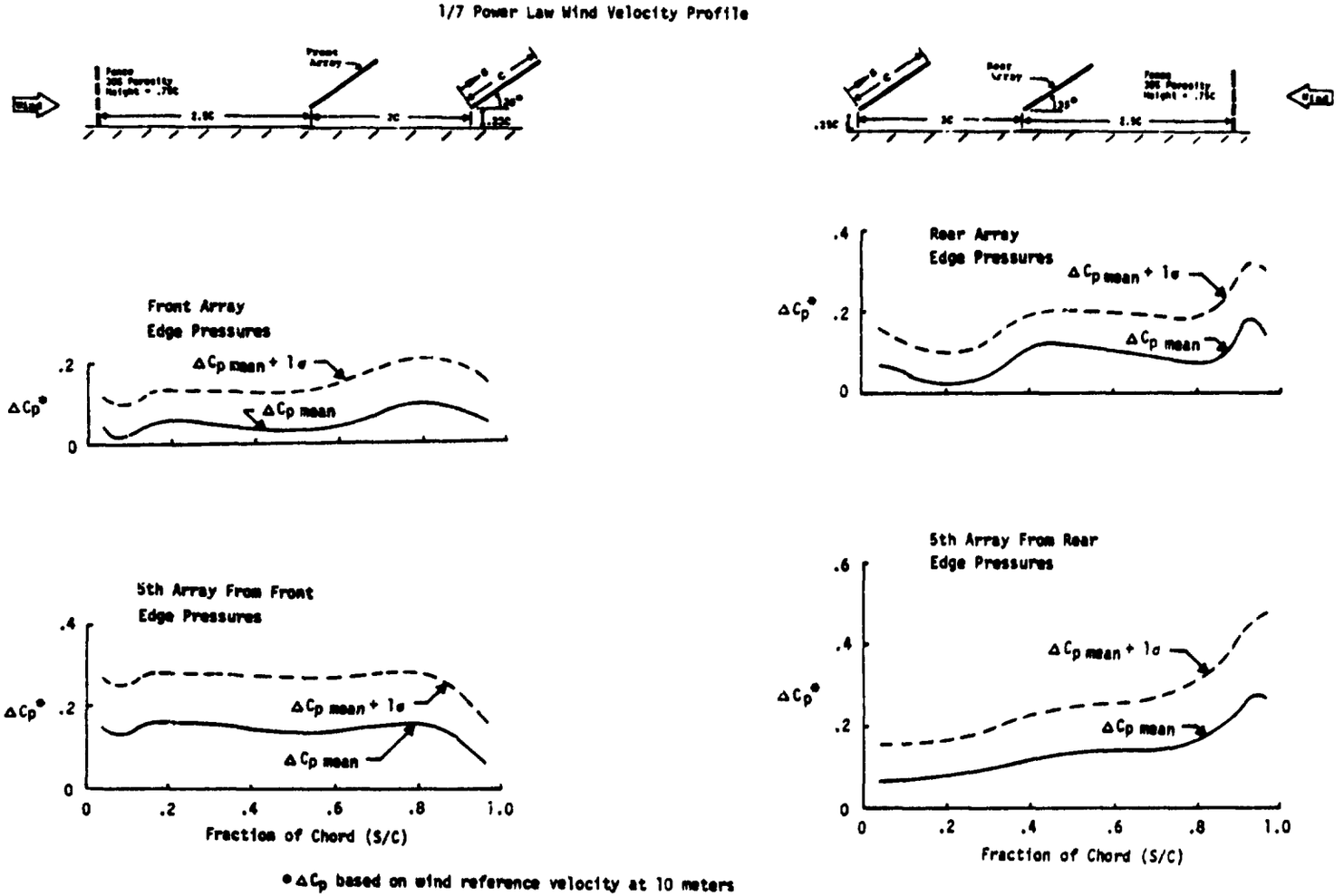


Figure 4-8. Effect of Fence on Array Chordwise Pressure Coefficient Distribution Located .15 Chord Lengths from Side Edge for Head-On and Rearward Winds

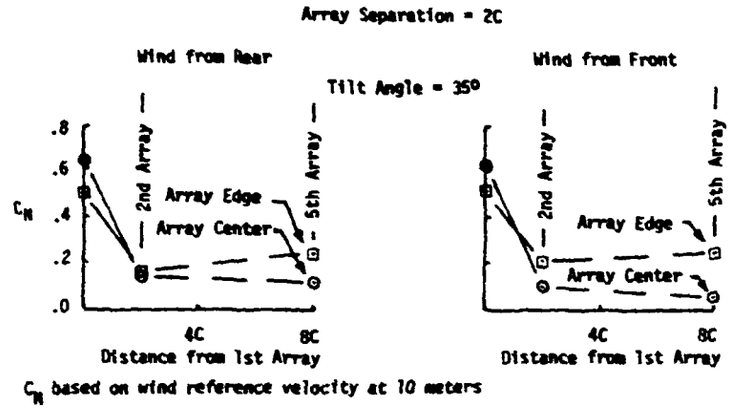


Figure 4-9. Comparison Between Array Edge and Center of Span Normal Force Coefficients for Head-On and Rearward Winds (No Fence)

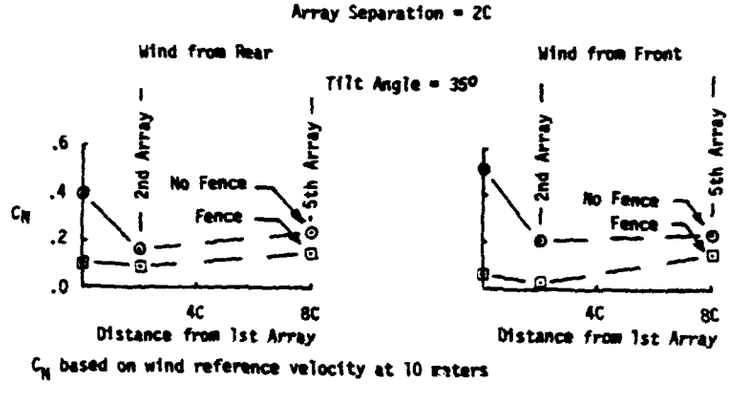


Figure 4-10. Effect of Fence on Array Edge Normal Force Coefficients for Head-On and Rearward Winds

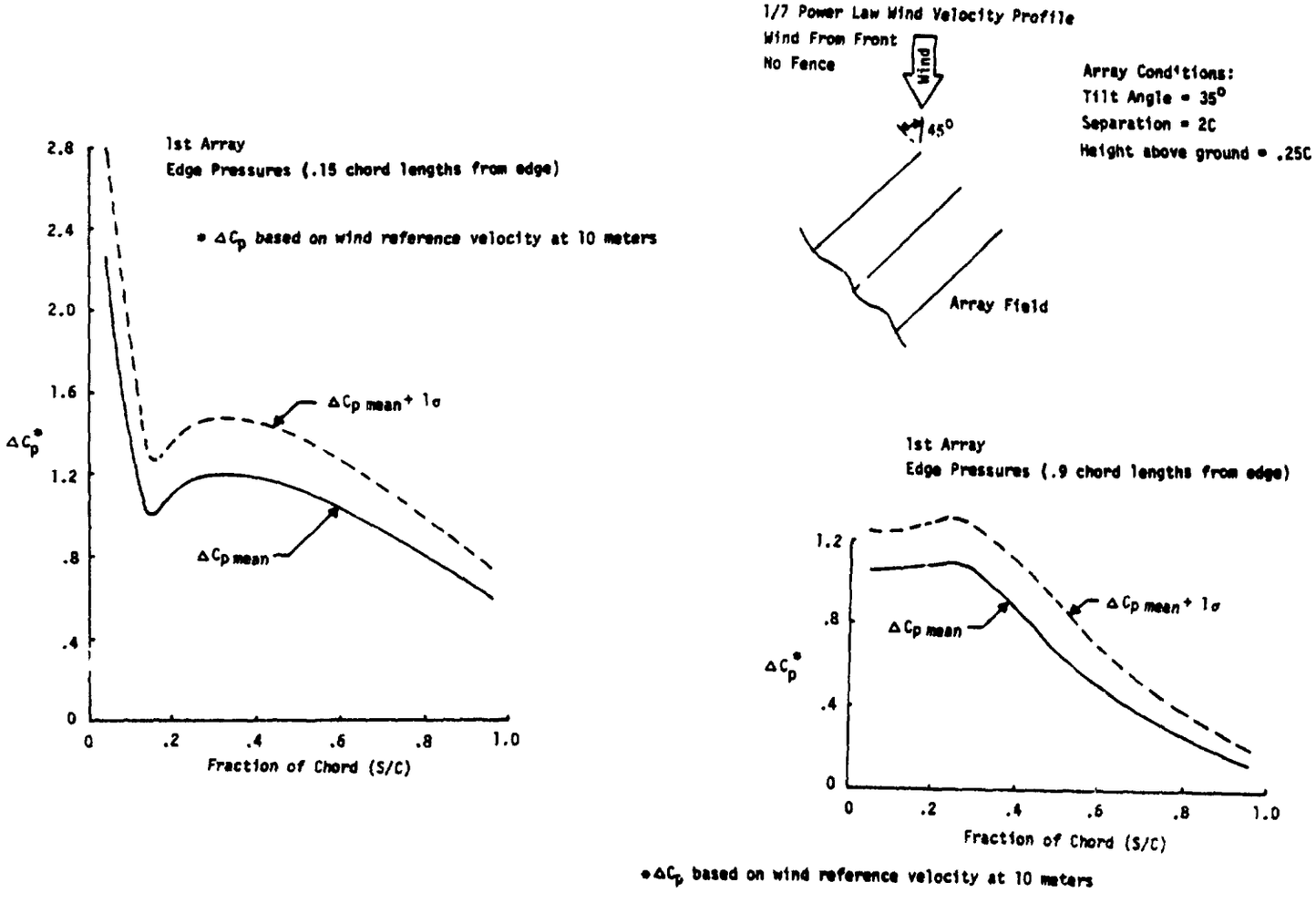


Figure 4-11a Effect of Oblique Winds on Array Edge Pressure Distribution (No Fence, Wind from Front)

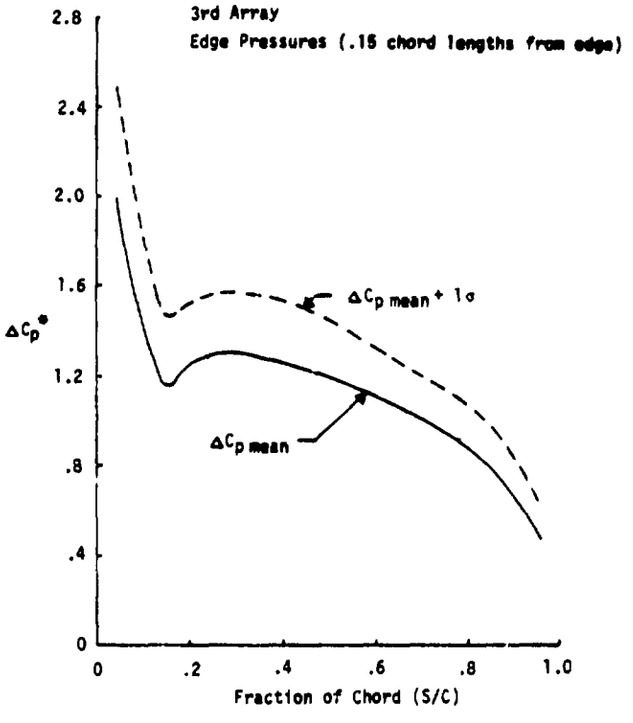
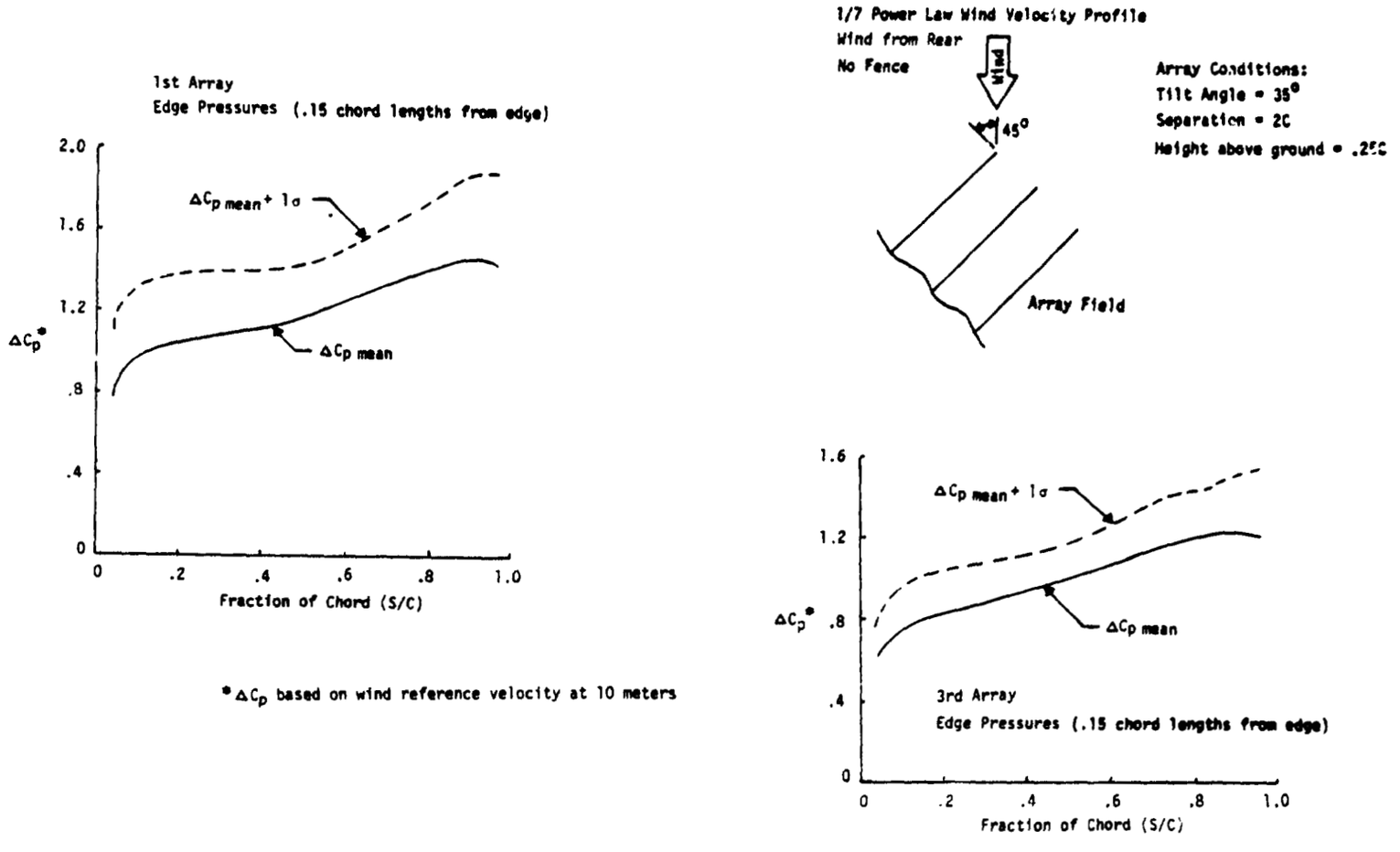


Figure 4-11a. Concluded



*ΔC_p based on wind reference velocity at 10 meters

Figure 4-11b. Effect of Oblique Winds on Array Edge Pressure Distribution (No Fence, Wind from Rear)

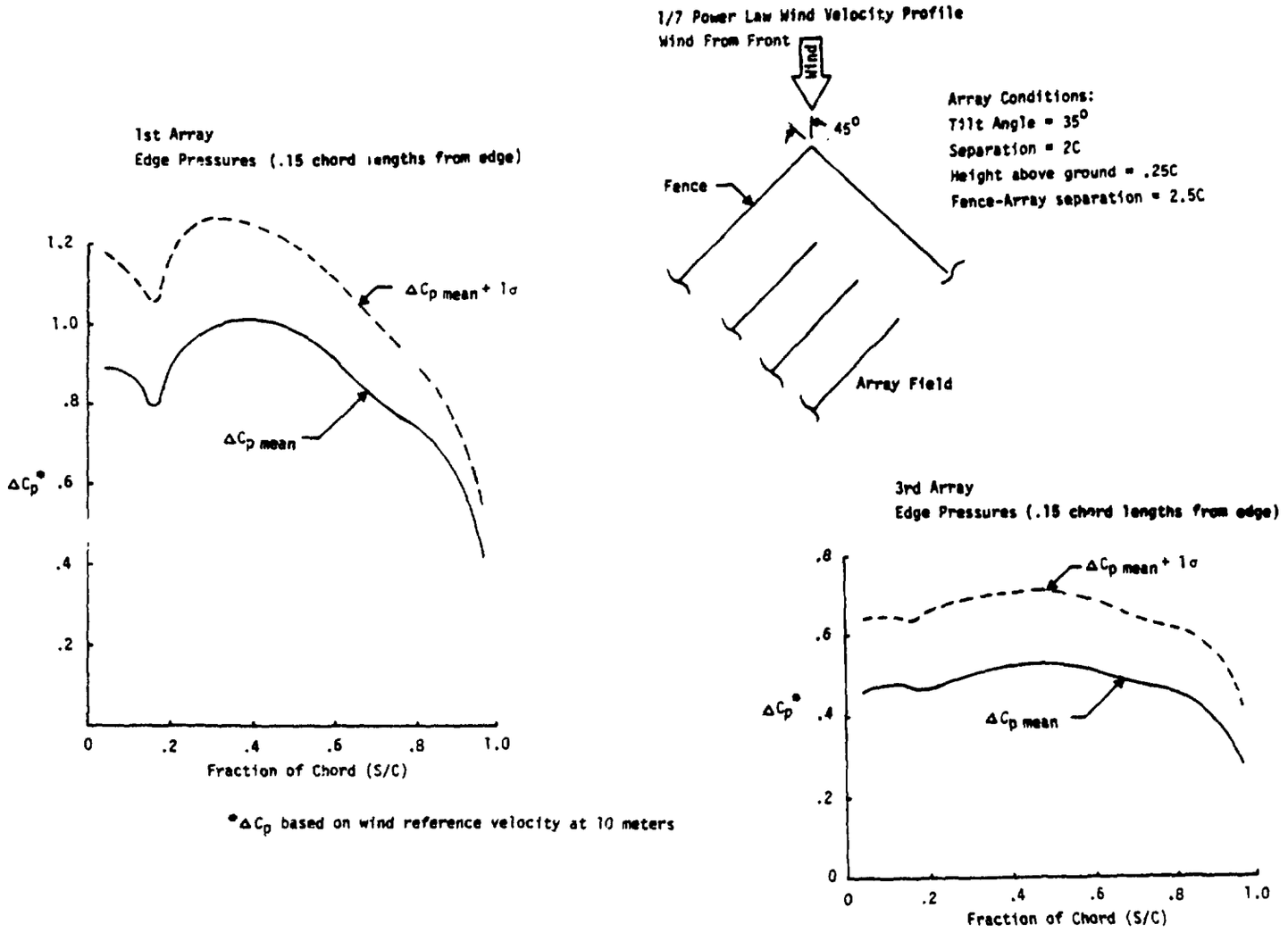


Figure 4-11c. Effect of Oblique Winds on Array Edge Pressure Distribution (Conventional Fence, Wind from Front)

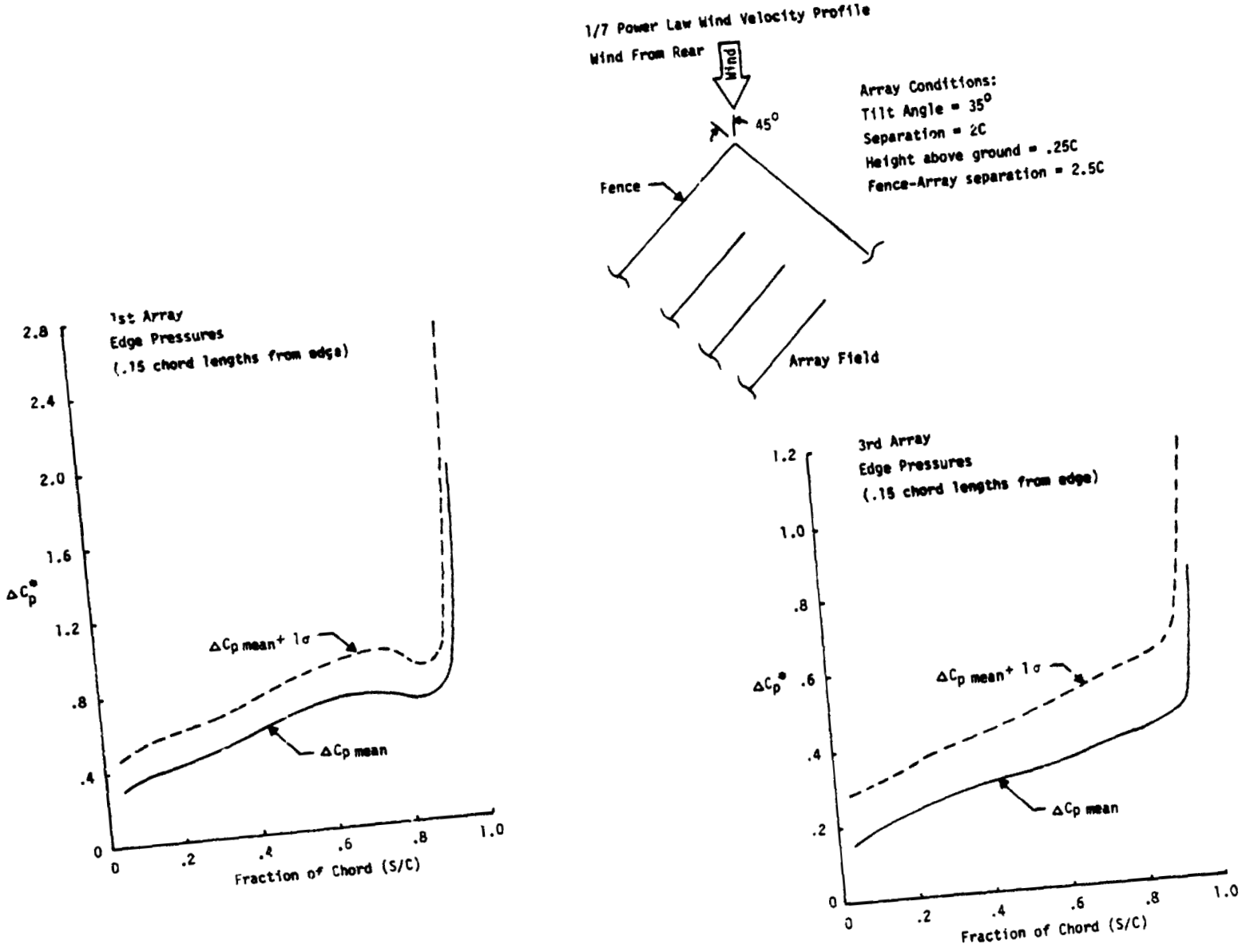


Figure 4-11d. Effect of Oblique Winds on Array Edge Pressure Distribution (Conventional Fence, Wind from Rear)

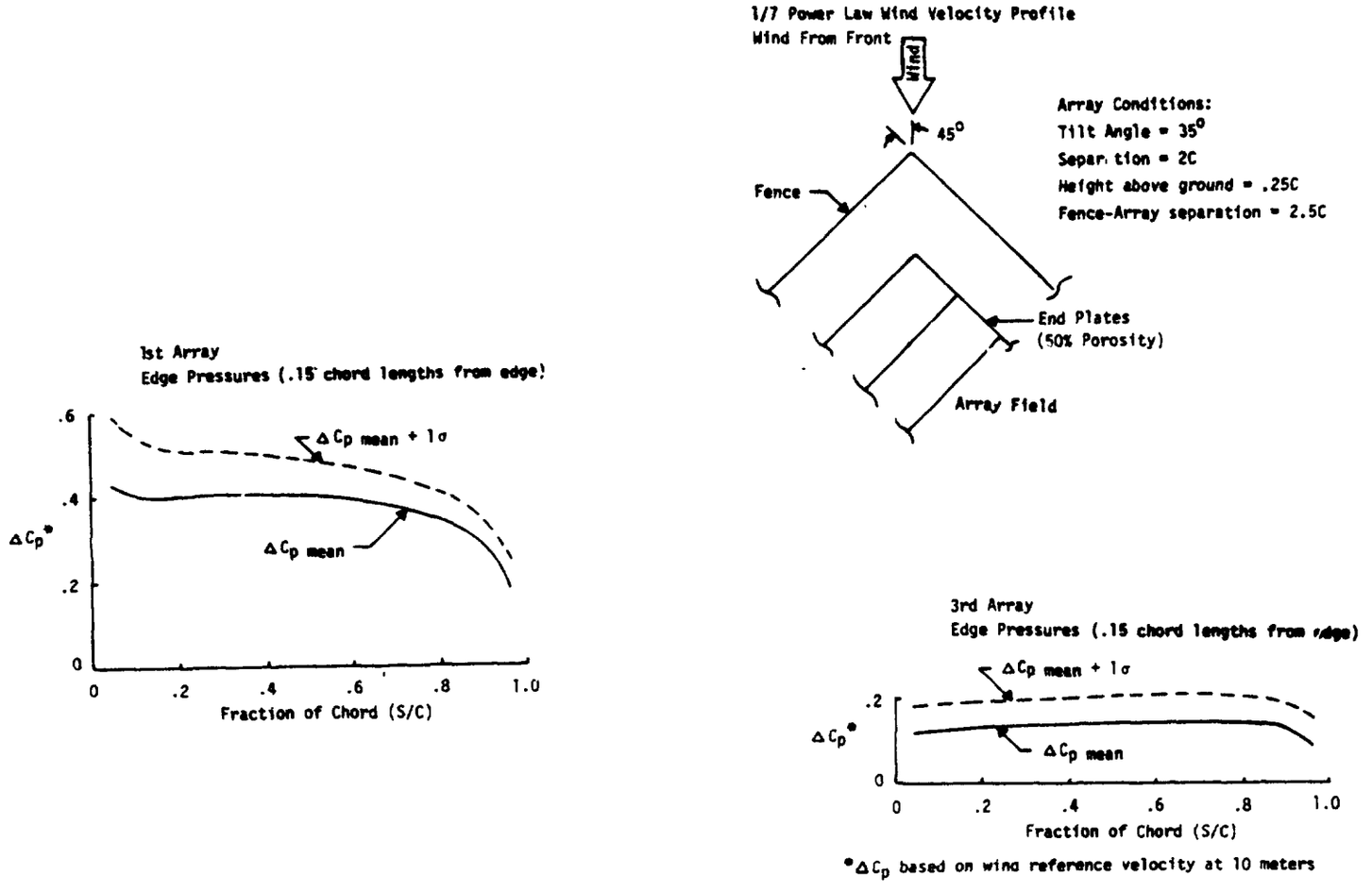


Figure 4-11e. Effect of Oblique Winds on Array Edge Pressure Distribution (Conventional Fence, Endplated Arrays, Wind from Front)

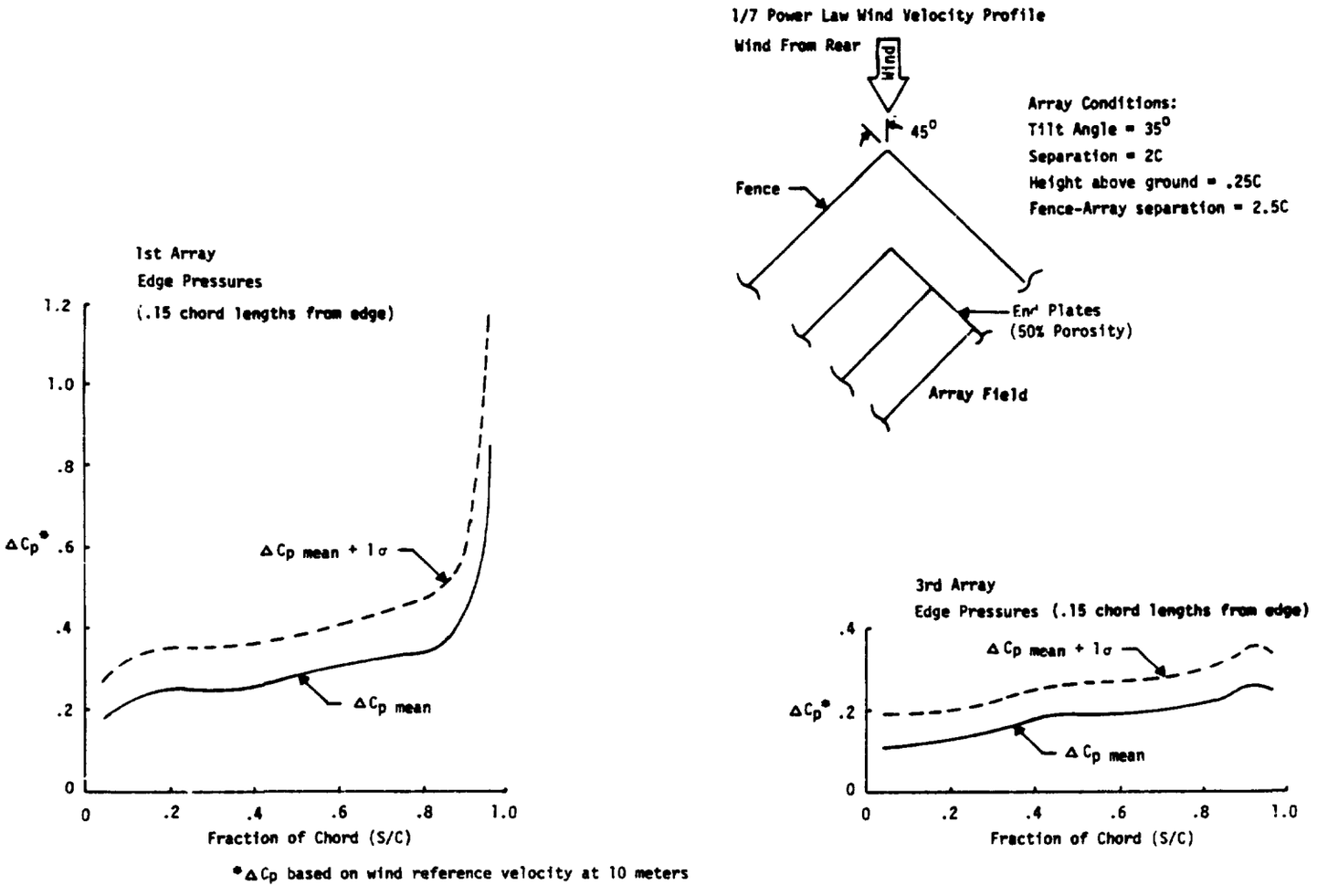


Figure 4-11f. Effect of Oblique Winds on Array Edge Pressure Distribution (Conventional Fence, Endplated Arrays, Wind from Rear)

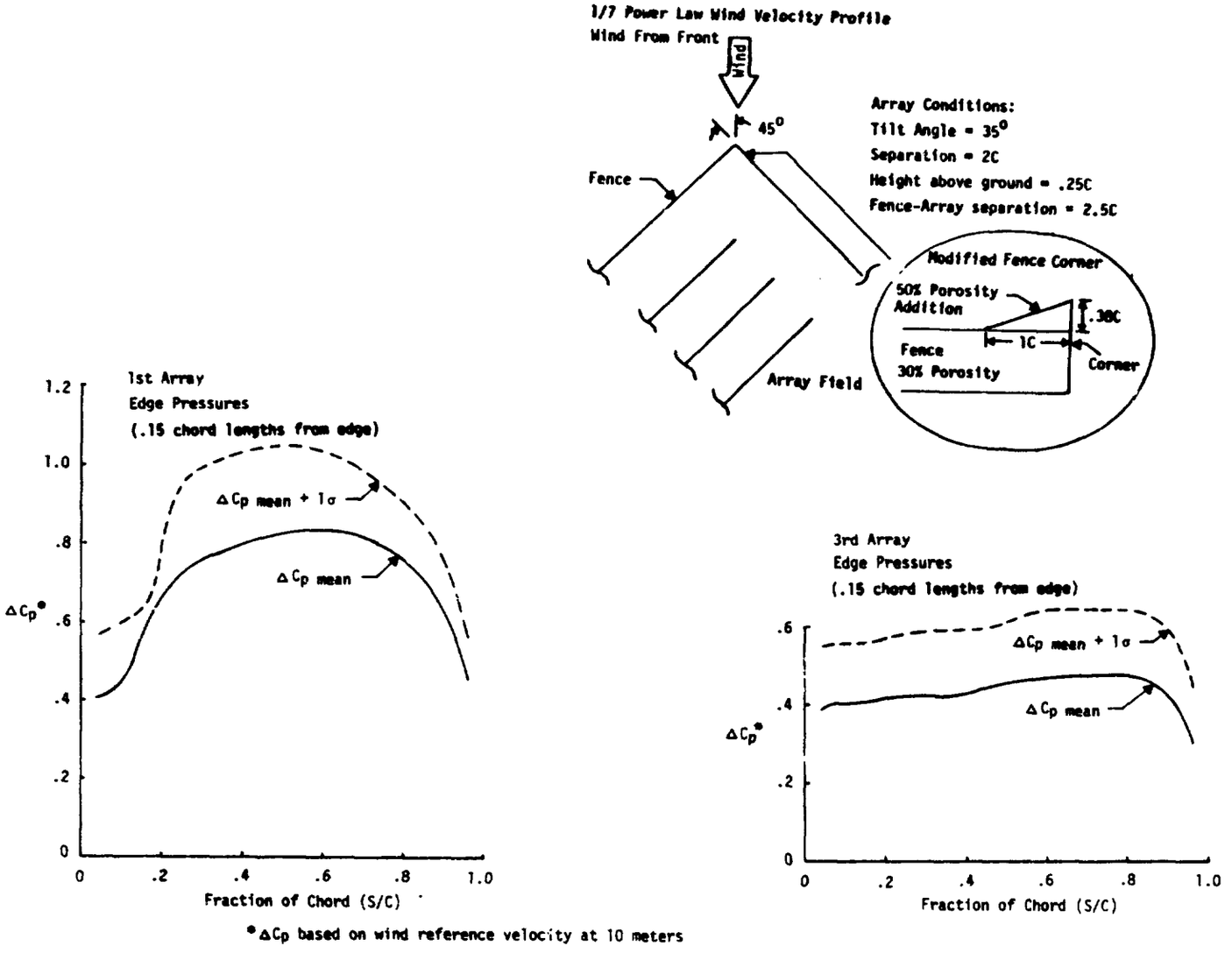


Figure 4-11g. Effect of Oblique Winds on Array Edge Pressure Distribution (Modified Fence Corner, Wind from Front)

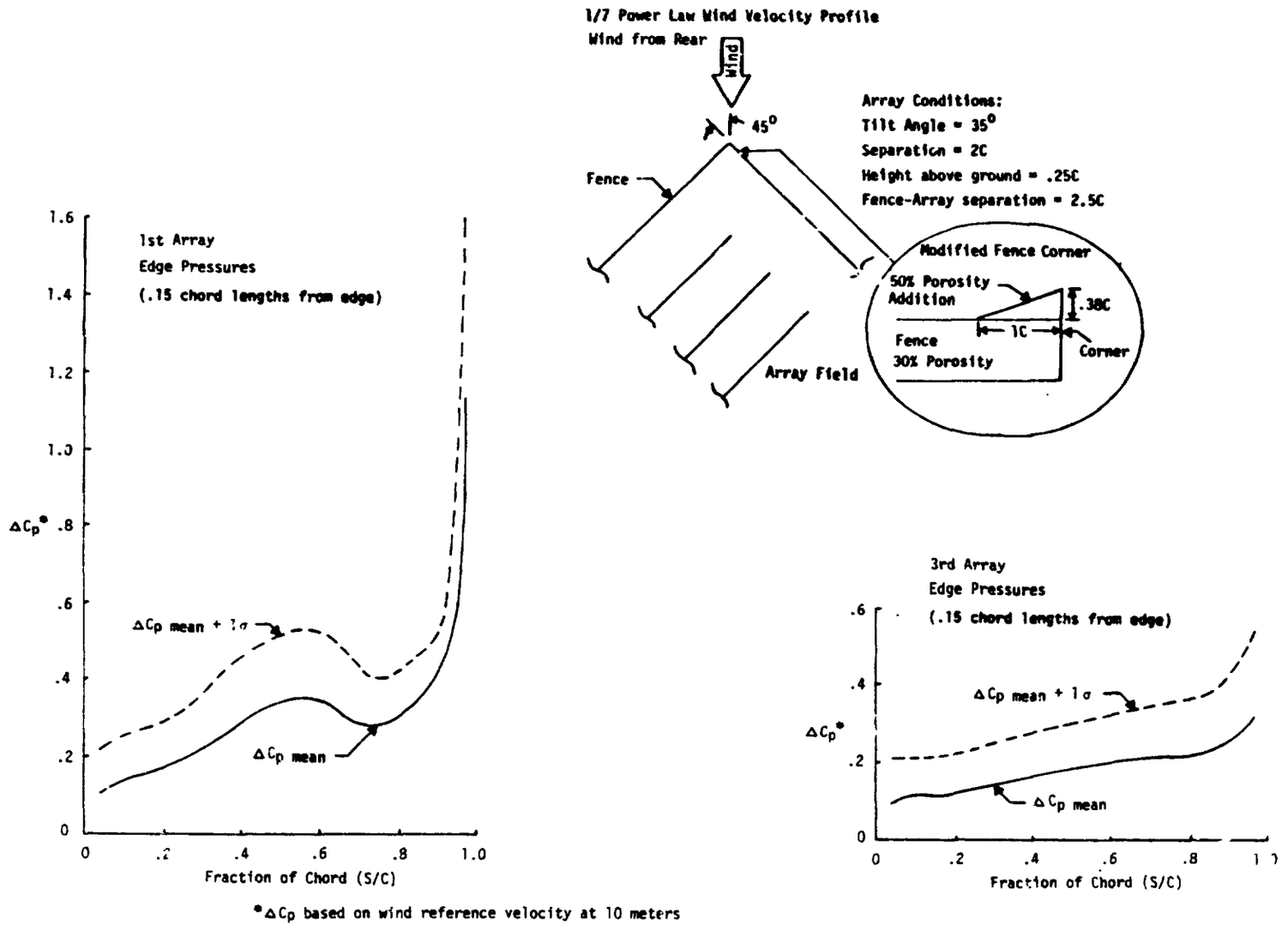


Figure 4-11h. Effect of Oblique Winds on Array Edge Pressure Distribution (Modified Fence Corner, Wind from Rear)

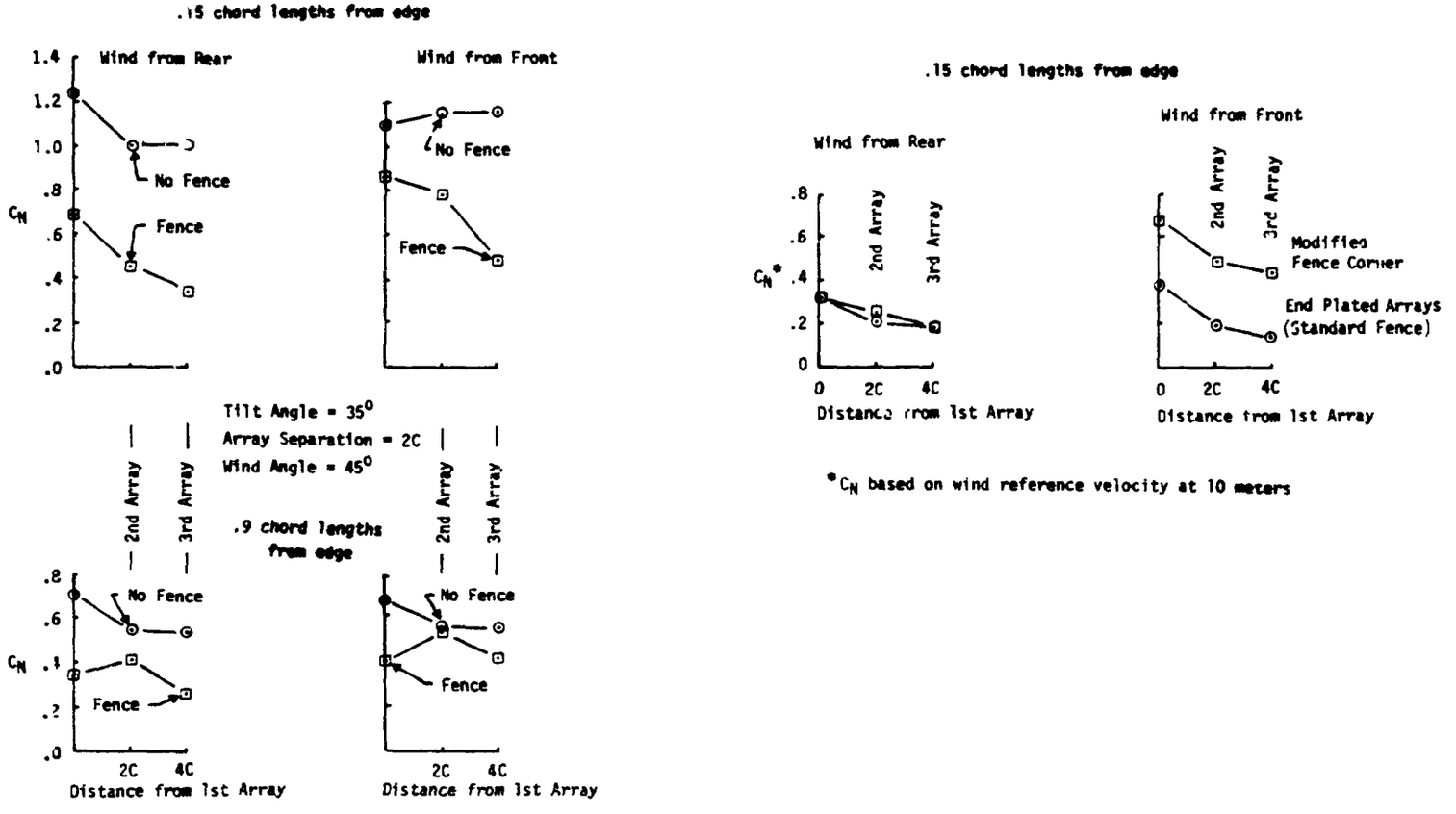


Figure 4-12. Effect of Oblique Winds on Array Normal Force Coefficients at Array Edge

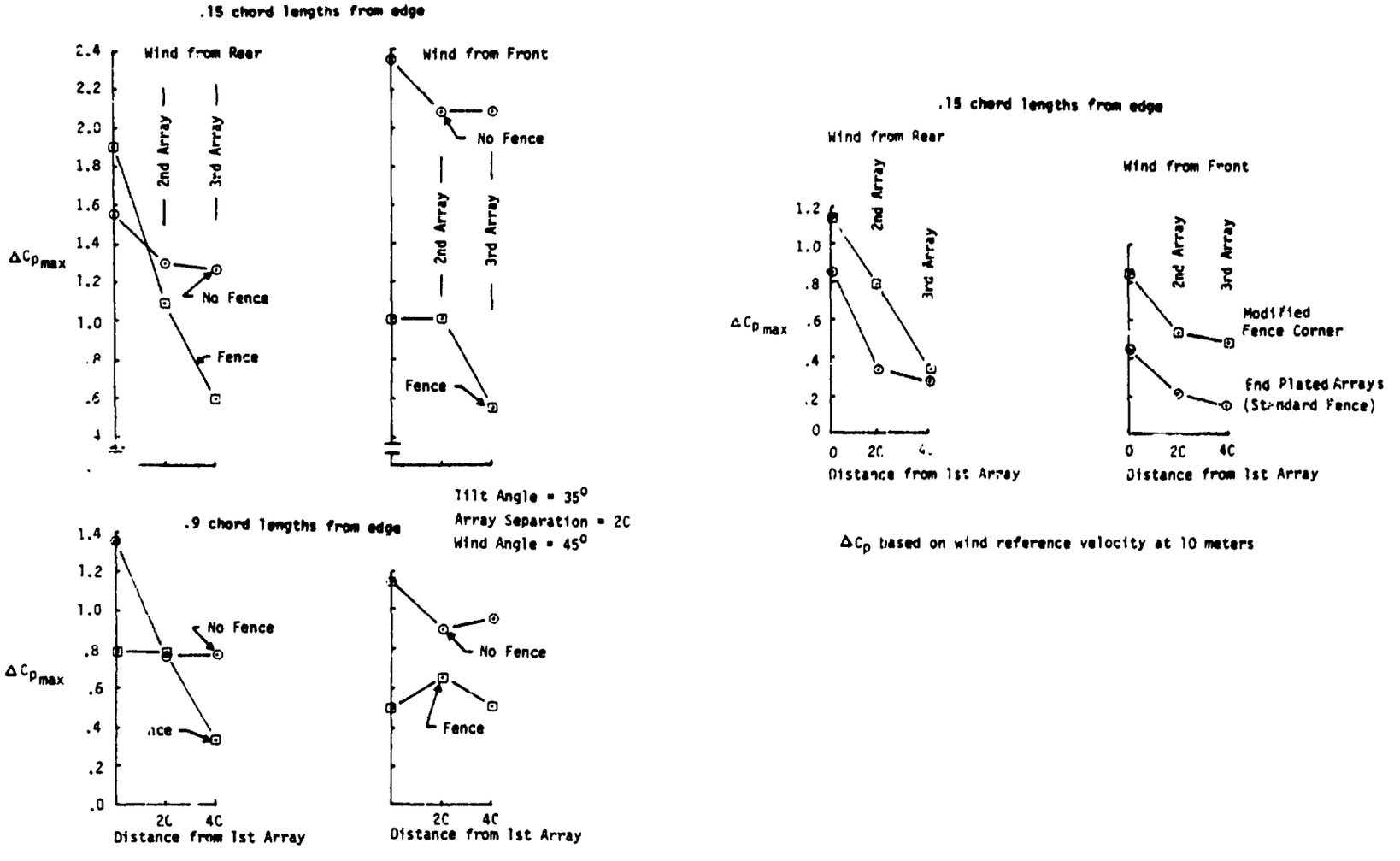


Figure 4-13. Maximum Pressure Coefficient at Array Side Edge Due to Oblique Winds

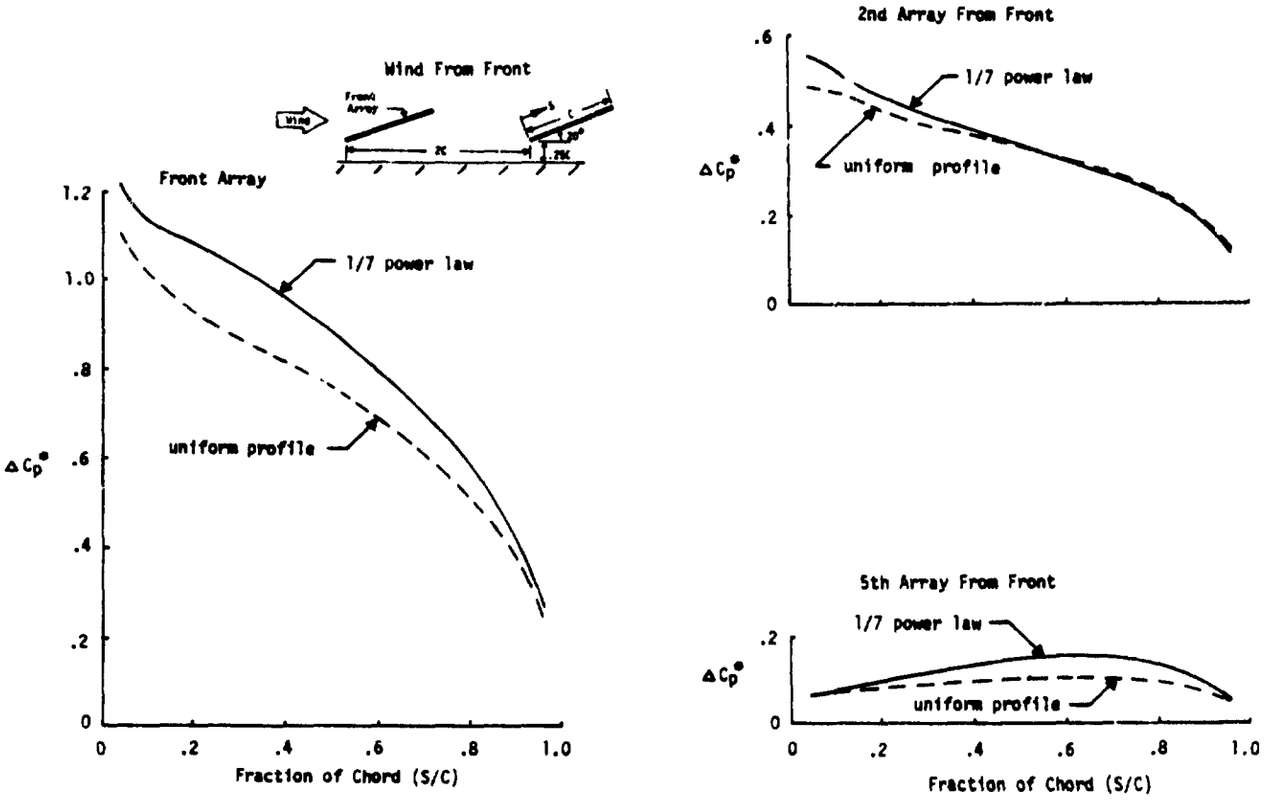
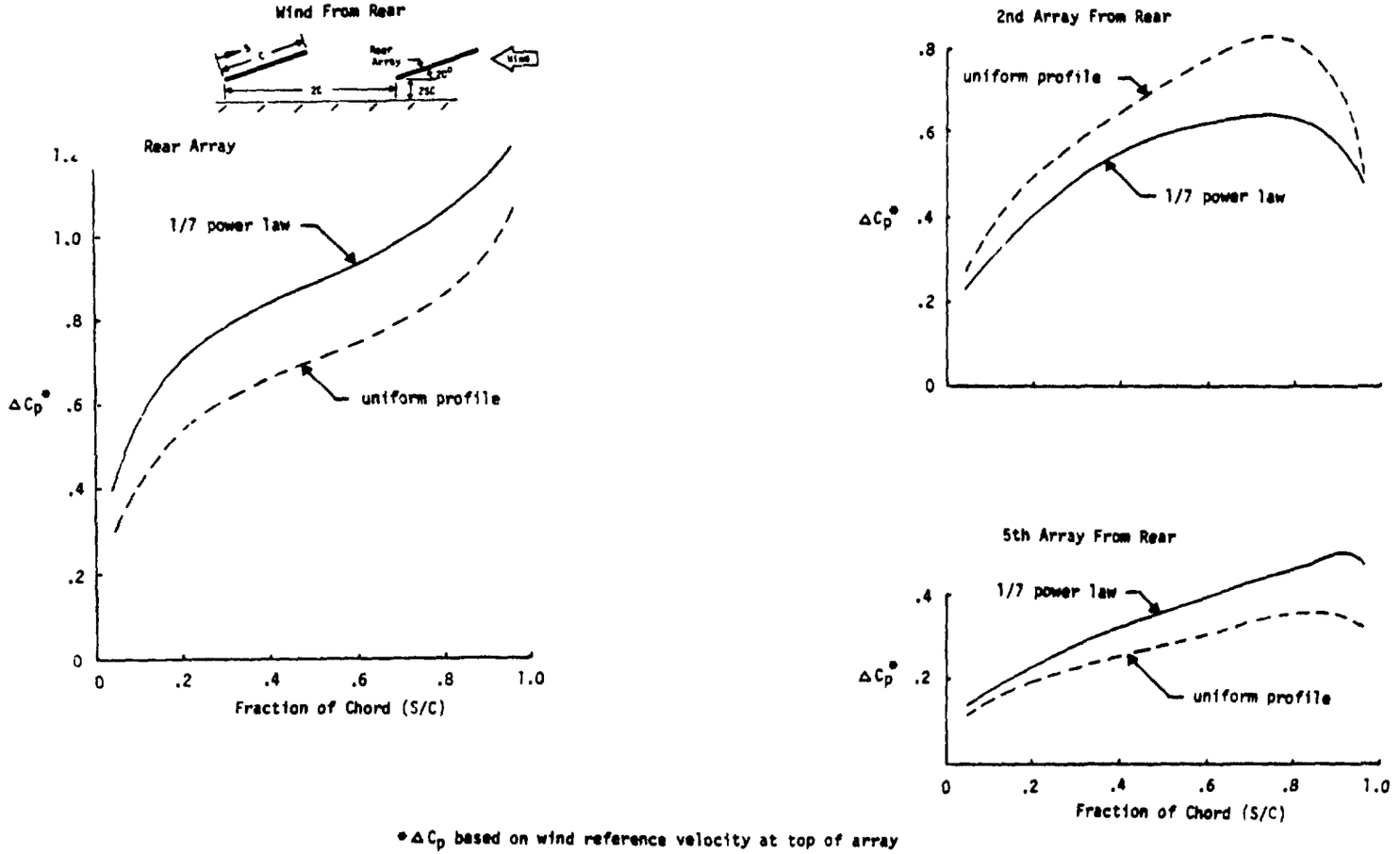


Figure 4-14a. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle = 20°, Wind from Front)



*ΔC_p based on wind reference velocity at top of array

Figure 4-14b. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle = 20°, Wind from Rear)

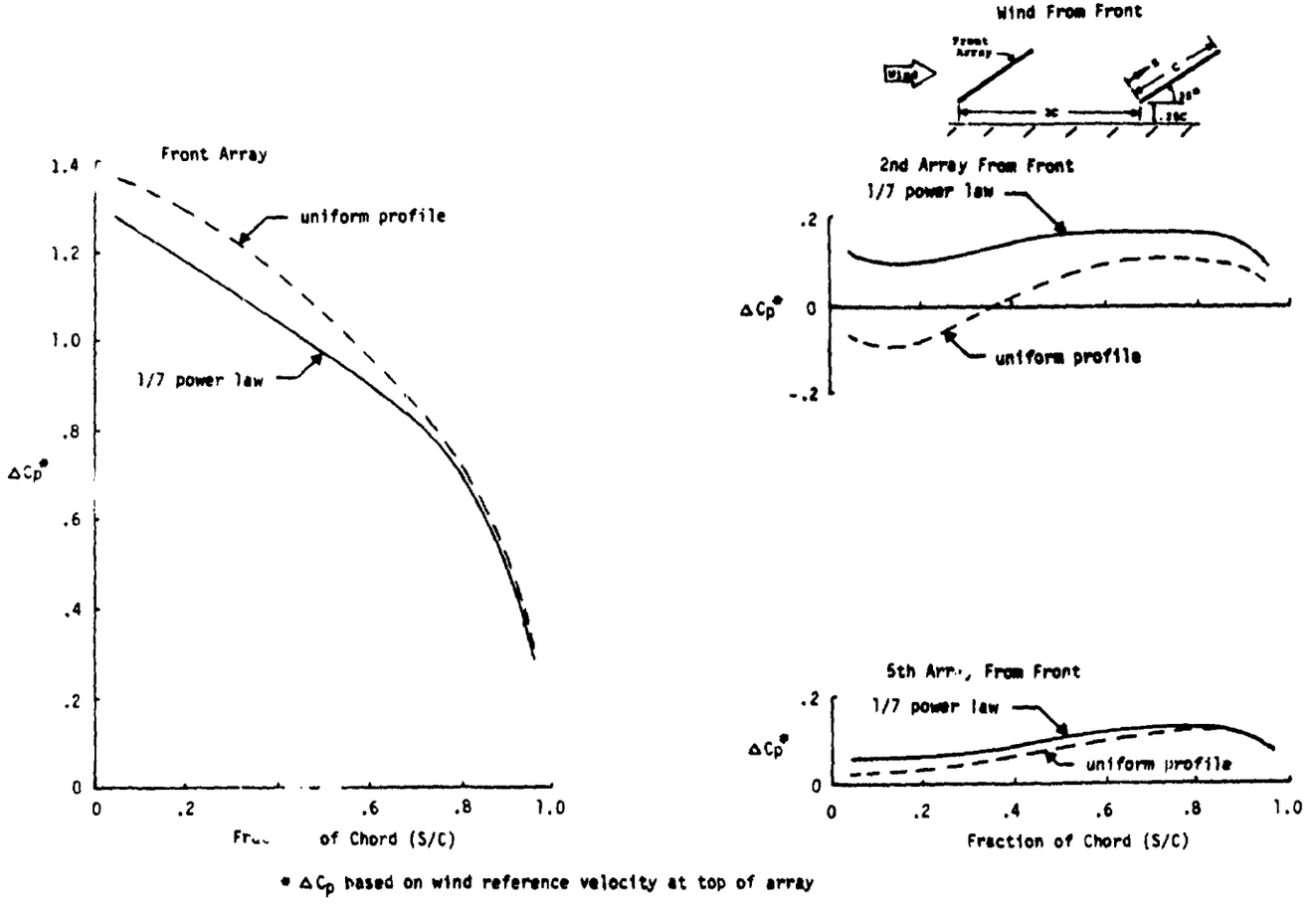


Figure 4-14c. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle = 35°, Wind from Front)

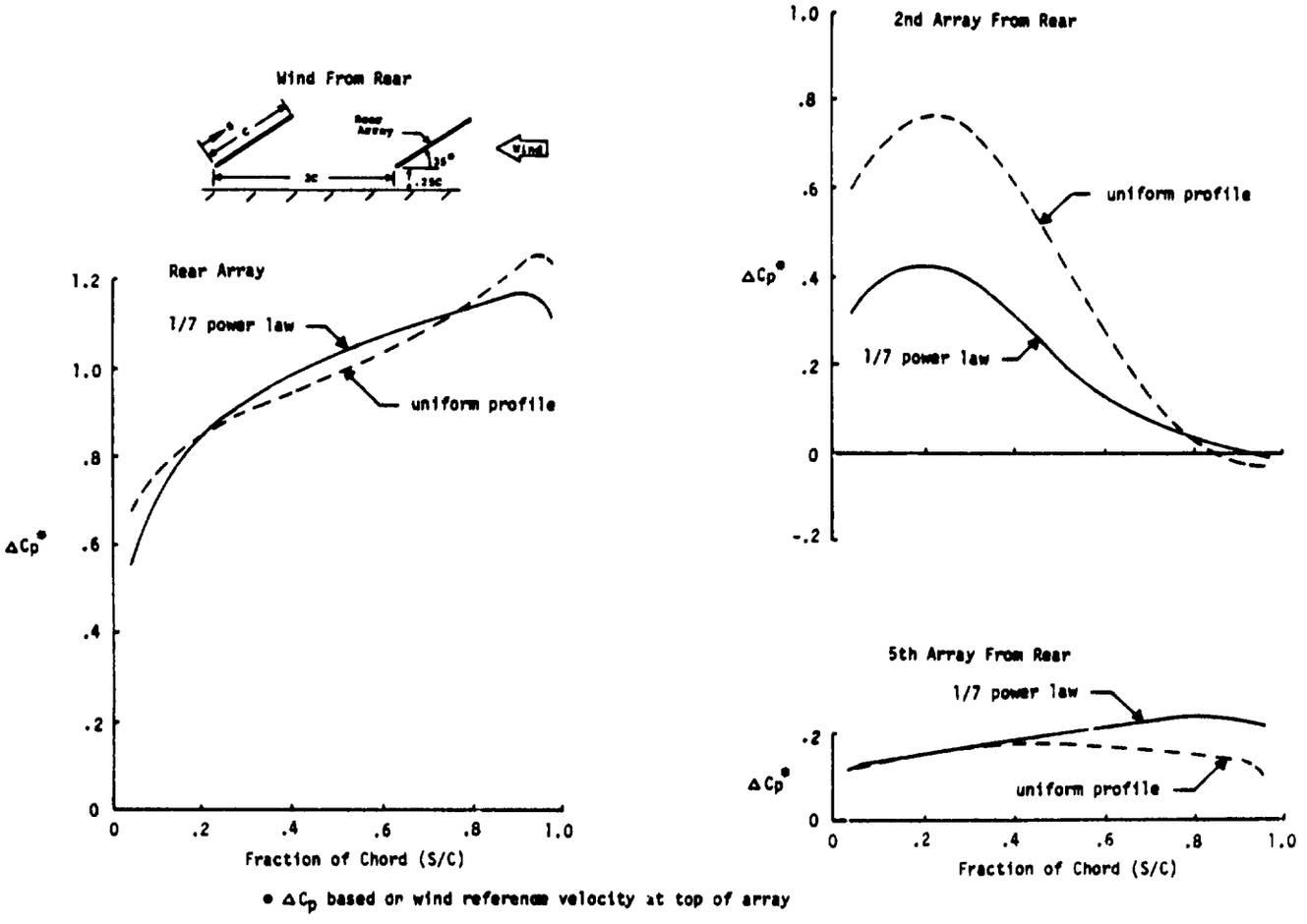
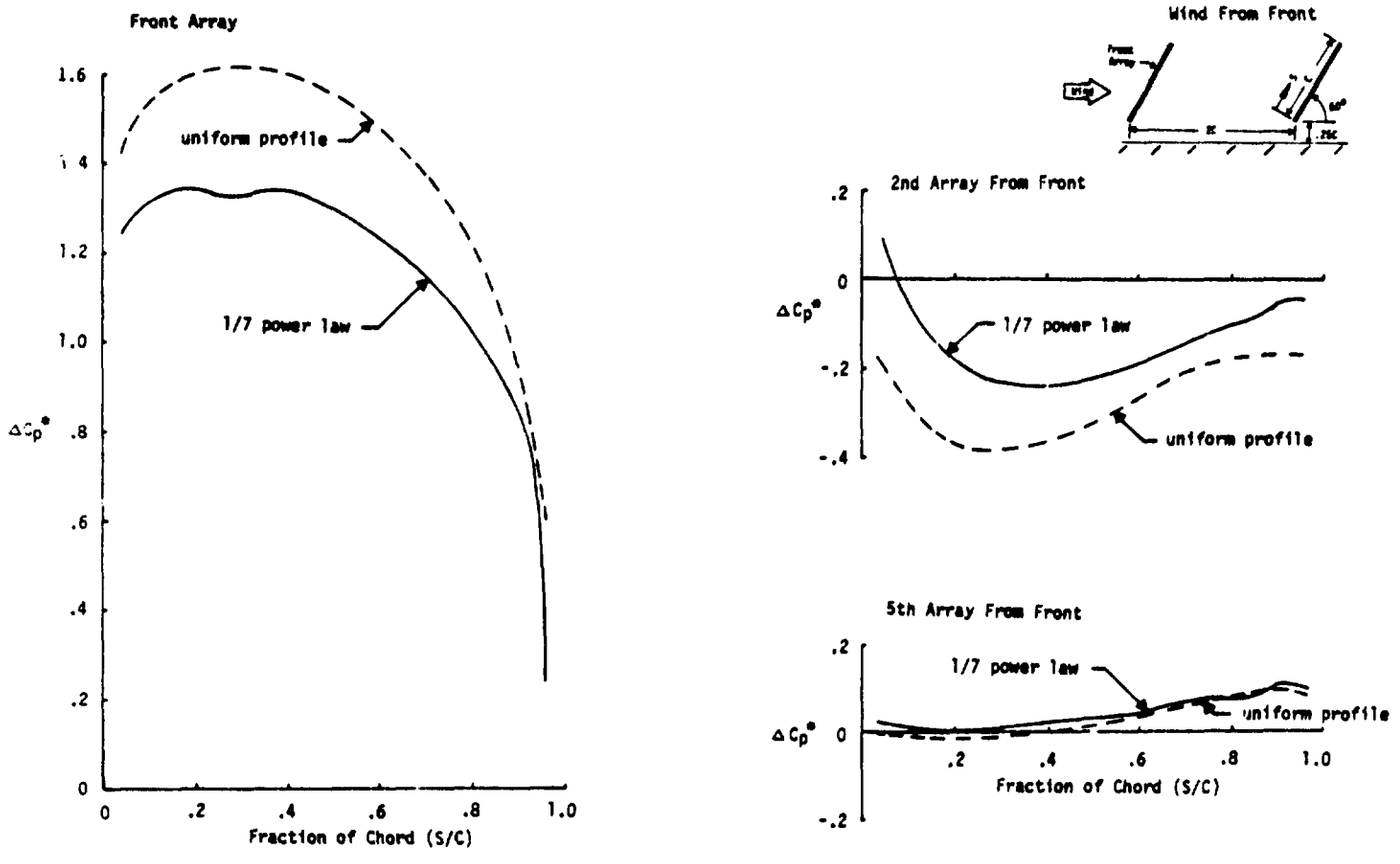
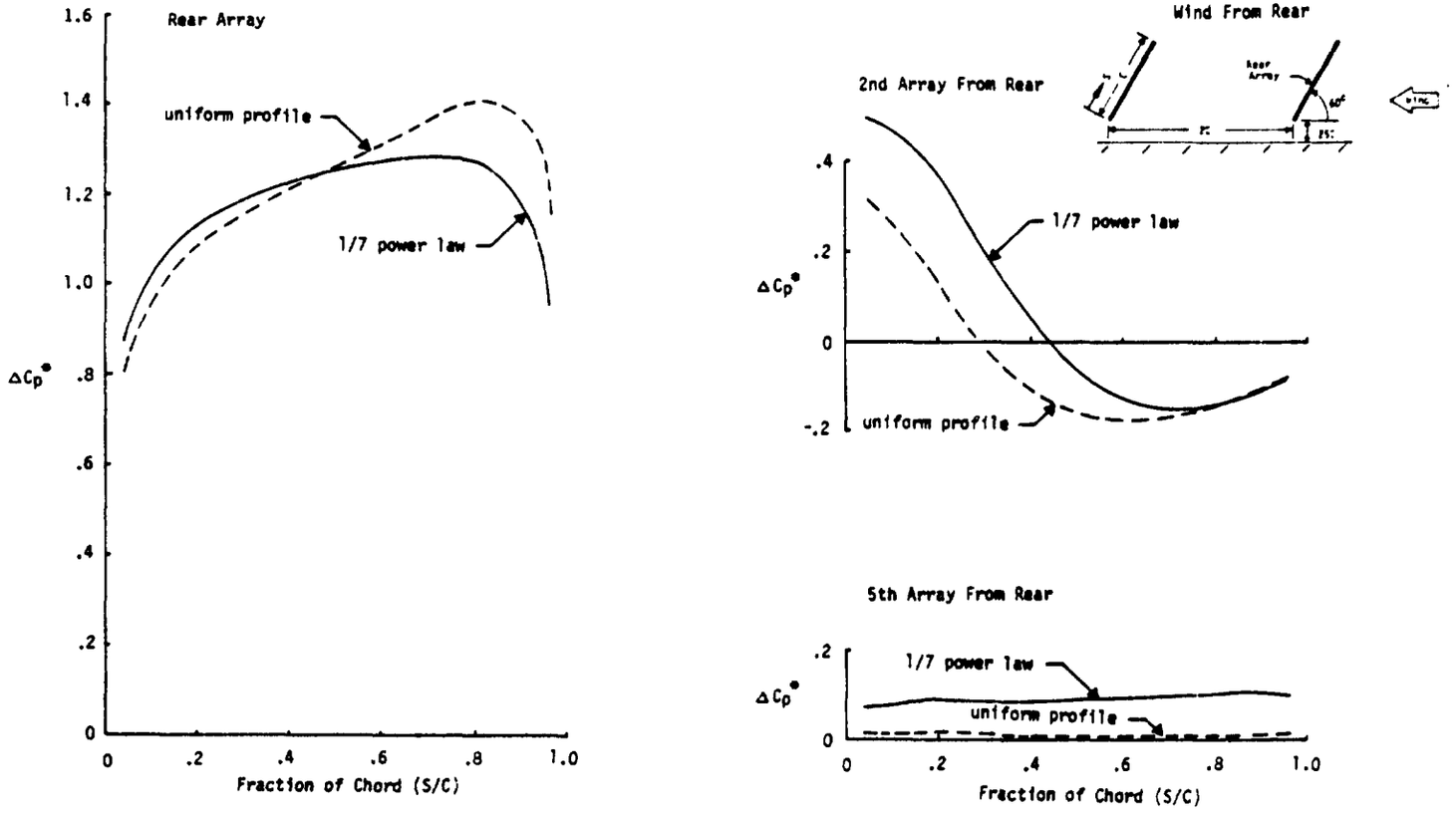


Figure 4-14d. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle=35^{o}, Wind from Rear)



* ΔC_p based on wind reference velocity at top of array

Figure 4-14e. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle = 60°, Wind from Front)



● ΔCp based on wind reference velocity at top of array

Figure 4-14f. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle = 60°, Wind from Rear)

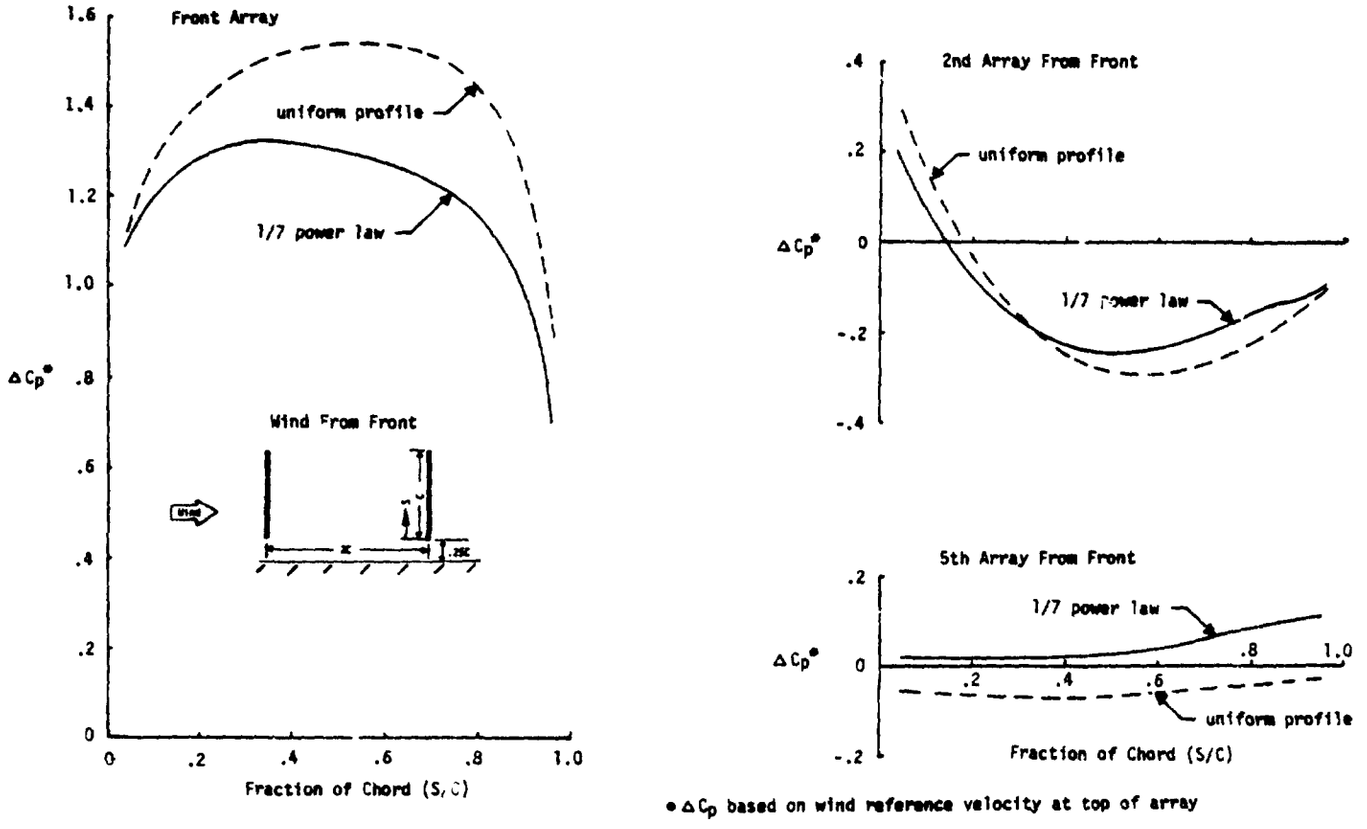


Figure 4-14g. Array Pressure Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles (Tilt Angle = 90°)

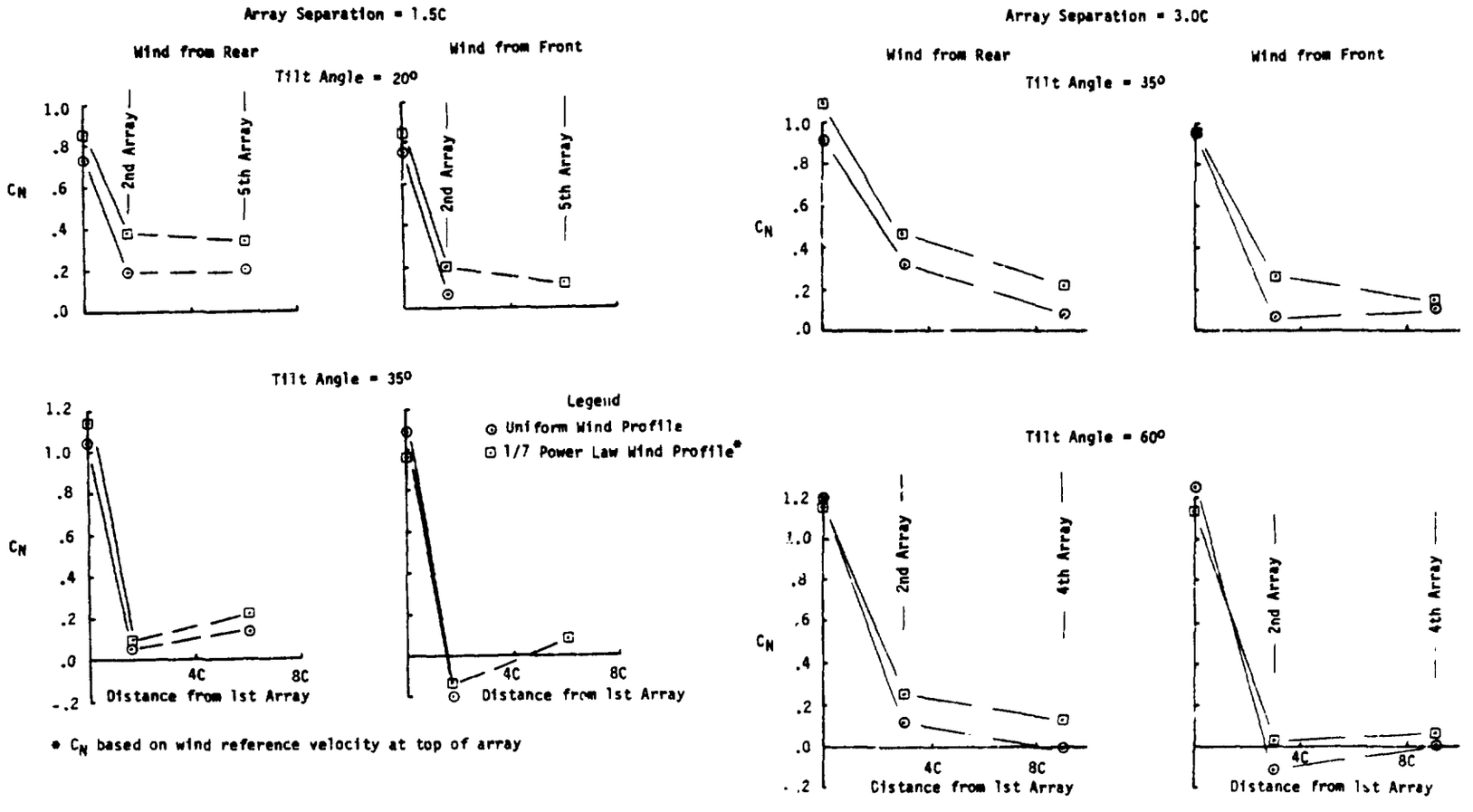
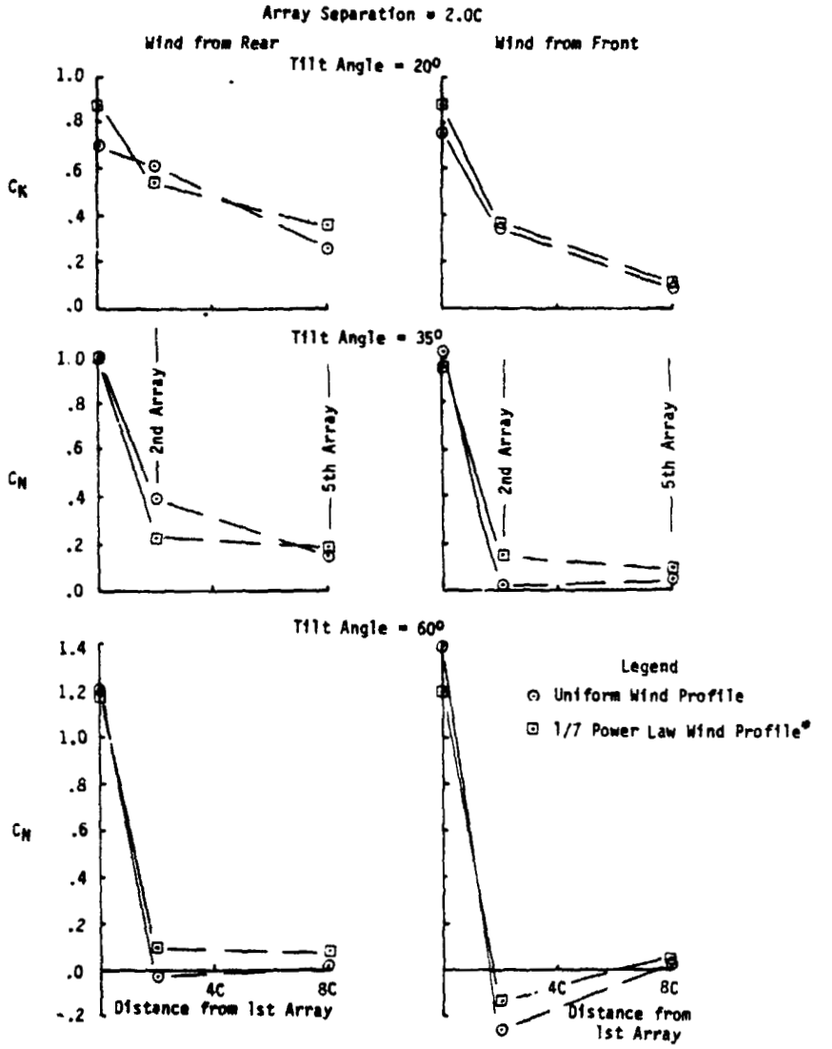


Figure 4-15. Array Normal Force Coefficient Comparison Between Uniform and Boundary Layer Wind Profiles.



* C_N based on wind reference velocity at top of array

Figure 4-15. Concluded

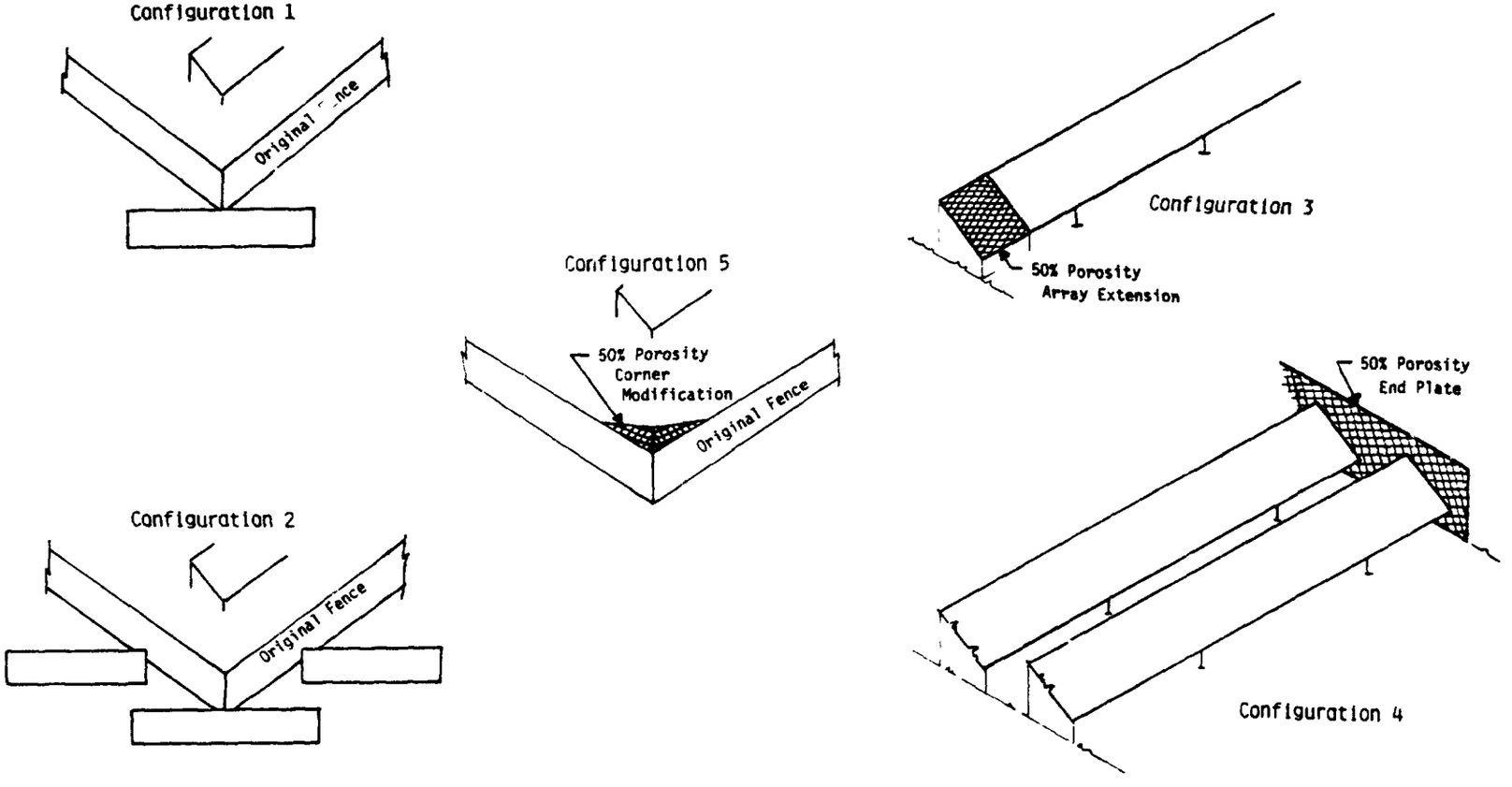


Figure 4-16. Configurations for Edge Load Reduction Study

5.0 THEORETICAL - EXPERIMENTAL RESULTS COMPARISON

The theoretical results developed in Phase II and presented in reference 5 were calculated based on a uniform velocity profile and were then adjusted to reflect the boundary layer velocity profile. Figure 5-1 shows the comparison of the theoretical results to the wind tunnel test results for the net pressure coefficient distribution along the chord of a single array located out of the influence of the ground and in a uniform velocity profile for three angles of attack (20°, 35°, and 60°). (Since the theoretical results were based on an infinite aspect ratio array, all theoretical-experimental comparisons utilize the mid-span test results.) The results differ by approximately 5% to 10% except for very low pressure coefficients; this comparison is considered very good and demonstrates that theoretical methods can be used to accurately predict the aerodynamic loads on an array located sufficiently far from the ground so that ground effects are not a consideration.

When the array is located in close ground proximity, the theoretical method tends to overpredict the pressure coefficients as compared to the wind tunnel test; this is shown in Figure 5-2. When the tilt angle of the array is small (20°), the theoretical results match the wind tunnel test results within approximately 20% or less. However, as the tilt angle increases (35° and 60°), the theoretical-experimental results become increasingly farther apart. The difference is due (at least in part) to the blockage effect that occurs to the air flow because of the restricted area between the ground and the lower edge of the array and the effects of air viscosity (not considered in the theoretical model) in this restricted flow regime. From the test results, of which Figure 5-3 is a typical example, flow blockage is seen to occur because of the ground-to-array gap. Figure 5-3 indicates that the flow is blocked and decreases in velocity as the gap is reduced in value from $H/C = \infty$ to .25 as evidenced by the increase in pressure on the lower edge ($S/C = 0$) on the windward face of the array and by the smaller negative pressure on the base pressure face. Because of the flow restriction at the gap, the flow in front of the windward face of the array is also affected, and the windward face pressure distribution is modified across the total face depending on the amount of restriction of the flow. In contrast to the test results, the theoretical separated inviscid flow method predicts that the air flow increases in velocity to allow a given mass of air to flow through the gap to compensate for the restricted gap area. This increase in velocity is further intensified as the

array presents a more bluff configuration to the wind at increasing tilt angles. Consequently, because of the inviscid flow assumptions in the theoretical method, there is an increasing spread with tilt angle between theoretical and test results as the tilt angle is increased from 20°.

In the Phase II study, reference 5, it was recommended that the theoretical normal force and pressure coefficients for all downwind arrays be calculated as 60% of the windward array. The amount of protection afforded to the downwind arrays in an array field is more complex than can be covered by a blanket percent reduction as shown in Figure 5-4; it is a function of the tilt angle and to a lesser extent, the wind direction. In general, the larger the tilt angle, the greater is the protection afforded to the downwind arrays by the windward array and the greater the load reduction. From the theoretical - experimental data comparison, the theoretical results presented in reference 5 are conservative for steady state wind loads on arrays without protective fences and can be used for design studies of photovoltaic flat plate arrays in lieu of specific test data relating to the design. However, the design would be penalized in terms of structural costs by the conservative loads.

When a fence is used as a protective wind barrier for the arrays, reference 5 recommended using the velocity isotachs behind a fence to calculate the dynamic pressure. Using this dynamic pressure with the theoretical normal force coefficients, the average normal forces per unit area were calculated and presented in reference 5 as Table 6-2 for various tilt angles and for an 8.2 foot fence. The appropriate results were extracted and are presented in Table 5-1 of this document, together with the results from the wind tunnel test for arrays positioned behind a 6 foot fence and in a boundary layer wind. The comparison is reasonably satisfactory at the 20° tilt angle, less so at 35°, and poor at 60°. Thus, the technique suggested in reference 5 should only be used for the smaller tilt angles and only when more reliable results are not available.

Table 5-1. Example of Average Normal Wind Forces on Arrays behind Protective Fences by Theoretical and Wind Tunnel Test Methods (Behind)

Wind from Front			
	Average Normal Wind Forces per unit area (psf)		
Tilt Angle	20°	35°	60°
Theory *	1.06	1.63	9.62
W.T. Test	1.03	2.46	4.92
Wind from Rear			
Theory *	1.63	2.22	11.21
W.T. Test	1.44	2.46	5.13

* Dynamic factor of 1.5 removed from Table 6-2, reference 5

The array key wind parameters detailed in reference 5 are also shown in Figure 5-5. These parameters were verified by the wind tunnel test except for the dynamic pressure which is a fundamental parameter used in both test and theoretical methods. In general, the trends of all parameters, except ground clearance, were verified. However, the test results show that the parameters are all interelated and cannot be separated as in Figure 5-5. As an example, angle of attack, ground clearance, and array spacing, are all affected by each other. Consequently, to predict the sensitivity precisely, a family of curves would be required varying only one parameter at a time. This would require an enormous amount of test data and results.

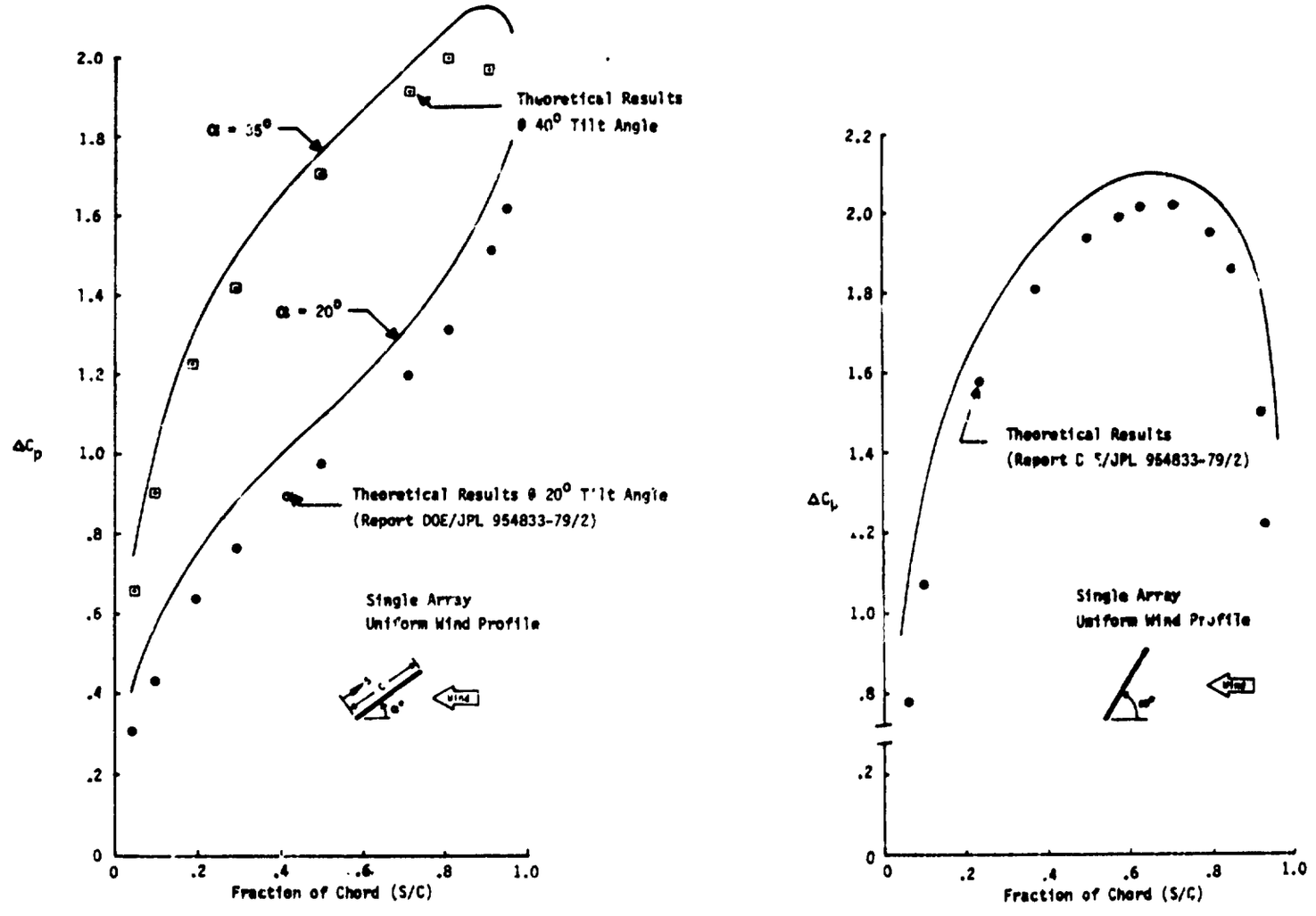


Figure 5-1. Array Pressure Coefficient Distribution Comparison Between Wind Tunnel Test and Theoretical Methods in Free Air

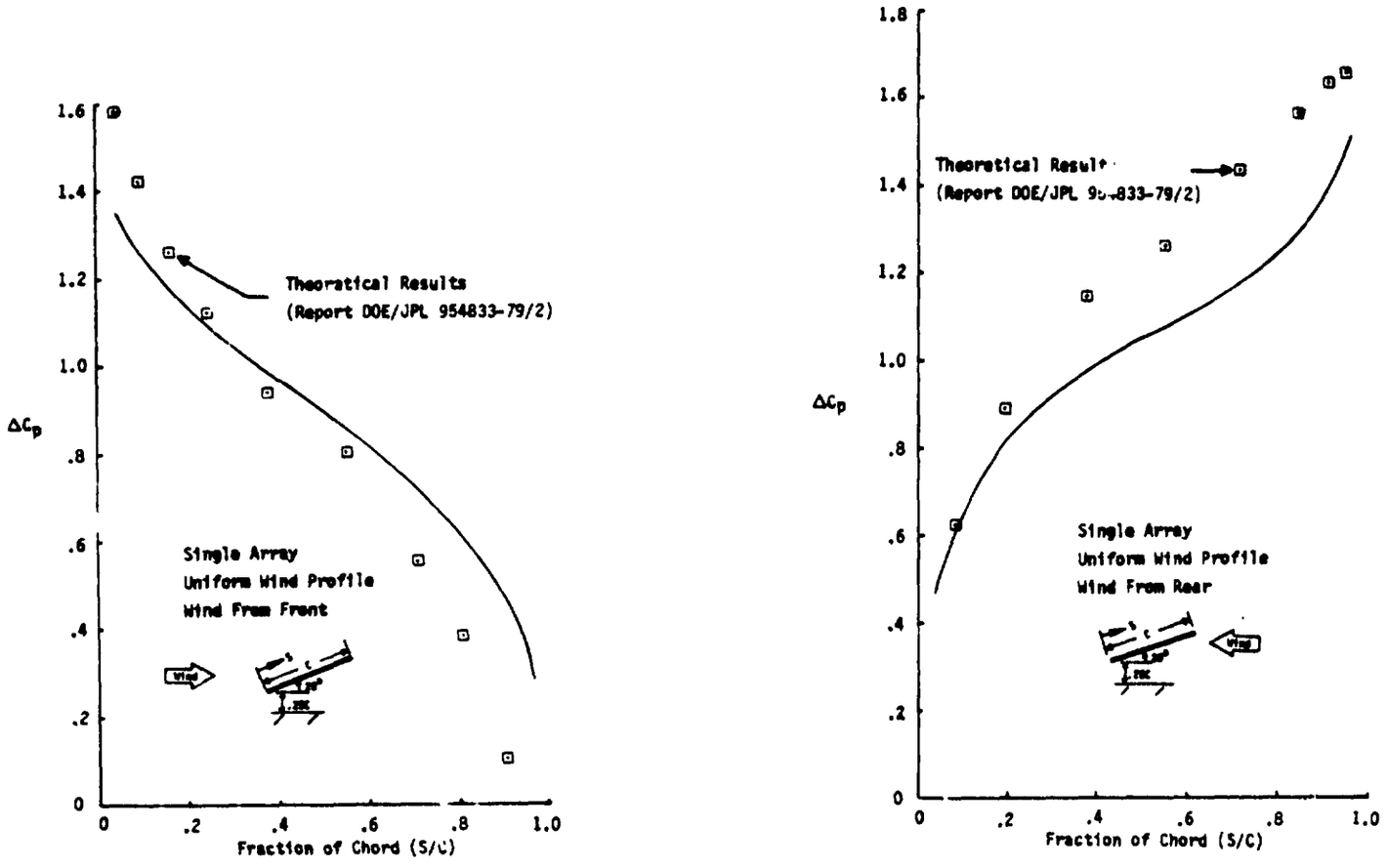


Figure 5-2a. Array Pressure Coefficient Distribution Comparison Between Wind Tunnel Test and Theoretical Methods in Close Ground Proximity (Tilt Angle = 20°)

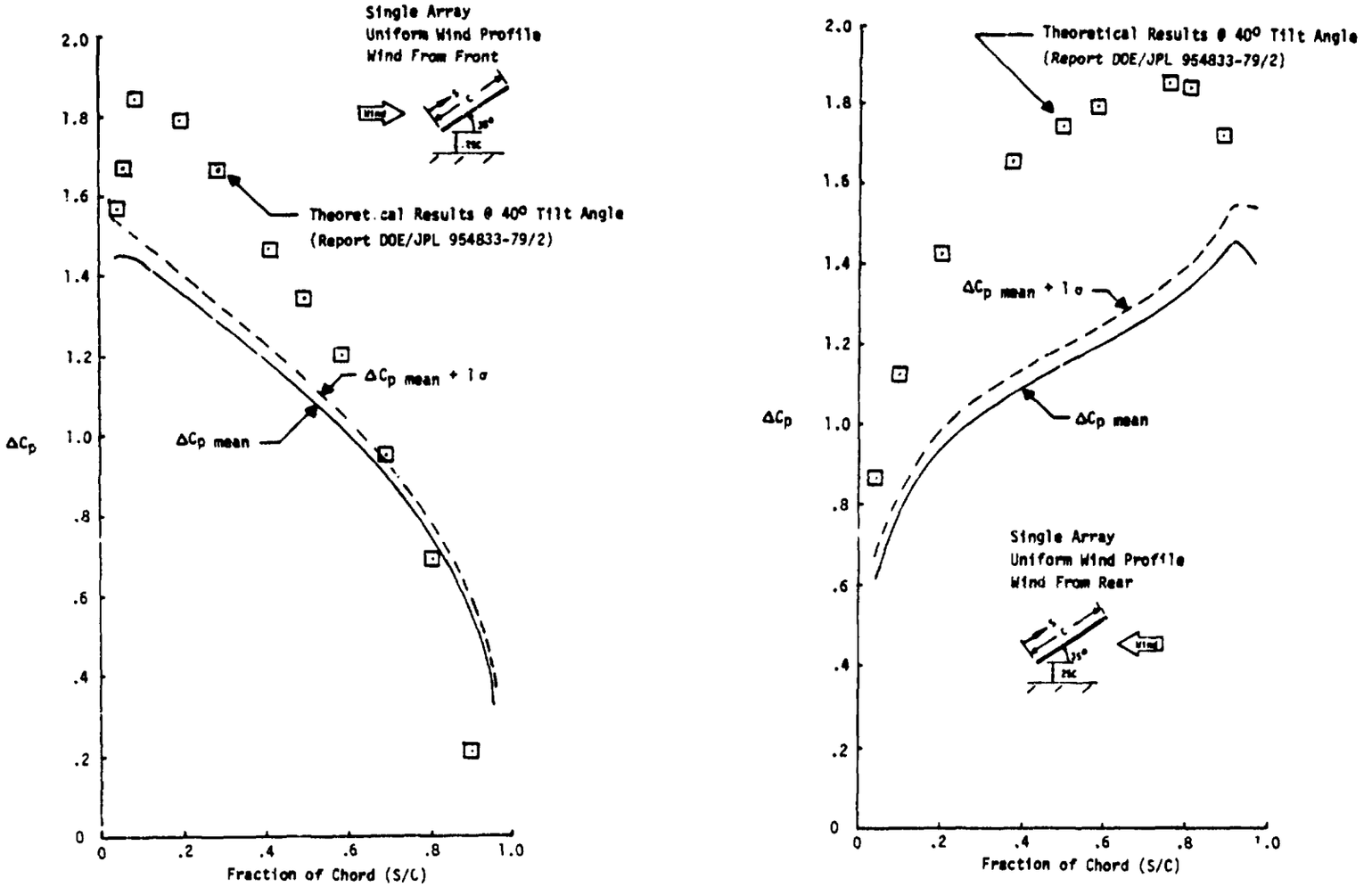


Figure 5-2b. Array Pressure Coefficient Distribution Comparison Between Wind Tunnel Test and Theoretical Methods In Close Ground Proximity (Tilt Angle = 35°)

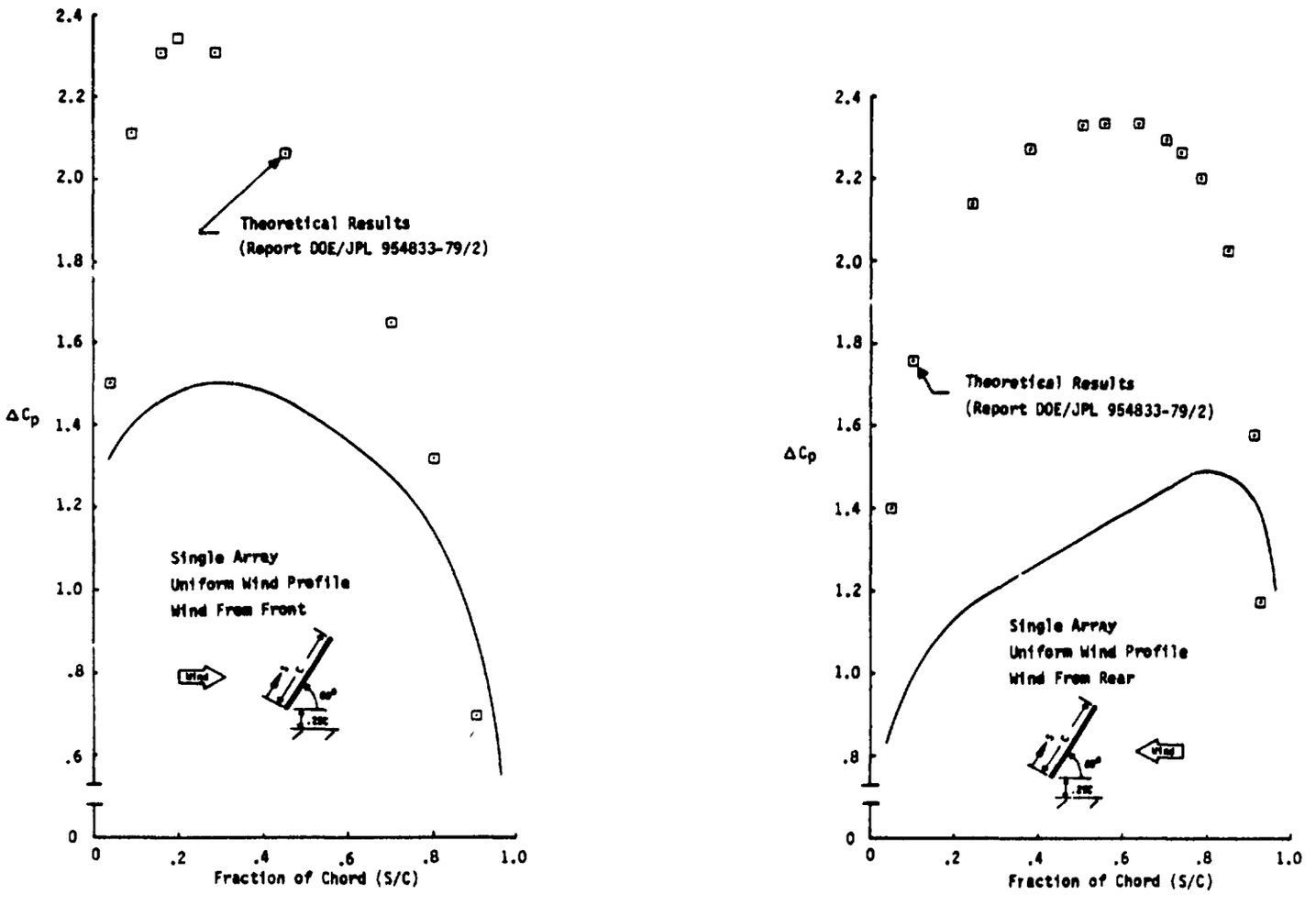


Figure 5-2c. Array Pressure Coefficient Distribution Comparison Between Wind Tunnel Test and Theoretical Methods in Close Ground Proximity (Tilt Angle = 60°)

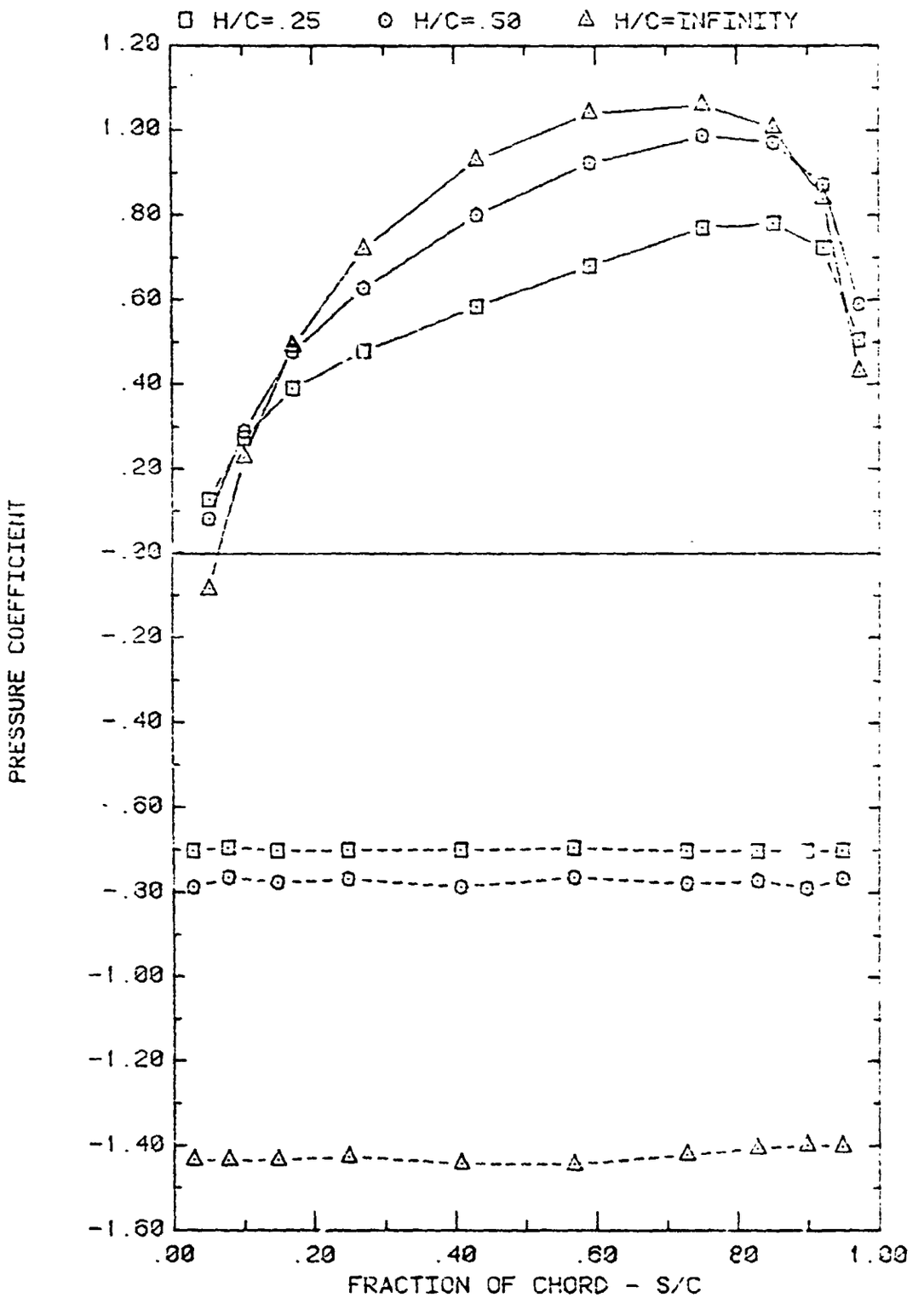


Figure 5-3. Effect of Ground Clearance on Front and Back Array Pressures in Uniform Flow (Tilt Angle = 60°, Wind from Back)

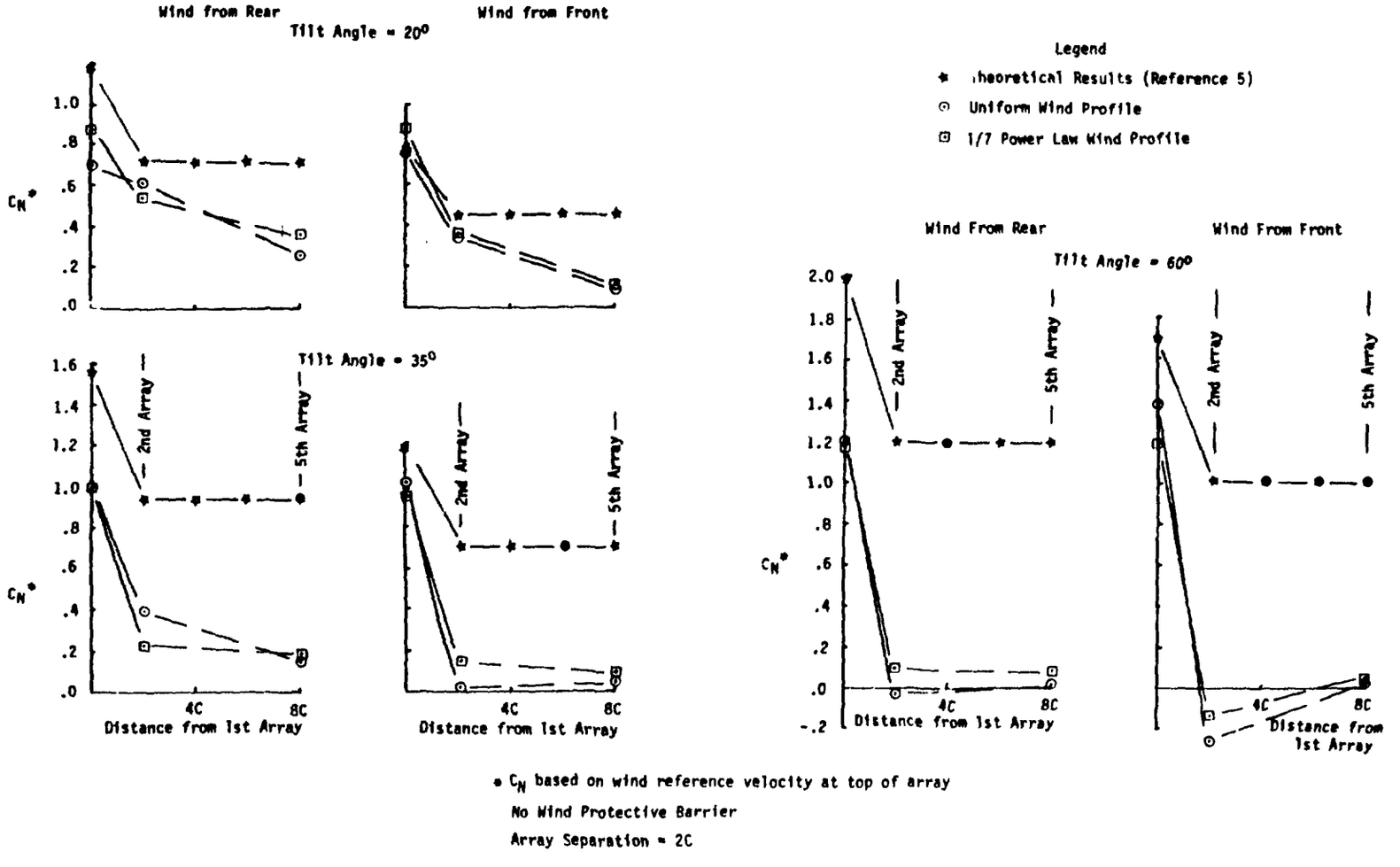


Figure 5-4. Array Normal Force Coefficient Comparison Between Wind Tunnel Test and Theoretical Methods

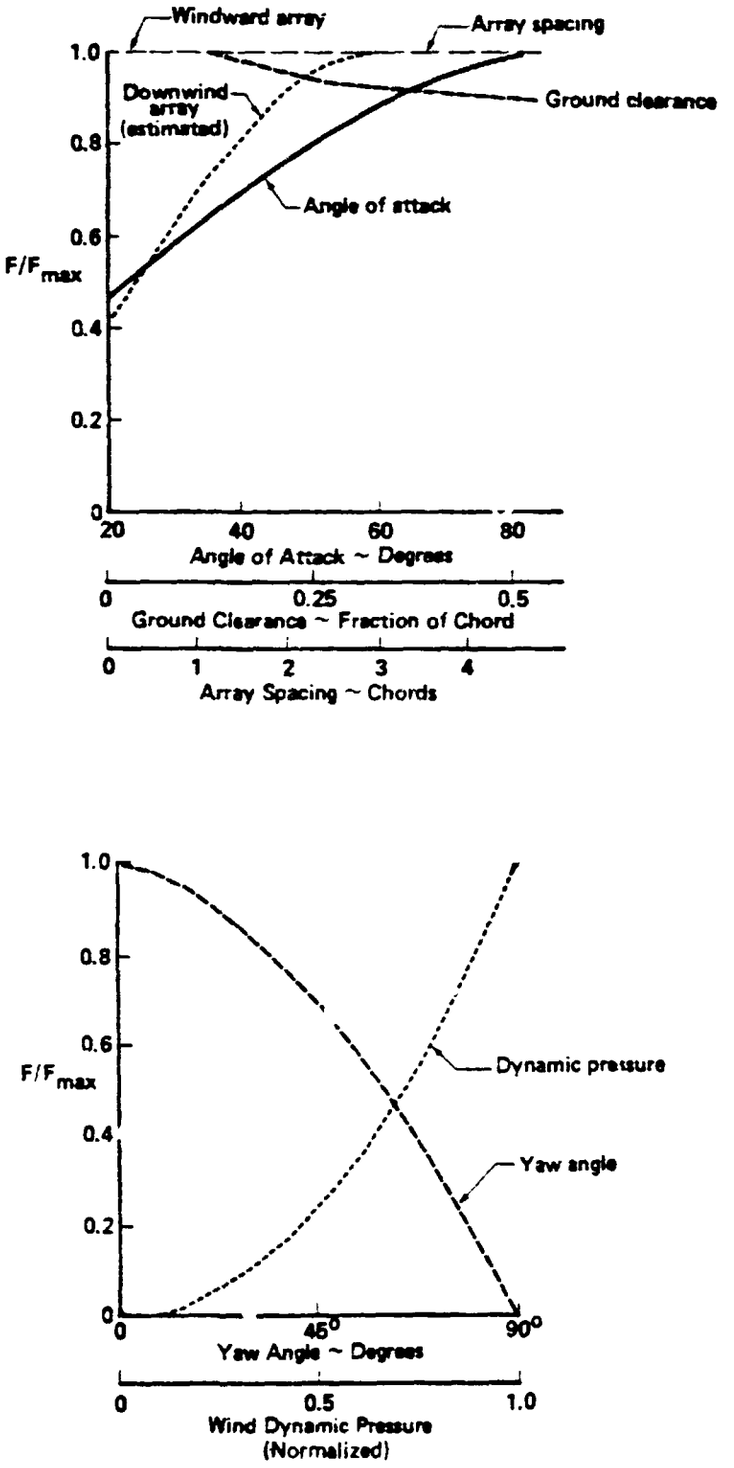


Figure 5-5. Theoretical Key Wind Loads Parameters and Their Sensitivity in Separated Flow Analyses (Reference 5)

6.0 DISCUSSION AND CONCLUSIONS

Currently, there are no known published data or results of wind loads from full sized photovoltaic arrays placed in the natural environment. The wind tunnel test utilizing the Meteorological Wind Tunnel and simulating the natural boundary layer wind as a 1/7 power law wind profile is the closest simulation compared to theoretical methods or uniform wind tunnel simulations of arrays placed in the natural environment. Therefore, all results from the different analyses were compared to the results obtained from the wind tunnel test that simulated the wind boundary layer.

Theoretical methods to calculate pressures and forces on arrays positioned at tilt angles greater than fifteen to twenty degrees require the use of separated flow analysis techniques that are directly applicable only to single arrays with infinite aspect ratios. Thus, the results must be extrapolated or modified for the array edges, arrays positioned behind fences, and interior arrays in an array field as performed in reference 5. The theoretical array pressure distribution and normal force results for the windward array and interior arrays were shown to be conservative (over designed) compared to the boundary layer wind tunnel test. The theoretical normal force results for arrays positioned behind fences are fairly close but conservative for tilt angles less than 35° and become much more conservative for tilt angles near 60°. As a result, if theoretical means are used for determining steady state wind loads on photovoltaic arrays and for sizing the array structural members, the arrays will be overstrength for steady state wind loading.

Most previous wind tunnel tests have been conducted for various shapes of structure in uniform wind profiles and out of the ground effect. Normal force coefficients for flat plates, cylinders, and spheres are readily available in the literature for this condition. If the flat plate coefficients for plates out of the ground effect are used for arrays close to the ground, they will yield normal wind forces that are ultra conservative. If test results are obtained for flat plate arrays in an array field and in a uniform flow wind tunnel with the influence of the ground effect, the results are variable, some conditions are conservative and others unconservative. Consequently, the results from a uniform flow wind tunnel for flat plate arrays would require a factor of safety to be applied to assure that the results are conservative if

used in an absolute sense for design values. However, the results are adequate to be used for trade studies in preliminary design such as using load alleviation devices, etc.

The boundary layer wind tunnel test for the flat plate photovoltaic array field produced some interesting results and conclusions. A fence (or the first windward array, if no fence exists) protects the downwind arrays except near the array edges from the wind. The wind normal forces and pressures of these downwind arrays are several times smaller than the first windward array when no fence protects it. In addition, as the tilt angles of the arrays increase, the greater the wind protection received by the downwind arrays and the smaller the normal forces and pressures on the arrays. Wind direction (frontal or rearward) does not significantly affect the results. The normal forces and pressures on arrays positioned as close as three to four rows from the front have the same magnitude whether a fence protects the field or not. A fence will significantly lower the loads on the first array and can even lower the first array loads below the loads on the arrays within the field. Thus, a fence can actually overprotect the arrays close to the fence. If the fence to protect the arrays from wind is properly designed, all arrays could be designed for the wind loads experienced by the interior arrays.

The pressure distribution on arrays protected by a fence and/or within the array field are essentially flat, resulting in no pitching moment on the array. In contrast to this, the first and second array without a protective fence have varying pressure distributions. The first array has a pressure distribution typical of a single flat plate. The second array is affected considerably by the downwash and turbulence of the first array and may have a pressure distribution along a chord that changes from positive to negative pressures. Another noteworthy observation is that the pressure on the base pressure side is flat for all conditions except near the edges.

The wind loads on the array edges are considerably different from the remainder of the array field. Vortices are produced by array corners and fence corners and can produce very high wind loads at and near the array edges, depending on the wind direction. Pressure coefficients tend to be especially high in the localized leading edge-side edge area of the array . The high wind loads diminish to the loads within the array field at approximately two slant height distances from the edge, again depending on the wind direction. Several means

to alleviate the wind loads at the edges were presented in Section 4 but even the reduced edge loads are still several times the array mid-span loads.

In the wind tunnel test, the fluctuating pressures were recorded for a finite time, averaged to obtain the steady state loads and the rms value of the variable loads calculated to obtain indications of the level of the pressures produced by the array generated turbulence. The actual rms values will be larger than those recorded because of the damping inherent in the data acquisition. However, the rms load values do give an indication of the turbulence. In general, from the test results, the front arrays received the most turbulence induced loads when a fence existed and the second arrays received the most when no fence existed.

For design purposes, envelopes of the normal force and pressure coefficients were developed, where applicable, to encompass the steady state loads for all tilt angles and wind directions. These design envelope loads are explained and presented in total in Section 7.0.

7.0 STEADY STATE WIND LOAD DESIGN GUIDELINES

Based on the results of the boundary layer wind tunnel test and the results of the theoretical study documented in reference 5, the following design guidelines are given for determining wind loading on photovoltaic flat plate arrays. The normal force and pressure coefficient guidelines were obtained by enveloping the results from the wind tunnel test and are valid for arrays with separations from 1.5C to 3.0C. Wind tunnel tests with the winds normal to the spanwise axis of the arrays were used for the guidelines. From the theoretical study and aerodynamic principles, winds normal to the spanwise axis will produce the maximum pressure loading on the arrays at locations at least two slant heights from the array side edges.

7.1 Wind Loads on Arrays Behind a Protective Wind Barrier

If a fence is used to protect the arrays in an array field, the steady state wind loading on the first arrays will be the same or less than the arrays within the field if the fence* is properly designed for wind protection. Figure 7-1a presents normal force coefficients for conditions where the first array is protected from wind loading at least as well as the arrays interior to the field. This figure can be used to calculate steady state wind forces on arrays and array supporting structure in an array field. These loads are not applicable for the structure within two slant heights from the edge. The steady state normal wind force on the array is calculated by the equation:

$$F_N = q\, S\, C_{N1} \quad - - - - (1)$$

*The fence used in this study had a porosity of 30% and a height equal to three-quarters of the array slant height. Since this study did not investigate other fence configurations, it is the designer's responsibility to assure that his fence design produces as much wind protection as the fence used in this study. There are several papers referred to in reference 5 that investigates the effects of fence porosity on the wind velocity behind the fence. In general, a porosity of from 30% to 50% produces the best wind protection. A solid fence tends to increase the turbulence compared to a higher porosity fence and also causes reversed flow behind the fence. The height of the fence is less critical than fence porosity on array loads provided that the height of the fence is near or above the array height.

where:

F_N = Steady state normal force (lbs)

q = Dynamic pressure (psf) for reference design velocity at 10 meters

S = Area of array (ft^2)

$C_{N1} = K_1 \ C_N$

= Corrected normal force coefficient

C_N = Normal force coefficient from figure 7-1a

K_1 = Scale factor to correct for array size

$$= \left(\frac{C \sin\alpha + H_0}{8 \sin\alpha + 2}\right)^{.28}$$

C = Array slant height (ft)

H_0 = Ground clearance (ft)

α = Tilt angle (degrees)

The scale factor (K_1) corrects (in an approximate manner) the wind forces for arrays whose slant height and ground clearance are different than the test array baseline size of 8 ft. slant height and 2 ft. ground clearance. This scale factor considers the difference in the wind velocity at the top of an array whose size and position is different from the baseline array relative to the wind velocity at the top of the baseline array.

Figure 7-1b presents steady state pressure coefficients normalized to the normal force coefficients at corresponding tilt angles. The steady state pressure distributions on the arrays behind a fence are essentially constant or vary linearly (increasing from the trailing edge to the leading edge) for all tilt angles. The pressures can be calculated by the equation:

$$p = qC_{p1} \text{ - - - - (2)}$$

where:

p = Steady state local pressure loading (psf)

q = Dynamic pressure (psf) for reference design velocity at 10 meters

$C_{p1} = K_1 C_p$

= Corrected pressure coefficient

K_1 = Scale factor to correct for array size and ground clearance

$$= \left(\frac{C \sin\alpha + H_0}{8 \sin\alpha + 2}\right)^{.2}$$

C = Array slant height (ft)

H_0 = Ground clearance (ft)

α = Tilt angle (degrees)

$\frac{C_p}{C_N}$ = Normalized pressure coefficient from figure 7-1b

C_N = Normal force coefficient from figure 7-1a

The steady state pressure loading is valid for all flat plate array panels in an array field except for panels within two slant heights from the edge. Where leading edge (L.E.) and trailing edge (T.E.) are given, the pressure loading is assumed as linearly increasing from the trailing edge value to the leading edge value. It should be noted that some conservatism is designed into the panel pressure loading by assuming a flat or linearly varying pressure coefficient. This conservatism can be seen in the normalized pressure coefficient shown in Figure 7-1. If the pressure coefficient distribution was matched exactly, the C_p/C_N curve would be equal to 1.0. Thus, conservatism of from 10 to 20% is built into the pressure loading by simplifyng the distribution.

The use of these design guidelines can best be illustrated by the following example:

1. Determine the design normal force and pressure distribution on an array interior to an array field for a 90 mph wind approaching the front of the array and at sea level. The array slant height is 8 feet, ground clearance is 2 feet, span is 10 feet, and the tilt angle is 30 degrees.

q = wind dynamic pressure at 10 meter height

$= .5\rho V^2$

$= .5\ (.002378)(131.23)^2$

$= 20.5$ psf

S = area of array

$= 8 \times 10$

$= 80\ ft^2.$

K_1 = Scale factor

$$= \left(\frac{8 \sin (30^0) + 2}{8 \sin (30^0) + 2}\right)^{.28}$$

$$= 1.0$$

C_N = .16 from figure 7-1a

$C_{N1} = K_1 C_N$

$$= .16$$

To calculate the normal force

$$F_N = qSC_{N1}$$

$$= 20.5 \times 80 \times .16$$

= 262.4 lbs. force normal to the array (30° from vertical) and in downward direction per figure 7-1a

To calculate the pressure distribution along the chord

$$p = q\, C_{p1}$$

$$C_{p1} = K_1 \frac{Cp}{C_N} C_N$$

From figure 7-1b

$\frac{C_p}{C_N}$ = 1.18 at trailing edge (top edge for wind from front)

= 1.26 at leading edge (bottom edge for wind from front)

C_N = .16 from figure 7-1a

K_1 = 1.0

therefore

C_{p1} = 1.18 x .16

= .19 trailing edge

and C_{p1} = 1.26 x .16

= .20 leading edge

The local pressure is

p = 20.5 (.19)

= 3.9 psf at trailing edge (downward direction per figure 7-1b)

p = 20.5 (.20)

= 4.1 psf at leading edge (downward direction per figure 7-1b)

Therefore, the pressure varies on the panel from 4.1 psf at the leading edge (lower edge) to 3.9 psf at the trailing edge (upper edge) for a 90 mph wind approaching the front of the array field.

7.2 Wind Loads on Arrays Without a Protective Wind Barrier

If an array field is to be designed without a protective fence, the first two arrays from the front and back need to be designed for larger wind loads than in Section 7.1. All remaining arrays interior to these two front arrays can be designed to withstand wind loads given in Figure 7-1. The maximum normal wind forces on the first two arrays from the front and back of the array field can be calculated similarly to those in Section 7.1 using the normal force coefficient envelope and the delta pressure coefficient presented in Figure 7-2a and b. As an example:

- Calculate the normal force and pressure on the first array for the same conditions as in the example in 7.1.

To calculate the normal force:

From before

$q = 20.5$ psf

$S = 80.\ ft^2$

$K_1 = 1.0$

From figure 7-2a

$C_N = .65$

Therefore the normal force on the array is

$F_N = 20.5 \times 80 \times .65$

$= 1066$ lbs in downward direction per figure 7-2a

C-2

To calculate the panel pressure

$\frac{C_p}{C_N}$ = 0.8 at trailing edge

= 1.28 at leading edge

C_N = .65

p = 20.5 x 0.8 x .65

= 10.7 psf at trailing edge

= 20.5 x 1.28 x .65

= 17.1 psf at leading edge

Therefore, the pressure varies from 17.1 psf at the leading edge to 10.7 psf at the trailing edge with the pressure in downward direction per figure 7-2b.

7.3 Array Edge Wind Loads

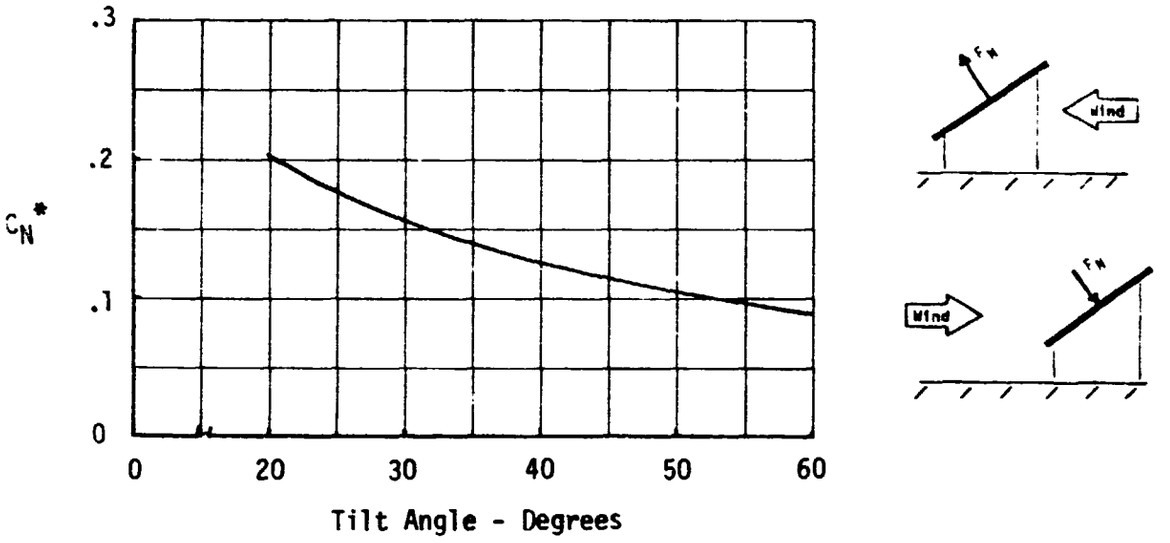
The wind loads within two slant heights from the side edges have a different character than those within the array field because of the corner vortices. This test program was primarily directed towards the wind loads within an array field and only a limited amount of testing was devoted to the edge loads. Consequently, a comprehensive set of wind load guidelines for the edge loads cannot be detailed from the test data. However, the following normal force coefficients and pressure coefficients are given as guidelines and can be used in the design of the edge arrays if the following design conditions are satisfied.

Array tilt angle ≃ 35°
Fence design details, if applicable, as footnoted in Section 7.1
Fence corner modifications, if applicable, as shown in configuration 5, Figure 4-16

The normal force coefficients and delta pressure coefficients for arrays within two slant heights from the side edge of the array field and for three field configurations - no fence, fence, and fence with the corners modified - are shown

in Figures 7-3a to 7-3c. These coefficients are based on the test data located .15 chord lengths from the side edge. Since the loads decrease with distance in from the edge, these coefficients are conservative if used over the two slant heights from the side edge. In addition, the pressure distributions show high pressure coefficients located within 5% to 10% from the upper edge. Since a structural support is likely to be located on the leading and trailing edges to support the arrays, these high pressure loads, within 10% of the top edge, may not be critical to the design of the panels and may not need to be considered in their design. The effect of this high pressure loading is in the normal force coefficient calculation which is a parameter used to size the supporting structure.

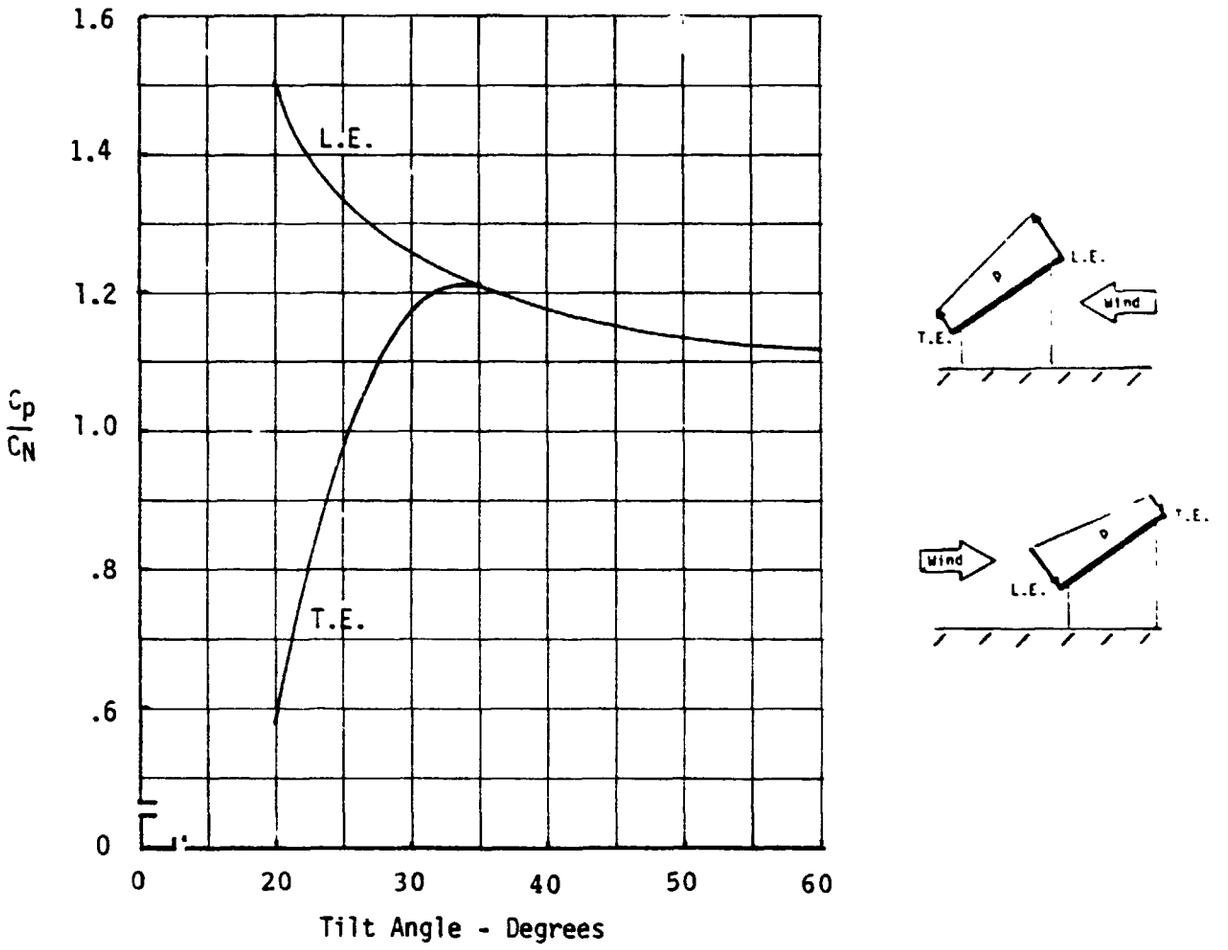
The application of these coefficients is similar to the examples shown in Section 7.1 and 7.2, except that C_p replaces $\left(\frac{C_p}{C_N}\right)(C_N)$ in the examples.



• C_N based on wind reference velocity at 10 meters

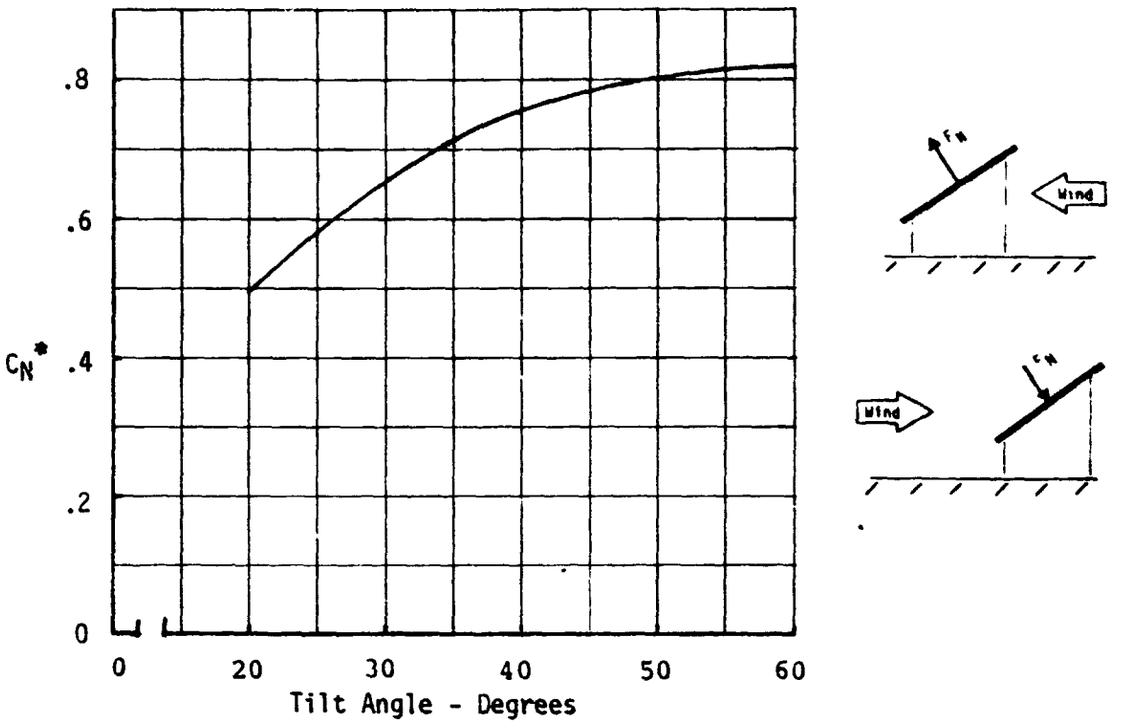
exception: not valid within two slant heights from the side edges

Figure 7-1a. Steady State Wind Normal Force Coefficient Envelope for Arrays Within an Array Field or Behind a Protective Wind Barrier.



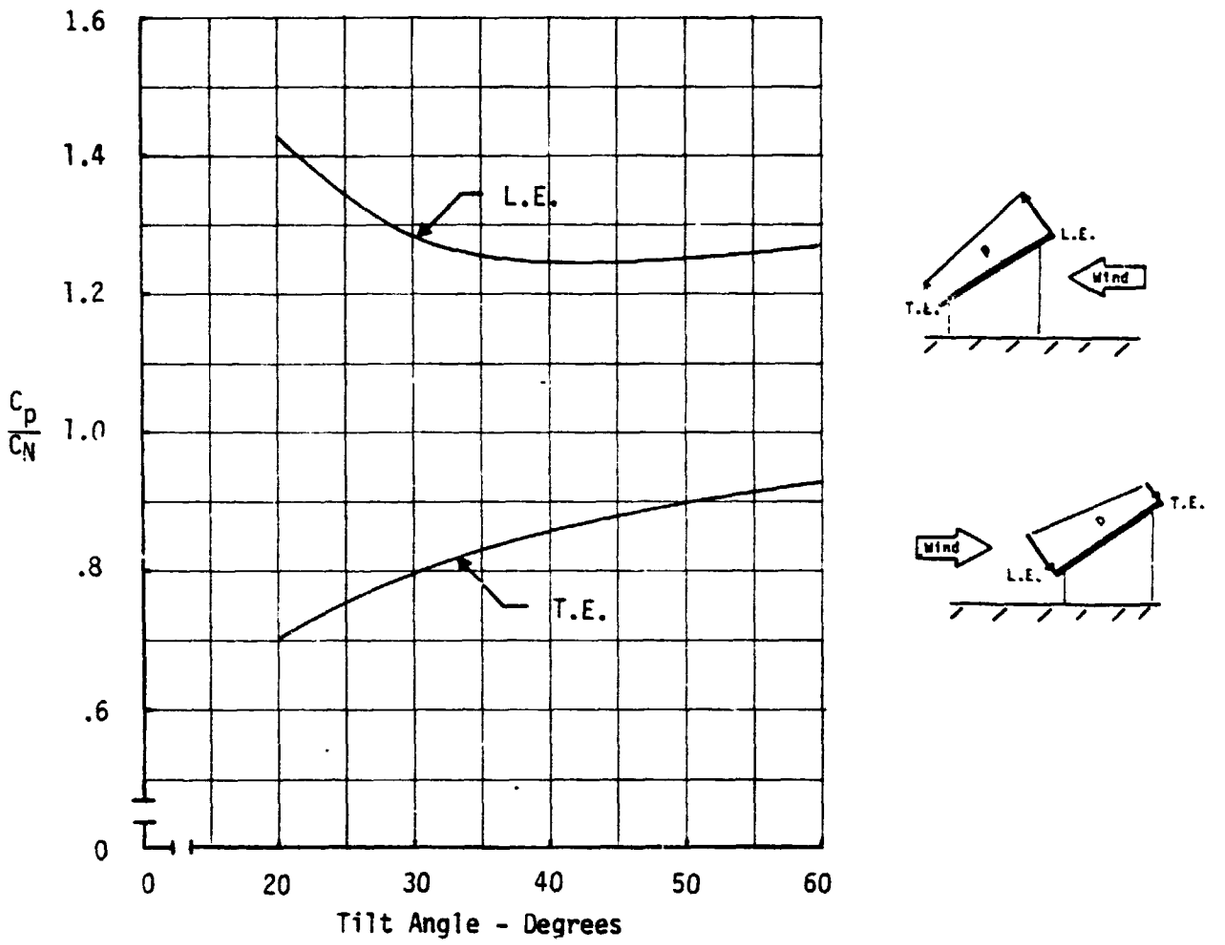
exception: not valid within two slant heights from the side edges

Figure 7-1b. Steady State Wind Normalized Pressure Coefficient Envelope for Arrays Within an Array Field or Behind a Protective Wind Barrier



- C_N based on wind reference velocity at 10 meters
  exception: not valid within two slant heights from the side edges

Figure 7-2a. Steady State Wind Normal Force Coefficient Envelope for the Two Outer Boundary Array Rows in an Array Field Unprotected from the Wind



exception: not valid within two slant heights from the side edges

Figure 7-2b. Steady State Wind Normalized Pressure Coefficient Envelope for the Two Outer Boundary Array Rows in an Array Field Unprotected from the Wind

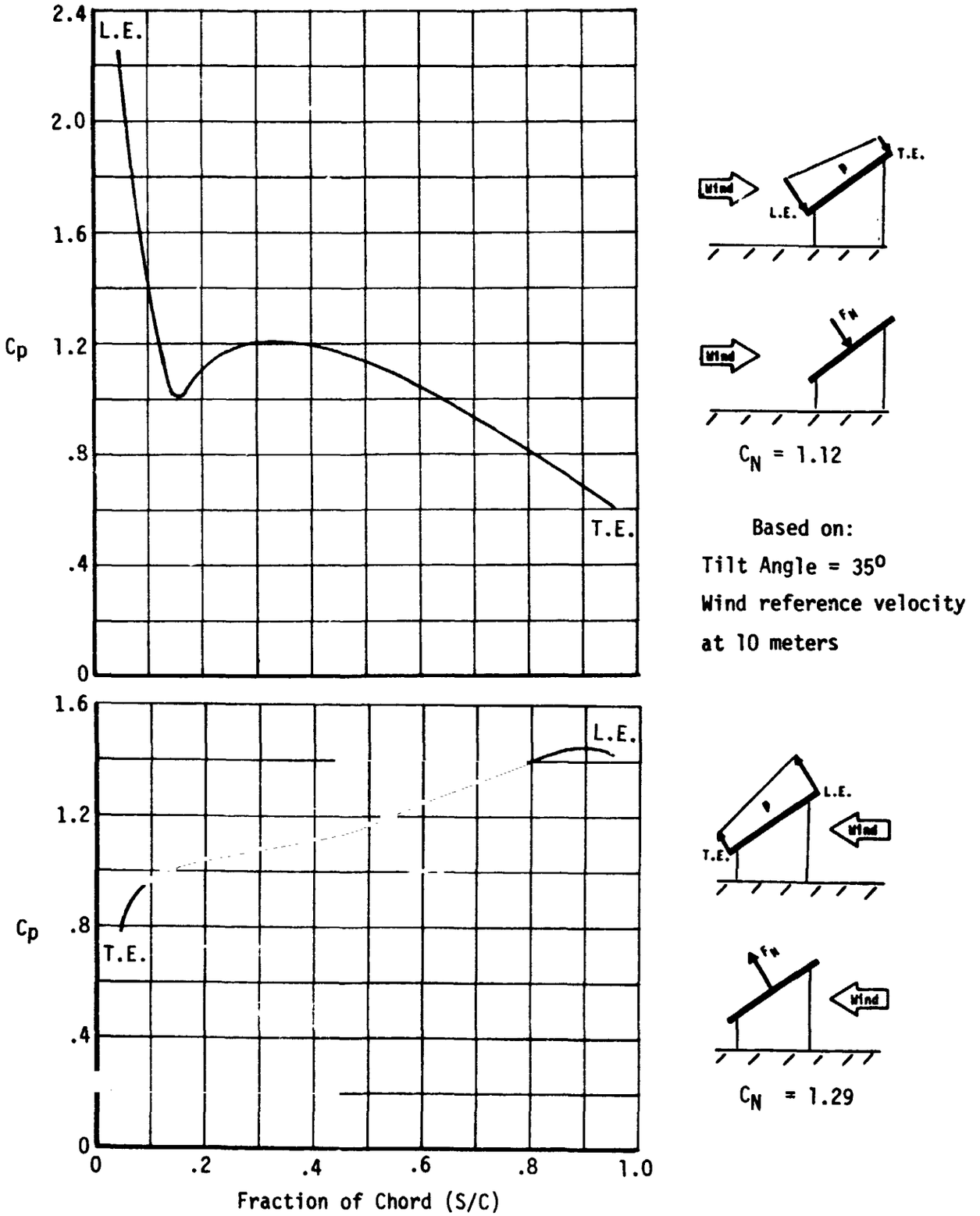


Figure 7-3a. Steady State Wind Pressure Coefficient and Normal Force Coefficient Guidelines for Edge Arrays in an Array Field (No Fence)

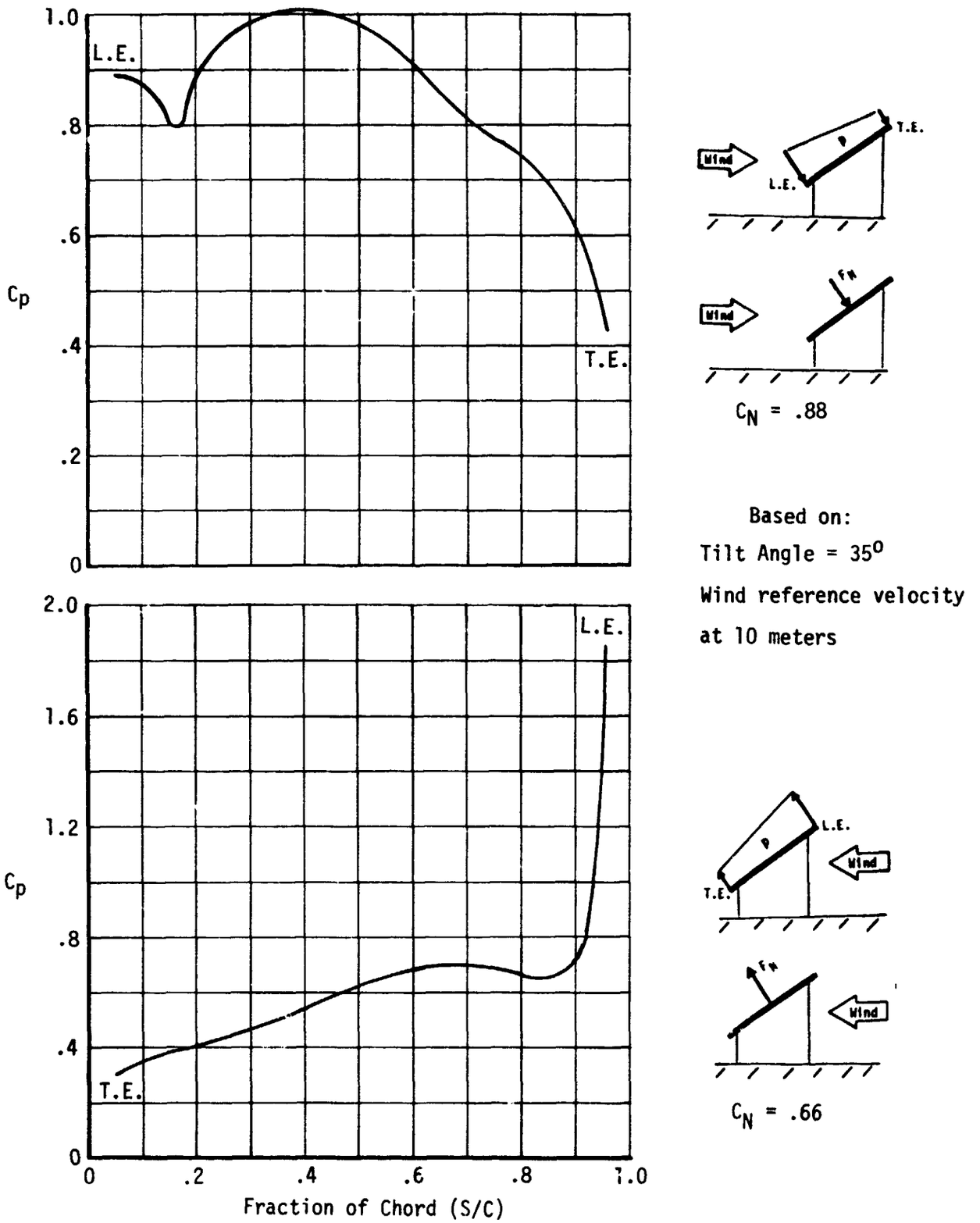


Figure 7-3b. Steady State Wind Pressure Coefficient and Normal Force Coefficient Guidelines for Edge Arrays in an Array Field (Fence)

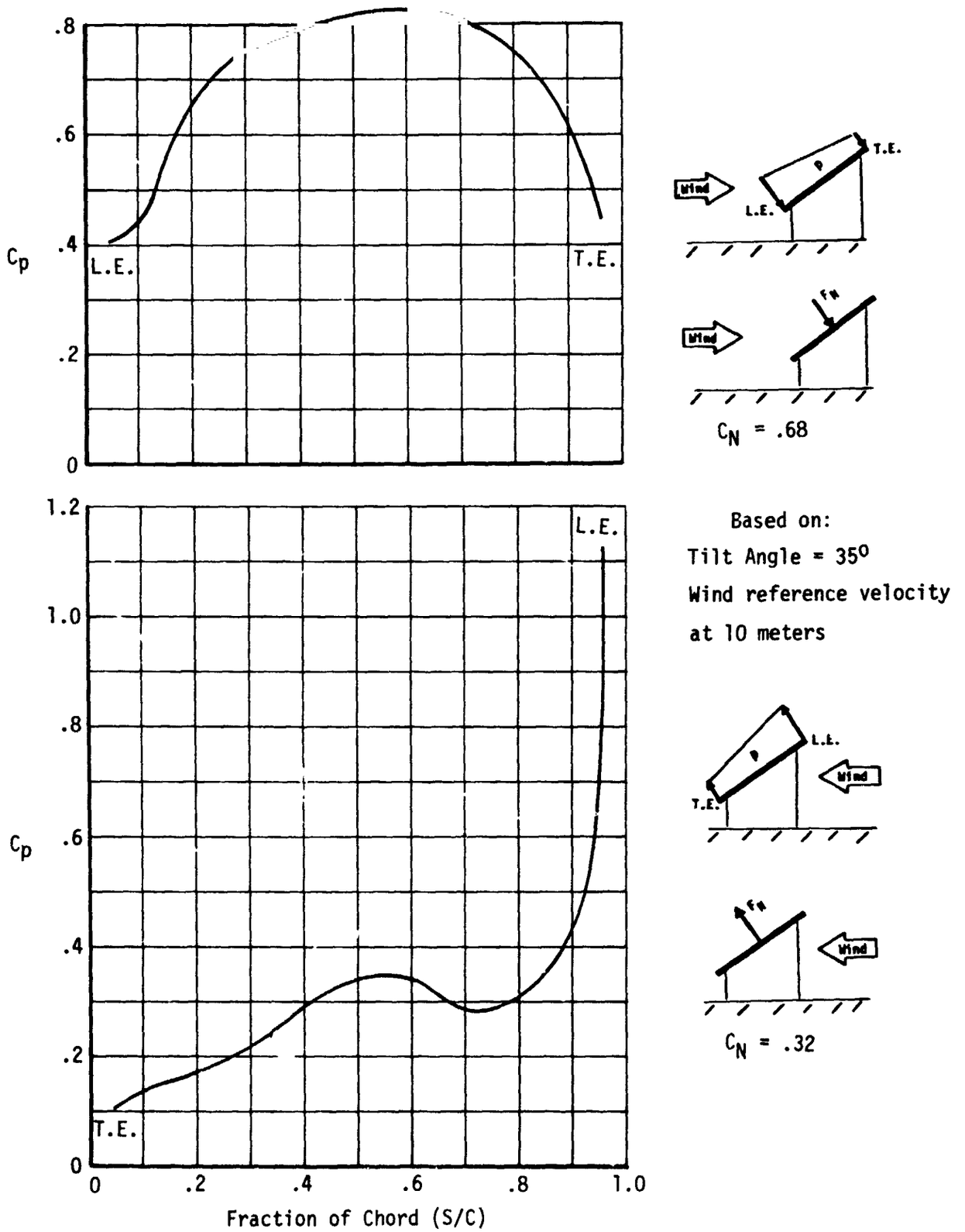


Figure 7-3c. Steady State Wind Pressure Coefficient and Normal Force Coefficient Guidelines for Edge Arrays in an Array Field (Fence with Modified Corners)

8.0 NEW TECHNOLOGY

No reportable items of new technology have been identified by Boeing during the contract of this work.

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APPENDIX

WIND LOADS ON FLAT PLATE PHOTOVOLTAIC ARRAY FIELDS

PHASE III - FINAL REPORT

WIND TUNNEL TEST REPORT

Prepared for Jet Propulsion Laboratry
under Contract No. 9654833

Boeing Engineering and Construction Company
A Division of The Boeing Company)
Seattle, Washigton 98124

WIND PRESSURES AND FORCES ON FLAT-PLATE PHOTOVOLTAIC SOLAR ARRAYS

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CER80-81NH-JAP-MP-JEC13

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LIST OF SYMBOLS

Symbol	Definition
c	chord length of solar array
C_N	normal force coefficient
C_p	pressure coefficient
ΔC_{pmax}	maximum pressure difference
D	characteristic length in Reynolds number
FC	fence configuration
F(N)	velocity spectrum
H	ground clearance of solar array
H_{af}	height of additional fence
H_f	height of fence
H_s	height of spoiler
MC	model configuration
N	frequency
P	pressure
P_{af}	porosity of additional fence
P_f	porosity of spoiler
q_∞	dynamic pressure measured outside simulated boundary layer
q_{ref}	reference dynamic pressure
s	chordwise position--the edge where $s = 0$ corresponds to the leading edge for $\alpha \geq 90°$ and the trailing edge for $\alpha < 90°$
s_{max}	chordwise position where maximum pressure difference is observed
U	velocity of wind
U_{ref}	reference velocity of wind
U_{rms}	variance of fluctuating velocity

LIST OF SYMBOLS (Cont.)

Symbol	Definition
U_δ	velocity of wind at simulated boundary layer height
U_∞	velocity of wind measured outside simulated boundary layer
x	separation distance of solar array
x_f	seqaration distance between fence and solar array
α	angle of attack of solar array
δ	height of simulated boundary layer
ν	kinematic viscosity of air
ρ	density of air

1. INTRODUCTION

An important factor influencing the design and subsequently cost of large photovoltaic power generating systems, which involve a large number of simple structural elements and supports, is the magnitude of wind-induced loads. It has been recognized that usual design procedures, like the ANSI code (A58.1 - 1972) for example [1], are not adequate for accurate wind design of these repetitive, photovoltaic arrays with their distinctive configuration, orientation and limited height. In fact, the information presently available in the technical literature is not sufficient even for an optimum design of the structure for supporting a single photovoltaic array. Wind loads on individual arrays at different locations in a large array field are more difficult to determine as they vary according to the array location in the field and wind direction in a complicated manner. Higher loads are expected to exist at the edges of the field, but those can be reduced by carefully designed fences or barriers.

A theoretical study of the aerodynamics of flat plate arrays was recently made by Ronald D. Miller and Donald Zimmerman [2] at the Boeing Engineering and Construction Company (BECC). The study identified the basic features of the flat plate array loading which can be used for design purposes. It has been recognized by the authors, however, that theoretically derived design criteria are conservative and a wind-tunnel study of the wind loadings of such arrays was therefore recommended.

This report describes the experimental study of wind loading on flat plate photovoltaic arrays and array fields performed in the Meteorological Wind Tunnel of the Fluid Dynamics and Diffusion Laboratory at Colorado State University for BECC. The experimental program was developed in cooperation with Ronald D. Miller (BECC). The program's objectives were to determine the pressure distribution and forces acting on photovoltaic arrays for different angles of attack, two wind directions, head on winds and cornering winds (WD = 0° and 45° as defined in Figure 11) and two velocity profiles, as well as to investigate the effect of different fences and barriers on the wind loading at the edges and corners of an array field.

The wind-tunnel results were analyzed and the effect of the various parameters are presented in a form permitting calculation of the wind loading on prototype photovoltaic structures.

In view of the large number of data points collected in the report, it was found convenient to present most of the pressure measurements in a separate Appendix. The main report includes, however, a full description of the various runs and the calculated values of the normal force coefficient, the maximum local pressure coefficient and its location for each run in a tabulated form (Table 1 to 16) as well as a graphical representation of these data.

2. EXPERIMENTAL CONFIGURATION

2.1 Wind Tunnel

The Meteorological Wind Tunnel of the Fluid Dynamics and Diffusion Laboratory at Colorado State University (Figure 1) is characterized by a long (96 ft), slightly diverging test section, 6 ft-8 in. wide (at the turntable) and 6 ft high. The ceiling is adjustable to avoid pressure gradient along the test section. This facility is driven by a 400 HP variable pitch propeller with air flow velocity varying continuously from 0.5 fps up to 100 fps.

2.2 Flow Simulation

The primary consideration in modeling wind forces on structures in a wind tunnel is that the wind characteristics in the tunnel simulate natural boundary-layer winds at the actual site. In general this requires that the vertical distribution of mean velocity and turbulence in the wind tunnel boundary layer match those at the site and that the Reynolds numbers of the model and the prototype be equal. In addition, the small-scale model must be geometrically similar to its prototype. A detailed discussion of these requirements and their implementation in the wind-tunnel environment can be found in references 3, 4, and 5.

The construction of a 1:24 scale model of a prototype structure and its immediate surroundings (in this case, a flat, open area), submerged in a turbulent boundary layer of the Meteorological Wind Tunnel, shown in Figure 1, satisfies all the above criteria except those of equal Reynolds numbers and similarity of turbulence intensity and scale.

The kinematic viscosity ν appearing in the Reynolds number UD/ν is the same for both the tunnel and the full-scale structure. Because of this, the wind-tunnel air speed, U, would have to be 24 times the full-scale value if the model and prototype Reynolds numbers are to be equal. Testing at such high wind speeds is not feasible. However, for Reynolds numbers larger than 2×10^4 for sharp-edged structures where the flow separation point is fixed, there is no significant change in the values of aerodynamic coefficients as the Reynolds number increases. Since typical Reynolds number values are 10^6-10^7 for high-wind, full-scale flow and about 5×10^4 for wind-tunnel flows, acceptable flow similarity is achieved without equality of Reynolds numbers.

At a model scale of 1:24, the larger scales of turbulence in the atmospheric boundary layer are not simulated in the wind-tunnel flow. However, because the integral scale of the turbulence in the wind tunnel was 2 to 3 times the largest dimension of the model collector, the influence of the scale of turbulence is not expected to be significant [6]. Evidence exists which demonstrates some influence of turbulence intensity on drag of flat plates [6,7,8]. Because the turbulence intensity difference between the current simulation and a simulation with complete similarity of turbulent structure is not large, the effects due to turbulence intensity should be small. For cases where an upstream collector disturbs the approach flow, turbulence characteristics are dominated by the wake characteristics of the upstream object and possible differences due to turbulence intensity should further decrease.

An important factor which affects the wind loadings is the structure of the atmospheric boundary layer near the ground. The boundary layer which develops over a flat terrain is usually characterized by a non-uniform velocity profile which is closely described by a 1/7th power law mean velocity distribution. It is impossible to simulate in a wind tunnel the entire atmospheric boundary layer at the desired model scale for this study (1:24). One can, however, simulate the lower part of the atmospheric boundary layer in a 45 in. deep wind tunnel boundary layer [3-5].

The shape of the 1/7th power law boundary layer, which will be referred to as the Nonuniform flow 1 was obtained by means of selected roughness on the wind-tunnel floor upstream of the model. Forty ft of test section length were covered with 1 in. cubes followed by a 40 ft length of pegboard with 0.25 in. diameter pegs projecting 0.5 in. above the pegboard base (see Figure 2). In addition to the floor roughness, four triangular spires were installed at the test section entrance in order to get a thicker boundary layer than would otherwise be obtained. The normalized velocity and turbulence profiles of this boundary layer are shown in Figure 3 and data is tabulated in the Appendix. Turbulence intensity is the root-mean-square of the longitudinal fluctuating velocity divided by the local mean velocity. The turbulence intensity reached values of 20 percent in the boundary layer.

The spectrum of longitudinal velocity fluctuations is shown in Figures 4 and 5, including two suggested analytical models of velocity spectra for the atmosphere by Harris (9) and Davenport (10).

The spectra were obtained at 4 and 8 in. above the wind-tunnel floor. In this plot N is frequency, F(N) is the velocity spectrum, U^2_{rms} is the variance of the fluctuating velocity, δ is the simulated boundary layer height (900 ft full-scale), and U_δ is the velocity at δ. The region where turbulence structure may be important to the determination of mean loading ranges upward from abscissa values of about 20 for wind speeds up to about 30 mph at 30 ft. Thus, the simulation has a turbulence intensity somewhat too high in the frequency range affecting mean wind loading on the model and too low in the low-frequency gusts.

The "Uniform Flow" velocity profile was obtained by placing the model at the upstream end of the test section. The measured velocity profile at that station, shown in Figure 6, indicates that a very thin boundary layer has developed along the short upstream section. Its effect on the wind loading on elevated panels is expected, however, to be small. A typical velocity distribution across the tunnel is shown in Figure 7.

2.3 The Models

Aluminum models of the flat photovoltaic array field having a geometrical scaling of 1:24 (Figure 2) and 1:12 (Figure 8) were constructed. (The 1:12 model was used in a limited number of tests only).

The chord size of the 1:24 model was c = 4 in., corresponding to a prototype value of 8 ft. Rows of pressure taps were drilled on each face of the array as shown in Figure 10. Each pressure tap represents the average pressure along a small section of the chord. The row at the edge of the array was used to study the wind loading at the side edge of the field.

To study the wind loadings on an array located in an array field, 1:24 scale models of array rows were constructed, which could be placed on the wind tunnel floor at desired locations to simulate the relative position in the field on the array with the pressure taps on which the wind loading was measured. Figure 2 shows a photograph of a 1:24 model of a photovoltaic array field in the wind tunnel. Figure 8 shows a photograph of the 1:12 model.

The fence was simulated in the model by perforated sheet metal, with holes of 3/16 in. diameter, having the same porosity (about 30 percent) as the prototype fence (see Figure 9).

3. INSTRUMENTATION AND DATA ACQUISITION

3.1 Measurements of Flow Characteristics

Velocity and turbulence intensity profiles for the approach flow under test conditions were made at the locations of the model in the tunnel (turntable) with the model removed.

The measurements were made with a Thermosystems Model 1050 constant-temperature anemometer with a 0.001 in. diameter platinum film sensing element 0.02 in. long. The sensing probe was attached to a vertical traverse to measure velocities and turbulent intensities at different heights. Output was processed through the Laboratory on-line digital data acquisition system.

Tests were made at only one wind speed in the tunnel around 50 ft/sec. This wind was sufficiently high to ensure Reynolds number similarity between the model and prototype.

The reference velocity at each test was measured using a pitot-static tube which was connected to a Setra differential pressure transducer. The pitot tube was placed outside the simulated boundary layer and recorded the value of $q_\infty = \rho U_\infty^2/2$, where ρ is the mass density of the air. The ratio of the reference velocity U_{ref}, at a prototype height of 10 m above the ground, to U_∞ was determined from the velocity distribution of the boundary layer according to the scale of the model. The value

$$q_{ref} = \frac{\rho U_{ref}^2}{2} = \frac{\rho U_\infty^2}{2} \left(\frac{U_{ref}}{U_\infty}\right)^2 \qquad (1)$$

at the height corresponding to 10 m above ground in the prototype was later used in calculating the dimensionless force and moment coefficients of the array, so that it was not necessary to measure the density of the air.

3.2 Pressure Measurements

Each pressure tap was connected through a pressure switch to a calibrated Setra differential transducer which measured the value of the local pressure above the ambient pressure at the test section away from the model. The output from the pressure transducers was recorded for 16 seconds at a 250 sample per second rate. The data was then analyzed by a Hewlett-Packard System 1000 minicomputer under program control and recorded. The minicomputer calculated the local pressure coefficients and using the reference total value q_{ref}, at 30 ft prototype height,

$$C_p = \frac{P}{q_{ref}} \tag{2}$$

3.3 Normal Force Calculations

The local force per unit area acting on each section of the array is equal to the difference in the pressures measured at the center of that section on the opposite faces of the array. The magnitude of this pressure difference is

$$\Delta p(s) = P(s)_{\text{lower face of array}} - P(s)_{\text{upper face of array}} \tag{3}$$

where s designates the position of the section as defined in Figure 11. A positive value of $\Delta p(s)$ will thus correspond to a

normal net force per unit area with an upward component as shown schematically in Figure 11.

The dimensionless local pressure difference is defined as

$$\Delta C_p = \frac{\Delta P}{q_{ref}} . \tag{4}$$

The maximum value of this coefficient, $\Delta C_{p_{max}}$ is of particular interest. The normal force N acting on the entire array can be calculated by integrating the value of $\Delta p(s)$ over the cord. Similarly, the normal force coefficient C_N is given by

$$C_N = \frac{N}{c} = \frac{1}{c} \int_o^c \Delta C_p(s)\, ds \tag{5}$$

The direction of a positive normal force is shown in Figure 11. In most cases one would expect to find negative values of C_N for $\alpha > 90°$.

4. PRESENTATION AND ANALYSIS OF THE EXPERIMENTAL DATA

4.1 Single Array Tests

Typical records of the pressure distribution on a single photovoltaic array for head-on winds (WD = 0°) in the uniform flow are shown in Figures 12-14.* The solid lines in Figure 12 show the local pressure coefficient distributions on the upstream face of the panel. Positive values are usually recorded on the upstream face. The pressure coefficients on the downstream face, marked by dashed lines, are negative and hardly vary across the panel, indicating a flow separation, which was observed in the flow visualization study for both the single array and many of the arrays in an array field, see for example Figure 31. The shape of the pressure distribution curves on the upstream face of the panel is almost symmetric for $\alpha = 90°$, but it becomes more and more skewed as the angle of attack decreases (Figure 12) or increases (Figure 13). Figure 14 shows the same data but for a large ground clearance, $H/c = \infty$ (actually measured at $H/c = 1.7$).

Comparing Figures 12 and 14 one finds that the pressure distribution on the upstream face of the panel is not affected to a large extent by the ground clearance. The back pressure, on the other hand, appears to change significantly. A value of $C_p \tilde{=} -1.35$ was recorded for $\alpha = 90°$, $H/c = \infty$, whereas a value of $C_p = -0.75$ was recorded for the same angle of attack with a ground clearance of $H/c = 0.25$. This reduction of the back pressure reduces significantly the normal force acting on the plate. Figure 15 shows the absolute values of

*Unless explicitly stated, the data refers to the measurements at the center of the array (see Figure 10).

the normal force for all the single array tests in a uniform flow. Evidently, the same effect is apparent at all angles of attack.

The reduced drag at small ground clearances may be due to the changes in the wakes caused by the reduction in the eddy size downstream of the panel. It should be recalled that the approach velocities in these tests are independent of height. The complicated nature of the interaction between these eddies and the flow, which determine the base pressure, makes it difficult to predict the value of these pressures theoretically.

The pressure distributions on a single array (H/c = 0.25) in a nonuniform flow are shown in Figures 16 and 17. A clear reduction of the pressure coefficients relative to those in the uniform flow is observed. The corresponding absolute values of the normal force for the two cases are shown in Figure 18. The average ratio $C_N(\text{uniform})/C_N(\text{nonuniform})$ is 1.43 $\pm$ 5% for these tests. This large reduction is primarily due to the relatively small wind speeds at the height of the array for the nonuniform velocity profile. It should be recalled that q_{ref} is measured at the height of 10 m above the ground whereas the center of the panel, for this value of ground clearance, varies from 3.36 ft for $\alpha = 20°$ to 6 ft for $\alpha = 90°$. The corresponding ratios of $q_{ref}/q_{\text{center of panel}}$ for these cases in a 1/7th power law velocity distribution are 1.89 and 1.61 respectively. Obviously, the difference in the dynamic pressure of the free stream at the height of the panel alone cannot fully explain the observed changes. Comparing the ratio of the back pressures in the two cases, for example, one finds an average ratio

of almost 2, whereas the ratio of the pressure coefficients on the upstream face of the panel is only around 1.5. The shape of the corresponding pressure distribution curves is also different for the two cases.

4.2 Array Field Tests

A wide field of photovoltaic arrays is characterized by the separation distance, x/c, between the array (see Figure 11) and their angle of attack. The value of the normal force acting on each array depends, of course, on its position in the field. Figure 19 shows the values of C_N for the 1st, 2nd and 5th arrays (from the upstream edge of the field) for head-on uniform winds. The magnitudes of the normal force on array No. 1 are approximately equal to their values in a single array. A drastic reduction in the magnitude of the normal forces on the 2nd and 5th arrays is observed. In some cases the direction of the normal force is reversed.

The magnitude of the forces acting on the 1st array can be reduced by building a fence or a barrier (zero porosity fence) upstream of the field. The effect of the fence depends on its porosity, height and distance. Figure 20 shows the effect of a 30 percent porosity fence and a zero porosity fence on the magnitude of the normal forces acting on the 1st and 2nd rows for different fence heights, and for an angle of attack $\alpha = 35°$. Similar results are obtained at different angles of attacks (see Figure 21).

The magnitude of the normal forces at the edge of an array, in case of head-on winds, is expected to be smaller than that of the forces acting on the center of the array. In case of side winds, however, the edges of the field and particularly the upstream corner will be exposed to higher loads. These forces can be reduced by a side fence and/or by different corner fence configurations. Figure 22 shows the corner fence configurations tested in this study. Their effect on the magnitude of the normal force for cornering winds is shown in Figure 23, which clearly exhibits the effect of properly designed fences on the normal forces at the field edges and corners.

Another way to reduce forces at the edge of the array field is to extend the array by an inexpensive stronger structure or by modifying the shape of the array edges. Several configurations, shown in Figure 24, have been studied. The fence configurations are also tabulated in Table 17. Their effect on the normal forces at the corner for $WD = 45°$ is shown in Figure 25 for $\alpha = 35°$ and $\alpha = 145°$.

An overall view of the results and the effect of the various parameters on the normal forces is shown in Figures 26-30. Figures 26 and 27 show the effect of the distance between the arrays for different angles of attack. Figure 28 summarizes the fence study for head-on winds. Figures 29-30 show the effect of the corner fences and the modifications of the array edges. All test configurations investigated for this study are listed in Table 18.

4.3 Flow Visualization

Flow visualization was used in this study to explore the structure of the flow in the array field and to obtain a better understanding of the force and pressure measurements.

Figure 31a shows the wake behind the first array in the field and behind an array in the center of the field. Clear flow separation is observed for this angle of attack and spacing. Figures 31b and 31c show the structure and the nature of the flow at different points between the arrays.

Figure 32 shows two corner fence configurations and their effect on the flow structure near the fence.

5. CONCLUSIONS

Wind loadings on photovoltaic arrays in a large array field were measured on 1:24 and 1:12 scale wind-tunnel models. The dimensionless pressure and force coefficients measured are independent of the Reynolds number and can therefore be used for the design of prototype arrays.

Considerable differences were found between the normal force coefficients for uniform and nonuniform velocity fields. The arrays at the edges and corners of the field will usually be exposed to much larger forces than the arrays in the interior of the field. These forces can be considerably reduced, however, by fences and barriers. Data is presented which make it possible to design the prototype array field and fences for given atmospheric winds.

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FIGURES

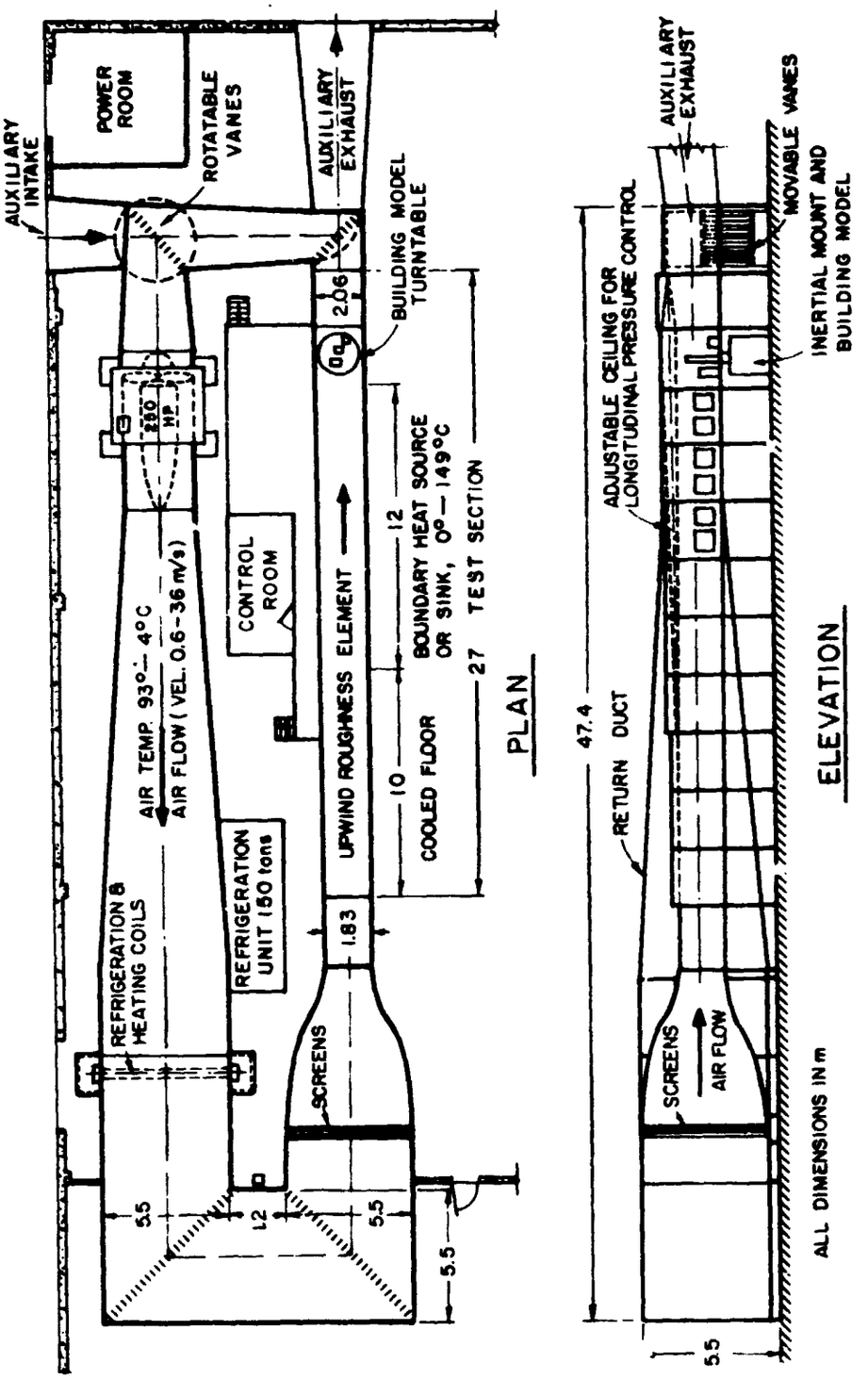


Figure 1. Meteorological Wind Tunnel

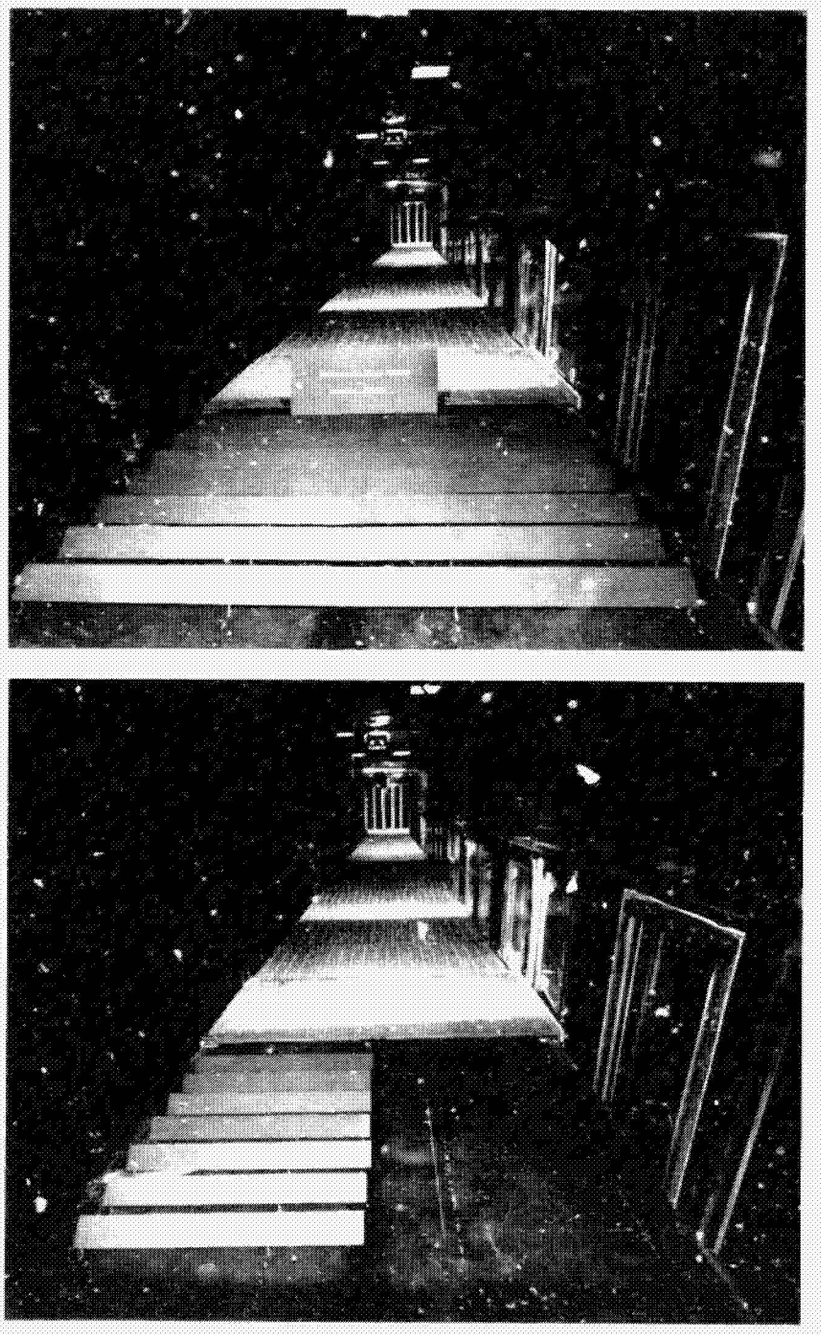


Figure 2. Array Field Models in Meteorological Wind Tunnel

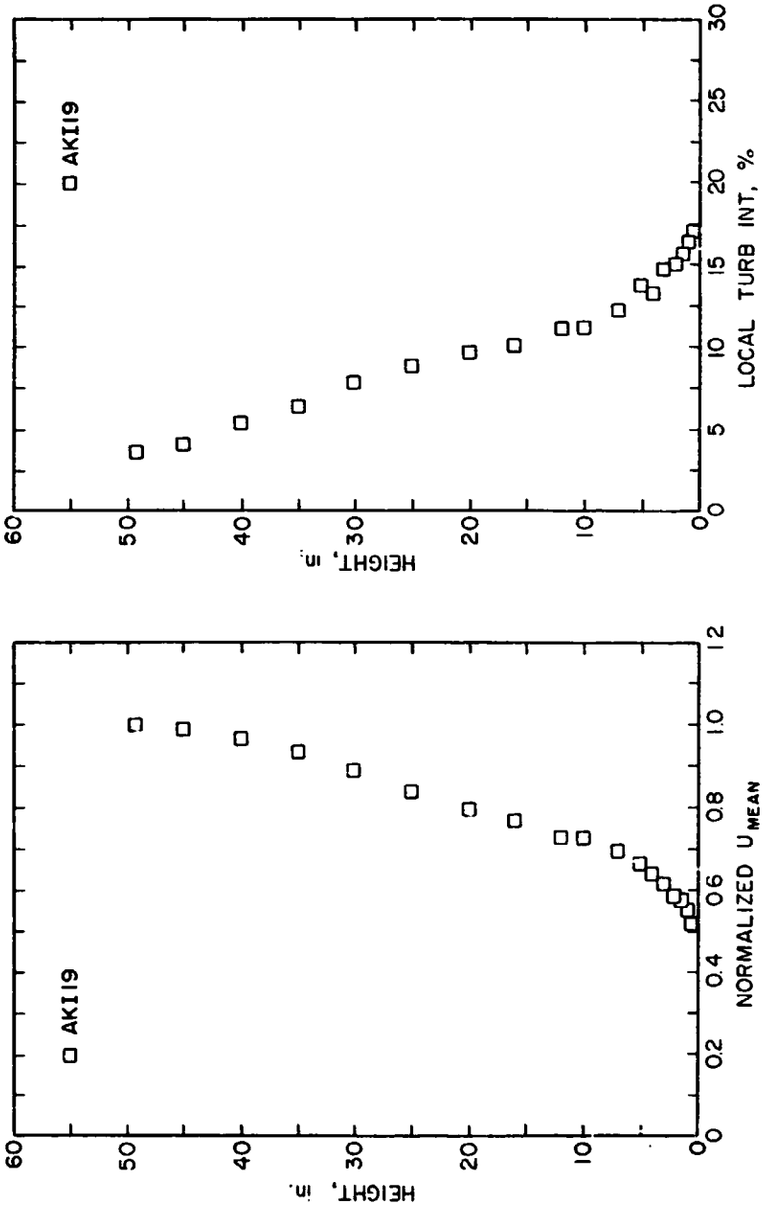


Figure 3. Mean Velocity and Turbulence Distribution in Nonuniform Flow

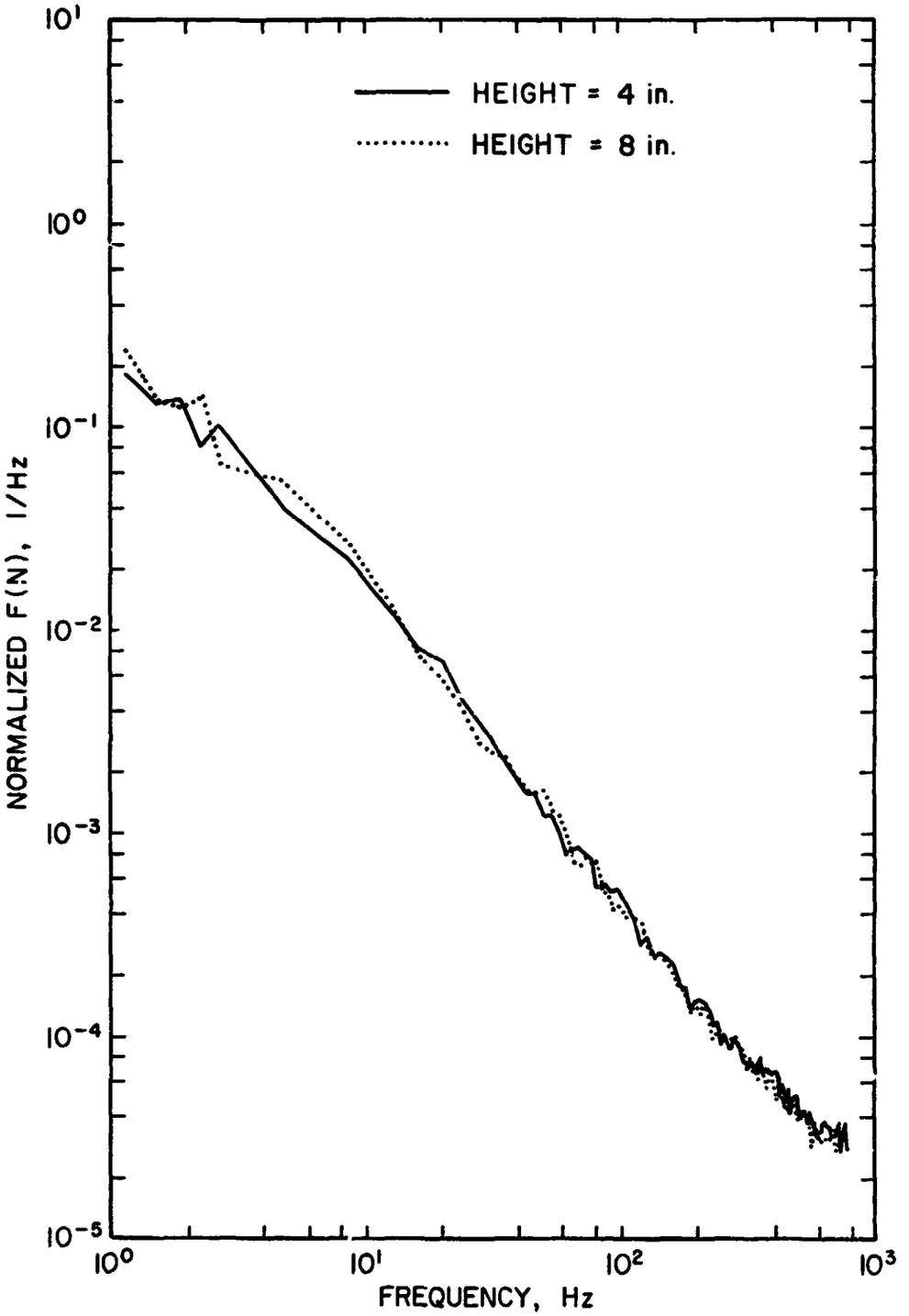


Figure 4. One Dimensional Velocity Spectra in Nonuniform Flow

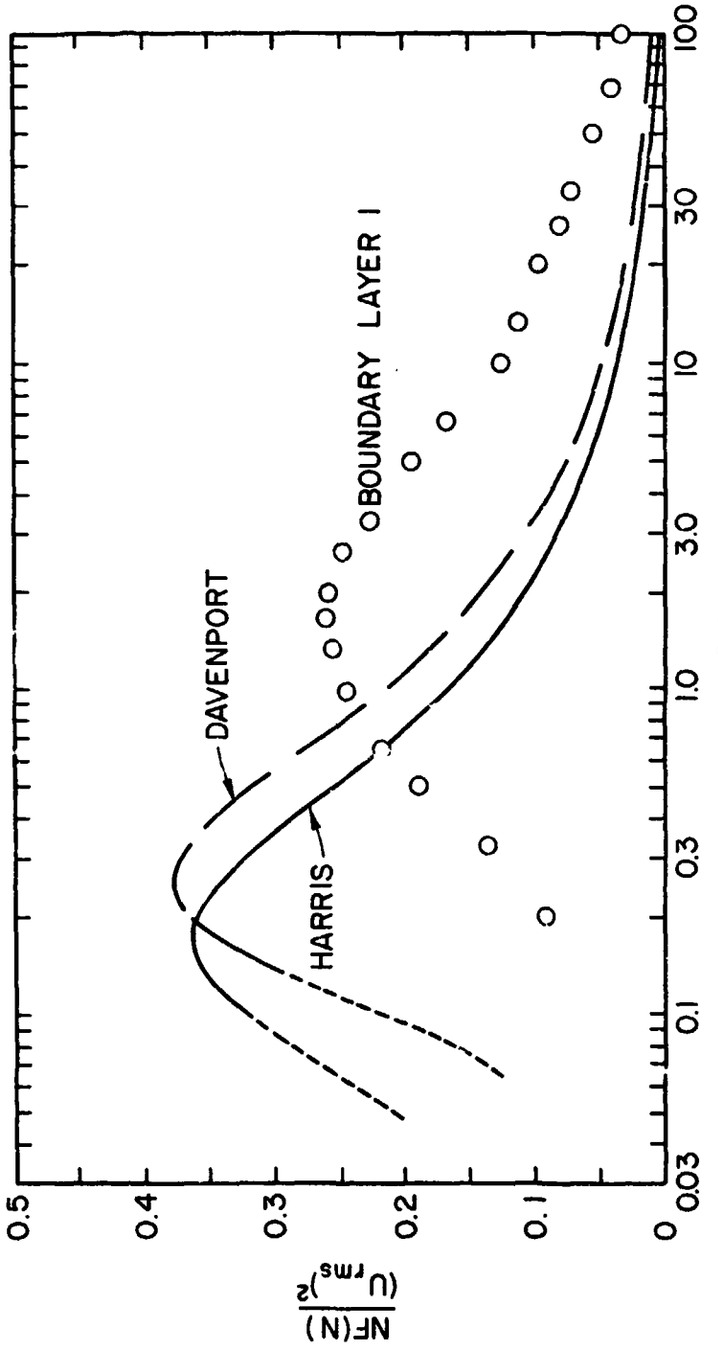


Figure 5. Turbulence Spectra in Nonuniform Flow (BL1) Compared to Atmospheric Spectra

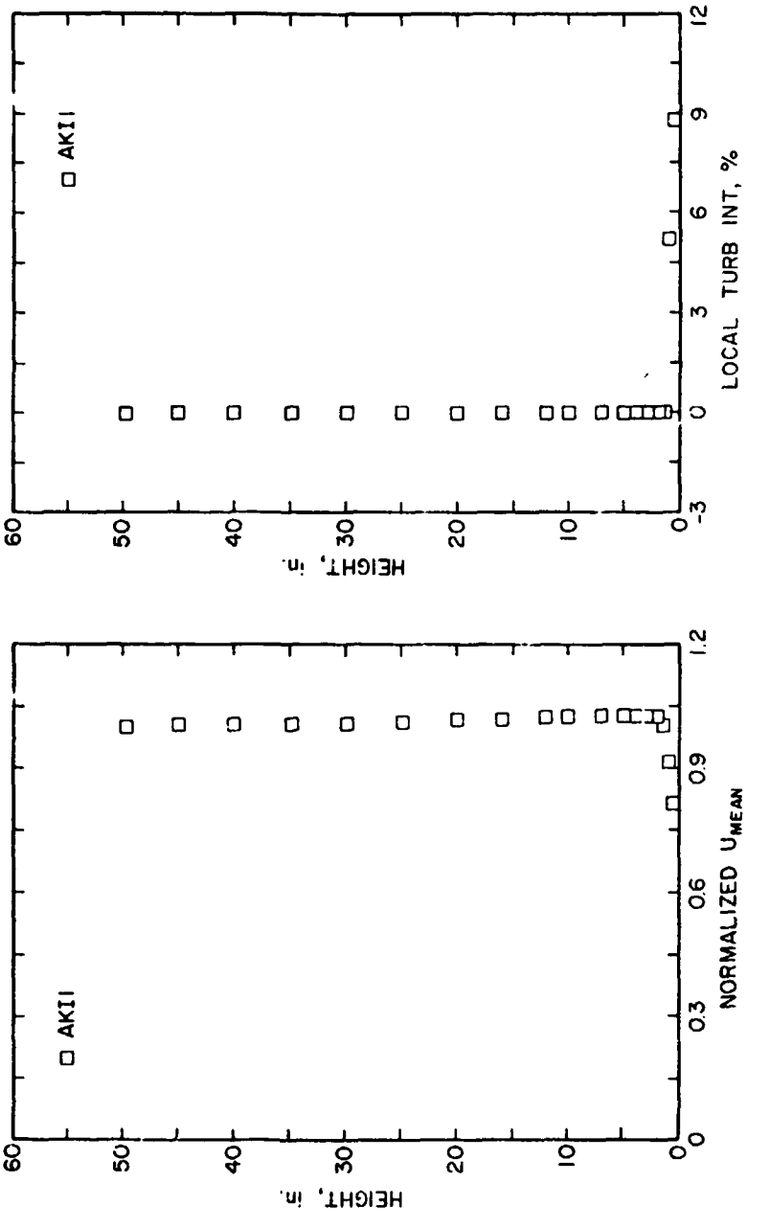


Figure 6. Mean Velocity and Turbulence Distribution in Uniform Flow

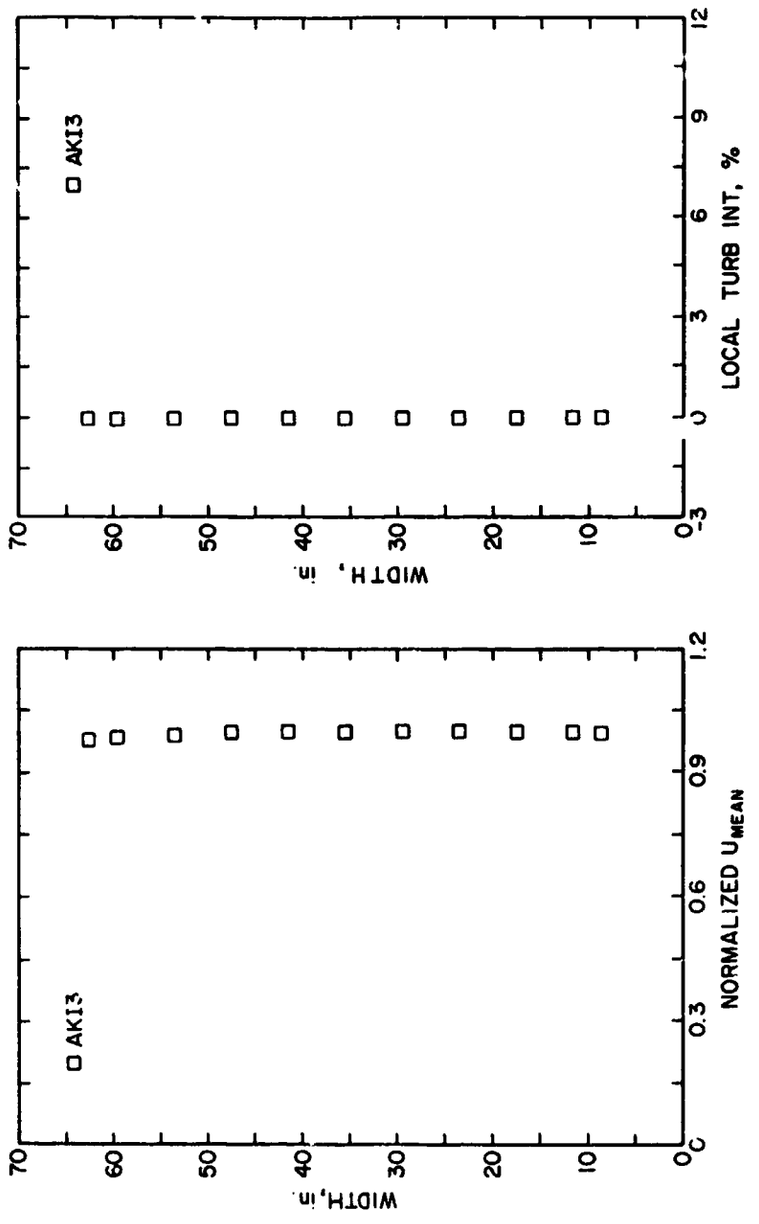


Figure 7. Typical Horizontal Velocity Distribution across Meteorological Wind Tunnel

Figure 8. 1:12 Scale Models in Meteorological Wind Tunnel

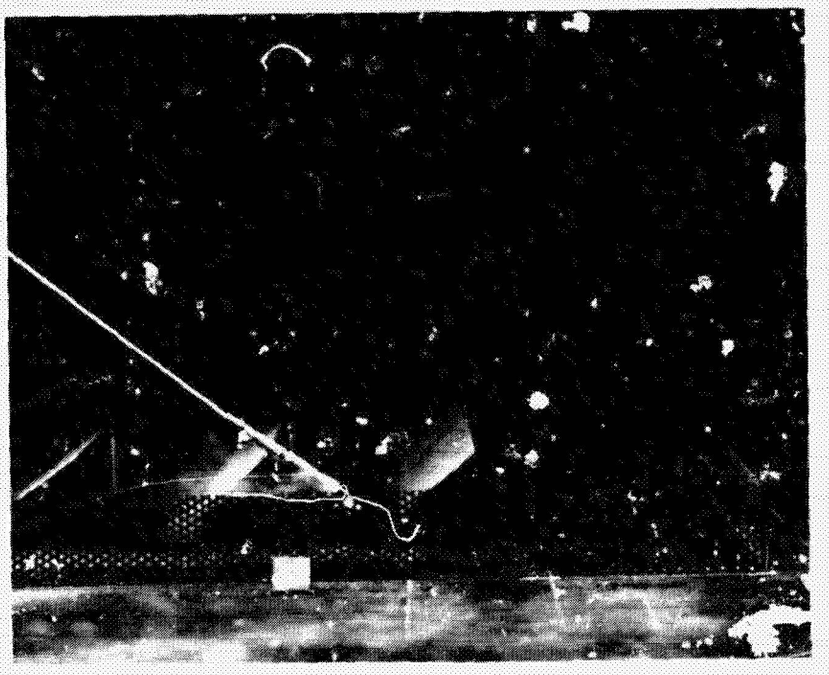
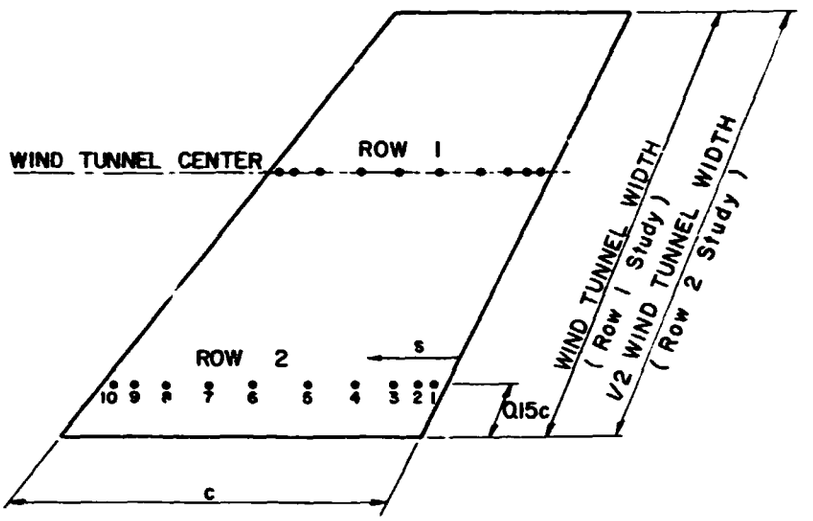


Figure 9. Photograph of Standard Corner Fence



TAP LOCATIONS - FRACTION OF CHORD s/c

	1	2	3	4	5	6	7	8	9	10
UPSTREAM SURFACE	0.052	0.102	0.172	0.272	0.432	0.592	0.752	0.852	0.922	0.972
DOWNSTREAM SURFACE	0.028	0.078	0.148	0.248	0.408	0.568	0.728	0.828	0.898	0.948

Figure 10. Position of Pressure Taps on Instrumented Model

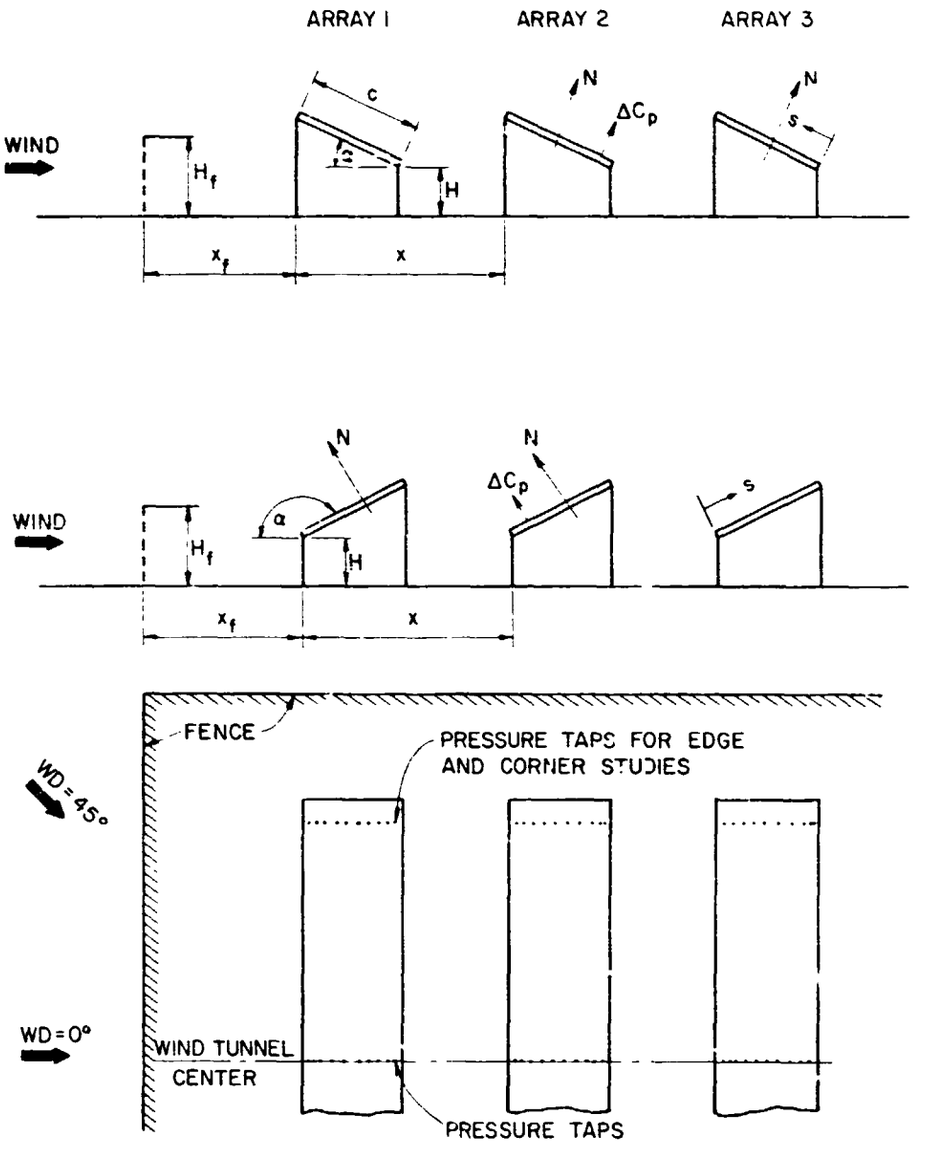


Figure 11. Schematic Description of Array Field

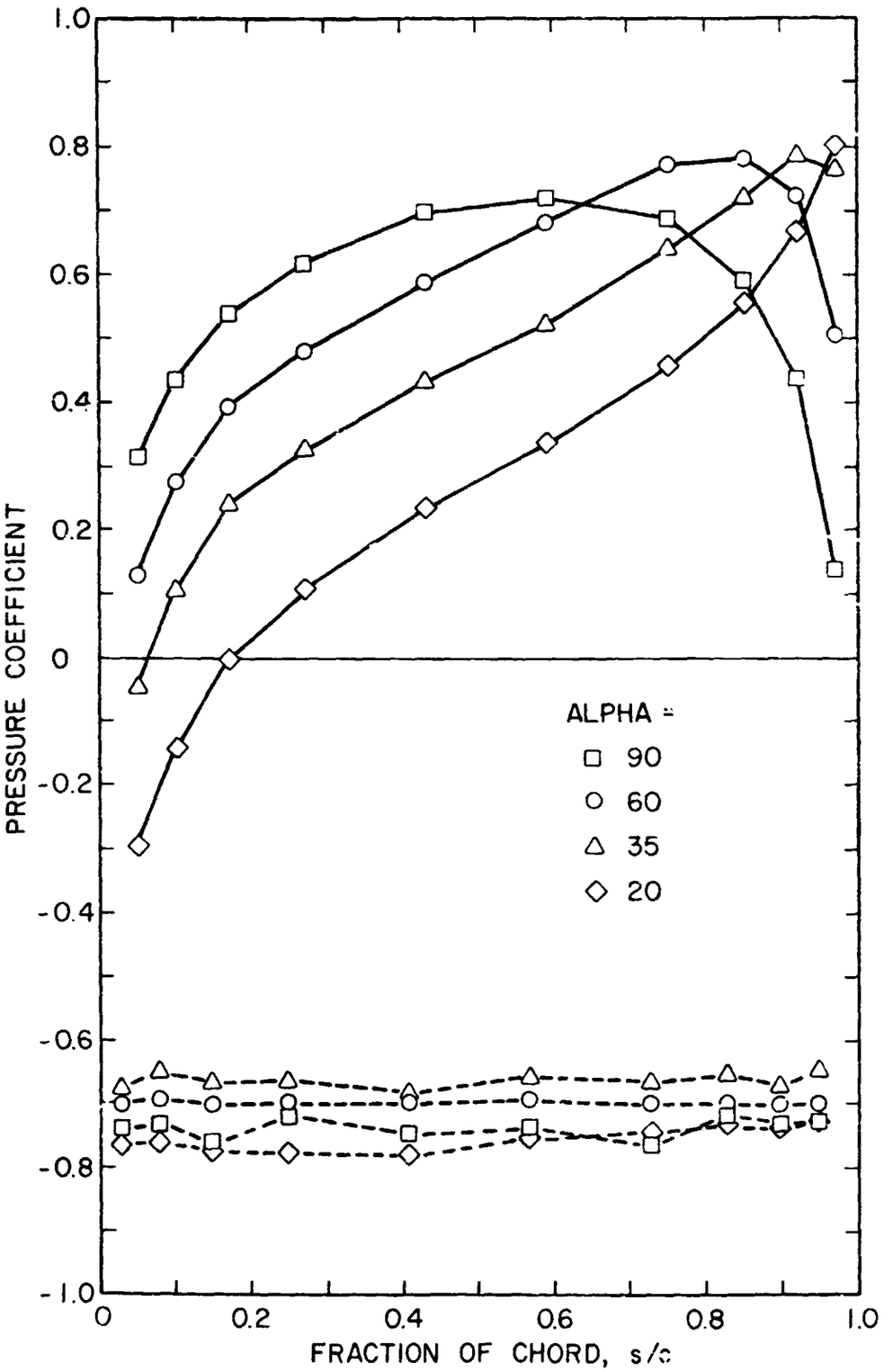


Figure 12. Front and Back Pressures on a Single Array in Uniform Flow, WD = 0°, H/c = 0.25, α = 20°, 35°, 60° and 90°

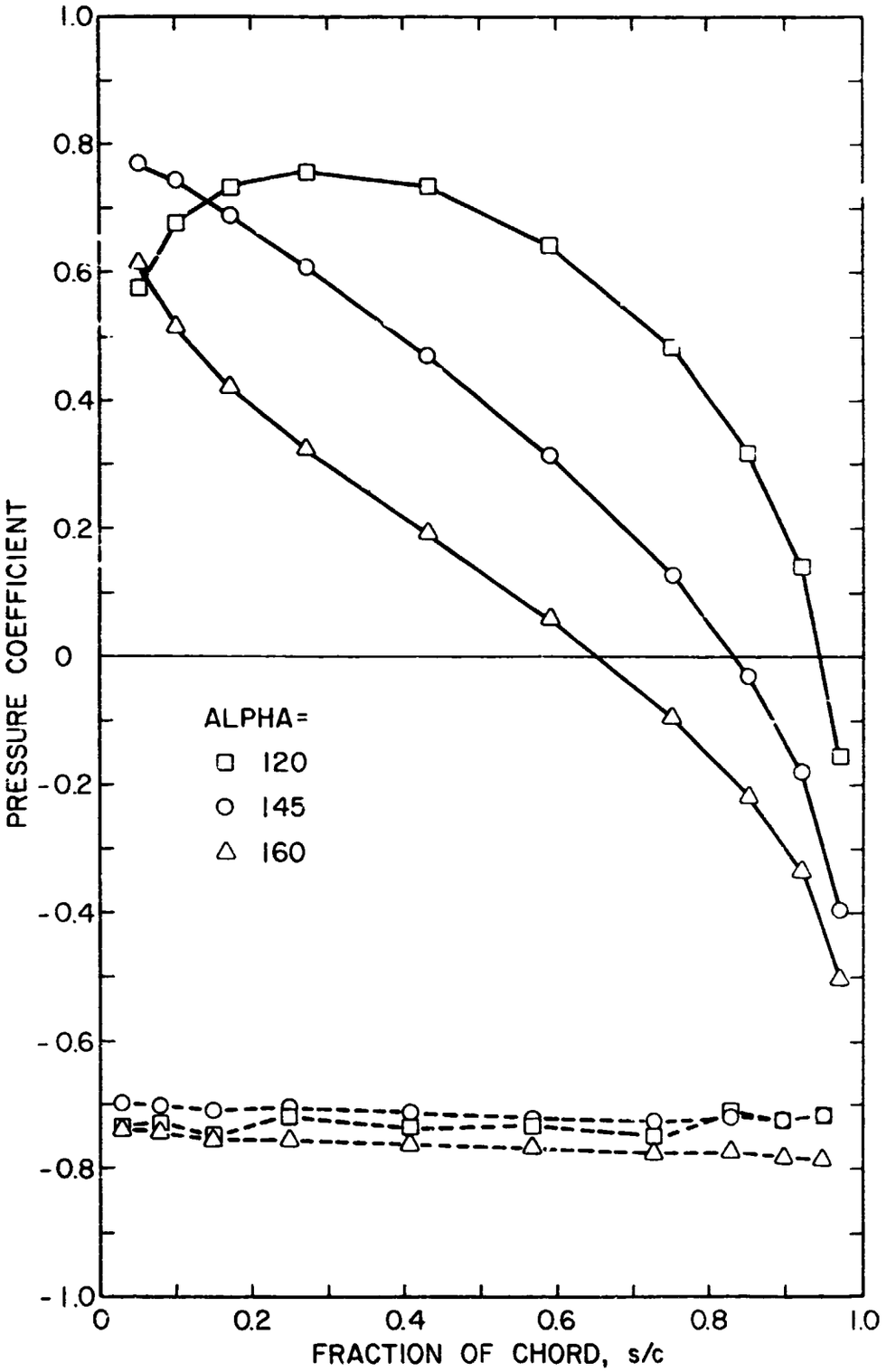


Figure 13. Front and Back Pressures on a Single Array in Uniform Flow, WD = 0°, H/c = 0.25, α = 120°, 145° and 160°

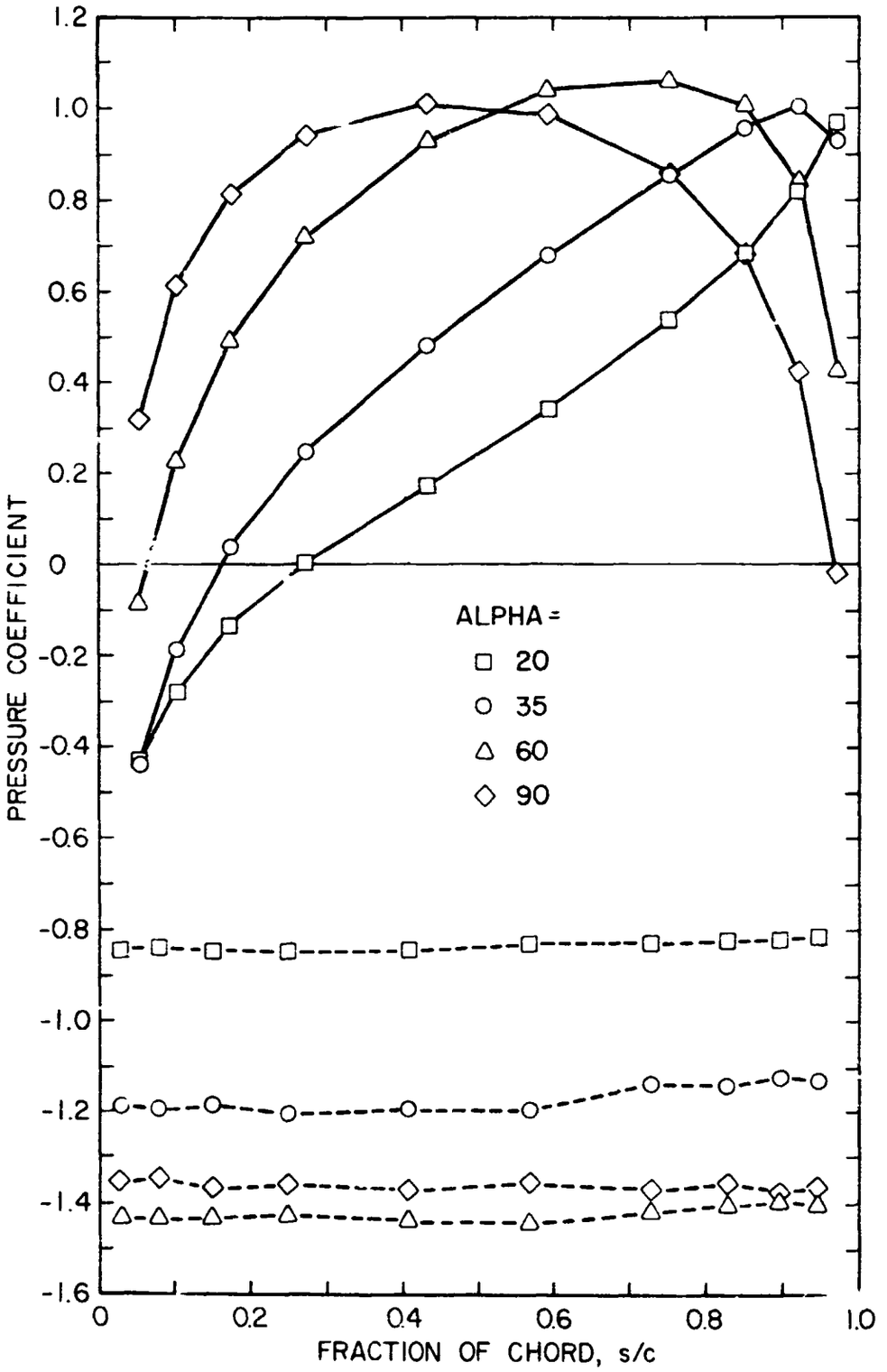


Figure 14. Front and Back Pressures on a Single Array in Uniform Flow, WD = 0°, H/c = infinity, α = 20°, 30°, 60°, and 90°

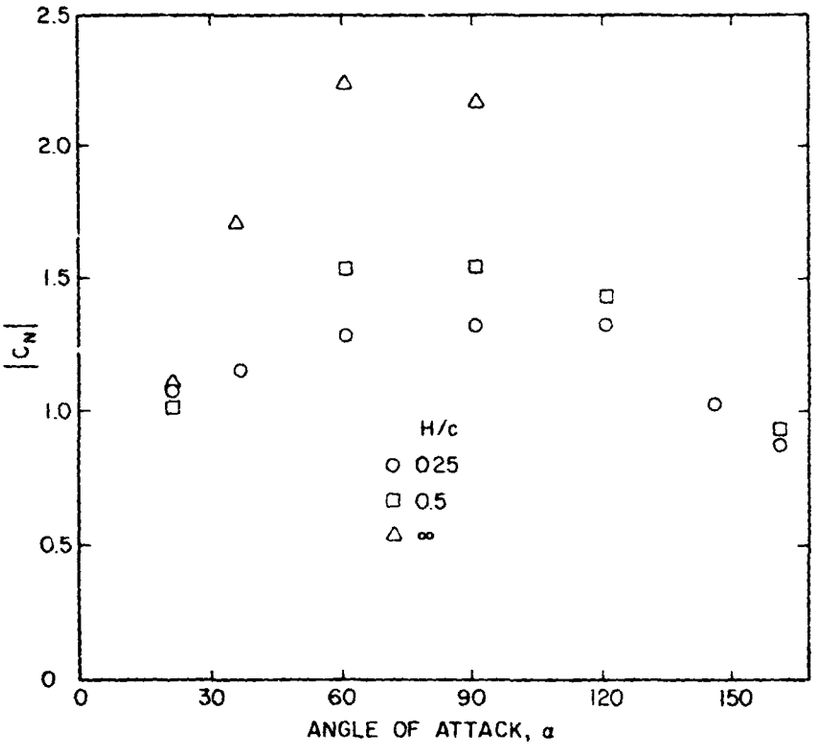


Figure 15. Absolute Values of Normal Force Coefficients on a Single Array in Uniform Flow, WD = 0°

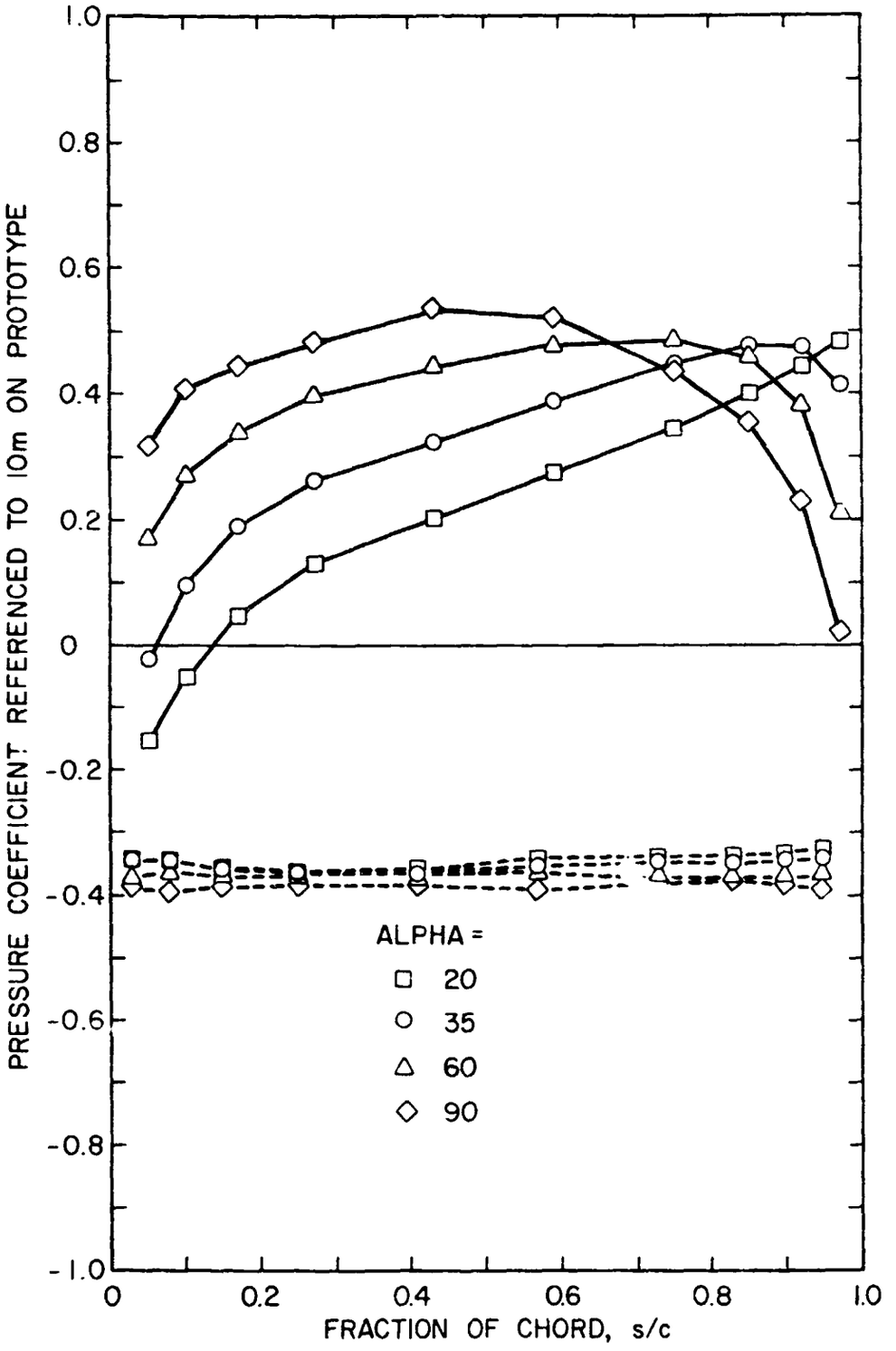


Figure 16. Front and Back Pressures on a Single Array in Nonuniform Flow, WD = 0°, H/c = 0.25, α = 20°, 30°, 60° and 90°

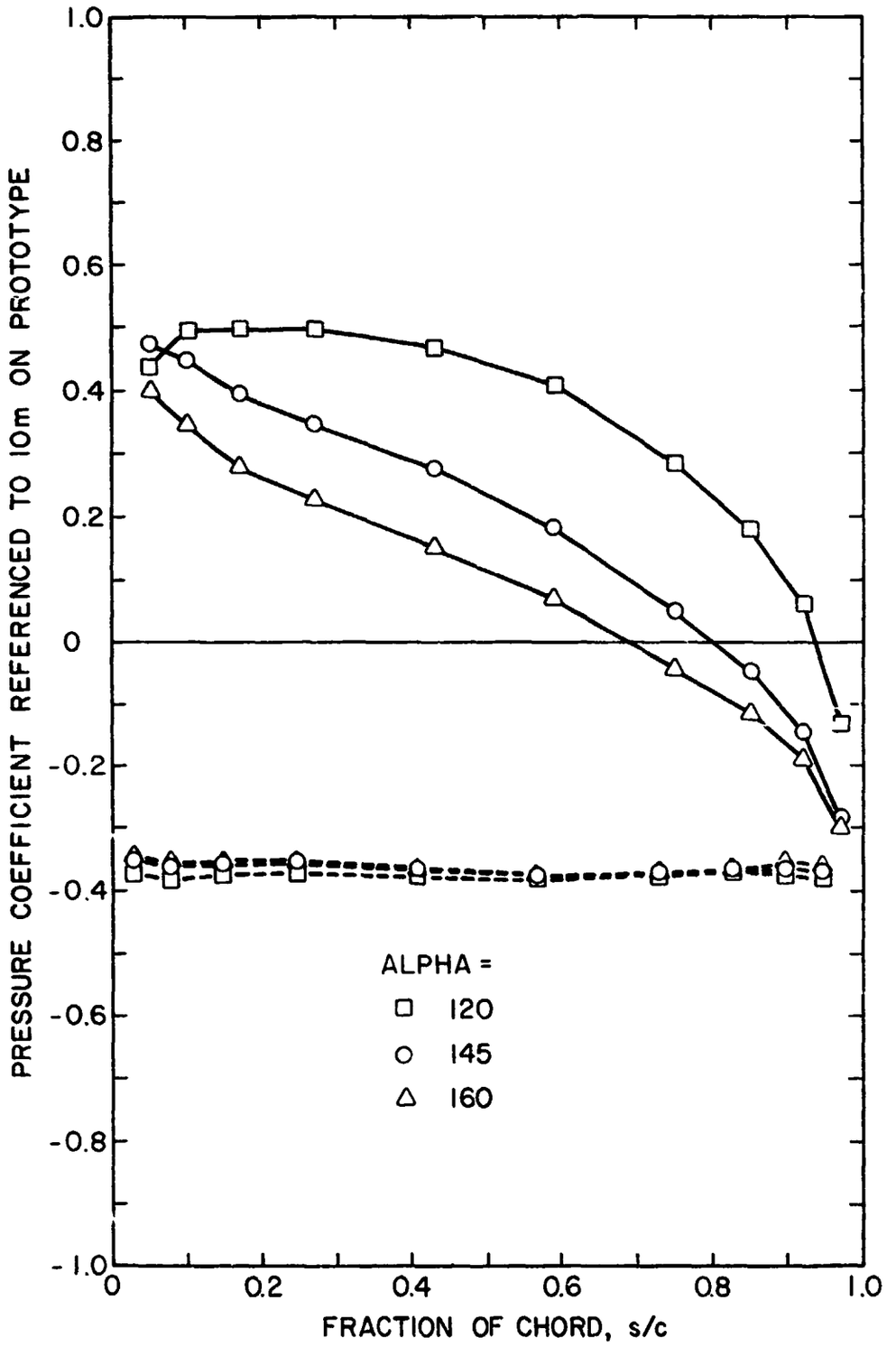


Figure 17. Front and Back Pressures on a Single Array in Nonuniform Flow, WD = 0°, H/c = 0.25, α = 120°, 145° and 160°

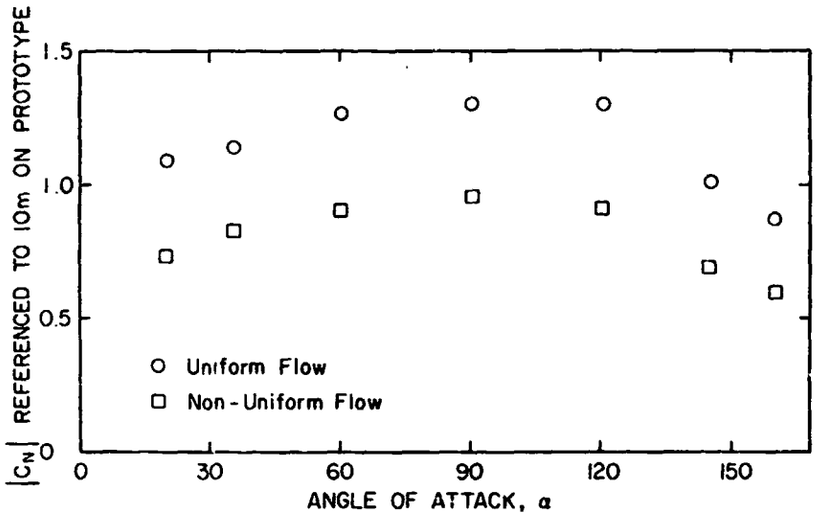


Figure 18. Absolute Values of Normal Force Coefficients on a Single Array in Nonuniform and Uniform Flows, WD = 0°, H/c = 0.25

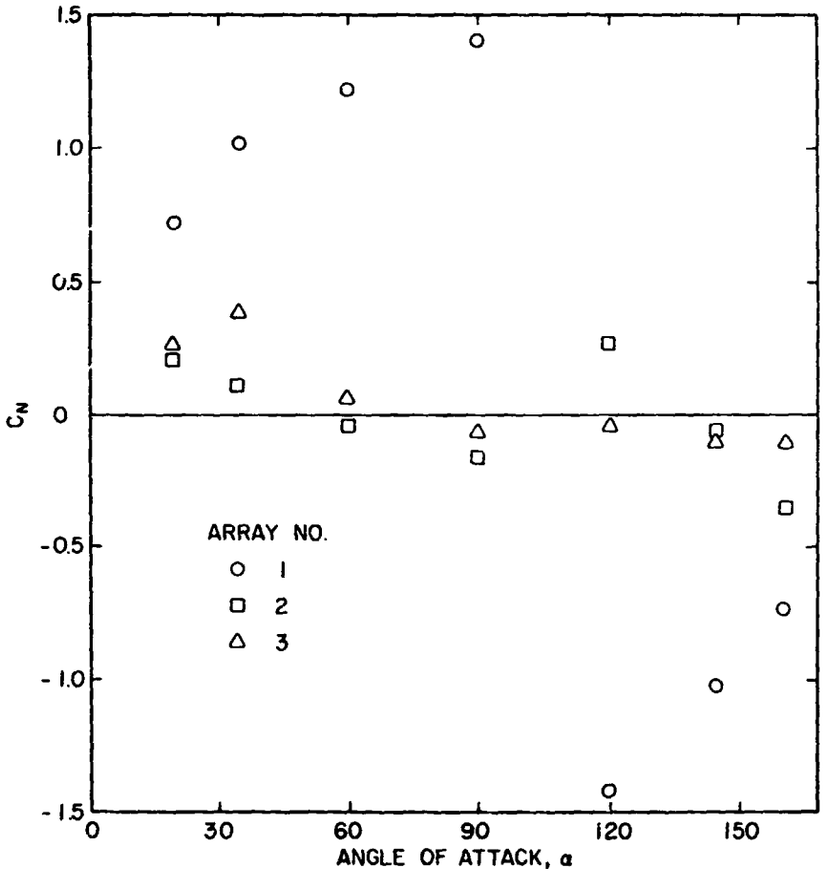


Figure 19. Normal Force Coefficients for an Array Field in Uniform Flow, WD = 0°, x/c = 2.0, H/c = 0.25, No Fence

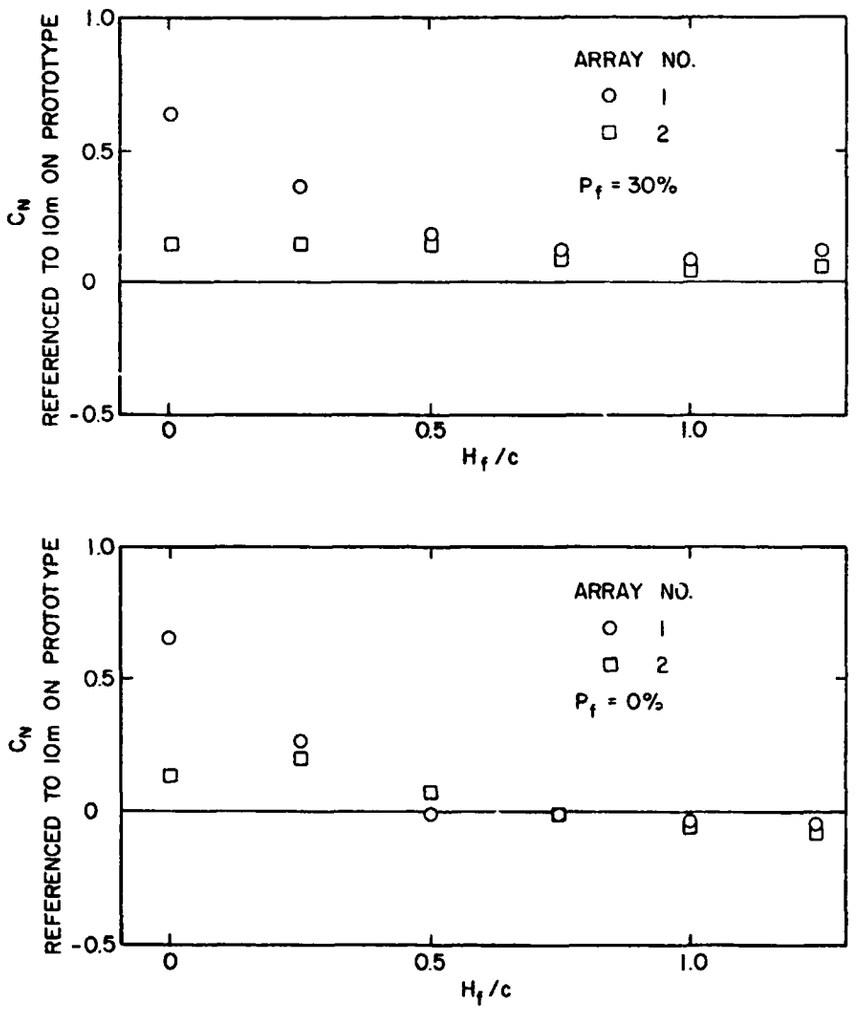


Figure 20. Normal Force Coefficients for an Array Field with a Fence of Various Height and Porosity, WD = 0°, x/c = 2.0, H/c = 0.25, α = 35°

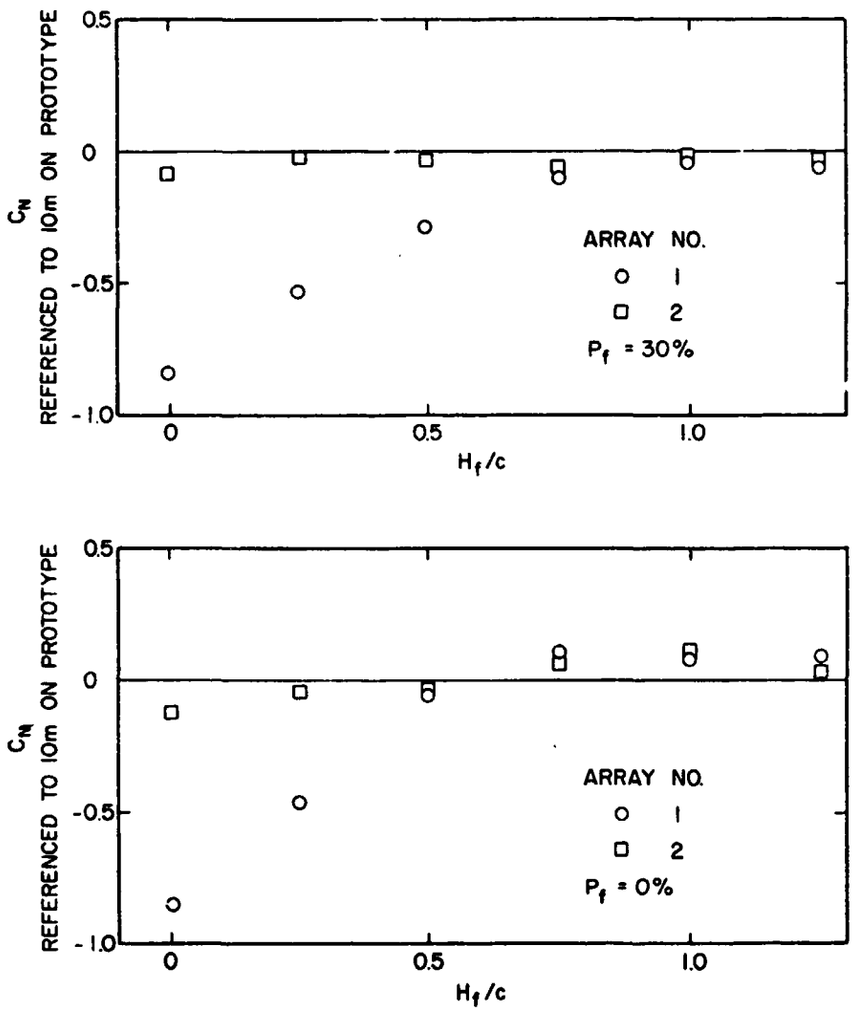


Figure 21. Normal Force Coefficients for an Array Field with a Fence of various Height and Porosity, WD = 0°, x/c = 2-0, H/c = 0.25, α = 145°

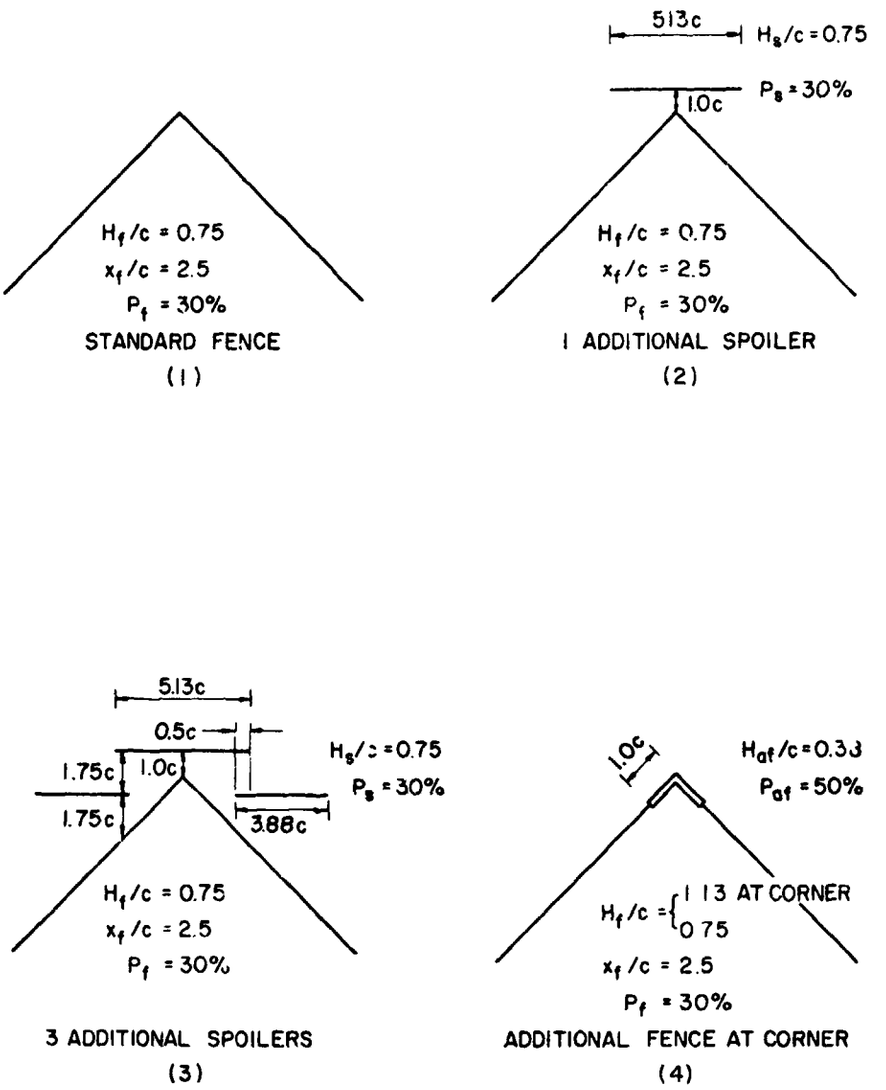


Figure 22. Corner Fence Configurations

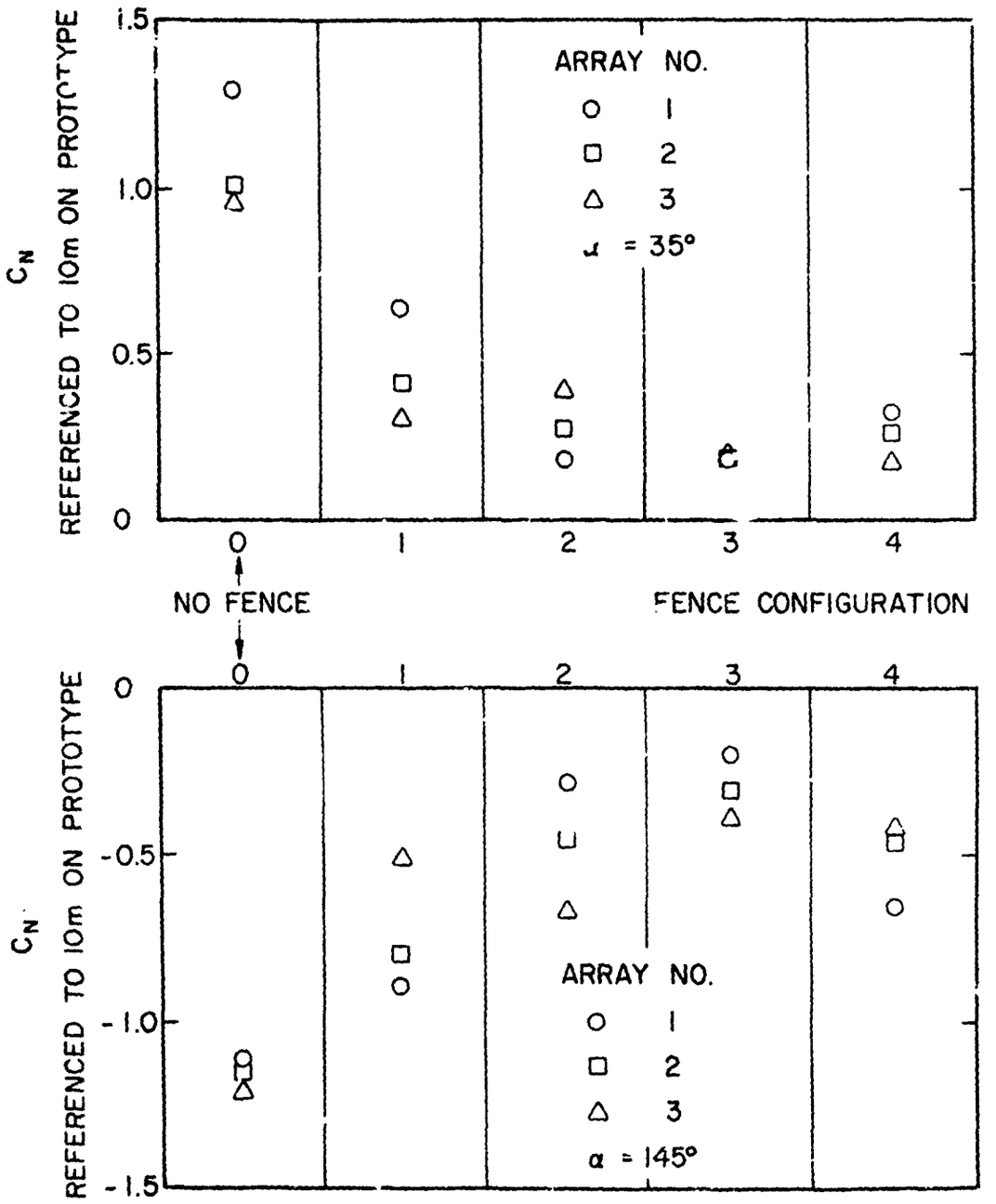


Figure 23. Normal Force Coefficients for an Array Field with Various Fence Configurations; WD = 45°, x/c = 2.0, H/c = 0.25, MC = 0

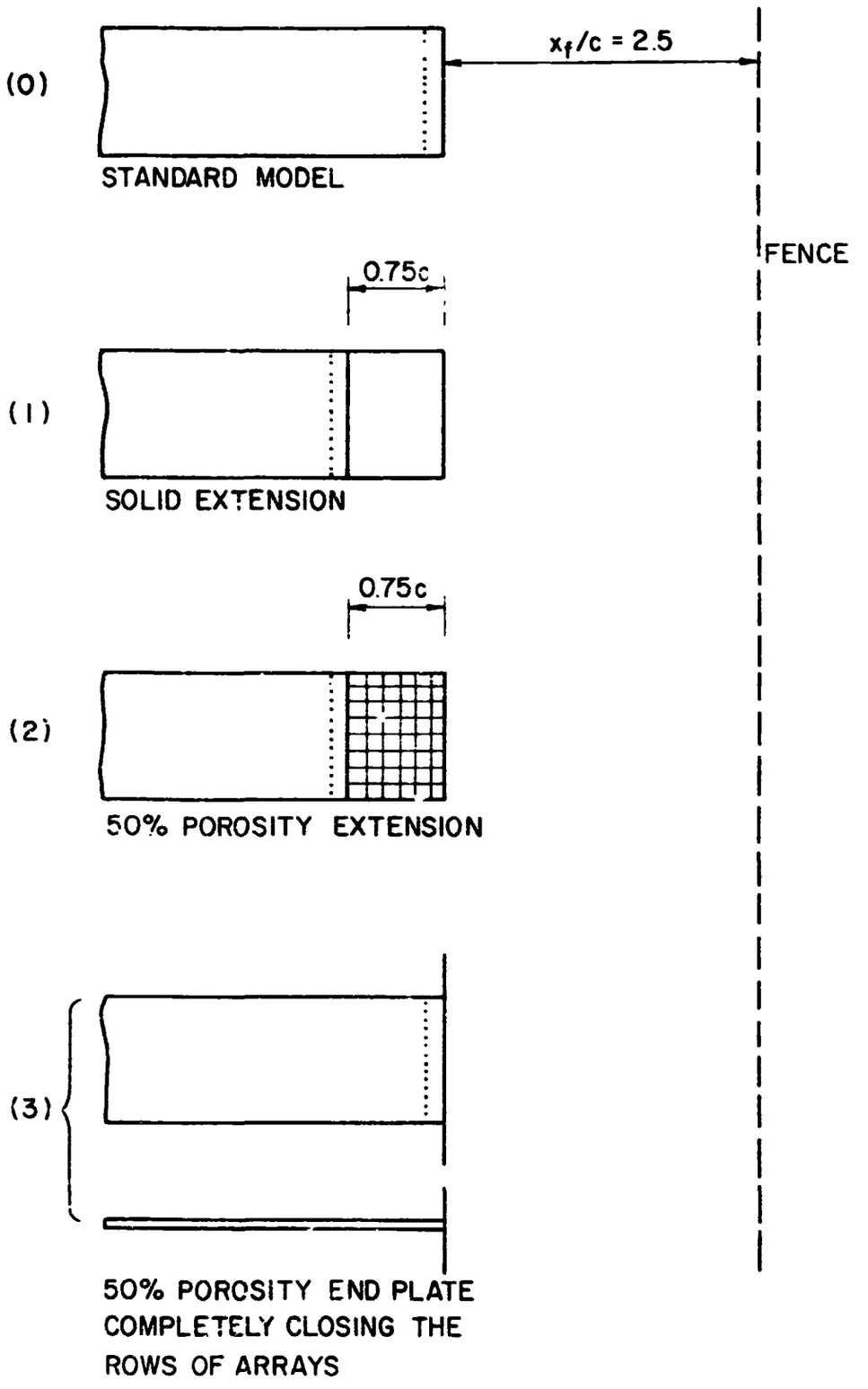


Figure 24. Model Configurations

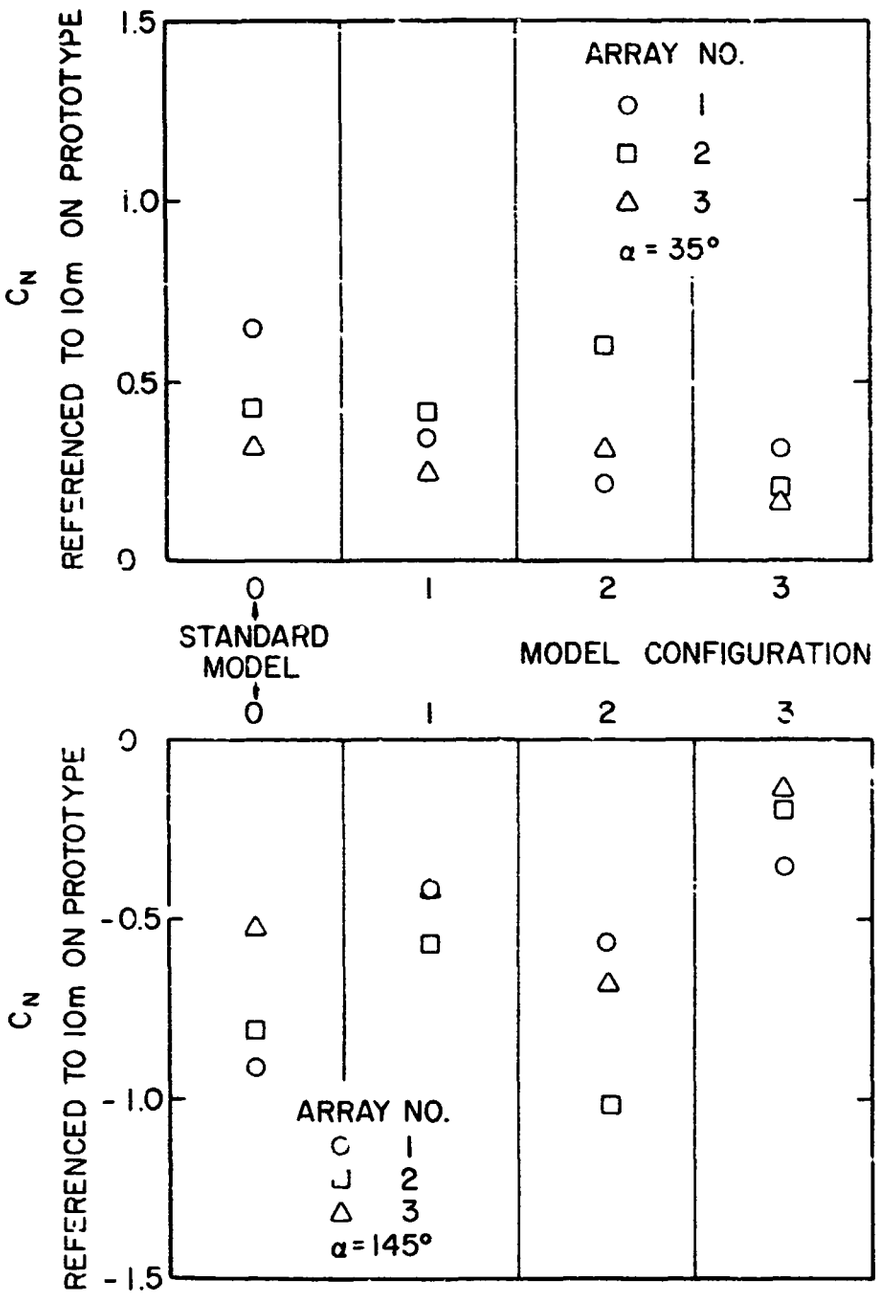


Figure 25. Normal Force Coefficients for an Array Field with Various Model Configurations, WD = 45°, x/c = 2.0, H/c = 0.25, FC = 1

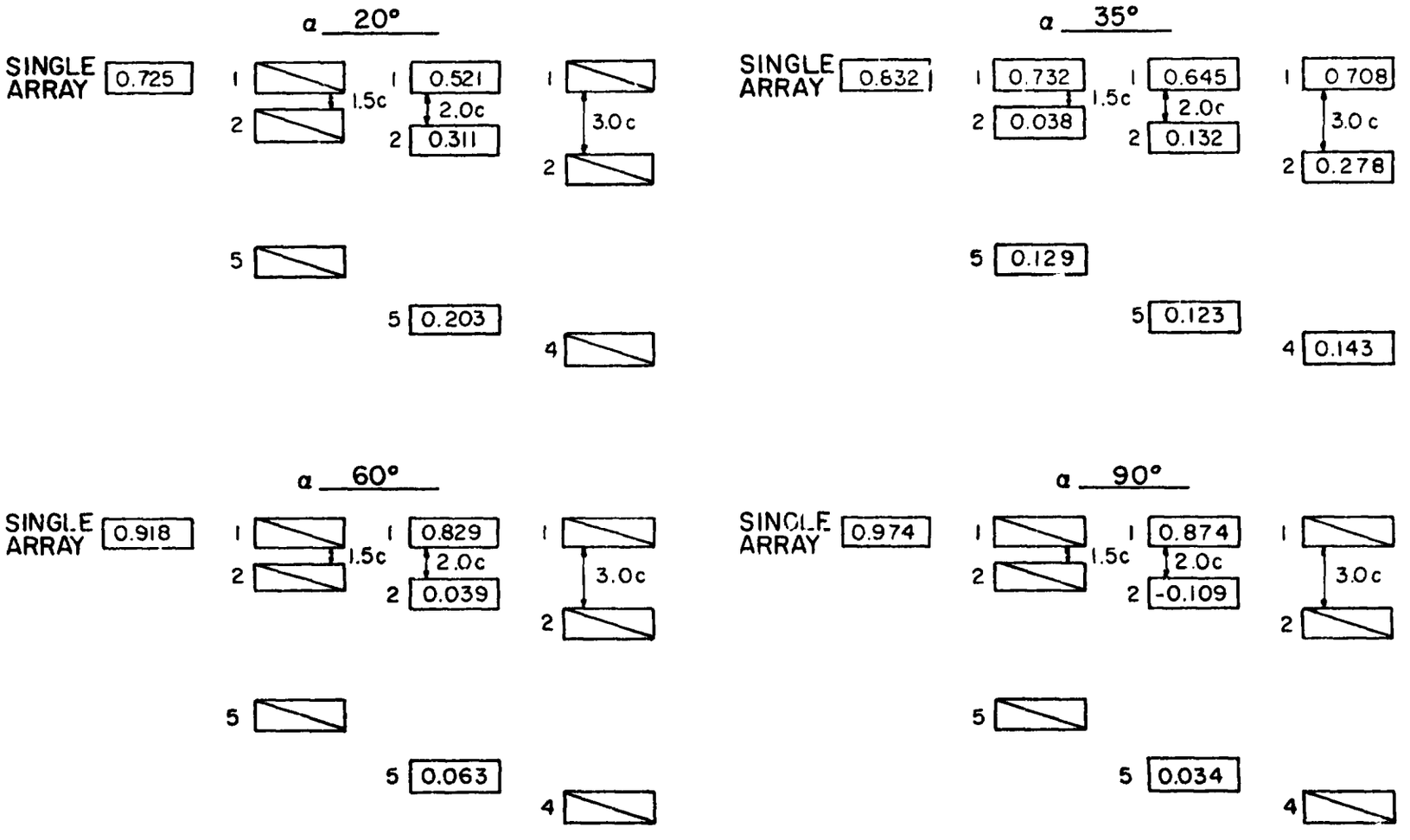


Figure 26. Normal Force Coefficients for an Array Field in Nonuniform Flow, No Fence, WD = 0°, H/c = 0.25, α = 20°, 35°, 60° and 90°

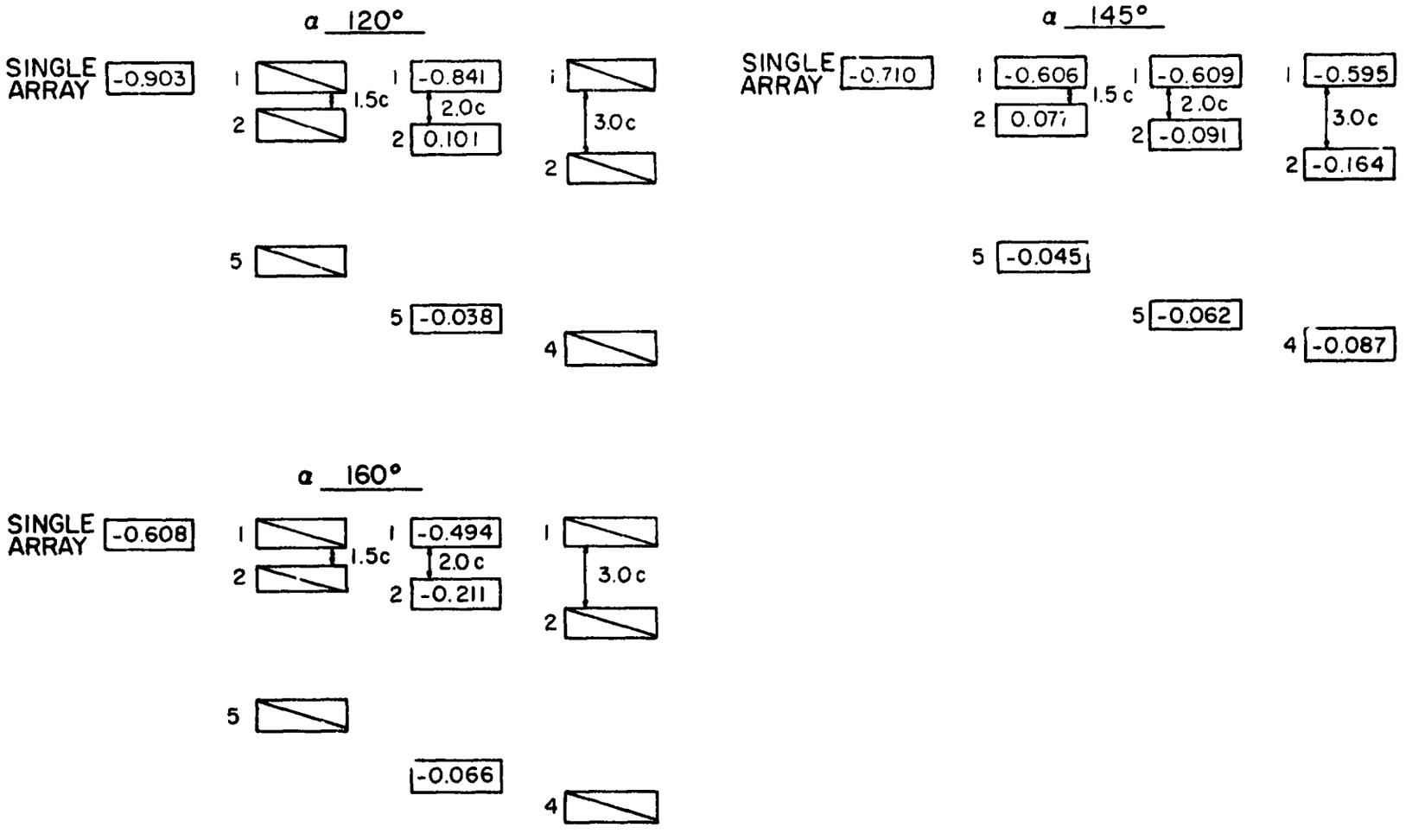


Figure 27. Normal Force Coefficients for an Array Field in Nonuniform Flow, No Fence, WD = 0°, H/c = 0.25, α = 120°, 145° and 160°

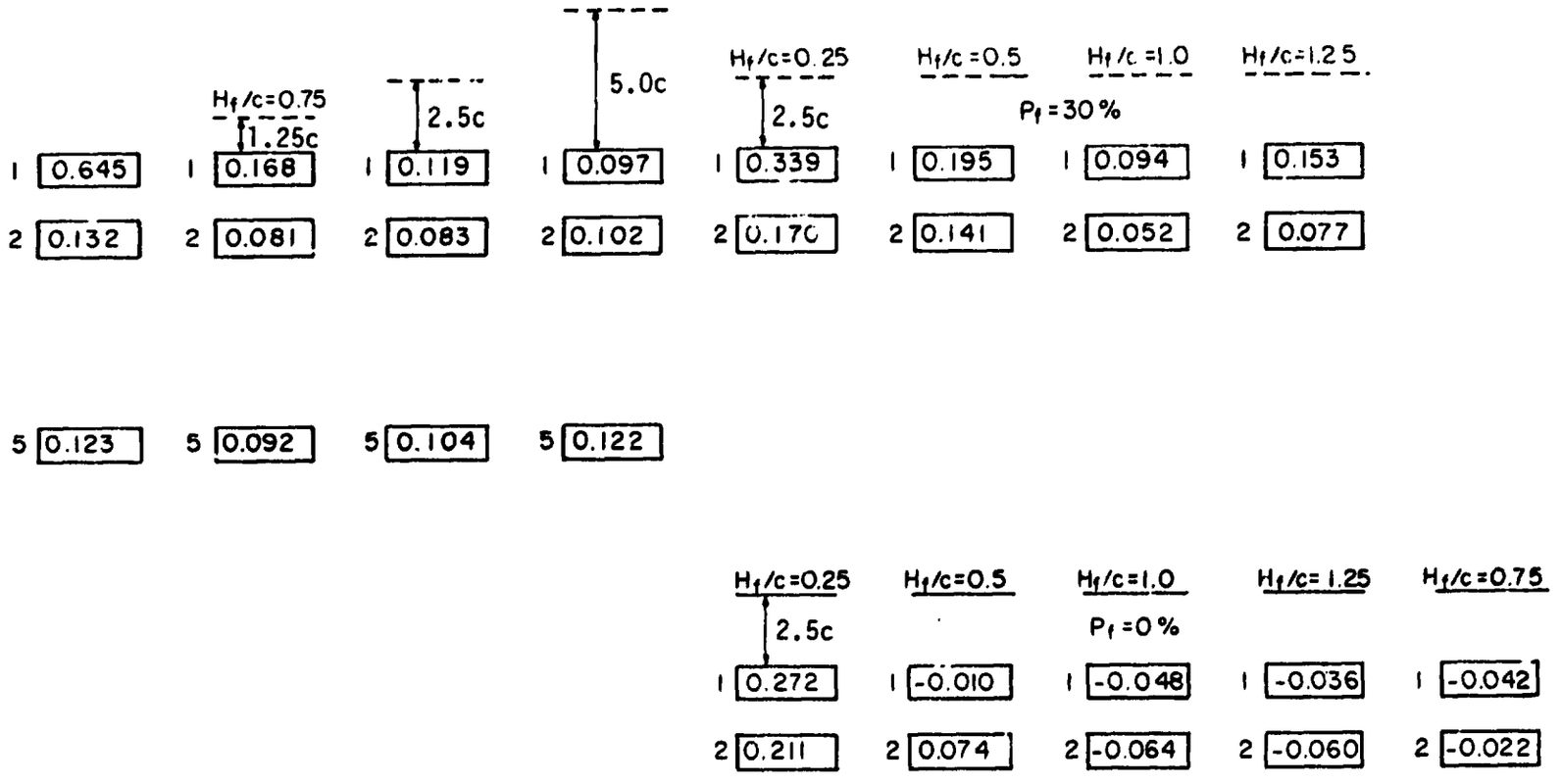


Figure 28a. Normal Force Coefficients for an Array Field with Various Fences, WD = 0°, x/c = 2.0, H/c = 0.25, α = 35°, Nonuniform Flow

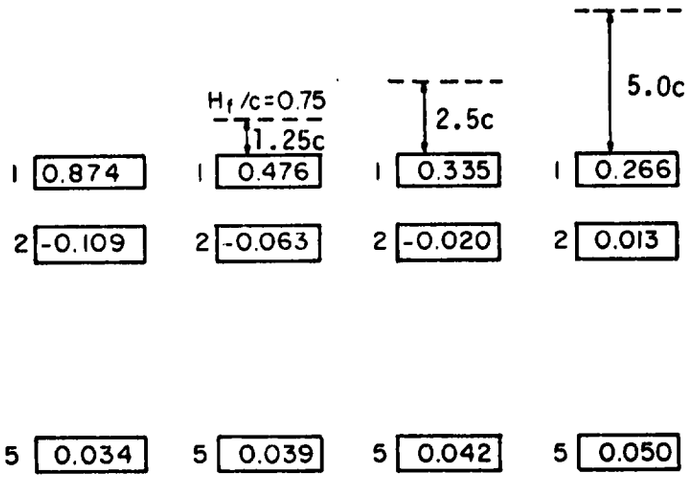


Figure 28b. Normal Force Coefficients for an Array Field with Various Fences, WD = 0°, x/c = 2.0, H/c = 0.25, α = 90°, Nonuniform Flow

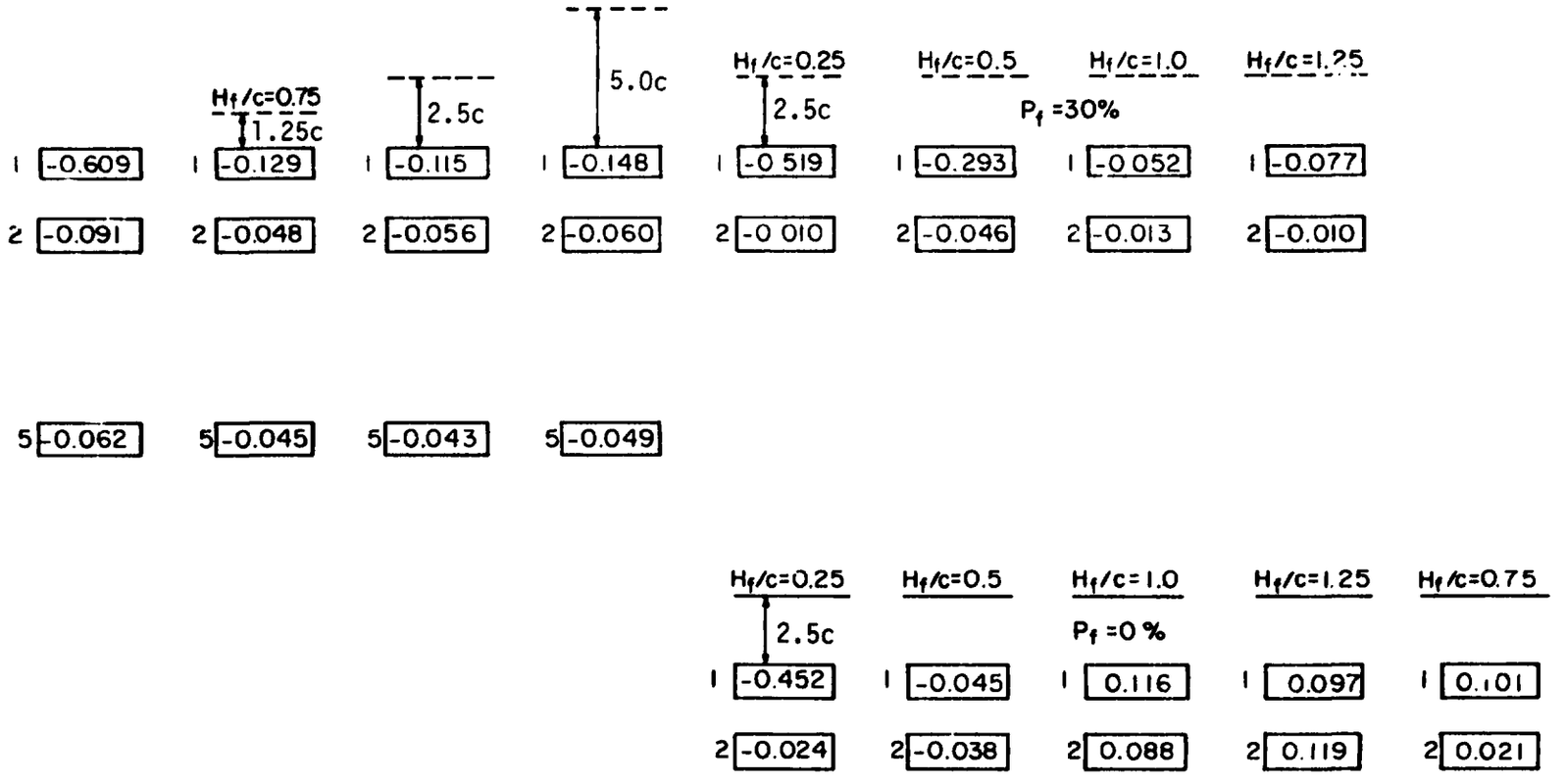


Figure 28c. Normal Force Coefficients for an Array Field with Various Fences, WD = 0°, x/c = 2.0, H/c = 0.25, α = 145°, Nonuniform Flow

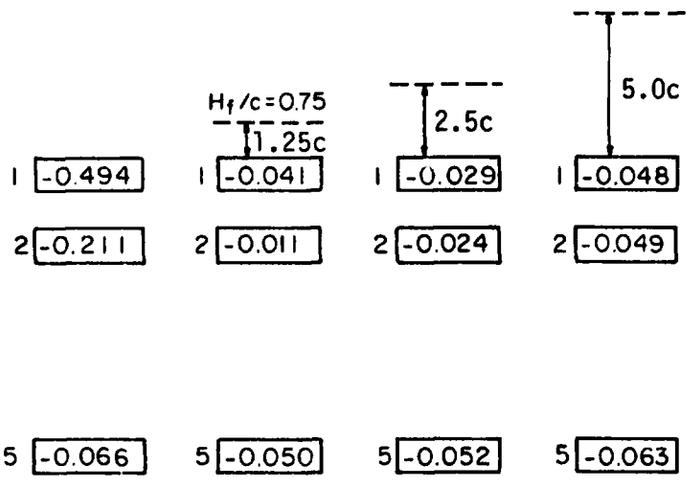


Figure 28d. Normal Force Coefficients for an Array Field with Various Fences, WD = 0°, x/c = 2.0, H/c = 0.25, α = 160°, Nonuniform Flow

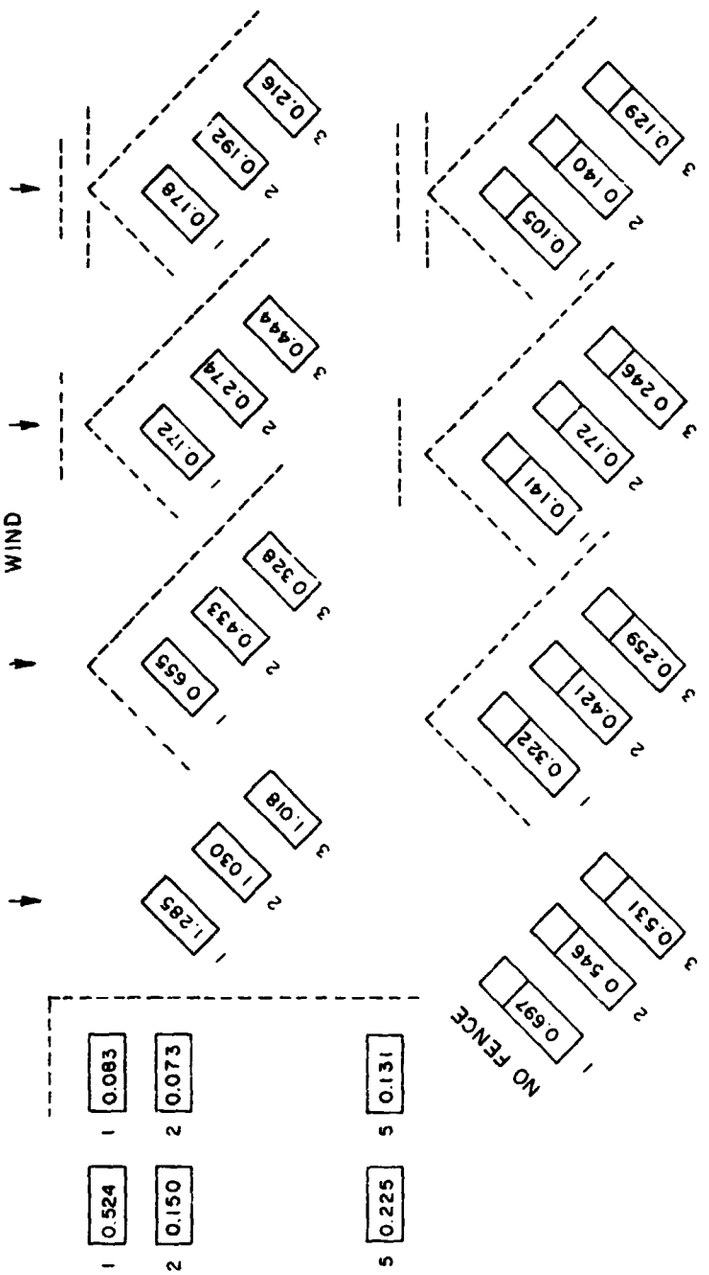


Figure 29a. Normal Force Coefficients for an Array Field, Edge and Corner Studies, x/c = 2.0, H/c = 0.25, α = 35°, Nonuniform Flow

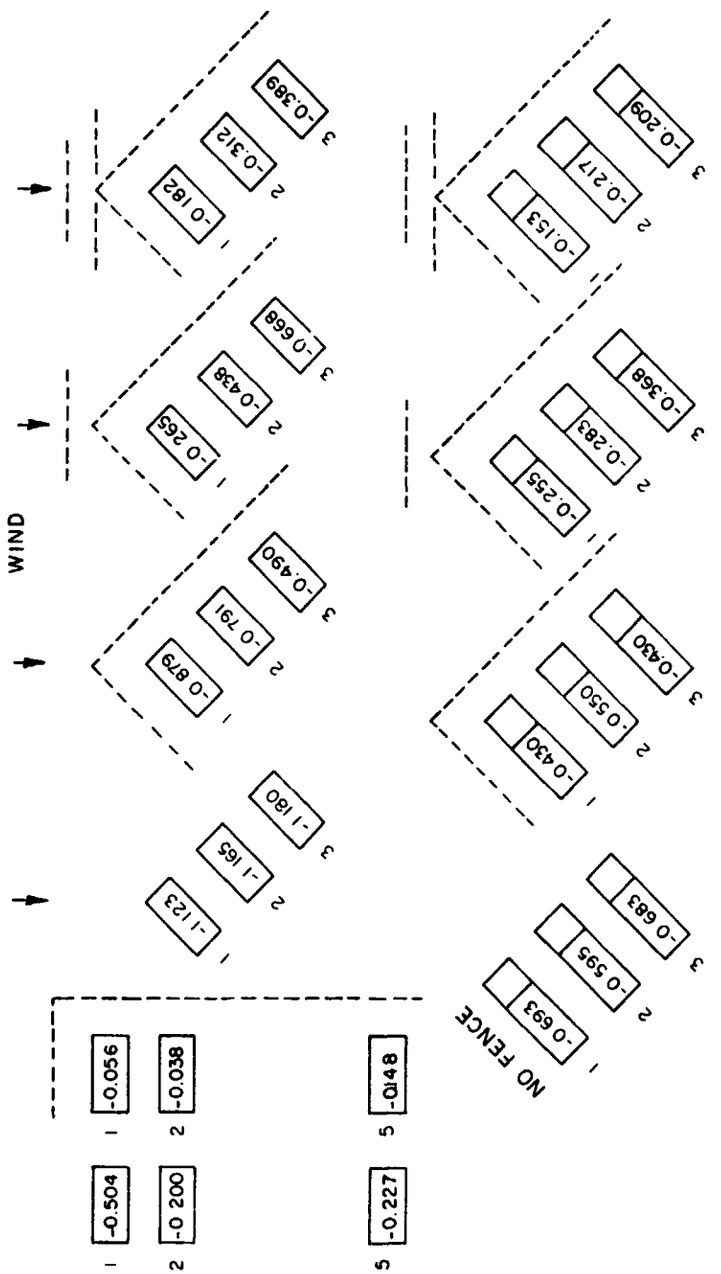


Figure 29b. Normal Force Coefficients for an Array Field, Edge and Corner Studies, x/c = 2.0, H/c = 0.25, α = 145°, Nonuniform Flow

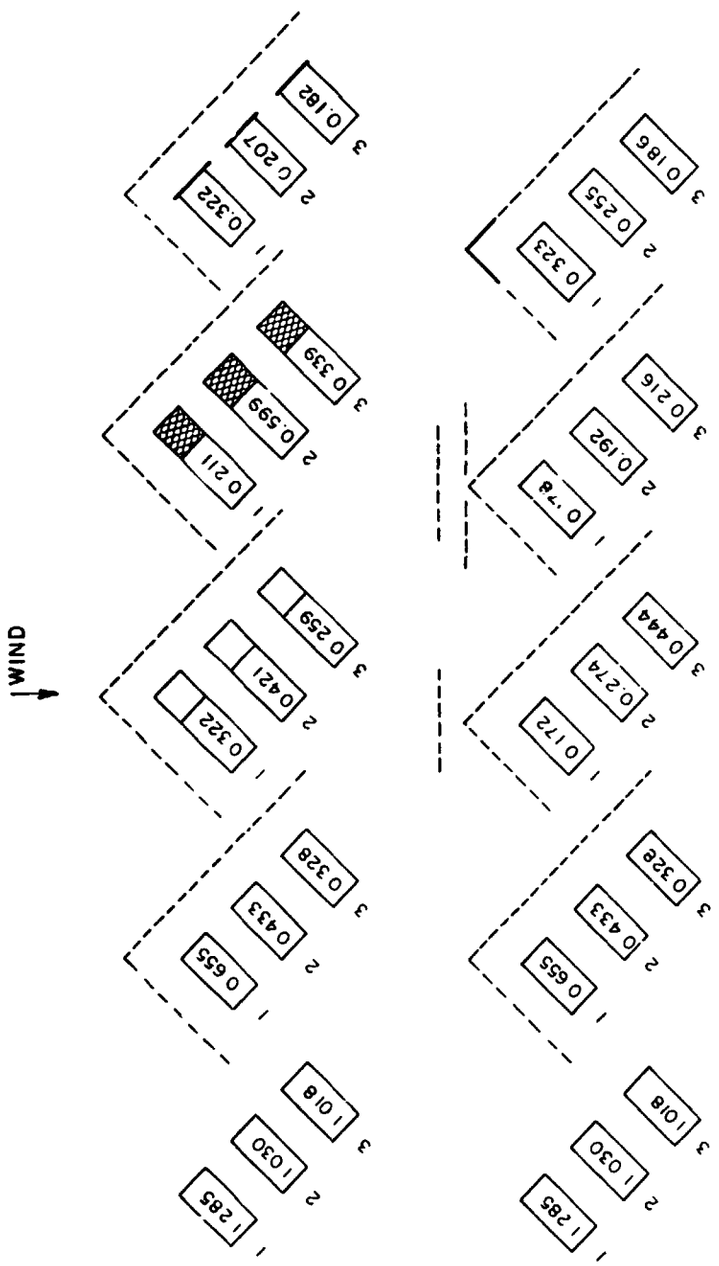


Figure 30a. Normal Force Coefficients for an Array Field, Corner Study with Various Fence and Model Configurations, x/c = 2.0, H/c = 0.25, α = 35°, Nonuniform Flow

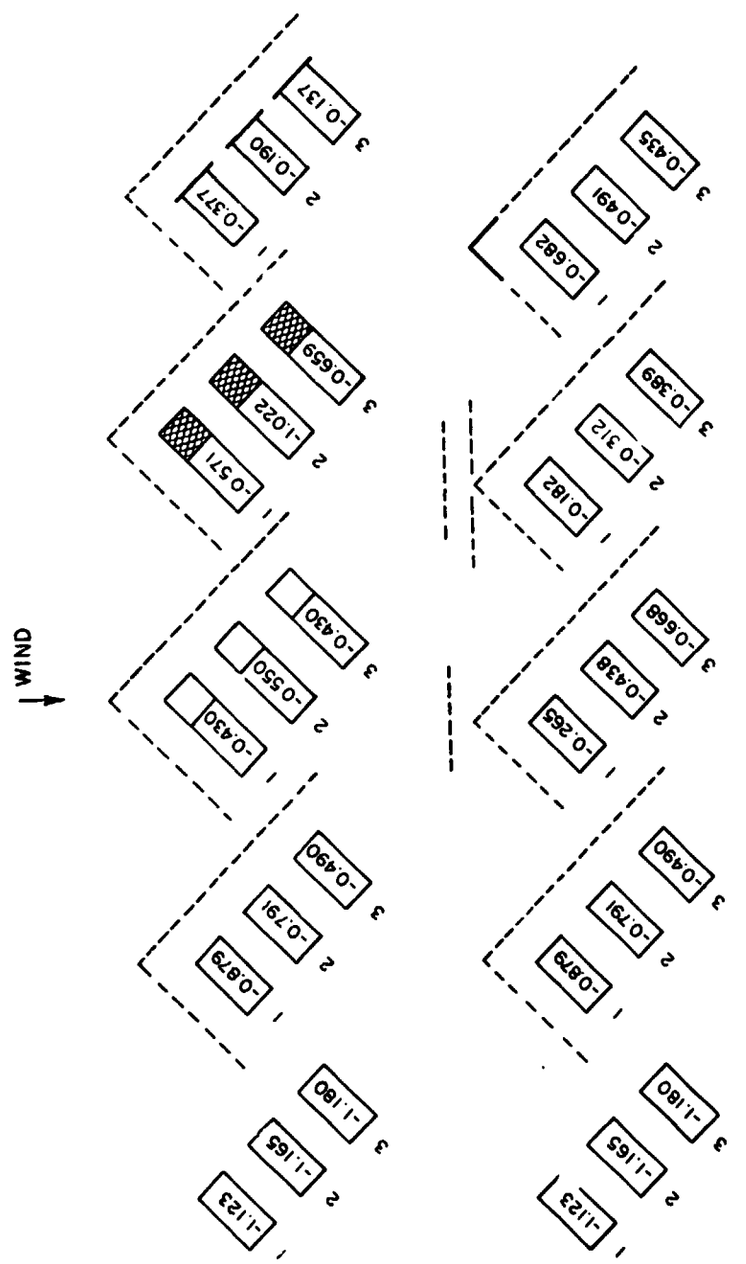


Figure 30b. Normal Force Coefficients for an Array Field, Corner Study with Various Fence and Model Configurations, x/c = 2.0, H/c = 0.25, α = 145°, Nonuniform flow

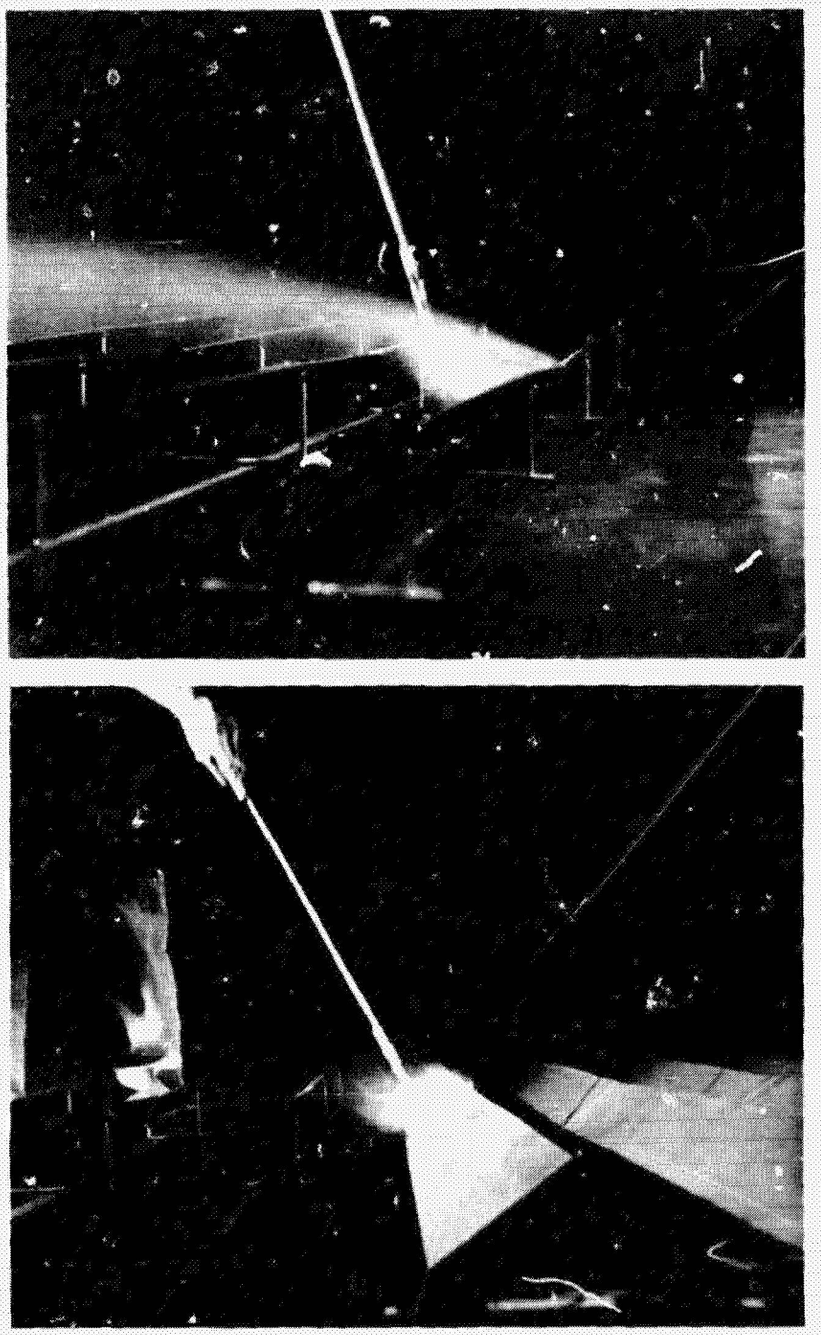


Figure 31a. Flow visualization for an Array Field, WD = 0°

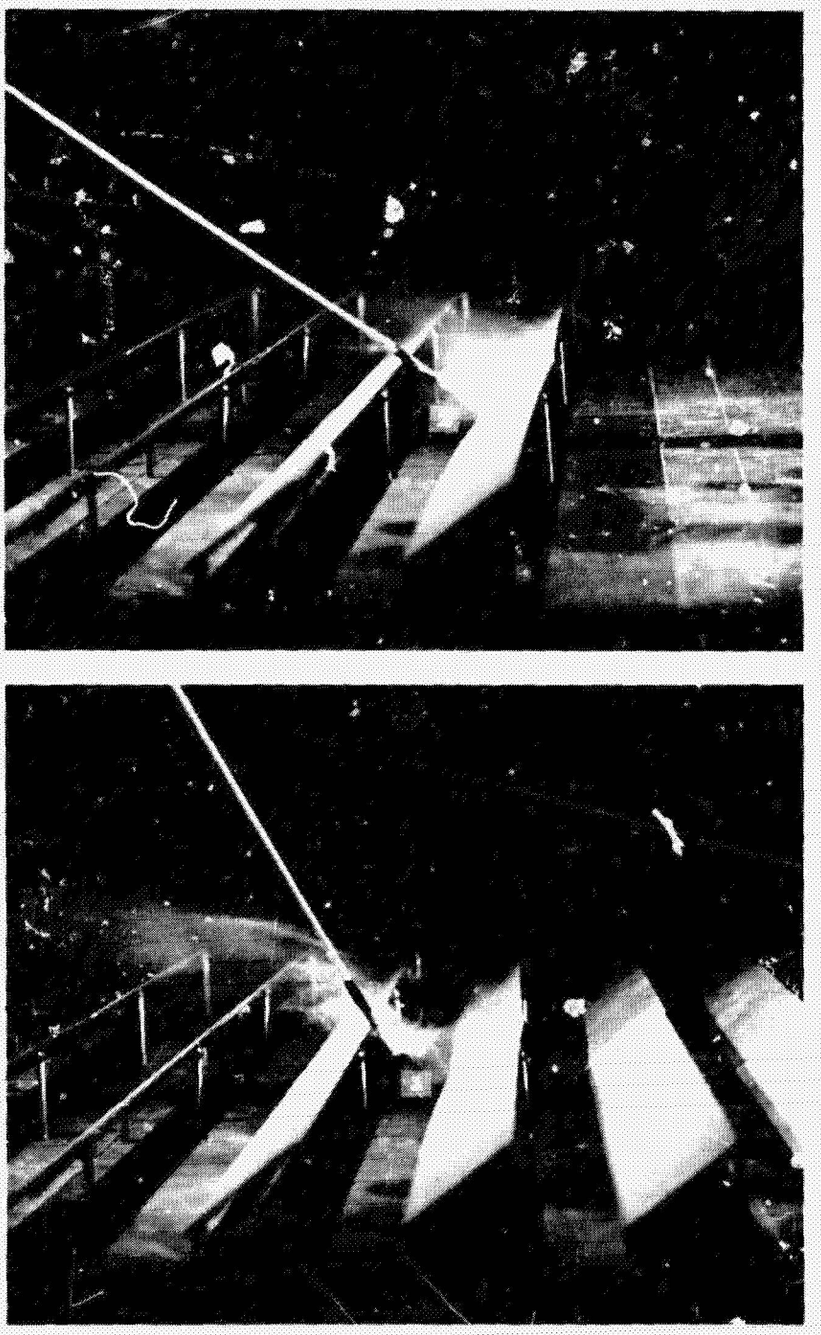


Figure 31b. Flow Visualization for an Array Field, WD = 0°

Figure 31c. Flow Visualization for an Array Field, WD = 0°

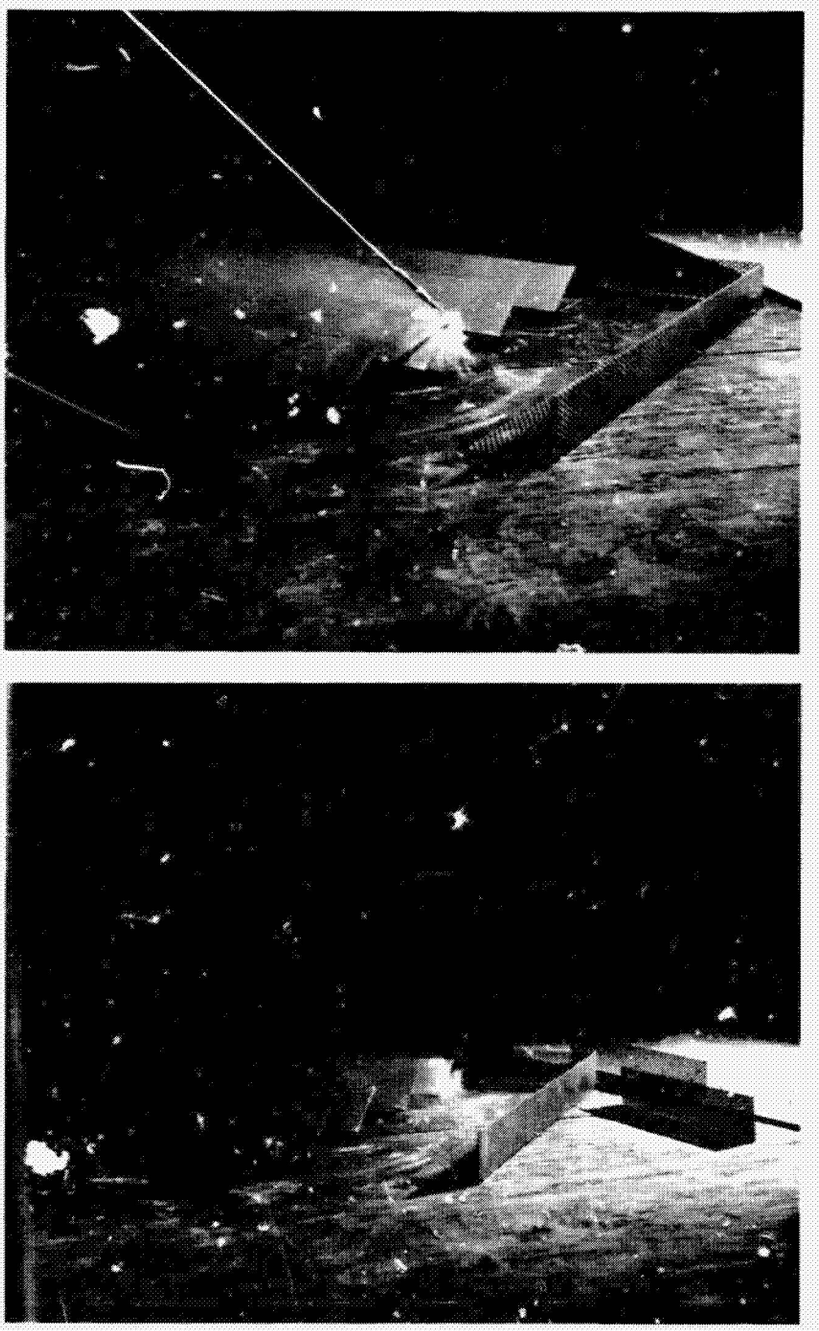


Figure 32. Flow Visualization for an Array Field, WD = 45°

TABLES

Table 1. Normal Force and Maximum Pressure Difference for a Single Array in Uniform Flow

File Name	H/c	α	C_N	$\Delta C_{p\ max}$	s_{max}/c
A02001	0.25	20	1.086	1.53	0.98
A03501	0.25	35	1.145	1.45	0.89
A06001	0.25	60	1.283	1.48	0.83
A09001	0.25	90	1.320	1.46	0.59
A12001	0.25	120	-1.320	-1.48	0.29
A14501	0.25	145	-1.024	-1.46	0.06
A16001	0.25	160	-0.885	-1.37	0.05
B02001	0.5	20	1.015	1.66	0.96
B06001	0.5	60	1.523	1.76	0.74
B09001	0.5	90	1.534	1.74	0.42
B12001	0.5	120	-1.440	-1.73	0.18
B16001	0.5	160	-0.936	-1.49	0.04
C02001	∞	20	1.133	1.79	0.97
C03501	∞	35	1.715	2.13	0.91
C06001	∞	60	2.228	2.48	0.71
C09001	∞	90	2.168	2.35	0.42

Table 2. Normal Force and Maximum Pressure Difference for an Array Field in Uniform Flow, x/c = 2.0

File Name	Array #	α	C_N	$\Delta C_{p\ max}$	s_{max}/c
E02001	1	20	0.717	1.06	0.96
E02101	2	20	0.210	0.82	0.73
E02201	5	20	0.267	0.91	0.86
E03501	1	35	1.006	1.24	0.91
E03601	2	35	0.383	0.75	0.26
E03701	5	35	0.100	0.20	0.45
E06001	1	60	1.220	1.39	0.84
E06101	2	60	-0.05[illegible]	0.32	0.05
E06201	5	60	0.011	-0.04	0.46
E09001	1	90	1.400	1.56	0.58
E09101	2	90	-0.156	-0.28	0.59
E09201	5	90	-0.056	-0.07	0.42
E12001	1	120	-1.419	-1.60	0.27
E12101	2	120	0.277	0.38	0.28
E12201	5	120	-0.026	-0.10	0.92
E14501	1	145	-1.021	-1.38	0.04
E14601	2	145	-0.031	-0.11	0.74
E14701	5	145	-0.072	-0.10	0.83
E16001	1	160	-0.734	-1.10	0.05
E16101	2	160	-0.348	-0.48	0.05
E16201	5	160	-0.084	-0.10	0.59

Table 3. Normal Force and Maximum Pressure Difference for an Array Field in Uniform Flow, x/c = 1.5 and 3.0

File Name	x/c	Array #	α	C_N	$\Delta C_{p\ max}$	s_{max}/c
D03501	1.5	1	35	1.065	1.32	0.92
D03601	1.5	2	35	0.034	0.43	0.97
D03701	1.5	5	35	0.123	0.25	0.19
D14501	1.5	1	145	-1.076	-1.44	0.05
D14601	1.5	2	145	0.168	0.30	0.08
F03501	3.0	1	35	0.925	1.13	0.97
F03601	3.0	2	35	0.326	0.48	0.26
F03701	3.0	4	35	0.081	0.12	0.95
F14501	3.0	1	145	-0.937	-1.38	0.06
F14601	3.0	2	145	-0.063	-0.08	0.56
F14701	3.0	4	145	-0.116	-0.14	0.74

Table 4. Normal Force and Maximum Pressure Difference for a Single Array in Nonuniform Flow

File Name	H_f/c	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
G02001	---	20	0.725	0.96	0.96
GC3501	---	35	0.832	0.98	0.85
G06001	---	60	0.918	1.02	0.74
G09001	---	90	0.974	1.05	0.44
G12001	---	120	-0.903	-1.04	0.16
G14501	---	145	-0.710	-0.99	0.05
G16001	---	160	-0.608	-0.87	0.05
G01101	0.25	35	0.504	0.71	0.96
G01201	0.5	35	0.295	0.41	0.96
G01301	0.75	35	0.143	0.18	0.82
G01401	1.0	35	0.099	0.11	0.81
G01501	1.25	35	0.286	0.34	0.85
G02101	0.25	145	-0.577	-0.66	0.32
G02201	0.5	145	-0.309	-0.38	0.56
G02301	0.75	145	-0.120	-0.14	0.54
G02401	1.0	145	-0.066	-0.08	0.08
G02501	1.25	145	-0.196	-0.28	0.06

*referenced to 10 m on prototype

Table 5. Normal Force and Maximum Pressure Difference for an Array Field in Nonuniform Flow, x/c = 2.0

File Name	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
I02001	1	20	0.521	0.73	0.95
I02101	2	20	0.311	0.38	0.74
I02201	5	20	0.203	0.31	0.90
I03501	1	35	0.645	0.76	0.91
I03601	2	35	0.132	0.29	0.20
I03701	5	35	0.123	0.15	0.74
I06001	1	60	0.829	0.90	0.75
I06101	2	60	0.039	0.34	0.06
I06201	5	60	0.063	0.08	0.83
I09001	1	90	0.874	0.97	0.28
I09101	2	90	-0.109	-0.20	0.57
I09201	5	90	0.034	0.08	0.96
I12001	1	120	-0.841	-0.94	0.17
I12101	2	120	0.101	0.17	0.42
I12201	5	120	-0.031	-0.08	0.92
I14501	1	145	-0.609	-0.83	0.05
I14601	2	145	-0.091	-0.11	0.13
I14701	5	145	-0.062	-0.08	0.78
I16001	1	160	-0.494	-0.71	0.05
I16101	2	160	-0.211	-0.32	0.05
I16201	5	160	-0.066	-0.08	0.59

*referenced to 10 m on prototype

Table 6. Normal Force and Maximum Pressure Difference for an Array Field in Nonuniform Flow, x/c = 1.5 and 3.0

File Name	x/c	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
H03501	1.5	1	35	0.732	0.85	0.93
H03601	1.5	2	35	0.038	0.29	0.16
H03701	1.5	5	35	0.129	0.18	0.43
H14501	1.5	1	145	-0.606	-0.81	0.05
H14601	1.5	2	145	0.077	0.17	0.05
H14701	1.5	5	145	-0.045	-0.11	0.82
J03501	3.0	1	35	0.708	0.83	0.93
J03601	3.0	2	35	0.278	0.42	0.40
J03701	3.0	4	35	0.143	0.21	0.82
J14501	3.0	1	145	-0.595	-0.78	0.05
J14601	3.0	2	145	-0.164	-0.18	0.56
J14701	3.0	4	145	-0.087	-0.10	0.63

*referenced to 10 m on prototype

Table 7. Normal Force and Maximum Pressure Difference for an Array Field with a Fence, $H_f/c = 0.75$, $P_f = 30\%$, $x_f/c = 1.25$

File Name	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
K03501	1	35	0.168	0.20	0.82
K03601	2	35	0.081	0.10	0.53
K03701	5	35	0.092	0.14	0.90
K09001	1	90	0.476	0.53	0.84
K09101	2	90	-0.063	-0.13	0.46
K09201	5	90	0.039	0.08	0.86
K14501	1	145	-0.129	-0.15	0.17
K14601	2	145	-0.048	-0.06	0.76
K14701	5	145	-0.045	-0.07	0.77
K16001	1	160	-0.041	-0.06	0.11
K16101	2	160	-0.011	-0.03	0.82
K16201	5	160	-0.050	-0.07	0.61

*referenced to 10 m on prototype

Table 8. Normal Force and Maximum Pressure Difference for an Array Field with a Fence, $H_f/c = 0.75$, $P_f = 30\%$, $x_f/c = 2.5$

File Name	Array #	α	C_N*	ΔC_p*max	s_{max}/c
L03501	1	35	0.119	0.13	0.58
L03601	2	35	0.083	0.11	0.83
L03701	5	35	0.104	0.13	0.84
L09001	1	90	0.335	0.38	0.83
L09101	2	90	-0.020	-0.04	0.44
L09201	5	90	0.042	0.08	0.92
L14501	1	145	-0.115	-0.13	0.73
L14601	2	145	-0.056	-0.08	0.77
L14701	5	145	-0.043	-0.08	0.85
L16001	1	160	-0.029	-0.06	0.12
L16101	2	160	-0.024	-0.03	0.58
L16201	5	160	-0.052	-0.08	0.58

*referenced to 10 m on prototype

Table 9. Normal Force and Maximum Pressure Difference for an Array Field with a Fence, $H_f/c = 0.75$, $P_f = 30\%$, $x_f/c = 5.0$

File Name	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
M03501	1	35	0.097	0.13	0.83
M03601	2	35	0.102	0.14	0.84
M03701	5	35	0.122	0.17	0.95
M09001	1	90	0.266	0.34	0.82
M09101	2	90	0.013	0.03	0.24
M09201	5	90	0.050	0.08	0.96
M14501	1	145	-0.148	-0.27	0.44
M14601	2	145	-0.060	-0.10	0.77
M14701	5	145	-0.049	-0.08	0.76
M16001	1	160	-0.048	-0.06	0.28
M16101	2	160	-0.049	-0.07	0.60
M16201	5	160	-0.063	-0.08	0.55

*referenced to 10 m on prototype

Table 10. Normal Force and Maximum Pressure Difference for an Array Field with a Fence of Various Height and Porosity

File Name	P_f	H_f/c	Array #	α	C_N	$\Delta C_p^*{}_{max}$	s_{max}/c
N11101	30%	0.25	1	35	0.339	0.49	0.96
011101	30%	0.25	2	35	0.170	0.22	0.41
N11201	30%	0.5	1	35	0.195	0.27	0.95
011201	30%	0.5	2	35	0.141	0.20	0.89
N11401	30%	1.0	1	35	0.094	0.11	0.42
011401	30%	1.0	2	35	0.052	0.08	0.43
N11501	30%	1.25	1	35	0.153	0.20	0.91
011501	30%	1.25	2	35	0.077	0.13	0.42
N12101	30%	0.25	1	145	-0.519	-0.64	0.15
012101	30%	0.25	2	145	-0.010	-0.06	0.76
N12201	30%	0.5	1	145	-0.293	-0.34	0.71
012201	30%	0.5	2	145	-0.046	-0.10	0.78
N12401	30%	1.0	1	145	-0.052	-0.07	0.18
012401	30%	1.0	2	145	-0.013	-0.06	0.74
N12501	30%	1.25	1	145	-0.077	-0.13	0.14
012501	30%	1.25	2	145	-0.010	-0.03	0.74
N01301	0%	0.75	1	35	-0.042	-0.06	0.26
001301	0%	0.75	2	35	-0.022	-0.04	0.26
N02301	0%	0.75	1	145	0.101	0.15	0.41
002301	0%	0.75	2	145	0.021	0.06	0.26

*referenced to 10 m on prototype

Table 11. Normal Force and Maximum Pressure Difference for an Array Field, Edge Study

File Name	Fence	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
P03501	✓	1	35	0.083	0.18	0.91
P03601	✓	2	35	0.073	0.17	0.92
P03701	✓	5	35	0.137	0.29	0.94
P14501	✓	1	145	-0.056	-0.08	0.83
P14601	✓	2	145	-0.038	-0.08	0.83
P14701	✓	5	145	-0.108	-0.17	0.73
Q03501	---	1	35	0.524	0.78	0.95
Q03601	---	2	35	0.150	0.32	0.92
Q03701	---	5	35	0.225	0.46	0.95
Q14501	---	1	145	-0.504	-0.71	0.05
Q14601	---	2	145	-0.200	-0.34	0.06
Q14701	---	5	145	-0.227	-0.36	0.06

*referenced to 10 m on prototype

Table 12. Normal Force and Maximum Pressure Difference for an Array Field, No Fence, Corner Study

File Name	MC	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
U03501	0	1	35	1.285	1.48	0.90
U03601	0	2	35	1.030	1.27	0.90
U03701	0	3	35	1.018	1.26	0.90
U1450.	0	1	145	-1.123	-2.34	0.03
U146C.	0	2	145	-1.165	-2.04	0.03
U14701	0	3	145	-1.180	-2.03	0.03
V03501	1	1	35	0.697	1.36	0.83
V03601	1	2	35	0.546	0.76	0.81
V03701	1	3	35	0.531	0.76	0.81
V14501	1	1	145	-0.693	-1.13	0.24
V14601	1	2	145	-0.595	-0.90	0.21
V14701	1	3	145	-0.638	-0.97	0.21

*referenced to 10 m on prototype

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Table 13. Normal Force and Maximum Pressure Difference for an Array Field with Various Fences, Corner Study

File Name	FC	Array #	α	C_N*	$\Delta C_{p\,max}$*	s_{max}/c
R01101	1	1	35	0.655	1.93	0.96
S01101	1	2	35	0.433	1.09	0.96
T01101	1	3	35	0.328	0.62	0.96
R02101	1	1	145	0.879	-1.04	0.41
S02101	1	2	145	-0.791	-1.02	0.04
T02101	1	3	145	-0.490	-0.53	0.46
R01201	2	1	35	0.172	0.52	0.96
S01201	2	2	35	0.274	0.71	0.96
T01201	2	3	35	0.444	1.22	0.96
R02201	2	1	145	-0.265	-0.28	0.56
S02201	2	2	145	-0.438	-0.49	0.43
T02201	2	3	145	-0.668	-0.76	0.39
R01301	3	1	35	0.178	0.52	0.96
S01301	3	2	35	0.192	0.52	0.96
T01301	3	3	35	0.216	0.67	0.96
R02301	3	1	145	-0.182	-0.20	0.73
S02301	3	2	145	-0.312	-0.34	0.58
T02301	3	3	145	-0.389	-0.43	0.42

*referenced to 10 m on prototype

Table 14. Normal Force and Maximum Pressure Difference for an Array Field with Various Fences, MC = 1, Corner Study

File Name	FC	Array #	α	C_N*	$\Delta C_p{}^*_{max}$	s_{max}/c
R11101	1	1	35	0.322	0.77	0.96
S11101	1	2	35	0.421	0.78	0.96
T11101	1	3	35	0.259	0.34	0.84
R12101	1	1	145	-0.430	-0.50	0.43
S12101	1	2	145	-0.550	-0.64	0.40
T12101	1	3	145	-0.430	-0.50	0.27
R11201	2	1	35	0.141	0.27	0.97
S11201	2	2	35	0.172	0.31	0.97
T11201	2	3	35	0.246	0.50	0.97
R12201	2	1	145	-0.255	-0.29	0.43
S12201	2	2	145	-0.283	-0.34	0.38
T12201	2	3	145	-0.368	-0.43	0.29
R11301	3	1	35	0.105	0.20	0.96
S11301	3	2	35	0.140	0.27	0.96
T11301	3	3	35	0.129	0.22	0.96
R12301	3	1	145	-0.153	-0.17	0.43
S12301	3	2	145	-0.217	-0.27	0.43
T12301	3	3	145	-0.209	-0.25	0.43

*referenced to 10 m on prototype

Table 15. Normal Force and Maximum Pressure Difference for an Array Field with Various Models, FC = 1 and 4, Corner Study

File Name	MC	FC	α	Array #	C_N*	ΔC_p*$_{max}$	s_{max}/c
R21101	2	1	35	1	0.211	0.67	0.96
S21101	2	1	35	2	0.599	1.64	0.96
T21101	2	1	35	3	0.339	0.53	0.96
R22101	2	1	145	1	-0.571	-0.67	0.72
S22101	2	1	145	2	-1.022	-1.19	0.16
T22101	2	1	145	3	-0.659	-0.74	0.42
R31101	3	1	35	1	0.322	0.85	0.96
S31101	3	1	35	2	0.207	0.36	0.96
T31101	3	1	35	3	0.182	0.25	0.96
R32101	3	1	145	1	-0.377	-0.45	0.04
S32101	3	1	145	2	-0.190	-0.21	0.74
T32101	3	1	145	3	-0.137	-0.15	0.61
R01401	0	4	35	1	0.323	0.14	0.82
S01401	0	4	35	2	0.255	0.13	0.83
T01401	0	4	35	3	0.186	0.15	0.83
R02401	0	4	145	1	-0.682	-0.14	0.73
S02401	0	4	145	2	-0.491	-0.10	0.77
T02401	0	4	145	3	-0.435	-0.09	0.76

*referenced to 10 m on prototype

Table 16. Normal Force and Maximum Pressure Difference for an Array Field with a Fence, $H_f/c = 1.0$, $\alpha = 60°$ and $120°$

File Name	α	Array #	C_N*	ΔC_p*max	s_{max}/c
N23401	60	1	0.183	0.12	0.54
N24401	60	2	0.025	0.04	0.72
N25401	60	5	0.053	0.05	0.94
N33401	120	1	-0.165	-0.10	0.18
N34401	120	2	-0.015	-0.06	0.28
N35401	120	5	-0.048	-0.05	0.79

*referenced to 10 m on prototype

Table 17. Fence Configurations

FC	H_f/c	x_f/c	P_f	
1	0.75	2.5	30%	see Figure 22
2	0.75	2.5	30%	
3	0.75	2.5	30%	
4	0.75	2.5	30%	
5	0.75	1.25	30%	
6	0.75	5.0	30%	
7	0.25	2.5	30%	
8	0.5	2.5	30%	
9	1.0	2.5	30%	
10	1.25	2.5	30%	
11	0.25	2.5	0%	
12	0.5	2.5	0%	
13	0.75	2.5	0%	
14	1.0	2.5	0%	
15	1.25	2.5	0%	

Table 18. List of Test Configurations

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC[1]	M[2]
	Uniform	1/7 th		Single	Multiple						
A02001	✓		0	✓		0.25	-	20	-	-	0
A03501	✓		0	✓		0.25	-	35	-	-	0
A06001	✓		0	✓		0.25	-	60	-	-	0
A09001	✓		0	✓		0.25	-	90	-	-	0
A12001	✓		0	✓		0.25	-	120	-	-	0
A14501	✓		0	✓		0.25	-	145	-	-	0
A16001	✓		0	✓		0.25	-	160	-	-	0
B02001	✓		0	✓		0.5	-	20	-	-	0
B06001	✓		0	✓		0.5	-	60	-	-	0
B09001	✓		0	✓		0.5	-	90	-	-	0
B12001	✓		0	✓		0.5	-	120	-	-	0
B16001	✓		0	✓		0.5	-	160	-	-	0
C02001	✓		0	✓		∞	-	20	-	-	0
C03501	✓		0	✓		∞	-	35	-	-	0
C06001	✓		0	✓		∞	-	60	-	-	0
C09001	✓		0	✓		∞	-	90	-	-	0
D02001	✓		0		✓	0.25	1.5c	20	1	-	0
D02101	✓		0		✓	0.25	1.5c	20	2	-	0
D02201	✓		0		✓	0.25	1.5c	20	5	-	0
D03501	✓		0		✓	0.25	1.5c	35	1	-	0
D03601	✓		0		✓	0.25	1.5c	35	2	-	0
D03701	✓		0		✓	0.25	1.5c	35	5	-	0
D14501	✓		0		✓	0.25	1.5c	145	1	-	0
D14601	✓		0		✓	0.25	1.5c	145	2	-	0
D16001	✓		0		✓	0.25	1.5c	160	1	-	0
D16101	✓		0		✓	0.25	1.5c	160	2	-	0
E02001	✓		0		✓	0.25	2.0c	20	1	-	0
E02101	✓		0		✓	0.25	2.0c	20	2	-	0
E02201	✓		0		✓	0.25	2.0c	20	5	-	0
E03501	✓		0		✓	0.25	2.0c	35	1	-	0
E03601	✓		0		✓	0.25	2.0c	35	2	-	0
E03701	✓		0		✓	0.25	2.0c	35	5	-	0
E06001	✓		0		✓	0.25	2.0c	60	1	-	0
E06101	✓		0		✓	0.25	2.0c	60	2	-	0
E06201	✓		0		✓	0.25	2.0c	60	5	-	0
E09001	✓		0		✓	0.25	2.0c	90	1	-	0
E09101	✓		0		✓	0.25	2.0c	90	2	-	0
E09201	✓		0		✓	0.25	2.0c	90	5	-	0
E12001	✓		0		✓	0.25	2.0c	120	1	-	0
E12101	✓		0		✓	0.25	2.0c	120	2	-	0
E12201	✓		0		✓	0.25	2.0c	120	5	-	0
E14501	✓		0		✓	0.25	2.0c	145	1	-	0
E14601	✓		0		✓	0.25	2.0c	145	2	-	0
E14701	✓		0		✓	0.25	2.0c	145	5	-	0
E16001	✓		0		✓	0.25	2.0c	160	1	-	0
E16101	✓		0		✓	0.25	2.0c	160	2	-	0
E16201	✓		0		✓	0.25	2.0c	160	5	-	0
F03501	✓		0		✓	0.25	3.0c	35	1	-	0

[1] defined in Table 17

[2] defined in Figure 24

Table 18. (continued)

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
F03601	✓		0		✓	0.25	3.0c	35	2	-	0
F03701	✓		0		✓	0.25	3.0c	35	4	-	0
F06001	✓		0		✓	0.25	3.0c	60	1	-	0
F06101	✓		0		✓	0.25	3.0c	60	2	-	0
F06201	✓		0		✓	0.25	3.0c	60	4	-	0
F12001	✓		0		✓	0.25	3.0c	120	1	-	0
F12101	✓		0		✓	0.25	3.0c	120	2	-	0
F12201	✓		0		✓	0.25	3.0c	120	4	-	0
F14501	✓		0		✓	0.25	3.0c	145	1	-	0
F14601	✓		0		✓	0.25	3.0c	145	2	-	0
F14701	✓		0		✓	0.25	3.0c	145	4	-	0
G02001		✓	0	✓		0.25	-	20	-	-	0
G03501		✓	0	✓		0.25	-	35	-	-	0
G06001		✓	0	✓		0.25	-	60	-	-	0
G09001		✓	0	✓		0.25	-	90	-	-	0
G12001		✓	0	✓		0.25	-	120	-	-	0
G14501		✓	0	✓		0.25	-	145	-	-	0
G16001		✓	0	✓		0.25	-	160	-	-	0
G01101		✓	0	✓		0.25	-	35	-	7	0
G01201		✓	0	✓		0.25	-	35	-	8	0
G01301		✓	0	✓		0.25	-	35	-	1	0
G01401		✓	0	✓		0.25	-	35	-	9	0
G01501		✓	0	✓		0.25	-	35	-	10	0
G02101		✓	0	✓		0.25	-	145	-	7	0
G02201		✓	0	✓		0.25	-	145	-	8	0
G02301		✓	0	✓		0.25	-	145	-	1	0
G02401		✓	0	✓		0.25	-	145	-	9	0
G02501		✓	0	✓		0.25	-	145	-	10	0
H02001		✓	0		✓	0.25	1.5c	20	1	-	0
H02101		✓	0		✓	0.25	1.5c	20	2	-	0
H02201		✓	0		✓	0.25	1.5c	20	5	-	0
H03501		✓	0		✓	0.25	1.5c	35	1	-	0
H03601		✓	0		✓	0.25	1.5c	35	2	-	0
H03701		✓	0		✓	0.25	1.5c	35	5	-	0
H14501		✓	0		✓	0.25	1.5c	145	1	-	0
H14601		✓	0		✓	0.25	1.5c	145	2	-	0
H14701		✓	0		✓	0.25	1.5c	145	5	-	0
H16001		✓	0		✓	0.25	1.5c	160	1	-	0
H16101		✓	0		✓	0.25	1.5c	160	2	-	0
H16201		✓	0		✓	0.25	1.5c	160	5	-	0
I02001		✓	0		✓	0.25	2.0c	20	1	-	0
I02101		✓	0		✓	0.25	2.0c	20	2	-	0
I02201		✓	0		✓	0.25	2.0c	20	5	-	0
I03501		✓	0		✓	0.25	2.0c	35	1	-	0
I03601		✓	0		✓	0.25	2.0c	35	2	-	0
I03701		✓	0		✓	0.25	2.0c	35	5	-	0
I06001		✓	0		✓	0.25	2.0c	60	1	-	0
I06101		✓	0		✓	0.25	2.0c	60	2	-	0

Table 18. (continued)

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
I06201		✓	0		✓	0.25	2.0c	60	5	-	0
I09001		✓	0		✓	0.25	2.0c	90	1	-	0
I09101		✓	0		✓	0.25	2.0c	90	2	-	0
I09201		✓	0		✓	0.25	2.0c	90	5	-	0
I12001		✓	0		✓	0.25	2.0c	120	1	-	0
I12101		✓	0		✓	0.25	2.0c	120	2	-	0
I12201		✓	0		✓	0.25	2.0c	120	5	-	0
I14501		✓	0		✓	0.25	2.0c	145	1	-	0
I14601		✓	0		✓	0.25	2.0c	145	2	-	0
I14701		✓	0		✓	0.25	2.0c	145	5	-	0
I16001		✓	0		✓	0.25	2.0c	160	1	-	0
I16101		✓	0		✓	0.25	2.0c	160	2	-	0
I16201		✓	0		✓	0.25	2.0c	160	5	-	0
J03501		✓	0		✓	0.25	3.0c	35	1	-	0
J03601		✓	0		✓	0.25	3.0c	35	2	-	0
J03701		✓	0		✓	0.25	3.0c	35	4	-	0
J06001		✓	0		✓	0.25	3.0c	60	1	-	0
J06101		✓	0		✓	0.25	3.0c	60	2	-	0
J06201		✓	0		✓	0.25	3.0c	60	4	-	0
J12001		✓	0		✓	0.25	3.0c	120	1	-	0
J12101		✓	0		✓	0.25	3.0c	120	2	-	0
J12201		✓	0		✓	0.25	3.0c	120	4	-	0
J14501		✓	0		✓	0.25	3.0c	145	1	-	0
J14601		✓	0		✓	0.25	3.0c	145	2	-	0
J14701		✓	0		✓	0.25	3.0c	145	4	-	0
K03501		✓	0		✓	0.25	2.0c	35	1	5	0
K03601		✓	0		✓	0.25	2.0c	35	2	5	0
K03701		✓	0		✓	0.25	2.0c	35	5	5	0
K09001		✓	0		✓	0.25	2.0c	90	1	5	0
K09101		✓	0		✓	0.25	2.0c	90	2	5	0
K09201		✓	0		✓	0.25	2.0c	90	5	5	0
K14501		✓	0		✓	0.25	2.0c	145	1	5	0
K14601		✓	0		✓	0.25	2.0c	145	2	5	0
K14701		✓	0		✓	0.25	2.0c	145	5	5	0
K16001		✓	0		✓	0.25	2.0c	160	1	5	0
K16101		✓	0		✓	0.25	2.0c	160	2	5	0
K16201		✓	0		✓	0.25	2.0c	160	5	5	0
L03501		✓	0		✓	0.25	2.0c	35	1	1	0
L03601		✓	0		✓	0.25	2.0c	35	2	1	0
L03701		✓	0		✓	0.25	2.0c	35	5	1	0
L09001		✓	0		✓	0.25	2.0c	90	1	1	0
L09101		✓	0		✓	0.25	2.0c	90	2	1	0
L09201		✓	0		✓	0.25	2.0c	90	5	1	0
L14501		✓	0		✓	0.25	2.0c	145	1	1	0
L14601		✓	0		✓	0.25	2.0c	145	2	1	0
L14701		✓	0		✓	0.25	2.0c	145	5	1	0
L16001		✓	0		✓	0.25	2.0c	160	1	1	0
L16101		✓	0		✓	0.25	2.0c	160	2	1	0

Table 18. (continued)

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
L16201		✓	0		✓	0.25	2.0c	160	5	1	0
M03501		✓	0		✓	0.25	2.0c	35	1	6	0
M03601		✓	0		✓	0.25	2.0c	35	2	6	0
M03701		✓	0		✓	0.25	2.0c	35	5	6	0
M09001		✓	0		✓	0.25	2.0c	90	1	6	0
M09101		✓	0		✓	0.25	2.0c	90	2	6	0
M09201		✓	0		✓	0.25	2.0c	90	5	6	0
M14501		✓	0		✓	0.25	2.0c	145	1	6	0
M14601		✓	0		✓	0.25	2.0c	145	2	6	0
M14701		✓	0		✓	0.25	2.0c	145	5	6	0
M16001		✓	0		✓	0.25	2.0c	160	1	6	0
M15101		✓	0		✓	0.25	2.0c	160	2	6	0
M16201		✓	0		✓	0.25	2.0c	160	5	6	0
N01101		✓	0		✓	0.25	2.0c	35	1	11	0
N01201		✓	0		✓	0.25	2.0c	35	1	12	0
N01301		✓	0		✓	0.25	2.0c	35	1	13	0
N01401		✓	0		✓	0.25	2.0c	35	1	14	0
N01501		✓	0		✓	0.25	2.0c	35	1	15	0
N02101		✓	0		✓	0.25	2.0c	145	1	11	0
N02201		✓	0		✓	0.25	2.0c	145	1	12	0
N02301		✓	0		✓	0.25	2.0c	145	1	13	0
N02401		✓	0		✓	0.25	2.0c	145	1	14	0
N02501		✓	0		✓	0.25	2.0c	145	1	15	0
N11101		✓	0		✓	0.25	2.0c	35	1	7	0
N11201		✓	0		✓	0.25	2.0c	35	1	8	0
N11401		✓	0		✓	0.25	2.0c	35	1	9	0
N11501		✓	0		✓	0.25	2.0c	35	1	10	0
N12101		✓	0		✓	0.25	2.0c	145	1	7	0
N12201		✓	0		✓	0.25	2.0c	145	1	8	0
N12401		✓	0		✓	0.25	2.0c	145	1	9	0
N12501		✓	0		✓	0.25	2.0c	145	1	10	0
N23401		✓	0		✓	0.25	2.0c	60	1	9	0
N24401		✓	0		✓	0.25	2.0c	60	2	9	0
N25401		✓	0		✓	0.25	2.0c	60	5	9	0
N33401		✓	0		✓	0.25	2.0c	120	1	9	0
N34401		✓	0		✓	0.25	2.0c	120	2	9	0
N35401		✓	0		✓	0.25	2.0c	120	5	9	0
O01101		✓	0		✓	0.25	2.0c	35	2	11	0
O01201		✓	0		✓	0.25	2.0c	35	2	12	0
O01301		✓	0		✓	0.25	2.0c	35	2	13	0
O01401		✓	0		✓	0.25	2.0c	35	2	14	0
O01501		✓	0		✓	0.25	2.0c	35	2	15	0
O02101		✓	0		✓	0.25	2.0c	145	2	11	0
O02201		✓	0		✓	0.25	2.0c	145	2	12	0
O02301		✓	0		✓	0.25	2.0c	145	2	13	0
O02401		✓	0		✓	0.25	2.0c	145	2	14	0
O02501		✓	0		✓	0.25	2.0c	145	2	15	0
O11101		✓	0		✓	0.25	2.0c	35	2	7	0

Table 18. (continued)

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
O11201		✓	0		✓	0.25	2.0c	35	2	8	0
O11401		✓	0		✓	0.25	2.0c	35	2	9	0
O11501		✓	0		✓	0.25	2.0c	35	2	10	0
O12101		✓	0		✓	0.25	2.0c	145	2	7	0
O12201		✓	0		✓	0.25	2.0c	145	2	8	0
O12401		✓	0		✓	0.25	2.0c	145	2	9	0
O12501		✓	0		✓	0.25	2.0c	145	2	10	0
P03501		✓	0		(edge)	0.25	2.0c	35	1	1	0
P03601		✓	0		(edge)	0.25	2.0c	35	2	1	0
P03701		✓	0		(edge)	0.25	2.0c	35	5	1	0
P14501		✓	0		(edge)	0.25	2.0c	145	1	1	0
P14601		✓	0		(edge)	0.25	2.0c	145	2	1	0
P14701		✓	0		(edge)	0.25	2.0c	145	5	1	0
Q03501		✓	0		(edge)	0.25	2.0c	35	1	-	0
Q03601		✓	0		(edge)	0.25	2.0c	35	2	-	0
Q03701		✓	0		(edge)	0.25	2.0c	35	5	-	0
Q14501		✓	0		(edge)	0.25	2.0c	145	1	-	0
Q14601		✓	0		(edge)	0.25	2.0c	145	2	-	0
Q14701		✓	0		(edge)	0.25	2.0c	145	5	-	0
R01101		✓	45		✓	0.25	2.0c	35	1	1	0
R02101		✓	45		✓	0.25	2.0c	145	1	1	0
R01201		✓	45		✓	0.25	2.0c	35	1	2	0
R02201		✓	45		✓	0.25	2.0c	145	1	2	0
R01301		✓	45		✓	0.25	2.0c	35	1	3	0
R02301		✓	45		✓	0.25	2.0c	145	1	3	0
R01401		✓	45		✓	0.25	2.0c	35	1	4	0
R02401		✓	45		✓	0.25	2.0c	145	1	4	0
R11101		✓	45		✓	0.25	2.0c	35	1	1	1
R12101		✓	45		✓	0.25	2.0c	145	1	1	1
R11201		✓	45		✓	0.25	2.0c	35	1	2	1
R12201		✓	45		✓	0.25	2.0c	145	1	2	
R11301		✓	45		✓	0.25	2.0c	35	1	3	1
R12301		✓	45		✓	0.25	2.0c	145	1	3	1
R21101		✓	45		✓	0.25	2.0c	35	1	1	2
R22101		✓	45		✓	0.25	2.0c	145	1	1	2
R31101		✓	45		✓	0.25	2.0c	35	1	1	3
R32101		✓	45		✓	0.25	2.0c	145	1	1	3
S01101		✓	45		✓	0.25	2.0c	35	2	1	0
S02101		✓	45		✓	0.25	2.0c	145	2	1	0
S01201		✓	45		✓	0.25	2.0c	35	2	2	0
S02201		✓	45		✓	0.25	2.0c	145	2	2	0
S01301		✓	45		✓	0.25	2.0c	35	2	3	0
S02301		✓	45		✓	0.25	2.0c	145	2	3	0
S01401		✓	45		✓	0.25	2.0c	35	2	4	0
S02401		✓	45		✓	0.25	2.0c	145	2	4	0
S11101		✓	45		✓	0.25	2.0c	35	2	1	1
S12101		✓	45		✓	0.25	2.0c	145	2	1	1
S11201		✓	45		✓	0.25	2.0c	35	2	2	1

Table 18. (continued)

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
S12201		✓	45		✓	0.25	2.0c	145	2	2	1
S11301		✓	45		✓	0.25	2.0c	35	2	3	1
S12301		✓	45		✓	0.25	2.0c	145	2	3	1
S21101		✓	45		✓	0.25	2.0c	35	2	1	2
S22101		✓	45		✓	0.25	2.0c	145	2	1	2
S31101		✓	45		✓	0.25	2.0c	35	2	1	3
S32101		✓	45		✓	0.25	2.0c	145	2	1	3
T01101		✓	45		✓	0.25	2.0c	35	3	1	0
T02101		✓	45		✓	0.25	2.0c	145	3	1	0
T01201		✓	45		✓	0.25	2.0c	35	3	2	0
T02201		✓	45		✓	0.25	2.0c	145	3	2	0
T01301		✓	45		✓	0.25	2.0c	35	3	3	0
T02301		✓	45		✓	0.25	2.0c	145	3	3	0
T01401		✓	45		✓	0.25	2.0c	35	3	4	0
T02401		✓	45		✓	0.25	2.0c	145	3	4	0
T11101		✓	45		✓	0.25	2.0c	35	3	1	1
T12101		✓	45		✓	0.25	2.0c	145	3	1	1
T11201		✓	45		✓	0.25	2.0c	35	3	2	1
T12201		✓	45		✓	0.25	2.0c	145	3	2	1
T11301		✓	45		✓	0.25	2.0c	35	3	3	1
T12301		✓	45		✓	0.25	2.0c	145	3	3	1
T21101		✓	45		✓	0.25	2.0c	35	3	1	2
T22101		✓	45		✓	0.25	2.0c	145	3	1	2
T31101		✓	45		✓	0.25	2.0c	35	3	1	3
T32101		✓	45		✓	0.25	2.0c	145	3	1	3
U03501		✓	45		✓	0.25	2.0c	35	1	-	0
U03601		✓	45		✓	0.25	2.0c	35	2	-	0
U03701		✓	45		✓	0.25	2.0c	35	3	-	0
U14501		✓	45		✓	0.25	2.0c	145	1	-	0
U14601		✓	45		✓	0.25	2.0c	145	2	-	0
U14701		✓	45		✓	0.25	2.0c	145	3	-	0
V03501		✓	45		✓	0.25	2.0c	35	1	-	1
V03601		✓	45		✓	0.25	2.0c	35	2	-	1
V03701		✓	45		✓	0.25	2.0c	35	3	-	1
V14501		✓	45		✓	0.25	2.0c	145	1	-	1
V14601		✓	45		✓	0.25	2.0c	145	2	-	1
V14701		✓	45		✓	0.25	2.0c	145	3	-	1
W03501		✓	0		✓ (edge)	0.25	2.0c	35	1	-	0 (1:12)
W03601		✓	0		✓ (edge)	0.25	2.0c	35	2	-	0 (1:12)
W03701		✓	0		✓ (edge)	0.25	2.0c	35	5	-	0 (1:12)
W14501		✓	0		✓ (edge)	0.25	2.0c	145	1	-	0 (1:12)
W14601		✓	0		✓ (edge)	0.25	2.0c	145	2	-	0 (1:12)
W14701		✓	0		✓ (edge)	0.25	2.0c	145	5	-	0 (1:12)
X03501		✓	0		✓ (edge)	0.25	2.0c	35	1	1	0 (1:12)
X03601		✓	0		✓ (edge)	0.25	2.0c	35	2	1	0 (1:12)
X14501		✓	0		✓ (edge)	0.25	2.0c	145	1	1	0 (1:12)
X14601		✓	0		✓ (edge)	0.25	2.0c	145	2	1	0 (1:12)
20350x	✓		0	✓		0.25	-	35	-	-	0 (1:12)

APPENDIX B

Pressure Data Referenced to 10 m on Prototype

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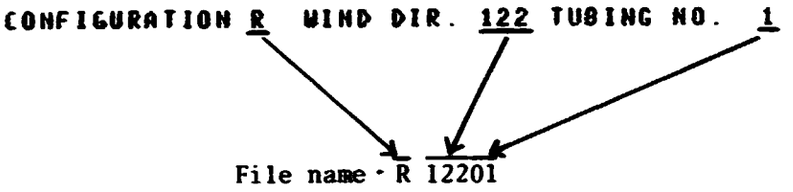
This appendix presents the data supplement consisting of the velocity and turbulent profile of the nonuniform flow, the digitized pressure data referenced to 10 m on prototype and the various plots of pressure distribution along the chord of the solar array.

Pressure coefficients are defined in Section 3.2 on the main report. The pressure tap numbers shown in Appendix B are defined that; on the upstream surface of the solar array, the number runs 1 through 10 from the edge where s/c = 0, and on the downstream surface, 20 through 11. The file name for each test configuration is formulated as follows.



Force and model configurations are schematically explained in Figures 22 and 24 of the main report, respectively. Fence configurations are also tabulated in Table 17 of that report.

List of Run Configurations

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
A02001	✓		0	✓		0.25	-	20	-	-	0
A03501	✓		0	✓		0.25	-	35	-	-	0
A06001	✓		0	✓		0.25	-	60	-	-	0
A09001	✓		0	✓		0.25	-	90	-	-	0
A12001	✓		0	✓		0.25	-	120	-	-	0
A14501	✓		0	✓		0.25	-	145	-	-	0
A16001	✓		0	✓		0.25	-	160	-	-	0
B02001	✓		0	✓		0.5	-	20	-	-	0
B06001	✓		0	✓		0.5	-	60	-	-	0
B09001	✓		0	✓		0.5	-	90	-	-	0
B12001	✓		0	✓		0.5	-	120	-	-	0
B16001	✓		0	✓		0.5	-	160	-	-	0
C02001	✓		0	✓		∞	-	20	-	-	0
C03501	✓		0	✓		∞	-	35	-	-	0
C06001	✓		0	✓		∞	-	60	-	-	0
C09001	✓		0	✓		∞	-	90	-	-	0
D02001	✓		0		✓	0.25	1.5c	20	1	-	0
D02101	✓		0		✓	0.25	1.5c	20	2	-	0
D02201	✓		0		✓	0.25	1.5c	20	5	-	0
D03501	✓		0		✓	0.25	1.5c	35	1	-	0
D03601	✓		0		✓	0.25	1.5c	35	2	-	0
D03701	✓		0		✓	0.25	1.5c	35	5	-	0
D14501	✓		0		✓	0.25	1.5c	145	1	-	0
D14601	✓		0		✓	0.25	1.5c	145	2	-	0
D16001	✓		0		✓	0.25	1.5c	160	1	-	0
D16101	✓		0		✓	0.25	1.5c	160	2	-	0
E02001	✓		0		✓	0.25	2.0c	20	1	-	0
E02101	✓		0		✓	0.25	2.0c	20	2		0
E02201	✓		0		✓	0.25	2.0c	20	5	-	0
E03501	✓		0		✓	0.25	2.0c	35	1	-	0
E03601	✓		0		✓	0.25	2.0c	35	2	-	0
E03701	✓		0		✓	0.25	2.0c	35	5	-	0
E06001	✓		0		✓	0.25	2.0c	60	1	-	0
E06101	✓		0		✓	0.25	2.0c	60	2	-	0
E06201	✓		0		✓	0.25	2.0c	60	5	-	0
E09001	✓		0		✓	0.25	2.0c	90	1	-	0
E09101	✓		0		✓	0.25	2.0c	90	2	-	0
E09201	✓		0		✓	0.25	2.0c	90	5	-	0
E12001	✓		0		✓	0.25	2.0c	120	1	-	0
E12101	✓		0		✓	0.25	2.0c	120	2	-	0
E12201	✓		0		✓	0.25	2.0c	120	5	-	0
E14501	✓		0		✓	0.25	2.0c	145	1	-	0
E14601	✓		0		✓	0.25	2.0c	145	2	-	0
E14701	✓		0		✓	0.25	2.0c	145	5	-	0
E16001	✓		0		✓	0.25	2.0c	160	1	-	0
E16101	✓		0		✓	0.25	2.0c	160	2	-	0
E16201	✓		0		✓	0.25	2.0c	160	5	-	0
F03501	✓		0		✓	0.25	3.0c	35	1	-	0

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
F03601	✓		0		✓	0.25	3.0c	35	2	-	0
F03701	✓		0		✓	0.25	3.0c	35	4	-	0
F06001	✓		0		✓	0.25	3.0c	60	1	-	0
F06101	✓		0		✓	0.25	3.0c	60	2	-	0
F0620[illegible]	✓		0		✓	0.25	3.0c	60	4	-	0
F[illegible]2001	✓		0		✓	0.25	3.0c	120	1	-	0
F[illegible]21[illegible]	✓		0		✓	0.25	3.0c	120	2	-	0
F[illegible]2[illegible]t	✓		0		✓	0.25	3.0c	120	4	-	0
[illegible]1[illegible]601	✓		0		✓	0.25	3.0c	145	1	-	0
F14601	✓		0		✓	0.25	3.0c	145	2	-	0
F14[illegible]01	✓		0		✓	0.25	3.0c	145	4	-	0
G[illegible]2001		✓	0	✓		0.25	-	20	-	-	0
G03501		✓	0	✓		0.25	-	35	-	-	0
G060[illegible]1		✓	0	✓		0.25	-	60	-	-	0
G09[illegible]1		✓	0	✓		0.25	-	90	-	-	0
G[illegible]2[illegible]1		✓	0	✓		0.25	-	120	-	-	0
G14[illegible]1		✓	0	✓		0.25	-	145	-	-	0
G160[illegible]1		✓	0	✓		0.25	-	160	-	-	0
G01101		✓	0	✓		0.25	-	35	-	7	0
G01201		✓	0	✓		0.25	-	35	-	8	0
G01301		✓	0	✓		0.25	-	35	-	1	0
G01401		✓	0	✓		0.25	-	35	-	9	0
G01501		✓	0	✓		0.25	-	35	-	10	0
G02101		✓	0	✓		0.25	-	145	-	7	0
G02201		✓	0	✓		0.25	-	145	-	8	0
G02301		✓	0	✓		0.25	-	145	-	1	0
G02401		✓	0	✓		0.25	-	145	-	9	0
G02501		✓	0	✓		0.25	-	145	-	10	0
H02001		✓	0		✓	0.25	1.5c	20	1	-	0
H02101		✓	0		✓	0.25	1.5c	20	2	-	0
H02201		✓	0		✓	0.25	1.5c	20	5	-	0
H03501		✓	0		✓	0.25	1.5c	35	1	-	0
H03601		✓	0		✓	0.25	1.5c	35	2	-	0
H03701		✓	0		✓	0.25	1.5c	35	5	-	0
H14501		✓	0		✓	0.25	1.5c	145	1	-	0
H14601		✓	0		✓	0.25	1.5c	145	2	-	0
H14701		✓	0		✓	0.25	1.5c	145	5	-	0
H16001		[illegible]	0		✓	0.25	1.5c	160	1	-	0
H16101		[illegible]	0		✓	0.25	1.5c	160	2	-	0
H16201		✓	0		✓	0.25	1.5c	160	5	-	0
I02001		✓	0		✓	0.25	2.0c	20	1	-	0
I02101		✓	0		✓	0.25	2.0c	20	2	-	0
I02201		✓	0		✓	0.25	2.0c	20	5	-	0
I03[illegible]		✓	0		✓	0.25	2.0c	35	1	-	0
[illegible]3601		✓	0		✓	0.25	2.0c	35	2	-	0
I03701		✓	0		✓	0.25	2.0c	35	5	-	0
I06001		✓	0		✓	0.25	2.0c	60	1	-	0
I06101		✓	0		✓	0.25	2.0c	60	2	-	0

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
I06201		✓	0		✓	0.25	2.0c	60	5	-	0
I09001		✓	0		✓	0.25	2.0c	90	1	-	0
I09101		✓	0		✓	0.25	2.0c	90	2	-	0
I09201		✓	0		✓	0.25	2.0c	90	5	-	0
I12001		✓	0		✓	0.25	2.0c	120	1	-	0
I12101		✓	0		✓	0.25	2.0c	120	2	-	0
I12201		✓	0		✓	0.25	2.0c	120	5	-	0
I14501		✓	0		✓	0.25	2.0c	145	1	-	0
I14601		✓	0		✓	0.25	2.0c	145	2	-	0
I14701		✓	0		✓	0.25	2.0c	145	5	-	0
I16001		✓	0		✓	0.25	2.0c	160	1	-	0
I16101		✓	0		✓	0.25	2.0c	160	2	-	0
I16201		✓	0		✓	0.25	2.0c	160	5	-	0
J03501		✓	0		✓	0.25	3.0c	35	1	-	0
J03601		✓	0		✓	0.25	3.0c	35	2	-	0
J03701		✓	0		✓	0.25	3.0c	35	4	-	0
J06001		✓	0		✓	0.25	3.0c	60	1	-	0
J06101		✓	0		✓	0.25	3.0c	60	2	-	0
J06201		✓	0		✓	0.25	3.0c	60	4	-	0
J12001		✓	0		✓	0.25	3.0c	120	1	-	0
J12101		✓	0		✓	0.25	3.0c	120	2	-	0
J12201		✓	0		✓	0.25	3.0c	120	4	-	0
J14501		✓	0		✓	0.25	3.0c	145	1	-	0
J14601		✓	0		✓	0.25	3.0c	145	2	-	0
J14701		✓	0		✓	0.25	3.0c	145	4	-	0
K03501		✓	0		✓	0.25	2.0c	35	1	5	0
K03601		✓	0		✓	0.25	2.0c	35	2	5	0
K03701		✓	0		✓	0.25	2.0c	35	5	5	0
K09001		✓	0		✓	0.25	2.0c	90	1	5	0
K09101		✓	0		✓	0.25	2.0c	90	2	5	0
K09201		✓	0		✓	0.25	2.0c	90	5	5	0
K14501		✓	0		✓	0.25	2.0c	145	1	5	0
K14601		✓	0		✓	0.25	2.0c	145	2	5	0
K14701		✓	0		✓	0.25	2.0c	145	5	5	0
K16001		✓	0		✓	0.25	2.0c	160	1	5	0
K16101		✓	0		✓	0.25	2.0c	160	2	5	0
K16201		✓	0		✓	0.25	2.0c	160	5	5	0
L03501		✓	0		✓	0.25	2.0c	35	1	1	0
L03601		✓	0		✓	0.25	2.0c	35	2	1	0
L03701		✓	0		✓	0.25	2.0c	35	5	1	0
L09001		✓	0		✓	0.25	2.0c	90	1	1	0
L09101		✓	0		✓	0.25	2.0c	90	2	1	0
L09201		✓	0		✓	0.25	2.0c	90	5	1	0
L14501		✓	0		✓	0.25	2.0c	145	1	1	0
L14601		✓	0		✓	0.25	2.0c	145	2	1	0
L14701		✓	0		✓	0.25	2.0c	145	5	1	0
L16001		✓	0		✓	0.25	2.0c	160	1	1	0
L16101		✓	0		✓	0.25	2.0c	160	2	1	0

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
L16201		✓	0		✓	0.25	2.0c	160	5	1	0
M03501		✓	0		✓	0.25	2.0c	35	1	6	0
M03601		✓	0		✓	0.25	2.0c	35	2	6	0
M03701		✓	0		✓	0.25	2.0c	35	5	6	0
M09001		✓	0		✓	0.25	2.0c	90	1	6	0
M09101		✓	0		✓	0.25	2.0c	90	2	6	0
M09201		✓	0		✓	0.25	2.0c	90	5	6	0
M14501		✓	0		✓	0.25	2.0c	145	1	6	0
M14601		✓	0		✓	0.25	2.0c	145	2	6	0
M14701		✓	0		✓	0.25	2.0c	145	5	6	0
M16001		✓	0		✓	0.25	2.0c	160	1	6	0
M16101		✓	0		✓	0.25	2.0c	160	2	6	0
M16201		✓	0		✓	0.25	2.0c	160	5	6	0
N01101		✓	0		✓	0.25	2.0c	35	1	11	0
N01201		✓	0		✓	0.25	2.0c	35	1	12	0
N01301		✓	0		✓	0.25	2.0c	35	1	13	0
N01401		✓	0		✓	0.25	2.0c	35	1	14	0
N01501		✓	0		✓	0.25	2.0c	35	1	15	0
N02101		✓	0		✓	0.25	2.0c	145	1	11	0
N02201		✓	0		✓	0.25	2.0c	145	1	12	0
N02301		✓	0		✓	0.25	2.0c	145	1	13	0
N02401		✓	0		✓	0.25	2.0c	145	1	14	0
N02501		✓	0		✓	0.25	2.0c	145	1	15	0
N11101		✓	0		✓	0.25	2.0c	35	1	7	0
N11201		✓	0		✓	0.25	2.0c	35	1	8	0
N11401		✓	0		✓	0.25	2.0c	35	1	9	0
N11501		✓	0		✓	0.25	2.0c	35	1	10	0
N12101		✓	0		✓	0.25	2.0c	145	1	7	0
N12201		✓	0		✓	0.25	2.0c	145	1	8	0
N12401		✓	0		✓	0.25	2.0c	145	1	9	0
N12501		✓	0		✓	0.25	2.0c	145	1	10	0
N23401		✓	0		✓	0.25	2.0c	60	1	9	0
N24401		✓	0		✓	0.25	2.0c	60	2	9	0
N25401		✓	0		✓	0.25	2.0c	60	5	9	0
N33401		✓	0		✓	0.25	2.0c	120	1	9	0
N34401		✓	0		✓	0.25	2.0c	120	2	9	0
N35401		✓	0		✓	0.25	2.0c	120	5	9	0
O01101		✓	0		✓	0.25	2.0c	35	2	11	0
O01201		✓	0		✓	0.25	2.0c	35	2	12	0
O01301		✓	0		✓	0.25	2.0c	35	2	13	0
O01401		✓	0		✓	0.25	2.0c	35	2	14	0
O01501		✓	0		✓	0.25	2.0c	35	2	15	0
O02101		✓	0		✓	0.25	2.0c	145	2	11	0
O02201		✓	0		✓	0.25	2.0c	145	2	12	0
O02301		✓	0		✓	0.25	2.0c	145	2	13	0
O02401		✓	0		✓	0.25	2.0c	145	2	14	0
O02501		✓	0		✓	0.25	2.0c	145	2	15	0
O11101		✓	0		✓	0.25	2.0c	35	2	7	0

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
O11201		✓	0		✓	0.25	2.0c	35	2	8	0
O11401		✓	0		✓	0.25	2.0c	35	2	9	0
O11501		✓	0		✓	0.25	2.0c	35	2	10	0
O12101		✓	0		✓	0.25	2.0c	145	2	7	0
O12201		✓	0		✓	0.25	2.0c	145	2	8	0
O12401		✓	0		✓	0.25	2.0c	145	2	9	0
O12501		✓	0		✓	0.25	2.0c	145	2	10	0
P03501		✓	0		✓ (edge)	0.25	2.0c	35	1	1	0
P03601		✓	0		✓ (edge)	0.25	2.0c	35	2	1	0
P03701		✓	0		✓ (edge)	0.25	2.0c	35	5	1	0
P14501		✓	0		✓ (edge)	0.25	2.0c	145	1	1	0
P14601		✓	0		✓ (edge)	0.25	2.0c	145	2	1	0
P14701		✓	0		✓ (edge)	0.25	2.0c	145	5	1	0
Q03501		✓	0		✓ (edge)	0.25	2.0c	35	1	-	0
Q03601		✓	0		✓ (edge)	0.25	2.0c	35	2	-	0
Q03701		✓	0		✓ (edge)	0.25	2.0c	35	5	-	0
Q14501		✓	0		✓ (edge)	0.25	2.0c	145	1	-	0
Q14601		✓	0		✓ (edge)	0.25	2.0c	145	2	-	0
Q14701		✓	0		✓ (edge)	0.25	2.0c	145	5	-	0
R01101		✓	45		✓	0.25	2.0c	35	1	1	0
R02101		✓	45		✓	0.25	2.0c	145	1	1	0
R01201		✓	45		✓	0.25	2.0c	35	1	2	0
R02201		✓	45		✓	0.25	2.0c	145	1	2	0
R01301		✓	45		✓	0.25	2.0c	35	1	3	0
R02301		✓	45		✓	0.25	2.0c	145	1	3	0
R01401		✓	45		✓	0.25	2.0c	35	1	4	0
R02401		✓	45		✓	0.25	2.0c	145	1	4	0
R11101		✓	45		✓	0.25	2.0c	35	1	1	1
R12101		✓	45		✓	0.25	2.0c	145	1	1	1
R11201		✓	45		✓	0.25	2.0c	35	1	2	1
R12201		✓	45		✓	0.25	2.0c	145	1	2	1
R11301		✓	45		✓	0.25	2.0c	35	1	3	1
R12301		✓	45		✓	0.25	2.0c	145	1	3	1
R21101		✓	45		✓	0.25	2.0c	35	1	1	2
R22101		✓	45		✓	0.25	2.0c	145	1	1	2
R31101		✓	45		✓	0.25	2.0c	35	1	1	3
R32101		✓	45		✓	0.25	2.0c	145	1	1	3
S01101		✓	45		✓	0.25	2.0c	35	2	1	0
S02101		✓	45		✓	0.25	2.0c	145	2	1	0
S01201		✓	45		✓	0.25	2.0c	35	2	2	0
S02201		✓	45		✓	0.25	2.0c	145	2	2	0
S01301		✓	45		✓	0.25	2.0c	35	2	3	0
S02301		✓	45		✓	0.25	2.0c	145	2	3	0
S01401		✓	45		✓	0.25	2.0c	35	2	4	0
S02401		✓	45		✓	0.25	2.0c	145	2	4	0
S11101		✓	45		✓	0.25	2.0c	35	2	1	1
S12101		✓	45		✓	0.25	2.0c	145	2	1	1
S11201		✓	45		✓	0.25	2.0c	35	2	2	1

File Name	Flow Profile		WD	Array		H/c	x	α	Array #	FC	MC
	Uniform	1/7 th		Single	Multiple						
S12201		✓	45		✓	0.25	2.0c	145	2	2	1
S11301		✓	45		✓	0.25	2.0c	35	2	3	1
S12301		✓	45		✓	0.25	2.0c	145	2	3	1
S21101		✓	45		✓	0.25	2.0c	35	2	1	2
S22101		✓	45		✓	0.25	2.0c	145	2	1	2
S31101		✓	45		✓	0.25	2.0c	35	2	1	3
S32101		✓	45		✓	0.25	2.0c	145	2	1	3
T01101		✓	45		✓	0.25	2.0c	35	3	1	0
T02101		✓	45		✓	0.25	2.0c	145	3	1	0
T01201		✓	45		✓	0.25	2.0c	35	3	2	0
T02201		✓	45		✓	0.25	2.0c	145	3	2	0
T01301		✓	45		✓	0.25	2.0c	35	3	3	0
T02301		✓	45		✓	0.25	2.0c	145	3	3	0
T01401		✓	45		✓	0.25	2.0c	35	3	4	0
T02401		✓	45		✓	0.25	2.0c	145	3	4	0
T11101		✓	45		✓	0.25	2.0c	35	3	1	1
T12101		✓	45		✓	0.25	2.0c	145	3	1	1
T11201		✓	45		✓	0.25	2.0c	35	3	2	1
T12201		✓	45		✓	0.25	2.0c	145	3	2	1
T11301		✓	45		✓	0.25	2.0c	35	3	3	1
T12301		✓	45		✓	0.25	2.0c	145	3	3	1
T21101		✓	45		✓	0.25	2.0c	35	3	1	2
T21101		✓	45		✓	0.25	2.0c	145	3	1	2
T31101		✓	45		✓	0.25	2.0c	35	3	1	3
T32101		✓	45		✓	0.25	2.0c	145	3	1	3
U03501		✓	45		✓	0.25	2.0c	35	1	-	0
U03601		✓	45		✓	0.25	2.0c	35	2	-	0
U03701		✓	45		✓	0.25	2.0c	35	3	-	0
U14501		✓	45		✓	0.25	2.0c	145	1	-	0
U14601		✓	45		✓	0.25	2.0c	145	2	-	0
U14701		✓	45		✓	0.25	2.0c	145	3	-	0
V03501		✓	45		✓	0.25	2.0c	35	1	-	1
V03601		✓	45		✓	0.25	2.0c	35	2	-	1
V03701		✓	45		✓	0.25	2.0c	35	3	-	1
V14501		✓	45		✓	0.25	2.0c	145	1	-	1
V14601		✓	45		✓	0.25	2.0c	145	2	-	1
V14701		✓	45		✓	0.25	2.0c	145	3	-	1
W03501		✓	0		✓ (edge)	0.25	2.0c	35	1	-	0 (1:12)
W03601		✓	0		✓ (edge)	0.25	2.0c	35	2	-	0 (1:12)
W03701		✓	0		✓ (edge)	0.25	2.0c	35	5	-	0 (1:12)
W14501		✓	0		✓ (edge)	0.25	2.0c	145	1	-	0 (1:12)
W14601		✓	0		✓ (edge)	0.25	2.0c	145	2	-	0 (1:12)
W14701		✓	0		✓ (edge)	0.25	2.0c	145	5	-	0 (1:12)
X03501		✓	0		✓ (edge)	0.25	2.0c	35	1	1	0 (1:12)
X03601		✓	0		✓ (edge)	0.25	2.0c	35	2	1	0 (1:12)
X14501		✓	0		✓ (edge)	0.25	2.0c	145	1	1	0 (1:12)
X14601		✓	0		✓ (edge)	0.25	2.0c	145	2	1	0 (1:12)
Z03501	✓		0	✓		0.25	-	35	-	-	0 (1:12)

DATA FOR PROJECT 6022 CONFIG. A WIND DIR. 20 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- .297	.131	.143	- .917	11	- .724	.066	- .502	- .977
2	- .145	.111	.214	- .576	12	- .739	.068	- .502	- .986
3	- .006	.099	.262	- .287	13	- .735	.066	- .513	- .984
4	.109	.087	.340	- .133	14	- .745	.070	- .547	-1.005
5	.223	.068	.419	.057	15	- .755	.062	- .587	- .989
6	.276	.055	.501	.185	16	- .781	.065	- .594	-1.062
7	.458	.046	.598	.324	17	- .778	.073	- .537	-1.162
8	.514	.047	.724	.411	18	- .773	.093	- .393	-1.253
9	.565	.049	.830	.466	19	- .761	.118	- .278	-1.256
10	.791	.076	1.035	.455	20	- .767	.156	- .158	-2.059

DATA FOR PROJECT 6022 CONFIG A WIND DIR. 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- .046	.036	.081	- .193	11	- .647	.040	- .481	- .836
2	.104	.031	.213	- .032	12	- .673	.038	- .526	- .837
3	.240	.025	.337	.158	13	- .656	.037	- .524	- .775
4	.325	.024	.434	.241	14	- .667	.03	- .555	- .781
5	.433	.024	.551	.341	15	- .657	.031	- .531	- .812
6	.524	.027	.635	.433	16	- .685	.032	- .538	- .846
7	.641	.038	.787	.523	17	- .663	.033	- .536	- .823
8	.720	.058	.918	.500	18	- .668	.035	- .543	- .834
9	.785	.084	1.026	.472	19	- .650	.040	- .488	- .779
10	.764	.134	1.102	.259	20	- .675	.044	- .495	- .801

DATA FOR PROJECT 6022 CONFIG A WIND DIR. 60 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.128	.056	.341	- .026	11	- .699	.034	- .554	- .832
2	.273	.048	.484	.137	12	- .702	.033	- .562	- .802
3	.392	.040	.555	.258	13	- .701	.032	- .577	- .806
4	.480	.039	.655	.369	14	- .701	.032	- .568	- .814
5	.586	.040	.752	.423	15	- .694	.033	- .554	- .802
6	.680	.048	.865	.484	16	- .699	.034	- .558	- .802
7	.771	.066	1.051	.548	17	- .699	.035	- .525	- .808
8	.781	.088	1.081	.485	18	- .702	.035	- .554	- .804
9	.723	.110	1.093	.299	19	- .693	.039	- .519	- .828
10	.507	.147	.972	- .244	20	- .701	.041	- .516	- .836

DATA FOR PROJECT 6022 CONFIG. A WIND DIR 90 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.313	.079	.609	.043	11	- .729	.039	- .560	- .874
2	.436	.068	.716	.249	12	- .733	.037	- .560	- .868
3	.578	.059	.804	.364	13	- .718	.038	- .581	- .883
4	.617	.058	.668	.429	14	- .765	.037	- .614	- .922
5	.695	.057	.937	.529	15	- .738	.035	- .601	- .881
6	.718	.067	1.004	.523	16	- .746	.035	- .610	- .875
7	.687	.072	.966	.480	17	- .719	.034	- .574	- .844
8	.591	.081	.868	.349	18	- .763	.036	- .621	- .927
9	.435	.089	.736	.121	19	- .732	.036	- .592	- .884
10	.136	.100	.533	- .294	20	- .739	.039	- .584	- .908

DATA FOR PROJECT 6022 CONFIG. A WIND DIR. 120 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.577	.100	.895	.241	11	- .718	.034	- .541	- .848
2	.676	.078	.953	.400	12	- .725	.033	- .562	- .846
3	.735	.061	.963	.514	13	- .714	.033	- .595	- .839
4	.777	.054	.957	.597	14	- .750	.032	- .633	- .870
5	.795	.042	.904	.588	15	- .732	.031	- .605	- .841
6	.802	.047	.783	.481	16	- .737	.032	- .604	- .856
7	.795	.064	.664	.324	17	- .719	.032	- .613	- .871
8	.711	.079	.450	.104	18	- .749	.036	- .628	- .932
9	.551	.097	.337	- .085	19	- .728	.037	- .599	- .904
10	.153	.041	- .029	- .301	20	- .735	.042	- .583	- .912

DATA FOR PROJECT 6022 CONFIG. A WIND DIR 145 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.768	.071	.985	.537	11	- .722	.033	- .575	- .840
2	.742	.050	.893	.567	12	- .721	.031	- .603	- .853
3	.688	.035	.796	.576	13	- .718	.030	- .624	- .822
4	.607	.027	.703	.516	14	- .727	.031	- .628	- .847
5	.479	.019	.542	.393	15	- .721	.031	- .613	- .844
6	.314	.018	.385	.241	16	- .713	.032	- .605	- .841
7	.146	.017	.187	.055	17	- .705	.034	- .572	- .826
8	.030	.019	.035	- .111	18	- .709	.036	- .574	- .847
9	- .079	.023	- .091	- .251	19	- .704	.035	- .568	- .832
10	- .397	.028	- .274	- .496	20	- .690	.039	- .550	- .856

DATA FOR PROJECT 6022 CONFIG. A WIND DIR. 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.614	.035	.709	.461	11	-.787	.070	-.536	-1.163
2	.518	.025	.589	.422	12	-.783	.065	-.528	-1.140
3	.422	.018	.474	.342	13	-.775	.063	-.576	-1.087
4	.325	.015	.375	.268	14	-.776	.065	-.533	-1.109
5	.191	.014	.240	.138	15	-.769	.064	-.581	-1.088
6	.057	.015	.110	.006	16	-.763	.061	-.585	-1.124
7	-.095	.016	-.037	-.160	17	-.756	.054	-.559	-1.125
8	-.218	.020	-.137	-.294	18	-.754	.052	-.573	-.956
9	-.335	.025	-.237	-.439	19	-.743	.046	-.574	-.911
10	-.504	.038	-.359	-.684	20	-.737	.048	-.564	-.916

DATA FOR PROJECT 6022 CONFIG. B WIND DIR 20 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.379	.040	-.250	-.525	11	-.714	.038	-.576	-.879
2	-.248	.032	-.145	-.362	12	-.746	.039	-.604	-.906
3	-.102	.027	-.010	-.197	13	-.727	.037	-.568	-.885
4	.004	.025	.089	-.072	14	-.743	.038	-.605	-.902
5	.153	.020	.219	.093	15	-.729	.032	-.616	-.879
6	.298	.019	.365	.239	16	-.767	.035	-.646	-.979
7	.485	.017	.541	.433	17	-.750	.036	-.627	-.895
8	.615	.017	.670	.549	18	-.761	.040	-.622	-.948
9	.759	.016	.809	.688	19	-.746	.047	-.597	-.931
10	.929	.016	.980	.813	20	-.777	.060	-.566	-1.003

DATA FOR PROJECT 6022 CONFIG B WIND DIR 60 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.082	.041	.220	-.072	11	-.766	.037	-.630	-.896
2	.239	.037	.417	.153	12	-.729	.038	-.641	-.913
3	.379	.033	.598	.346	13	-.772	.037	-.633	-.911
4	.628	.032	.742	.491	14	-.779	.038	-.641	-.902
5	.800	.030	.891	.665	15	-.763	.037	-.543	-.903
6	.923	.030	1.003	.764	16	-.706	.039	-.505	-.934
7	.908	.028	1.069	.779	17	-.708	.039	-.506	-.904
8	.972	.029	1.117	.732	18	-.776	.040	-.574	-.919
9	.873	.031	1.054	.646	19	-.764	.039	-.606	-.913
10	.591	.041	.783	.319	20	-.788	.040	-.636	-.950

DATA FOR PROJECT 6022 CONFIG B WIND DIR 90 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.497	.074	.694	.201	11	-.755	.038	-.592	-.893
2	.700	.062	.865	.467	12	-.760	.038	-.595	-.879
3	.837	.050	.902	.653	13	-.753	.038	-.582	-.880
4	.931	.041	1.065	.759	14	-.772	.038	-.623	-.891
5	.971	.029	1.059	.824	15	-.760	.037	-.606	-.869
6	.931	.025	1.009	.799	16	-.768	.037	-.615	-.884
7	.862	.022	.868	.667	17	-.750	.036	-.551	-.866
8	.637	.024	.735	.482	18	-.769	.037	-.543	-.881
9	.429	.027	.516	.274	19	-.754	.036	-.559	-.872
10	.089	.035	.213	-.121	20	-.760	.038	-.568	-.882

DATA FOR PROJECT 6022 CONFIG. B WIND DIR 120 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.052	.058	1.026	.576	11	-.752	.037	-.601	-.881
2	.242	.041	1.071	.752	12	-.756	.036	-.601	-.883
3	.374	.029	1.064	.857	13	-.749	.035	-.625	-.875
4	.447	.021	1.029	.845	14	-.764	.034	-.638	-.880
5	.446	.017	.911	.777	15	-.754	.032	-.658	-.860
6	.397	.016	.752	.626	16	-.759	.031	-.670	-.861
7	.288	.016	.542	.417	17	-.747	.032	-.606	-.870
8	.188	.017	.349	.213	18	-.759	.033	-.600	-.871
9	.036	.021	.169	-.005	19	-.746	.033	-.592	-.853
10	-.220	.027	-.122	-.325	20	-.750	.035	-.599	-.866

DATA FOR PROJECT 6022 CONFIG B WIND DIR 160 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.688	.017	.755	.631	11	-.855	.070	-.625	-1.196
2	.557	.015	.612	.507	12	-.854	.064	-.651	-1.187
3	.437	.014	.485	.391	13	-.854	.062	-.659	-1.166
4	.324	.013	.369	.280	14	-.850	.058	-.624	-1.165
5	.177	.012	.219	.138	15	-.836	.051	-.663	-1.154
6	.034	.014	.080	-.016	16	-.826	.048	-.668	-1.122
7	-.129	.016	-.070	-.188	17	-.800	.045	-.664	-.989
8	-.267	.021	-.196	-.346	18	-.805	.046	-.605	-.957
9	-.390	.028	-.282	-.491	19	-.798	.043	-.598	-.937
10	-.564	.045	-.402	-.739	20	-.795	.046	-.580	-.978

DATA FOR PROJECT 6022 CONFIG. C WIND DIR. 20 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.432	.068	-.185	-.715	11	-.814	.048	-.678 -1	.001
2	-.279	.052	-.121	-.478	12	-.842	.048	-.687 -1	.008
3	-.133	.040	.005	-.259	13	-.823	.048	-.694	.999
4	.005	.032	.118	-.089	14	-.828	.049	-.683 -1	.002
5	.174	.024	.255	.109	15	-.829	.048	-.683 -1	.060
6	.342	.020	.417	.284	16	-.844	.050	-.694 -1	.054
7	.539	.019	.614	.486	17	-.846	.054	-.689 -1	.110
8	.691	.018	.756	.626	18	-.844	.064	-.659 -1	.145
9	.820	.017	.883	.770	19	-.839	.079	-.494 -1	.353
10	.969	.016 1	.027	.920	20	-.843	.105	-.430 -1	.407

DATA FOR PROJECT 6022 CONFIG. C WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.441	.134	-.074 -1	.218	11	-1.130	.146	-.738 -1	.704
2	-.107	.100	.104	-.674	12	-1.123	.179	-.707 -1	.792
3	.033	.075	.233	-.387	13	-1.142	.179	-.783 -1	.772
4	.246	.056	.409	.078	14	-1.138	.179	-.766 -1	.808
5	.486	.043	.604	.297	15	-1.196	.152	-.824 -2	.330
6	.678	.034	.779	.541	16	-1.193	.158	-.633 -2	.408
7	.857	.029	.962	.762	17	-1.203	.171	-.482 -2	.170
8	.957	.024 1	.047	.883	18	-1.186	.196	-.393 -2	.434
9	1.004	.019 1	.076	.937	19	-1.193	.212	-.260 -2	.535
10	.930	.017	.989	.870	20	-1.188	.252	-.312 -3	.329

DATA FOR PROJECT 6022 CONFIG. C WIND DIR. 60 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.485	.037	.286	-.735	11 -1	.401	.188	-.757 -2	.467
2	-.217	.072	.503	-.228	12 -1	.399	.188	-.634 -2	.459
3	.491	.060	.701	.215	13 -1	.405	.189	-.593 -2	.466
4	.719	.046	.889	.511	14 -1	.420	.194	-.410 -2	.578
5	.930	.032 1	.054	.791	15 -1	.443	.200	-.656 -2	.617
6	1.042	.025 1	.139	.936	16 -1	.441	.204	-.739 -2	.438
7	1.060	.018 1	.124	.990	17 -1	.425	.219	-.688 -2	.703
8	1.006	.018 1	.065	.940	18 -1	.432	.239	-.629 -3	.283
9	.939	.024	.912	.722	19 -1	.434	.237	-.538 -3	.659
10	.431	.051	.583	.188	20 -1	.432	.250	-.540 -3	.573

DATA FOR PROJECT 6022 CONFIG C WIND DIR 90 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.316	.057	.466	.066	11 -1	.364	.174	-.478 -2	.576
2	.613	.040	.728	.443	12 -1	.388	.173	-.465 -2	.627
3	.808	.029	.901	.688	13 -1	.359	.156	-.606 -2	.425
4	.941	.023 1	.015	.857	14 -1	.371	.149	-.726 -2	.427
5	1.007	.017 1	.065	.948	15 -1	.355	.142	-.664 -2	.445
6	.988	.016 1	.045	.939	16 -1	.370	.144	-.576 -2	.275
7	.862	.019	.923	.774	17 -1	.360	.163	-.864 -2	.295
8	.682	.028	.792	.527	18 -1	.368	.170	-.810 -2	.432
9	.426	.039	.632	.183	19 -1	.347	.169	-.906 -2	.283
10	-.019	.067	.353	-.435	20 -1	.355	.172	-.915 -2	.286

DATA FOR PROJECT 6022 CONFIG. D WIND DIR. 20 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.122	.025	-.040	-.223	11	-.405	.027	-.305	-.497
2	-.021	.021	.056	-.101	12	-.409	.027	-.309	-.505
3	.079	.018	.139	.003	13	-.411	.025	-.323	-.503
4	.179	.017	.240	.100	14	-.414	.026	-.323	-.503
5	.276	.017	.337	.207	15	-.427	.024	-.340	-.507
6	.354	.018	.415	.299	16	-.437	.026	-.336	-.539
7	.441	.021	.521	.373	17	-.438	.027	-.335	-.554
8	.517	.027	.603	.417	18	-.435	.030	-.318	-.548
9	.619	.036	.718	.467	19	-.430	.035	-.244	-.575
10	.723	.068	.896	.444	20	-.426	.042	-.217	-.595

DATA FOR PROJECT 6022 CONFIG. D WIND DIR 21 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.109	.054	.102	-.369	11	-.400	.063	-.127	-.635
2	-.025	.060	.159	-.289	12	-.392	.062	-.143	-.667
3	.054	.072	.302	-.230	13	-.390	.058	-.170	-.644
4	.092	.094	.406	-.133	14	-.388	.057	-.154	-.637
5	.011	.120	.448	-.158	15	-.394	.051	-.221	-.676
6	-.248	.113	.290	-.722	16	-.394	.051	-.210	-.676
7	-.482	.074	-.120	-.828	17	-.391	.047	-.224	-.669
8	-.523	.062	-.266	-.744	18	-.391	.048	-.214	-.663
9	-.503	.052	-.208	-.691	19	-.372	.045	-.148	-.663
10	-.471	.057	-.245	-.742	20	-.369	.054	-.099	-.618

DATA FOR PROJECT 6022 CONFIG D WIND DIR. 4[illegible] TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 066	044	137	- 275	11	- 270	119	174	-1 132
2	- 029	041	147	- 183	12	- 258	105	194	-1 053
3	026	044	160	- 236	13	- 250	093	102	- 801
4	[illegible]	[illegible]	254	- 265	14	- 242	087	113	- 765
5	092	083	356	- 263	15	- 229	074	089	- 551
6	036	109	432	- 235	16	- 221	069	044	- 531
7	- 081	099	411	- 377	17	- 214	064	009	- 615
8	- 156	083	402	- 425	18	- 209	061	013	- 471
9	- 198	077	282	- 466	19	- 206	063	005	- 593
10	- 227	086	154	- 612	20	- 203	064	037	- 577

DATA FOR PROJECT 6022 CONFIG D WIND DIR 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 007	072	101	- 127	11	- 566	034	- 447	- 724
2	.146	028	240	044	12	- 579	032	- 462	- 707
3	.261	[illegible]	269	174	13	- 576	028	- 452	- 671
4	.351	025	452	271	14	- 577	027	- 457	- 666
5	447	025	553	376	15	- 562	025	- 458	- 640
6	530	029	649	441	16	- 572	026	- 472	- 678
7	637	040	773	499	17	- 577	025	- 452	- 618
8	712	061	896	450	18	- 585	025	- 467	- 682
9	770	087	1 012	417	19	- 589	025	- 496	- 682
10	.747	.138	1 101	186	20	- 608	027	- 506	- 707

DATA FOR PROJECT 6022 CONFIG D WIND DIR. 36 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 119	132	385	- 513	11	- 526	062	- 269	- 778
2	- 075	145	425	- 482	12	- 517	064	- 258	- 797
3	- 101	156	537	- 518	13	- 499	061	- 250	- 764
4	- 053	145	389	- 688	14	- 491	063	- 229	- 759
5	- 506	088	- 007	- 824	15	- 473	056	- 239	- 683
6	- 614	059	- 423	- 877	16	- 480	056	- 251	- 680
7	- 616	048	- 432	- 825	17	- 484	053	- 263	- 679
8	- 620	047	- 441	- 837	18	- 501	053	- 255	- 693
9	- 599	044	- 448	- 848	19	- 510	052	- 297	- 688
10	- 594	053	- 406	- 870	20	- 532	053	- 308	- 726

DATA FOR PROJECT 6022 CONFIG D WIND DIR 37 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 109	061	134	- 308	11	- 339	100	005	-1 599
2	- 072	068	237	- 277	12	- 349	092	- 005	-1 [illegible]
3	- 047	077	277	- 292	13	- 337	083	- 005	- 830
4	- 052	098	340	- 336	14	- 324	079	- 013	- 691
5	- 116	096	343	- 399	15	- 306	070	- 091	- 707
6	- 224	070	108	- 451	16	- 311	068	- 104	- 607
7	- 301	061	- 004	- 511	17	- 297	064	- 098	- 568
8	- 328	066	- 085	- 549	18	- 296	063	- 096	- 558
9	- 324	067	- 048	- 577	19	- 289	061	- 096	- 614
10	- 334	075	- 023	- 837	20	- 297	065	- 099	- 697

DATA FOR PROJECT 6022 CONFIG D WIND DIR 145 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	721	070	950	450	11	- 753	032	- 639	- 892
2	706	049	867	549	12	- 758	029	- 664	- 880
3	659	035	785	531	13	- 756	027	- 647	- 870
4	586	028	691	468	14	- 753	026	- 658	- 858
5	496	022	531	386	15	- 735	024	- 652	- 826
6	413	021	394	233	16	- 727	025	- 634	- 833
7	323	020	262	045	17	- 711	029	- 610	- 815
8	240	022	051	- 113	18	- 710	031	- 604	- 825
9	- 193	024	- 105	- 271	19	- 704	030	- 588	- 817
10	- 403	030	- 292	- 499	20	- 707	034	- 577	- 880

DATA FOR PROJECT 6022 CONFIG D WIND DIR 146 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 771	123	- 392	-1 368	11	- 350	058	- 177	- 679
2	- 726	074	- 405	-1 [illegible]	12	- 348	047	- 186	- 539
3	- 689	069	- 369	- 99[illegible]	13	- 349	042	- 184	- 510
4	- 610	081	- 227	-1 118	14	- 356	042	- 200	- 554
5	- 528	086	- 235	-1 174	15	- [illegible]	046	- 211	- 543
6	- 500	097	- 176	- 999	16	- [illegible]	050	- 184	- 582
7	- 478	122	004	-1 [illegible]	17	- [illegible]	058	- [illegible]	- [illegible]
8	- 452	150	254	-1 [illegible]	18	- 405	115	- 015	- [illegible]
9	- 422	178	391	-1 [illegible]	19	- 444	128	- 057	-1 [illegible]
10	- 413	210	285	-	20	- 498	158	- 100	-1 135

DATA FOR PROJECT 6022 CONFIG. D WIND DIR. 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.568	.037	.674	.431	11	-.625	.057	-.347	-.861
2	.431	.027	.564	.378	12	-.633	.056	-.347	-.867
3	.400	.020	.461	.332	13	-.634	.055	-.377	-.971
4	.314	.017	.367	.249	14	-.644	.059	-.362	-1.096
5	.201	.015	.250	.147	15	-.626	.058	-.335	-.923
6	.082	.013	.137	.021	16	-.607	.057	-.404	-.877
7	-.047	.016	.012	-.110	17	-.580	.056	-.403	-.820
8	-.153	.019	-.084	-.229	18	-.574	.055	-.396	-.806
9	-.245	.025	-.135	-.330	19	-.560	.051	-.395	-.791
10	-.381	.039	-.220	-.512	20	-.557	.053	-.364	-.805

DATA FOR PROJECT 6022 CONFIG D WIND DIR. 161 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.453	.138	.031	-1.008	11	-.207	.041	-.055	-.387
2	-.396	.106	-.032	-.911	12	-.213	.041	-.062	-.374
3	-.356	.094	-.041	-.839	13	-.213	.043	-.060	-.374
4	-.311	.093	.003	-.715	14	-.232	.048	-.049	-.469
5	-.256	.107	.233	-.675	15	-.250	.054	-.048	-.742
6	-.200	.145	.415	-.664	16	-.280	.065	-.034	-.679
7	-.116	.149	.441	-.609	17	-.334	.088	.012	-.636
8	-.091	.148	.453	-.594	18	-.400	.113	.064	-.863
9	-.090	.138	.414	-.555	19	-.494	.137	.026	-1.342
10	-.123	.117	.32	-.560	20	-.660	.201	.040	-1.484

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 20 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.095	.023	.015	-.175	11	-.358	.025	-.260	-.443
2	.018	.020	.096	-.060	12	-.364	.026	-.265	-.457
3	.121	.018	.189	.053	13	-.363	.024	-.269	-.446
4	.207	.017	.271	.147	14	-.367	.025	-.281	-.456
5	.297	.016	.360	.241	15	-.371	.025	-.276	-.496
6	.369	.017	.442	.310	16	-.380	.026	-.274	-.506
7	.451	.021	.520	.386	17	-.380	.026	-.281	-.508
8	.525	.027	.603	.410	18	-.381	.027	-.284	-.489
9	.605	.037	.711	.429	19	-.376	.029	-.267	-.473
10	.713	.069	.910	.442	20	-.379	.034	-.248	-.542

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 21 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.078	.055	.144	-.316	11	-.313	.091	.031	-.733
2	-.028	.055	.205	-.243	12	-.300	.088	.023	-.676
3	.047	.064	.265	-.181	13	-.294	.092	.007	-.896
4	.094	.080	.400	-.199	14	-.295	.092	-.008	-.716
5	.083	.107	.480	-.304	15	-.277	.068	.066	-.502
6	-.031	.126	.487	-.410	16	-.271	.063	.020	-.558
7	-.185	.110	.450	-.492	17	-.272	.053	-.035	-.529
8	-.274	.091	.273	-.577	18	-.274	.051	-.080	-.542
9	-.318	.068	.086	-.529	19	-.254	.049	-.076	-.422
10	-.341	.068	.040	-.647	20	-.243	.052	-.043	-.425

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 22 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.091	.038	.057	-.287	11	-.316	.181	.246	-1.959
2	-.059	.034	.065	-.201	12	-.305	.164	.193	-1.371
3	-.027	.032	.103	-.157	13	-.289	.140	.169	-1.158
4	.002	.034	.124	-.125	14	-.273	.121	.128	-.839
5	.034	.041	.189	-.120	15	-.240	.092	.101	-.644
6	.054	.056	.274	-.144	16	-.226	.080	.096	-.655
7	.069	.091	.377	-.231	17	-.210	.069	.020	-.586
8	.062	.096	.488	-.301	18	-.203	.065	.027	-.541
9	.049	.102	.429	-.385	19	-.200	.064	.052	-.703
10	.006	.113	.579	-.510	20	-.196	.065	.032	-.660

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.179	.028	.287	.087	11	-.499	.038	-.367	-.632
2	.264	.026	.366	.180	12	-.498	.035	-.377	-.626
3	.328	.024	.420	.239	13	-.497	.031	-.376	-.624
4	.387	.024	.484	.296	14	-.501	.030	-.385	-.621
5	.456	.025	.549	.382	15	-.503	.027	-.393	-.625
6	.524	.029	.630	.411	16	-.501	.029	-.392	-.631
7	.618	.039	.770	.500	17	-.494	.030	-.383	-.622
8	.690	.057	.891	.472	18	-.481	.032	-.358	-.649
9	.748	.083	.995	.447	19	-.491	.033	-.362	-.625
10	.736	.133	1.088	.190	20	-.492	.035	-.369	-.626

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	114	074	.446	- 228	11	- 474	.094	- 134	- 829
2	228	085	559	- 205	12	- 460	092	- 139	- 847
3	334	095	653	- 166	13	- 461	087	- 159	- 838
4	307	133	731	- 180	14	- 457	085	- 170	- 828
5	145	148	661	- 301	15	- 454	069	- 203	- 764
6	- 143	118	404	- 526	16	- 450	064	- 245	- 740
7	- 374	085	221	- 677	17	- 443	057	- 214	- 674
8	- 463	075	- 088	- 728	18	- 441	056	- 196	- 660
9	- 468	070	- 223	- 788	19	- 442	057	- 238	- 628
10	- 439	085	- 191	- 943	20	- 445	059	- 216	- 656

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 37 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 166	045	003	- 336	11	- 307	114	- 000	-1 347
2	- 149	045	040	- 327	12	- 306	106	- 019	-1 314
3	- 133	049	083	- 306	13	- 298	094	- 024	-1 028
4	- 123	054	138	- 284	14	- 294	086	- 013	- 960
5	- 112	062	175	- 294	15	- 286	074	- 059	- 697
6	- 116	071	24	- 317	16	- 284	069	- 083	- 684
7	- 136	070	239	- 342	17	- 275	064	- 096	- 597
8	- 160	070	172	- 314	18	- 275	069	- 100	- 767
9	- 177	067	114	- 456	19	- 276	072	- 031	- 697
10	- 210	073	122	- 692	20	- 286	086	- 029	- 799

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 60 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	147	054	324	- 005	11	- 626	021	- 487	- 753
2	288	047	443	156	12	- 629	030	- 493	- 727
3	399	040	560	280	13	- 626	029	- 507	- 713
4	483	039	644	338	14	- 627	029	- 513	- 724
5	583	040	766	463	15	- 629	025	- 524	- 715
6	671	048	905	526	16	- 639	025	- 529	- 732
7	759	069	989	548	17	- 644	024	- 539	- 727
8	774	089	1.080	497	18	- 649	025	- 565	- 741
9	726	108	1.036	393	19	- 644	027	- 494	- 734
10	533	145	936	044	20	- 653	028	- 524	- 753

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 61 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 242	016	615	- 825	11	- 596	060	- 322	- 800
2	- 291	001	582	- 787	12	- 584	059	- 332	- 788
3	- 372	171	432	- 787	13	- 571	055	- 343	- 751
4	- 533	122	092	- 862	14	- 560	053	- 357	- 730
5	- 685	073	- 378	- 949	15	- 552	047	- 350	- 708
6	- 729	061	- 530	- 966	16	- 557	046	- 354	- 709
7	- 718	057	- 485	- 995	17	- 559	045	- 378	- 698
8	- 705	059	- 481	- 970	18	- 562	047	- 368	- 730
9	- 685	057	- 479	- 947	19	- 558	051	- 336	- 724
10	- 672	065	- 449	-1 120	20	- 564	059	- 318	- 771

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 62 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 345	046	- 169	- 634	11	- 363	088	- 067	-1 028
2	- 342	046	- 169	- 608	12	- 360	085	- 074	-1 094
3	- 335	048	- 147	- 536	13	- 358	081	- 093	-1 733
4	- 334	049	- 132	- 620	14	- 353	074	- 108	- 945
5	- 336	051	- 144	- 658	15	- 346	059	- 128	- 667
6	- 340	053	- 086	- 596	16	- 347	054	- 153	- 584
7	- 344	062	- 053	- 639	17	- 349	048	- 174	- 586
8	- 348	070	010	- 791	18	- 350	046	- 167	- 594
9	- 349	079	076	- 947	19	- 352	044	- 203	- 599
10	- 356	101	388	- 973	20	- 357	047	- 211	- 675

DATA FOR PROJECT 6022 CONFIG E WIND DIR 90 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	289	083	573	004	11	- 808	054	- 561	- 984
2	438	068	763	147	12	- 807	051	- 557	- 980
3	535	058	807	311	13	- 816	046	- 523	- 962
4	619	056	887	421	14	- 820	043	- 536	- 981
5	688	054	909	510	15	- 835	039	- 492	- 951
6	715	061	956	491	16	- 839	039	- 669	- 964
7	669	070	943	420	17	- 834	038	- 720	- 984
8	563	080	867	271	18	- 814	041	- 704	- 998
9	376	093	692	- 021	19	- 823	041	- 689	- 978
10	075	106	432	- 381	20	- 822	045	- 665	-1 003

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 91 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.318	.232	.669	-.946	11	-.636	.081	-.377	-.914
2	-.433	.193	.459	-.911	12	-.624	.073	-.372	-.896
3	-.539	.141	.282	-.944	13	-.620	.066	-.330	-.846
4	-.741	.101	-.190	-1.098	14	-.610	.057	-.331	-.791
5	-.867	.072	-.598	-1.164	15	-.608	.049	-.353	-.780
6	-.888	.073	-.559	-1.155	16	-.608	.052	-.361	-.789
7	-.857	.074	-.536	-1.135	17	-.614	.064	-.380	-.832
8	-.808	.080	-.512	-1.084	18	-.611	.073	-.348	-.854
9	-.769	.092	-.498	-1.106	19	-.609	.075	-.350	-.862
10	-.735	.110	-.413	-1.232	20	-.610	.083	-.338	-.890

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 92 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.382	.053	-.186	-.623	11	-.362	.077	-.080	-.716
2	-.384	.052	-.218	-.641	12	-.362	.071	-.105	-.697
3	-.397	.052	-.244	-.708	13	-.364	.064	-.077	-.595
4	-.412	.054	-.241	-.777	14	-.362	.058	-.091	-.572
5	-.427	.060	-.225	-.771	15	-.363	.052	-.133	-.563
6	-.423	.071	-.227	-.805	16	-.356	.046	-.159	-.522
7	-.410	.088	.106	-.769	17	-.344	.045	-.175	-.514
8	-.397	.109	.425	-.862	18	-.331	.045	-.148	-.517
9	-.394	.127	.331	-1.070	19	-.325	.045	-.150	-.502
10	-.392	.160	.569	-1.255	20	-.329	.047	-.153	-.484

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 120 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.549	.102	.881	.245	11	-.862	.049	-.673	-1.057
2	.659	.077	.923	.408	12	-.866	.046	-.645	-1.052
3	.717	.061	.929	.524	13	-.860	.042	-.723	-1.019
4	.739	.054	.948	.565	14	-.870	.040	-.741	-1.015
5	.717	.045	.909	.566	15	-.870	.036	-.757	-.999
6	.622	.044	.767	.471	16	-.869	.036	-.743	-.994
7	.444	.043	.619	.281	17	-.868	.041	-.730	-1.005
8	.255	.046	.421	.072	18	-.870	.044	-.729	-1.025
9	.047	.052	.209	-.115	19	-.864	.043	-.717	-1.029
10	-.262	.056	-.086	-.453	20	-.867	.049	-.700	-1.092

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 121 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.692	.151	-.113	-1.341	11	-.505	.105	-.204	-1.289
2	-.770	.111	-.361	-1.194	12	-.497	.085	-.234	-.792
3	-.841	.091	-.524	-1.197	13	-.490	.072	-.270	-.772
4	-.880	.093	-.558	-1.178	14	-.494	.061	-.303	-.708
5	-.860	.092	-.411	-1.129	15	-.498	.056	-.302	-.702
6	-.776	.105	-.278	-1.216	16	-.503	.067	-.289	-.761
7	-.691	.136	-.030	-1.574	17	-.498	.090	-.216	-.802
8	-.672	.196	.113	-1.530	18	-.500	.111	-.152	-.912
9	-.665	.253	.189	-1.885	19	-.502	.111	-.132	-.903
10	-.682	.332	.134	-2.141	20	-.511	.121	-.088	-1.058

DATA FOR PROJECT 6022 CONFIG. E WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.330	.047	-.037	-.619	11	-.333	.050	-.151	-.553
2	-.332	.052	-.016	-.676	12	-.334	.046	-.169	-.525
3	-.330	.058	-.026	-.739	13	-.329	.043	-.201	-.509
4	-.326	.066	.043	-.719	14	-.328	.039	-.219	-.492
5	-.311	.076	.211	-.679	15	-.320	.035	-.194	-.484
6	-.290	.094	.357	-.664	16	-.315	.032	-.195	-.438
7	-.265	.115	.376	-.641	17	-.314	.031	-.178	-.440
8	-.253	.129	.352	-.707	18	-.319	.031	-.176	-.468
9	-.244	.136	.684	-.723	19	-.320	.030	-.187	-.486
10	-.258	.131	.654	-.719	20	-.326	.031	-.195	-.476

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.718	.073	.930	.485	11	-.666	.028	-.563	-.777
2	.705	.052	.864	.526	12	-.669	.026	-.579	-.763
3	.663	.037	.774	.512	13	-.669	.024	-.577	-.751
4	.591	.030	.691	.474	14	-.675	.025	-.585	-.769
5	.466	.023	.547	.383	15	-.669	.025	-.581	-.761
6	.320	.023	.416	.244	16	-.667	.026	-.581	-.777
7	.139	.021	.210	.054	17	-.657	.030	-.549	-.776
8	-.018	.022	.059	-.107	18	-.659	.032	-.542	-.779
9	-.162	.026	-.056	-.253	19	-.652	.030	-.538	-.765
10	-.368	.029	-.242	-.475	20	-.654	.034	-.534	-.819

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 146 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.478	.139	-.145	-1.136	11	-.331	.078	-.053	-.695
2	-.441	.119	-.065	-.886	12	-.312	.066	-.079	-.617
3	-.485	.118	-.038	-.850	13	-.334	.063	-.114	-.598
4	-.435	.137	-.121	-.919	14	-.351	.067	-.148	-.659
5	-.334	.148	-.379	-1.079	15	-.359	.075	-.131	-.774
6	-.267	.199	-.379	-1.060	16	-.367	.103	-.034	-.750
7	-.241	.236	-.374	-1.105	17	-.382	.157	-.147	-.991
8	-.243	.266	-.201	-1.154	18	-.398	.188	-.195	-1.142
9	-.249	.277	-.713	-1.168	19	-.408	.171	-.149	-1.110
10	-.286	.276	-.738	-1.280	20	-.422	.183	-.135	-1.166

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.244	.048	-.054	-.535	11	-.259	.027	-.166	-.413
2	-.240	.053	-.007	-.607	12	-.260	.025	-.172	-.396
3	-.232	.059	-.020	-.603	13	-.255	.023	-.180	-.348
4	-.223	.068	.151	-.574	14	-.257	.022	-.189	-.317
5	-.199	.081	.284	-.511	15	-.258	.020	-.192	-.326
6	-.169	.100	.452	-.582	16	-.263	.020	-.188	-.328
7	-.143	.106	.628	-.478	17	-.261	.022	-.187	-.329
8	-.143	.109	.518	-.468	18	-.263	.024	-.189	-.372
9	-.162	.105	.562	-.566	19	-.263	.026	-.182	-.396
10	-.190	.080	.413	-.570	20	-.268	.030	-.167	-.466

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.573	.040	.696	.393	11	-.576	.057	-.261	-.902
2	.496	.028	.587	.352	12	-.582	.056	-.290	-.908
3	.419	.020	.489	.324	13	-.586	.058	-.357	-.814
4	.338	.017	.399	.277	14	-.589	.062	-.353	-.829
5	.223	.015	.278	.163	15	-.585	.065	-.333	-1.064
6	.109	.015	.159	.050	16	-.582	.065	-.379	-1.611
7	-.021	.016	.029	-.082	17	-.558	.059	-.371	-.943
8	-.126	.019	-.066	-.186	18	-.544	.055	-.358	-.803
9	-.219	.023	-.125	-.296	19	-.531	.049	-.363	-.737
10	-.344	.035	-.211	-.464	20	-.530	.052	-.341	-.729

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 161 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.083	.029	.273	-.555	11	-.276	.048	-.070	-.471
2	.066	.085	.291	-.535	12	-.288	.050	-.087	-.497
3	.051	.078	.312	-.594	13	-.298	.053	-.064	-.543
4	.034	.087	.472	-.675	14	-.314	.060	-.000	-.787
5	.019	.095	.561	-.417	15	-.344	.071	.029	-.601
6	.019	.120	.625	-.513	16	-.387	.089	-.018	-.768
7	.039	.115	.506	-.497	17	-.443	.113	-.029	-.880
8	.071	.110	.381	-.463	18	-.501	.136	.002	-1.016
9	.107	.106	.331	-.543	19	-.544	.142	-.040	-1.175
10	.159	.088	.199	-.585	20	-.569	.156	-.092	-1.384

DATA FOR PROJECT 6022 CONFIG. E WIND DIR 162 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.177	.051	-.070	-.391	11	-.211	.018	-.139	-.284
2	-.168	.055	-.148	-.387	12	-.213	.018	-.153	-.283
3	-.158	.060	-.233	-.394	13	-.215	.017	-.164	-.272
4	-.149	.069	-.322	-.412	14	-.216	.017	-.163	-.270
5	-.136	.071	-.302	-.433	15	-.218	.017	-.165	-.281
6	-.120	.073	-.284	-.416	16	-.223	.019	-.163	-.290
7	-.121	.067	-.263	-.349	17	-.227	.024	-.145	-.327
8	-.135	.062	-.173	-.345	18	-.234	.032	-.139	-.443
9	-.159	.057	-.184	-.398	19	-.235	.037	-.134	-.492
10	-.173	.044	-.075	-.375	20	-.241	.041	-.129	-.523

DATA FOR PROJECT 6022 CONFIG. F WIND DIR 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.046	.031	.151	-.054	11	-.439	.029	-.321	-.535
2	.171	.027	.275	.082	12	-.441	.027	-.335	-.538
3	.273	.025	.394	.194	13	-.439	.025	-.347	-.533
4	.349	.024	.454	.274	14	-.435	.025	-.351	-.536
5	.437	.023	.524	.362	15	-.445	.026	-.356	-.564
6	.508	.026	.608	.420	16	-.446	.027	-.342	-.579
7	.607	.035	.781	.486	17	-.437	.030	-.285	-.578
8	.688	.050	.892	.513	18	-.420	.032	-.305	-.562
9	.762	.071	1.003	.510	19	-.432	.035	-.227	-.541
10	.783	.115	1.111	.325	20	-.432	.038	-.228	-.545

DATA FOR PROJECT 6022 CONFIG. F WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.120	.087	.168	-.411	11	-.457	.079	-.118	-.758
2	-.156	.129	.408	-.492	12	-.446	.077	-.134	-.731
3	.021	.111	.447	-.382	13	-.449	.075	-.157	-.768
4	.048	.112	.459	-.304	14	-.584	.098	-.216	-.939
5	.026	.139	.537	-.416	15	-.440	.066	-.209	-.666
6	-.094	.196	.700	-.707	16	-.427	.061	-.220	-.635
7	-.214	.129	.438	-.650	17	-.422	.056	-.253	-.620
8	-.303	.114	.631	-.677	18	-.544	.075	-.315	-.843
9	-.371	.092	.374	-.645	19	-.417	.059	-.226	-.632
10	-.557	.104	.194	-.983	20	-.411	.063	-.208	-.670

DATA FOR PROJECT 6022 CONFIG. F WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.180	.038	.008	-.419	11	-.281	.134	.069	-1.365
2	-.169	.037	.015	-.413	12	-.271	.119	.081	-1.185
3	-.167	.038	-.007	-.336	13	-.263	.108	.055	-1.283
4	-.164	.039	.009	-.349	14	-.251	.098	.045	-.955
5	-.160	.046	.030	-.395	15	-.246	.090	.013	-.982
6	-.156	.053	.054	-.404	16	-.235	.079	.162	-.795
7	-.158	.063	.074	-.521	17	-.225	.070	.055	-1.110
8	-.157	.073	.122	-.630	18	-.222	.069	-.033	-.854
9	-.159	.083	.173	-.621	19	-.231	.071	.056	-.575
10	-.171	.112	.328	-.964	20	-.235	.080	.043	-.672

DATA FOR PROJECT 6022 CONFIG. F WIND DIR 60 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.134	.053	.333	-.000	11	-.602	.038	-.415	-.747
2	.282	.046	.453	.151	12	-.607	.037	-.449	-.746
3	.404	.041	.590	.284	13	-.605	.035	-.443	-.738
4	.560	.040	.671	.381	14	-.603	.036	-.418	-.741
5	.611	.040	.793	.473	15	-.601	.035	-.450	-.724
6	.708	.049	.946	.509	16	-.609	.035	-.460	-.719
7	.786	.067	1.023	.565	17	-.609	.034	-.441	-.720
8	.816	.087	1.112	.466	18	-.611	.034	-.420	-.738
9	.751	.102	1.035	.333	19	-.615	.034	-.482	-.735
10	.572	.134	.974	.060	20	-.623	.035	-.475	-.755

DATA FOR PROJECT 6022 CONFIG F WIND DIR. 61 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.221	.163	.428	-.691	11	-.561	.064	-.346	-.828
2	-.204	.164	.539	-.675	12	-.557	.062	-.339	-.832
3	-.210	.158	.432	-.634	13	-.553	.058	-.341	-.815
4	-.280	.143	.356	-.676	14	-.545	.055	-.336	-.794
5	-.419	.112	.183	-.751	15	-.536	.050	-.363	-.766
6	-.533	.087	-.013	-.820	16	-.537	.048	-.367	-.723
7	-.603	.062	-.312	-.860	17	-.540	.049	-.373	-.737
8	-.617	.059	-.353	-.842	18	-.540	.053	-.360	-.795
9	-.609	.056	-.430	-.819	19	-.535	.056	-.335	-.775
10	-.598	.062	-.362	-.834	20	-.541	.062	-.313	-.830

DATA FOR PROJECT 6022 CONFIG. F WIND DIR 62 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.324	.055	-.160	-.631	11	-.331	.113	.066	-1.560
2	-.322	.054	-.154	-.605	12	-.326	.108	.050	-1.736
3	-.323	.053	-.121	-.686	13	-.321	.096	.007	-1.489
4	-.326	.057	-.092	-.579	14	-.314	.086	-.013	-1.022
5	-.330	.056	-.057	-.579	15	-.310	.078	-.102	-.999
6	-.332	.064	-.001	-.605	16	-.308	.067	-.061	-.724
7	-.329	.075	-.082	-.750	17	-.306	.060	-.133	-.830
8	-.330	.088	-.055	-.743	18	-.305	.056	-.139	-.711
9	-.329	.101	-.155	-.876	19	-.304	.055	-.130	-.658
10	-.340	.135	-.369	-1.207	20	-.313	.059	-.133	-.707

DATA FOR PROJECT 6022 CONFIG F WIND DIR 120 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.573	.098	.885	.279	11	-.719	.029	-.600	-.834
2	.674	.074	.928	.425	12	-.722	.028	-.613	-.826
3	.724	.058	.959	.534	13	-.720	.027	-.600	-.826
4	.737	.049	.938	.559	14	-.728	.027	-.631	-.821
5	.702	.042	.862	.573	15	-.722	.026	-.644	-.815
6	.606	.041	.748	.481	16	-.723	.026	-.635	-.807
7	.438	.038	.578	.319	17	-.713	.029	-.618	-.833
8	.262	.041	.400	.102	18	-.718	.032	-.619	-.838
9	.071	.046	.247	-.152	19	-.708	.032	-.607	-.848
10	-.211	.047	-.044	-.386	20	-.715	.037	-.599	-.879

DATA FOR PROJECT 6022 CONFIG. F WIND DIR 121 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.492	.183	.143	-1.176	11	-.463	.098	-.158	-.827
2	-.557	.141	-.008	-1.087	12	-.462	.089	-.167	-.788
3	-.613	.112	-.135	-.948	13	-.465	.081	-.202	-.721
4	-.655	.103	-.224	-.985	14	-.482	.075	-.226	-.707
5	-.667	.106	-.207	-.953	15	-.500	.079	-.246	-.730
6	-.630	.109	-.243	-.930	16	-.516	.077	-.295	-.852
7	-.563	.118	-.179	-1.445	17	-.515	.096	-.209	-.946
8	-.533	.141	-.093	-1.925	18	-.509	.109	-.170	-.964
9	-.520	.172	-.164	-2.049	19	-.499	.111	-.153	-.999
10	-.526	.196	-.198	-2.005	20	-.504	.116	-.119	-1.064

DATA FOR PROJECT 6022 CONFIG. F WIND DIR 122 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.273	.070	.199	-.719	11	-.271	.066	-.048	-.617
2	-.272	.081	.239	-.614	12	-.267	.060	-.066	-.555
3	-.268	.093	.295	-.594	13	-.263	.053	-.096	-.505
4	-.260	.111	.413	-.651	14	-.260	.048	-.080	-.456
5	-.261	.115	.718	-.652	15	-.255	.042	-.055	-.405
6	-.240	.135	.634	-.739	16	-.255	.038	-.066	-.399
7	-.218	.148	.615	-.778	17	-.257	.041	-.042	-.398
8	-.207	.159	.722	-.772	18	-.262	.040	-.056	-.422
9	-.207	.178	.788	-.836	19	-.262	.039	-.067	-.431
10	-.219	.176	.701	-1.232	20	-.270	.041	-.134	-.484

DATA FOR PROJECT 6022 CONFIG. F WIND DIR 145 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.723	.070	.924	.503	11	-.586	.029	-.480	-.709
2	.699	.056	.852	.531	12	-.591	.028	-.500	-.714
3	.652	.035	.765	.522	13	-.585	.028	-.495	-.728
4	.578	.028	.675	.473	14	-.596	.028	-.502	-.736
5	.459	.021	.538	.373	15	-.588	.028	-.500	-.713
6	.313	.020	.379	.242	16	-.586	.030	-.486	-.713
7	.140	.019	.203	.071	17	-.571	.032	-.444	-.688
8	-.009	.020	.053	-.075	18	-.577	.034	-.449	-.695
9	-.140	.023	-.060	-.211	19	-.567	.033	-.431	-.681
10	-.328	.027	-.225	-.423	20	-.569	.036	-.405	-.700

DATA FOR PROJECT 6022 CONFIG F WIND DIR 146 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.336	.102	.063	-.898	11	-.267	.065	-.028	-.598
2	-.327	.091	.039	-.767	12	-.292	.059	-.032	-.561
3	-.313	.088	.073	-.669	13	-.290	.056	-.055	-.517
4	-.295	.101	.175	-.936	14	-.311	.057	-.035	-.551
5	-.260	.108	.220	-.841	15	-.326	.054	-.136	-.561
6	-.247	.147	.520	-.760	16	-.336	.057	-.141	-.617
7	-.235	.166	.615	-.757	17	-.334	.077	-.099	-.679
8	-.233	.178	.640	-.888	18	-.350	.100	-.061	-.781
9	-.235	.175	.479	-.988	19	-.360	.104	-.042	-.[illegible]
10	-.258	.170	.539	-1.116	20	-.380	.115	-.060	-1.032

DATA FOR PROJECT 6022 CONFIG. F WIND DIR. 147 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.206	.069	.147	-.457	11	-.242	.029	-.129	-.394
2	-.191	.078	.243	-.527	12	-.243	.027	-.152	-.381
3	-.173	.087	.438	-.509	13	-.243	.025	-.150	-.348
4	-.152	.100	.515	-.499	14	-.246	.023	-.157	-.343
5	-.124	.107	.518	-.543	15	-.247	.022	-.168	-.339
6	-.108	.116	.532	-.489	16	-.250	.022	-.174	-.343
7	-.102	.116	.537	-.451	17	-.253	.026	-.167	-.390
8	-.115	.113	.550	-.480	18	-.256	.030	-.159	-.448
9	-.135	.107	.537	-.566	19	-.254	.034	-.152	-.477
10	-.169	.089	.274	-.475	20	-.260	.039	-.152	-.520

DATA FOR PROJECT 6022 CONFIG G WIND DIR 20 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.155	.063	.080	-.541	11	-.459	.078	-.199	-1.407
2	-.053	.056	.160	-.409	12	-.471	.082	-.188	-1.526
3	.048	.048	.202	-.300	13	-.474	.081	-.192	-1.460
4	.130	.049	.271	-.255	14	-.477	.085	-.191	-1.305
5	.201	.054	.356	-.202	15	-.479	.081	-.244	-.928
6	.273	.063	.470	-.237	16	-.502	.089	-.269	-.971
7	.343	.072	.615	-.134	17	-.509	.090	-.277	-.998
8	.399	.087	.724	-.158	18	-.502	.091	-.259	-1.009
9	.442	.104	.814	-.149	19	-.483	.091	-.195	-1.163
10	.481	.134	.960	-.047	20	-.483	.099	-.059	-1.605

DATA FOR PROJECT 6022 CONFIG. F WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.206	.069	.147	-.457	11	-.242	.029	-.129	-.394
2	-.191	.078	.243	-.527	12	-.243	.027	-.152	-.381
3	-.173	.087	.438	-.500	13	-.243	.025	-.150	-.348
4	-.152	.100	.515	-.499	14	-.246	.023	-.157	-.343
5	-.124	.107	.516	-.543	15	-.247	.022	-.168	-.339
6	-.108	.116	.532	-.489	16	-.250	.022	-.174	-.343
7	-.102	.116	.537	-.451	17	-.253	.026	-.167	-.390
8	-.113	.113	.550	-.480	18	-.256	.030	-.159	-.448
9	-.135	.107	.537	-.566	19	-.254	.034	-.152	-.477
10	-.169	.089	.274	-.475	20	-.260	.039	-.152	-.520

DATA FOR PROJECT 6022 CONFIG. G WIND DIR 20 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.155	.063	.080	-.641	11	-.459	.078	-.199	-1.407
2	-.053	.056	.160	-.409	12	-.471	.062	-.188	-1.526
3	.048	.048	.202	-.130	13	-.474	.081	-.192	-1.466
4	.130	.049	.277	-.055	14	-.477	.085	-.181	-1.305
5	.201	.054	.358	-.002	15	-.479	.081	-.244	-.928
6	.273	.062	.470	.037	16	-.502	.089	-.269	-.971
7	.343	.072	.615	.134	17	-.509	.090	-.277	-.998
8	.399	.087	.724	.158	18	-.502	.091	-.259	-1.009
9	.442	.104	.814	.149	19	-.483	.091	-.195	-1.163
10	.481	.136	.960	.047	20	-.483	.099	-.059	-1.605

DATA FOR PROJECT 6022 CONFIG. G WIND DIR 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.024	.051	.156	-.216	11	-.480	.073	-.122	-.883
2	.094	.053	.284	-.081	12	-.486	.073	-.117	-.836
3	.186	.057	.408	-.004	13	-.490	.070	-.114	-.812
4	.260	.065	.533	.075	14	-.490	.070	-.124	-.832
5	.322	.073	.661	.117	15	-.498	.065	-.307	-.813
6	.385	.085	.784	.146	16	-.504	.066	-.319	-.785
7	.445	.111	.837	.136	17	-.505	.065	-.304	-.760
8	.476	.135	.949	.046	18	-.497	.065	-.292	-.766
9	.472	.157	.998	-.069	19	-.481	.068	-.262	-.761
10	.411	.184	1.017	-.245	20	-.485	.071	-.193	-.793

DATA FOR PROJECT 6022 CONFIG G WIND DIR. 60 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.168	.066	.409	-.061	11	-.517	.061	-.310	-.857
2	.270	.073	.561	.036	12	-.524	.061	-.322	-.833
3	.338	.081	.671	.086	13	-.523	.059	-.317	-.776
4	.396	.090	.777	.163	14	-.522	.059	-.335	-.760
5	.442	.100	.845	.181	15	-.507	.056	-.354	-.719
6	.478	.112	.910	.194	16	-.514	.058	-.347	-.733
7	.484	.142	1.152	.038	17	-.516	.058	-.334	-.742
8	.458	.159	1.223	.059	18	-.516	.058	-.346	-.745
9	.379	.167	1.156	-.033	19	-.510	.056	-.330	-.709
10	.207	.168	.950	-.231	20	-.520	.059	-.301	-.733

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 90 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.313	.096	.710	-.039	11	-.551	.058	-.351	-.815
2	.405	.105	.886	.067	12	-.538	.056	-.347	-.728
3	.441	.110	.944	.124	13	-.528	.055	-.307	-.710
4	.480	.115	.985	.164	14	-.535	.055	-.336	-.731
5	.533	.134	1.015	.223	15	-.548	.053	-.361	-.752
6	.519	.142	1.060	.180	16	-.538	.053	-.378	-.746
7	.436	.143	.978	.091	17	-.537	.059	-.352	-.864
8	.352	.140	.882	.003	18	-.544	.062	-.363	-1.045
9	.227	.129	.713	-.115	19	-.556	.064	-.364	-1.154
10	.020	.116	.459	-.298	20	-.545	.066	-.337	-1.158

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 120 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.438	.121	.970	.071	11	-.535	.054	-.378	-.757
2	.496	.123	1.014	.139	12	-.527	.053	-.373	-.736
3	.499	.119	1.032	.160	13	-.520	.054	-.344	-.716
4	.499	.116	1.061	.157	14	-.529	.055	-.349	-.719
5	.469	.112	.864	.157	15	-.539	.054	-.365	-.725
6	.408	.111	.817	.106	16	-.530	.055	-.360	-.722
7	.284	.104	.701	-.021	17	-.521	.054	-.318	-.819
8	.178	.096	.574	-.125	18	-.526	.058	-.322	-.940
9	.059	.090	.418	-.202	19	-.534	.061	-.329	-1.008
10	-.135	.073	.166	-.382	20	-.525	.065	-.319	-1.087

DATA FOR PROJECT 6022 CONFIG. G WIND DIR 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.474	.129	.980	.159	11	-.522	.059	-.343	-.752
2	.450	.122	.907	.149	12	-.515	.059	-.347	-.764
3	.395	.110	.837	.141	13	-.516	.055	-.348	-.835
4	.346	.099	.806	.127	14	-.522	.057	-.345	-.895
5	.276	.086	.625	.020	15	-.528	.057	-.357	-.950
6	.181	.078	.518	-.047	16	-.513	.058	-.329	-.877
7	.047	.066	.322	-.152	17	-.496	.061	-.291	-.774
8	-.049	.056	.183	-.234	18	-.497	.064	-.275	-.944
9	-.146	.052	.122	-.311	19	-.505	.063	-.271	-.954
10	-.289	.050	-.110	-.461	20	-.493	.062	-.269	-.902

DATA FOR PROJECT 6022 CONFIG G WIND DIR 160 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.398	.105	.939	.087	11	-.506	.073	-.279	-.846
2	.347	.095	.844	.063	12	-.499	.072	-.300	-.813
3	.278	.084	.728	.031	13	-.515	.076	-.316	-.839
4	.226	.074	.620	.023	14	-.523	.080	-.293	-.984
5	.150	.056	.374	.003	15	-.530	.082	-.272	-.924
6	.067	.050	.277	-.078	16	-.515	.085	-.257	-.975
7	-.045	.041	.148	-.188	17	-.499	.084	-.274	-1.056
8	-.116	.041	.060	-.247	18	-.497	.080	-.256	-.934
9	-.193	.041	-.032	-.329	19	-.500	.074	-.276	-.814
10	-.300	.049	-.122	-.481	20	-.482	.073	-.257	-.776

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 11 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.129	.057	.052	-.410	11	-.400	.058	-.199	-.718
2	-.056	.056	.152	-.268	12	-.407	.061	-.201	-.764
3	-.002	.057	.206	-.226	13	-.413	.060	-.223	-.737
4	.032	.057	.247	-.198	14	-.414	.061	-.230	-.813
5	.046	.056	.269	-.159	15	-.414	.060	-.219	-.618
6	.075	.061	.344	-.125	16	-.423	.061	-.215	-.643
7	.129	.081	.488	-.116	17	-.422	.061	-.186	-.654
8	.184	.107	.661	-.153	18	-.413	.063	-.157	-.643
9	.241	.144	.814	-.162	19	-.410	.070	-.169	-1.113
10	.307	.203	1.003	-.240	20	-.416	.080	-.174	-1.222

DATA FOR PROJECT 6022 CONFIG. G WIND DIR 12 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.191	.062	.005	-.467	11	-.348	.086	-.064	-.787
2	-.146	.055	.060	-.375	12	-.350	.093	-.043	-.963
3	-.112	.052	.101	-.371	13	-.363	.093	-.050	-1.014
4	-.092	.052	.086	-.320	14	-.363	.096	-.036	-1.084
5	-.086	.055	.114	-.287	15	-.362	.085	-.118	-.766
6	-.071	.063	.162	-.322	16	-.370	.082	-.131	-.811
7	-.045	.071	.213	-.439	17	-.364	.074	-.178	-.824
8	-.020	.085	.282	-.492	18	-.353	.076	-.089	-.865
9	.006	.099	.375	-.471	19	-.349	.092	-.105	-.911
10	.046	.140	.586	-.572	20	-.361	.117	-.085	-1.277

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 13 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.214	.047	-.072	-.456	11	-.294	.103	-.043	-.970
2	-.190	.043	-.059	-.358	12	-.299	.106	-.029	-1.033
3	-.167	.043	-.027	-.329	13	-.302	.100	-.025	-.871
4	-.157	.045	-.012	-.308	14	-.297	.093	-.021	-.810
5	-.152	.046	-.002	-.390	15	-.292	.080	.017	-.767
6	-.141	.051	.024	-.549	16	-.295	.075	-.043	-.716
7	-.134	.056	.053	-.402	17	-.292	.066	-.102	-.667
8	-.134	.066	.092	-.422	18	-.288	.069	-.098	-.789
9	-.141	.070	.132	-.490	19	-.288	.078	-.086	-.837
10	-.149	.086	.229	-.841	20	-.299	.093	-.091	-1.081

DATA FOR PROJECT 6022 CONFIG G WIND DIR 14 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.221	.042	-.096	-.388	11	-.270	.061	.003	-.721
2	-.201	.041	-.074	-.353	12	-.274	.063	.016	-.757
3	-.189	.037	-.057	-.304	13	-.280	.061	.001	-.711
4	-.181	.038	-.043	-.296	14	-.277	.060	-.007	-.622
5	-.178	.038	-.036	-.318	15	-.276	.055	-.053	-.554
6	-.169	.040	-.028	-.325	16	-.280	.053	-.067	-.521
7	-.165	.048	-.010	-.417	17	-.281	.050	-.109	-.476
8	-.167	.054	-.001	-.504	18	-.278	.051	-.112	-.482
9	-.177	.057	-.005	-.792	19	-.274	.056	-.134	-.654
10	-.187	.062	.028	-.803	20	-.282	.065	-.126	-.691

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 19 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.155	.039	-.039	-.295	11	-.308	.046	-.166	-.530
2	-.110	.038	.010	-.243	12	-.312	.047	-.166	-.544
3	-.072	.036	.056	-.185	13	-.319	.047	-.175	-.545
4	-.045	.038	.092	-.163	14	-.315	.047	-.177	-.537
5	-.028	.038	.095	-.149	15	-.309	.043	-.156	-.500
6	-.005	.039	.117	-.128	16	-.313	.044	-.149	-.479
7	.009	.041	.149	-.156	17	-.318	.043	-.155	-.482
8	.013	.043	.160	-.156	18	-.312	.043	-.170	-.468
9	-.002	.042	.145	-.172	19	-.306	.044	-.169	-.513
10	-.027	.044	.135	-.191	20	-.310	.045	-.149	-.527

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 21 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.150	.114	.696	-.131	11	-.411	.051	-.216	-.593
2	.204	.117	.826	-.068	12	-.410	.050	-.233	-.584
3	.224	.115	.840	-.036	13	-.408	.050	-.252	-.626
4	.252	.118	.854	-.050	14	-.417	.053	-.253	-.637
5	.253	.105	.710	-.000	15	-.423	.054	-.243	-.657
6	.208	.097	.631	-.043	16	-.408	.059	-.211	-.679
7	.108	.084	.477	-.111	17	-.401	.070	-.178	-.817
8	.031	.072	.362	-.197	18	-.405	.078	-.155	-.979
9	-.053	.070	.286	-.272	19	-.416	.079	-.189	-1.034
10	-.176	.060	.072	-.392	20	-.409	.084	-.183	-1.091

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.063	.061	.296	-.306	11	-.304	.047	-.133	-.488
2	-.039	.064	.341	-.253	12	-.304	.045	-.157	-.477
3	-.029	.068	.377	-.250	13	-.308	.043	-.160	-.439
4	.000	.080	.538	-.223	14	-.316	.044	-.174	-.464
5	.030	.095	.649	-.236	15	-.324	.046	-.173	-.509
6	.039	.105	.679	-.219	16	-.313	.050	-.150	-.529
7	.008	.103	.518	-.287	17	-.309	.057	-.077	-.602
8	-.022	.097	.448	-.317	18	-.315	.062	-.081	-.640
9	-.063	.088	.279	-.306	19	-.324	.063	-.129	-.650
10	-.138	.075	.178	-.385	20	-.317	.066	-.112	-.675

DATA FOR PROJECT 6022 CONFIG. G WIND DIR 23 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.141	.052	.017	-.383	11	-.265	.042	-.096	-.439
2	-.141	.054	.037	-.385	12	-.261	.040	-.112	-.415
3	-.150	.055	.032	-.395	13	-.261	.037	-.143	-.383
4	-.144	.059	.094	-.436	14	-.268	.037	-.143	-.413
5	-.143	.060	.153	-.373	15	-.278	.037	-.163	-.398
6	-.145	.072	.251	-.430	16	-.269	.038	-.154	-.432
7	-.157	.077	.206	-.449	17	-.268	.044	-.120	-.443
8	-.157	.079	.212	-.460	18	-.272	.048	-.122	-.551
9	-.166	.083	.400	-.576	19	-.280	.047	-.133	-.533
10	-.196	.073	.275	-.555	20	-.271	.047	-.122	-.550

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 24 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.172	.044	-.023	-.342	11	-.262	.043	-.119	-.437
2	-.177	.046	-.012	-.364	12	-.257	.042	-.125	-.479
3	-.189	.046	-.035	-.380	13	-.255	.037	-.133	-.389
4	-.186	.049	-.028	-.389	14	-.263	.038	-.132	-.398
5	-.192	.052	-.000	-.429	15	-.271	.037	-.153	-.414
6	-.200	.059	.019	-.467	16	-.264	.037	-.136	-.400
7	-.215	.061	.015	-.501	17	-.263	.041	-.136	-.455
8	-.216	.062	.041	-.514	18	-.267	.045	-.132	-.564
9	-.218	.058	.080	-.472	19	-.274	.044	-.146	-.524
10	-.234	.057	.054	-.505	20	-.265	.043	-.143	-.490

DATA FOR PROJECT 6022 CONFIG. G WIND DIR. 25 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.014	.039	.122	-.142	11	-.304	.039	-.149	-.448
2	-.028	.040	.091	-.152	12	-.299	.038	-.149	-.436
3	-.053	.039	.065	-.175	13	-.291	.036	-.146	-.420
4	-.065	.040	.062	-.190	14	-.295	.037	-.146	-.427
5	-.084	.037	.056	-.245	15	-.302	.037	-.162	-.432
6	-.109	.039	.064	-.290	16	-.294	.038	-.149	-.429
7	-.148	.038	.035	-.345	17	-.293	.040	-.182	-.427
8	-.169	.037	.024	-.370	18	-.297	.041	-.176	-.438
9	-.197	.043	-.023	-.493	19	-.304	.040	-.185	-.438
10	-.237	.042	-.067	-.585	20	-.297	.039	-.180	-.426

DATA FOR PROJECT 6022 CONFIG. H WIND DIR 20 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.040	.062	.171	-.353	11	-.242	.079	-.002	-.670
2	.022	.057	.235	-.246	12	-.257	.082	-.001	-.722
3	.099	.050	.252	-.119	13	-.252	.082	.023	-.719
4	.146	.052	.300	-.069	14	-.270	.087	.018	-.947
5	.213	.055	.379	.016	15	-.273	.090	-.028	-1.249
6	.254	.062	.459	.038	16	-.294	.095	-.014	-1.020
7	.324	.073	.691	.092	17	-.284	.094	.003	-.949
8	.354	.086	.839	.094	18	-.291	.094	.004	-.797
9	.401	.100	.913	.113	19	-.272	.097	.086	-.683
10	.432	.132	1.053	.048	20	-.280	.101	.165	-.718

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 21 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.037	.067	.289	-.241	11	-.248	.178	.279	-1.334
2	.072	.069	.325	-.247	12	-.234	.161	.271	-1.335
3	.123	.075	.452	-.159	13	-.209	.141	.279	-1.174
4	.148	.089	.489	-.269	14	-.198	.131	.292	-.920
5	.157	.120	.539	-.324	15	-.165	.107	.206	-1.187
6	.079	.149	.576	-.378	16	-.159	.099	.241	-.832
7	-.025	.146	.765	-.536	17	-.138	.086	.178	-.686
8	-.103	.126	.509	-.617	18	-.137	.083	.197	-.662
9	-.137	.109	.362	-.638	19	-.122	.086	.263	-.756
10	-.187	.120	.308	-1.502	20	-.124	.087	.204	-.726

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.002	.054	.269	-.217	11	-.242	.194	.258	-1.534
2	.029	.050	.271	-.150	12	-.210	.166	.281	-1.348
3	.045	.052	.254	-.123	13	-.187	.137	.358	-.985
4	.066	.053	.288	-.101	14	-.154	.118	.345	-.939
5	.078	.059	.320	-.159	15	-.136	.098	.296	-.605
6	.099	.068	.366	-.171	16	-.114	.088	.246	-.540
7	.071	.071	.386	-.172	17	-.102	.079	.203	-.472
8	.054	.074	.421	-.187	18	-.084	.076	.194	-.409
9	.026	.078	.420	-.407	19	-.089	.080	.268	-.563
10	.006	.107	.489	-.757	20	-.084	.082	.253	-.597

DATA FOR PROJECT 6022 CONFIG. H WIND DIR 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.024	.052	.219	-.139	11	-.382	.076	-.057	-.833
2	.114	.055	.360	-.055	12	-.404	.075	-.048	-.907
3	.215	.061	.558	-.028	13	-.387	.071	-.097	-.946
4	.264	.068	.662	-.008	14	-.404	.071	-.168	-.817
5	.336	.074	.656	.084	15	-.399	.066	-.196	-.668
6	.376	.086	.713	.094	16	-.421	.067	-.150	-.697
7	.430	.108	.810	.108	17	-.401	.064	-.206	-.653
8	.438	.129	.963	.026	18	-.415	.065	-.202	-.690
9	.448	.149	1.133	.013	19	-.392	.067	-.170	-.643
10	.379	.180	1.245	-.175	20	-.415	.069	-.190	-.697

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.013	.123	.446	-.453	11	-.305	.124	.430	-1.099
2	.035	.145	.435	-.503	12	-.314	.122	.347	-1.051
3	.043	.184	.594	-.651	13	-.286	.114	.275	-1.007
4	-.040	.210	.581	-.655	14	-.293	.110	.242	-1.282
5	-.197	.194	.547	-.784	15	-.298	.092	.176	-.701
6	-.346	.135	.320	-.808	16	-.270	.087	.127	-.662
7	-.371	.094	.103	-.809	17	-.242	.079	.121	-.630
8	-.395	.090	-.083	-1.010	18	-.251	.078	.096	-.581
9	-.367	.087	-.076	-.948	19	-.234	.078	.067	-.714
10	-.374	.095	-.073	-.954	20	-.254	.085	.044	-1.285

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.035	.065	.212	-.335	11	-.207	.153	.231	-1.148
2	-.025	.067	.251	-.305	12	-.213	.141	.195	-1.282
3	-.004	.071	.361	-.219	13	-.186	.125	.206	-1.070
4	-.006	.075	.489	-.251	14	-.189	.116	.181	-.854
5	-.001	.072	.438	-.200	15	-.167	.106	.199	-.944
6	-.041	.071	.311	-.288	16	-.172	.100	.151	-.958
7	-.047	.082	.354	-.656	17	-.146	.089	.177	-.686
8	-.082	.093	.358	-1.113	18	-.156	.088	.181	-.891
9	-.083	.101	.473	-1.343	19	-.141	.094	.208	-1.051
10	-.127	.129	.391	-1.460	20	-.165	.105	.209	-1.002

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.432	.12v	.963	.143	11	-.424	.060	-.260	-.661
2	.411	.109	.920	.140	12	-.410	.058	-.245	-.623
3	.366	.100	.830	.113	13	-.427	.056	-.278	-.674
4	.332	.091	.751	.097	14	-.412	.056	-.263	-.663
5	.257	.083	.591	.027	15	-.419	.057	-.266	-.677
6	.187	.075	.495	-.016	16	-.396	.059	-.210	-.669
7	.077	.064	.325	-.102	17	-.415	.066	-.204	-.709
8	.002	.056	.198	-.174	18	-.398	.068	-.179	-.709
9	-.104	.055	.104	-.272	19	-.406	.065	-.199	-.693
10	-.211	.053	-.026	-.391	20	-.387	.068	-.158	-.695

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.382	.118	.040	-1.057	11	-.160	.060	.050	-.415
2	-.320	.093	.091	-.864	12	-.135	.053	.052	-.347
3	-.317	.092	.112	-.880	13	-.170	.050	-.006	-.350
4	-.261	.102	.055	-.786	14	-.157	.050	.048	-.427
5	-.283	.097	.060	-.819	15	-.176	.054	-.009	-.366
6	-.234	.109	.192	-.780	16	-.158	.061	.048	-.393
7	-.214	.137	.570	-.752	17	-.194	.080	.054	-.512
8	-.159	.155	.579	-.769	18	-.189	.095	.115	-.689
9	-.147	.156	.453	-.740	19	-.229	.106	.086	-.710
10	-.127	.154	.630	-.777	20	-.242	.125	.134	-.809

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.111	.049	.057	-.357	11	-.129	.042	.007	-.285
2	-.089	.049	.068	-.384	12	-.102	.040	.038	-.242
3	-.103	.051	.647	-.446	13	-.133	.038	-.013	-.261
4	-.075	.055	.098	-.391	14	-.110	.038	-.011	-.239
5	-.098	.064	.147	-.463	15	-.130	.037	-.009	-.259
6	-.050	.076	.382	-.316	16	-.106	.036	.009	-.226
7	-.043	.089	.707	-.334	17	-.141	.041	.024	-.264
8	-.015	.089	.597	-.269	18	-.119	.042	.051	-.262
9	-.057	.086	.428	-.351	19	-.140	.042	.027	-.282
10	-.055	.074	.297	-.303	20	-.115	.042	.045	-.275

DATA FOR PROJECT 6022 CONFIG. H WIND DIR 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.361	.106	.787	.079	11	-.307	.087	.016	-.765
2	.307	.092	.668	.075	12	-.321	.088	.047	-.774
3	.262	.079	.574	.063	13	-.326	.093	.076	-.804
4	.214	.070	.497	.027	14	-.344	.102	-.010	-.959
5	.140	.056	.342	-.024	15	-.368	.115	.007	-.970
6	.080	.051	.277	-.072	16	-.398	.127	-.051	-1.071
7	.014	.044	.201	-.119	17	-.398	.129	.003	-1.183
8	-.044	.043	.128	-.166	18	-.388	.121	-.079	-1.031
9	-.092	.046	.076	-.243	19	-.372	.108	-.069	-.983
10	-.165	.054	.031	-.401	20	-.367	.108	-.064	-.997

DATA FOR PROJECT 6022 CONFIG. H WIND DIR 161 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.166	.092	.097	-.735	11	-.134	.046	.023	-.362
2	-.134	.076	.104	-.642	12	-.131	.046	.056	-.395
3	-.113	.073	.252	-.403	13	-.136	.046	.022	-.306
4	-.077	.080	.309	-.513	14	-.141	.048	.040	-.331
5	-.046	.090	.461	-.361	15	-.154	.052	.071	-.365
6	-.018	.106	.475	-.428	16	-.166	.059	.039	-.392
7	-.010	.102	.487	-.433	17	-.190	.071	.084	-.462
8	-.017	.094	.339	-.510	18	-.216	.087	.100	-.606
9	-.036	.089	.344	-.407	19	-.255	.106	.042	-.804
10	-.069	.073	.211	-.345	20	-.311	.142	.085	-1.053

DATA FOR PROJECT 6022 CONFIG. H WIND DIR. 162 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.091	.047	.111	-.302	11	-.111	.038	.016	-.244
2	-.081	.050	.125	-.323	12	-.103	.038	.036	-.232
3	-.080	.054	.146	-.329	13	-.113	.037	.026	-.243
4	-.058	.061	.235	-.338	14	-.107	.037	.030	-.232
5	-.039	.066	.310	-.311	15	-.115	.036	.023	-.241
6	-.017	.071	.340	-.293	16	-.109	.037	.040	-.238
7	-.024	.065	.273	-.238	17	-.120	.036	.022	-.246
8	-.027	.060	.215	-.232	18	-.119	.038	.044	-.256
9	-.049	.059	.238	-.298	19	-.130	.038	.023	-.273
10	-.067	.051	.151	-.279	20	-.123	.040	.016	-.291

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 20 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.038	.061	.199	-.322	11	-.250	.080	.011	-.765
2	.032	.054	.257	-.208	12	-.255	.081	.019	-.820
3	.103	.053	.311	-.125	13	-.256	.082	-.004	-.785
4	.161	.056	.383	-.035	14	-.266	.086	-.004	-.917
5	.222	.060	.475	.006	15	-.268	.085	-.057	-.801
6	.269	.067	.544	.036	16	-.280	.089	-.061	-.759
7	.333	.080	.741	.065	17	-.282	.088	-.049	-.807
8	.371	.093	.790	.085	18	-.283	.089	.056	-.752
9	.417	.108	.902	.105	19	-.278	.094	-.002	-.878
10	.459	.141	1.058	.026	20	-.272	.097	.072	-.890

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 21 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.009	.059	.259	-.302	11	-.278	.233	.381	-2.012
2	.046	.059	.284	-.232	12	-.259	.208	.417	-1.580
3	.091	.061	.340	-.152	13	-.232	.177	.418	-1.454
4	.125	.068	.491	-.156	14	-.212	.152	.485	-1.331
5	.167	.082	.553	-.187	15	-.179	.111	.255	-.695
6	.181	.108	.630	-.246	16	-.166	.095	.206	-.965
7	.162	.142	.748	-.244	17	-.146	.077	.138	-.612
8	.119	.151	.853	-.343	18	-.140	.073	.121	-.468
9	.076	.145	.827	-.403	19	-.129	.072	.106	-.498
10	-.002	.151	.880	-.600	20	-.128	.072	.111	-.610

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.011	.052	.201	-.196	11	-.233	.190	.234	-1.532
2	.009	.049	.250	-.156	12	-.221	.172	.291	-1.198
3	.033	.048	.227	-.149	13	-.197	.145	.257	-1.066
4	.046	.048	.226	-.136	14	-.173	.123	.274	-1.012
5	.067	.051	.247	-.146	15	-.146	.097	.224	-.750
6	.080	.058	.277	-.139	16	-.128	.085	.195	-.524
7	.085	.065	.363	-.202	17	-.107	.075	.194	-.596
8	.080	.073	.470	-.239	18	-.097	.072	.166	-.569
9	.076	.078	.485	-.322	19	-.090	.071	.144	-.468
10	.049	.107	.565	-.697	20	-.091	.073	.136	-.562

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.079	.052	.265	-.112	11	-.264	.077	.034	-.620
2	.167	.055	.374	-.015	12	-.262	.075	.012	-.597
3	.242	.059	.458	.065	13	-.268	.072	-.026	-.598
4	.303	.064	.546	.114	14	-.272	.072	-.022	-.611
5	.367	.072	.624	.162	15	-.280	.062	-.048	-.558
6	.411	.083	.717	.153	16	-.280	.064	-.056	-.583
7	.452	.095	.781	.165	17	-.275	.063	-.067	-.546
8	.478	.114	.847	.139	18	-.272	.064	-.043	-.538
9	.491	.136	.922	.060	19	-.279	.066	.110	-.520
10	.453	.168	1.026	-.082	20	-.273	.069	.068	-.523

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.063	.085	.436	-.296	11	-.210	.126	.299	-1.150
2	.098	.095	.467	-.276	12	-.194	.118	.261	-1.065
3	.125	.118	.598	-.283	13	-.193	.111	.207	-1.181
4	.116	.132	.652	-.320	14	-.187	.106	.209	-1.155
5	.029	.144	.547	-.423	15	-.174	.089	.131	-.874
6	-.087	.136	.510	-.483	16	-.159	.078	.126	-.458
7	-.148	.123	.431	-.753	17	-.148	.070	.109	-.401
8	-.180	.104	.291	-.714	18	-.147	.069	.099	-.443
9	-.192	.093	.217	-.727	19	-.145	.074	.092	-.569
10	-.214	.101	.236	-.931	20	-.138	.078	.099	-.674

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.006	.052	.202	-.238	11	-.142	.151	.163	-1.671
2	.003	.050	.201	-.184	12	-.123	.133	.178	-1.294
3	.011	.053	.283	-.374	13	-.121	.118	.179	-.984
4	.027	.054	.321	-.326	14	-.114	.109	.184	-1.015
5	.029	.057	.308	-.228	15	-.106	.097	.247	-.732
6	.028	.063	.313	-.237	16	-.088	.088	.231	-.616
7	.027	.080	.546	-.361	17	-.079	.080	.179	-.667
8	.029	.087	.575	-.409	18	-.079	.079	.197	-.478
9	.021	.093	.537	-.755	19	-.082	.083	.198	-.787
10	-.007	.120	.608	-1.399	20	-.077	.092	.195	-.940

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 60 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.184	.075	.457	-.053	11	-.417	.060	-.230	-.779
2	.275	.082	.594	.034	12	-.416	.059	-.241	-.733
3	.345	.079	.727	.045	13	-.416	.057	-.235	-.687
4	.395	.086	.807	.140	14	-.420	.057	-.225	-.659
5	.441	.096	.924	.138	15	-.422	.060	-.226	-.625
6	.472	.111	1.064	.178	16	-.423	.061	-.228	-.619
7	.482	.134	1.008	.136	17	-.427	.060	-.213	-.622
8	.463	.150	1.037	.056	18	-.432	.061	-.212	-.625
9	.402	.160	1.006	-.018	19	-.425	.059	-.217	-.635
10	.250	.166	.851	-.222	20	-.427	.061	-.231	-.646

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 61 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.093	.167	.648	-.437	11	-.303	.101	.049	-1.012
2	.084	.176	.647	-.465	12	-.293	.096	.046	-1.119
3	.043	.189	.615	-.488	13	-.286	.089	.038	-.760
4	-.063	.187	.638	-.573	14	-.280	.083	.015	-.661
5	-.233	.153	.546	-.638	15	-.263	.071	.035	-.588
6	-.347	.115	.251	-.705	16	-.257	.068	.019	-.593
7	-.380	.100	.062	-1.293	17	-.257	.069	-.015	-.615
8	-.377	.095	.156	-1.396	18	-.261	.072	-.022	-.732
9	-.366	.093	.170	-1.096	19	-.256	.077	.012	-.607
10	-.358	.104	.238	-1.270	20	-.260	.082	.036	-.617

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 62 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.082	.057	.117	-.332	11	-.134	.085	.127	-.855
2	-.078	.058	.129	-.308	12	-.133	.083	.094	-.961
3	-.068	.057	.134	-.367	13	-.131	.079	.090	-.808
4	-.064	.062	.158	-.349	14	-.131	.074	.115	-.526
5	-.066	.067	.199	-.55:	15	-.128	.066	.134	-.832
6	-.068	.075	.236	-.788	16	-.123	.061	.121	-.729
7	-.062	.083	.348	-.354	17	-.125	.056	.113	-.618
8	-.059	.092	.447	-.413	18	-.130	.056	.109	-.550
9	-.059	.101	.471	-.460	19	-.131	.063	.062	-.555
10	-.066	.120	.602	-.654	20	-.134	.067	.063	-.787

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 90 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.343	.097	.857	.037	11	-.421	.054	-.245	-.608
2	.426	.102	.976	.098	12	-.430	.053	-.238	-.609
3	.477	.106	.978	.183	13	-.439	.057	-.208	-.627
4	.510	.113	.998	.201	14	-.441	.056	-.227	-.632
5	.512	.117	1.003	.233	15	-.436	.054	-.245	-.621
6	.494	.125	1.120	.201	16	-.446	.055	-.251	-.643
7	.441	.127	1.014	.131	17	-.453	.059	-.252	-.673
8	.366	.130	.978	.053	18	-.451	.061	-.248	-.735
9	.278	.125	.794	-.099	19	-.436	.060	-.242	-.773
10	.090	.113	.564	-.258	20	-.449	.064	-.174	-.927

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 91 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.074	.184	.688	-.562	11	-.229	.085	.038	-.995
2	-.145	.162	.520	-.627	12	-.226	.078	.012	-.839
3	-.238	.135	.307	-.644	13	-.226	.070	-.006	-.543
4	-.327	.112	.128	-.696	14	-.217	.064	-.001	-.492
5	-.388	.097	.030	-.660	15	-.211	.060	-.001	-.469
6	-.395	.082	-.028	-.677	16	-.220	.066	.002	-.500
7	-.357	.084	.070	-.820	17	-.222	.074	.040	-.549
8	-.329	.093	.248	-1.208	18	-.217	.079	.056	-.593
9	-.320	.108	.135	-1.148	19	-.208	.079	.064	-.537
10	-.306	.127	.244	-1.474	20	-.217	.083	.058	-.550

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 92 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.058	.048	.119	-.253	11	-.064	.059	.116	-.404
2	-.052	.050	.151	-.282	12	-.065	.056	.112	-.440
3	-.055	.052	.169	-.319	13	-.069	.052	.172	-.358
4	-.053	.056	.223	-.296	14	-.062	.049	.175	-.282
5	-.052	.062	.195	-.388	15	-.058	.046	.185	-.224
6	-.035	.071	.388	-.438	16	-.063	.045	.176	-.225
7	-.015	.082	.408	-.459	17	-.073	.045	.080	-.220
8	-.003	.095	.668	-.413	18	-.070	.043	.080	-.231
9	.006	.105	1.154	-.342	19	-.062	.045	.087	-.240
10	.012	.112	1.173	-.377	20	-.072	.048	.082	-.286

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 120 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.395	.116	.866	-.036	11	-.464	.054	-.272	-.653
2	.449	.116	.920	.090	12	-.472	.054	-.287	-.651
3	.471	.115	.921	.170	13	-.469	.053	-.287	-.651
4	.469	.115	.945	.154	14	-.470	.053	-.292	-.657
5	.457	.119	.953	.161	15	-.472	.053	-.294	-.656
6	.400	.117	.856	.070	16	-.479	.055	-.297	-.671
7	.305	.112	.713	-.029	17	-.474	.057	-.303	-.799
8	.198	.106	.640	-.122	18	-.472	.060	-.296	-.850
9	.091	.097	.544	-.168	19	-.471	.060	-.285	-.864
10	-.088	.081	.295	-.339	20	-.480	.068	-.277	-.960

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 121 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.179	.159	.452	-.698	11	-.238	.073	-.023	-.677
2	-.259	.126	.256	-.650	12	-.240	.067	-.044	-.697
3	-.334	.102	.135	-.693	13	-.233	.061	-.042	-.536
4	-.395	.091	.078	-.769	14	-.232	.057	-.040	-.450
5	-.407	.085	-.062	-.743	15	-.236	.058	-.045	-.462
6	-.371	.090	.080	-.713	16	-.246	.067	-.014	-.502
7	-.316	.094	.180	-.885	17	-.238	.078	-.000	-.598
8	-.299	.105	.345	-1.099	18	-.237	.084	.007	-.687
9	-.276	.118	.142	-1.046	19	-.237	.084	.038	-.754
10	-.274	.133	.213	-1.220	20	-.244	.087	.055	-1.010

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.106	.047	.118	-.282	11	-.113	.047	.042	-.313
2	-.107	.050	.108	-.312	12	-.118	.046	.029	-.285
3	-.105	.053	.130	-.359	13	-.110	.044	.045	-.338
4	-.107	.057	.133	-.372	14	-.110	.043	.037	-.305
5	-.093	.061	.141	-.404	15	-.109	.040	.033	-.267
6	-.080	.072	.284	-.400	16	-.115	.040	.033	-.255
7	-.060	.087	.499	-.437	17	-.112	.040	.039	-.243
8	-.037	.099	.702	-.523	18	-.113	.041	.041	-.251
9	-.039	.103	.632	-.355	19	-.114	.039	.039	-.24
10	-.048	.102	.576	-.454	20	-.122	.041	.019	-.25

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.486	.128	1.140	.208	11	-.351	.054	-.170	-.575
2	.458	.118	1.054	.194	12	-.359	.054	-.180	-.567
3	.428	.108	.916	.194	13	-.363	.058	-.186	-.559
4	.381	.099	.806	.148	14	-.371	.059	-.175	-.569
5	.313	.088	.639	.063	15	-.355	.059	-.154	-.598
6	.226	.080	.528	.030	16	-.356	.060	-.136	-.642
7	.133	.068	.431	-.023	17	-.352	.061	-.149	-.657
8	.043	.060	.313	-.122	18	-.356	.063	-.137	-.645
9	-.045	.056	.218	-.240	19	-.340	.060	-.144	-.592
10	-.174	.051	.009	-.384	20	-.345	.064	-.149	-.680

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.167	.121	.254	-.787	11	-.180	.059	.001	-.457
2	-.166	.103	.193	-.791	12	-.186	.055	-.014	-.398
3	-.159	.097	.155	-.654	13	-.184	.052	-.013	-.425
4	-.142	.099	.221	-.569	14	-.194	.053	-.008	-.426
5	-.113	.104	.418	-.524	15	-.201	.059	-.009	-.474
6	-.093	.125	.483	-.597	16	-.210	.073	.013	-.589
7	-.082	.143	.660	-.618	17	-.211	.098	.069	-.688
8	-.087	.157	.941	-.660	18	-.223	.114	.108	-.712
9	-.092	.158	.511	-.688	19	-.234	.115	.145	-.896
10	-.120	.148	.469	-.702	20	-.249	.121	.134	-.791

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.086	.048	.103	-.299	11	-.113	.039	.027	-.267
2	-.084	.050	.091	-.280	12	-.116	.039	.021	-.263
3	-.080	.052	.093	-.300	13	-.111	.039	.013	-.282
4	-.074	.056	.143	-.293	14	-.114	.040	.012	-.280
5	-.057	.064	.382	-.299	15	-.113	.039	.011	-.270
6	-.044	.075	.410	-.317	16	-.116	.040	.015	-.273
7	-.030	.082	.440	-.343	17	-.116	.037	.023	-.236
8	-.033	.083	.420	-.286	18	-.121	.039	.021	-.245
9	-.045	.074	.415	-.265	19	-.120	.039	.021	-.24
10	-.068	.065	.297	-.300	20	-.123	.041	.025	-.27

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.386	.094	.744	.128	11	-.285	.082	-.003	-.704
2	.338	.081	.634	.101	12	-.294	.084	-.023	-.664
3	.289	.071	.554	.073	13	-.312	.090	-.004	-.805
4	.244	.063	.503	.040	14	-.325	.098	-.001	-.782
5	.184	.057	.494	.019	15	-.350	.109	-.009	-.854
6	.126	.051	.389	-.028	16	-.370	.118	-.024	-1.350
7	.054	.044	.263	-.085	17	-.366	.114	-.032	-1.211
8	-.004	.041	.154	-.137	18	-.349	.107	-.059	-1.087
9	-.064	.044	.095	-.218	19	-.333	.097	-.065	-.900
10	-.136	.051	.019	-.347	20	-.325	.097	-.047	-.878

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 161 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.021	.083	.338	-.322	11	-.105	.046	.075	-.366
2	.038	.072	.336	-.234	12	-.110	.048	.072	-.337
3	.041	.070	.330	-.258	13	-.116	.049	.101	-.309
4	.050	.078	.340	-.251	14	-.119	.052	.089	-.383
5	.059	.089	.426	-.265	15	-.137	.056	.078	-.329
6	.058	.098	.524	-.290	16	-.162	.066	.083	-.526
7	.040	.090	.509	-.336	17	-.204	.086	.067	-.518
8	.016	.085	.389	-.334	18	-.236	.107	.117	-.717
9	-.008	.079	.317	-.342	19	-.273	.117	.071	-.894
10	-.041	.064	.263	-.366	20	-.302	.136	.055	-1.166

DATA FOR PROJECT 6022 CONFIG. I WIND DIR. 162 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.032	.053	.191	-.259	11	-.054	.035	.070	-.180
2	-.017	.055	.203	-.225	12	-.055	.035	.071	-.175
3	-.013	.058	.254	-.256	13	-.056	.036	.075	-.169
4	.001	.061	.336	-.252	14	-.050	.036	.084	-.164
5	.020	.065	.505	-.229	15	-.055	.036	.080	-.170
6	.031	.066	.512	-.242	16	-.057	.037	.077	-.185
7	.021	.060	.356	-.279	17	-.063	.039	.066	-.219
8	.009	.056	.306	-.326	18	-.059	.041	.064	-.229
9	-.009	.052	.257	-.166	19	-.065	.043	.057	-.249
10	-.023	.045	.182	-.174	20	-.070	.046	.067	-.279

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.070	.051	.263	-.097	11	-.335	.075	.100	-.666
2	.159	.054	.370	.020	12	-.340	.072	-.117	-.671
3	.249	.059	.469	.066	13	-.336	.069	-.124	-.662
4	.304	.064	.538	.089	14	-.344	.069	-.113	-.686
5	.364	.071	.622	.131	15	-.340	.065	-.124	-.639
6	.410	.083	.709	.129	16	-.347	.066	-.117	.39
7	.457	.111	.974	.154	17	-.340	.064	-.127	.05
8	.477	.132	1.084	.100	18	-.342	.065	-.130	-.621
9	.482	.153	1.177	.074	19	-.332	.065	-.997	-.595
10	.426	.182	1.241	-.106	20	-.336	.067	-.103	-.643

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.092	.072	.338	-.317	11	-.236	.136	.150	-1.256
2	.041	.075	.360	-.248	12	-.233	.129	.135	-1.115
3	.089	.085	.479	-.193	13	-.227	.119	.112	-1.136
4	.119	.094	.485	-.192	14	-.224	.109	.102	-.896
5	.137	.108	.587	-.183	15	-.216	.099	.074	-.744
6	.120	.125	.669	-.224	16	-.209	.088	.076	-.625
7	.072	.140	.661	-.398	17	-.196	.074	.030	-.553
8	.025	.139	.608	-.505	18	-.195	.073	.034	-.637
9	-.018	.134	.724	-.599	19	-.188	.083	.044	-1.140
10	-.082	.136	.548	-1.134	20	-.191	.090	.090	-1.108

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.034	.054	.159	-.255	11	-.158	.130	.154	-1.353
2	-.022	.053	.184	-.227	12	-.135	.123	.177	-1.194
3	-.000	.054	.238	-.344	13	-.150	.112	.276	-1.056
4	.007	.055	.292	-.453	14	-.149	.104	.409	-.787
5	.014	.059	.330	-.521	15	-.136	.088	.099	-.571
6	.011	.063	.357	-.282	16	-.127	.081	.110	-.649
7	.026	.077	.397	-.320	17	-.115	.074	.138	-.683
8	.026	.085	.502	-.418	18	-.117	.073	.118	-.756
9	.026	.093	.589	-.471	19	-.116	.076	.143	-.960
10	.009	.118	.813	-.763	20	-.121	.086	.107	-.995

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 60 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.178	.070	.459	-.042	11	-.380	.060	-.184	-.691
2	.268	.076	.693	.034	12	-.383	.059	-.191	-.641
3	.345	.079	.684	.126	13	-.383	.057	-.208	-.614
4	.394	.087	.765	.143	14	-.385	.057	-.188	-.612
5	.441	.096	.875	.147	15	-.396	.054	-.191	-.569
6	.475	.115	1.19	.162	16	-.388	.055	-.184	-.582
7	.51[illegible]	.134	1.147	.133	17	-.389	.056	-.184	-.587
8	.499	.151	1.111	.087	18	-.392	.057	-.188	-.619
9	.450	.164	1.153	-.025	19	-.386	.056	-.215	-.586
10	.309	.173	1.027	-.185	20	-.391	.057	-.209	-.606

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 61 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.030	.134	.598	-.384	11	-.256	.103	.072	-1.039
2	.051	.144	.670	-.380	12	-.258	.098	.054	-.958
3	.080	.148	.594	-.366	13	-.245	.091	.054	-.745
4	.043	.154	.651	-.361	14	-.243	.085	.042	-.746
5	-.033	.153	.552	-.494	15	-.229	.069	.025	-.7[illegible]
6	-.120	.145	.430	-.579	16	-.232	.065	.009	-.[illegible]
7	-.173	.119	.338	-.868	17	-.222	.065	-.010	-.4[illegible]1
8	-.206	.111	.379	-1.035	18	-.229	.069	-.020	-.[illegible]28
9	-.215	.101	.248	-.805	19	-.234	.080	-.022	-.612
10	-.239	.106	.368	-1.132	20	-.245	.086	-.037	-.787

DATA FOR PROJECT 6022 CONFIG J WIND DIR. 62 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.051	.056	.159	-.286	11	-.119	.081	.127	-.697
2	-.046	.056	.129	-.283	12	-.127	.080	.129	-.674
3	-.031	.057	.262	-.263	13	-.119	.076	.115	-.664
4	-.034	.059	.234	-.297	14	-.122	.073	.105	-.700
5	-.027	.064	.280	-.306	15	-.115	.063	.086	-.507
6	-.028	.071	.285	-.391	16	-.121	.059	.051	-.467
7	-.023	.086	.340	-.623	17	-.112	.055	.064	-.367
8	-.028	.094	.481	-.717	18	-.120	.057	.074	-.426
9	-.020	.099	.574	-.718	19	-.111	.064	.052	-.470
10	-.031	.117	.743	-.842	20	-.121	.069	.044	-.512

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 120 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.431	.116	.908	.107	11	-.410	.055	-.210	-.582
2	.474	.116	.956	.146	12	-.414	.054	-.225	-.582
3	.486	.114	.928	.149	13	-.417	.054	-.210	-.585
4	.480	.114	.921	.164	14	-.415	.054	-.208	-.578
5	.451	.112	.955	.188	15	-.419	.053	-.215	-.592
6	.395	.111	.880	.121	16	-.422	.054	-.211	-.606
7	.298	.106	.743	.022	17	-.410	.055	-.241	-.639
8	.199	.100	.635	-.077	18	-.406	.058	-.234	-.742
9	.083	.091	.509	-.214	19	-.409	.059	-.203	-.914
10	-.082	.075	.278	-.366	20	-.414	.067	-.163	-1.211

DATA FOR PROJECT 6022 CONFIG J WIND DIR. 121 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.125	.145	.455	-.660	11	-.199	.067	-.012	-.582
2	-.156	.120	.337	-.558	12	-.196	.061	-.005	-.637
3	-.188	.103	.200	-.518	13	-.187	.057	.036	-.565
4	-.208	.094	.143	-.562	14	-.186	.053	.017	-.436
5	-.200	.089	.134	-.720	15	-.195	.052	-.008	-.398
6	-.185	.094	.215	-.593	16	-.207	.055	-.035	-.390
7	-.171	.104	.374	-.971	17	-.197	.059	-.004	-.447
8	-.168	.112	.446	-.861	18	-.196	.065	-.008	-.530
9	-.174	.119	.553	-.937	19	-.199	.066	.002	-.525
10	-.180	.125	.616	-.944	20	-.202	.068	.016	-.558

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.071	.046	.089	-.315	11	-.089	.046	.058	-.300
2	-.067	.051	.106	-.328	12	-.090	.045	.054	-.280
3	-.062	.051	.228	-.310	13	-.085	.042	.083	-.258
4	-.058	.051	.364	-.318	14	-.085	.041	.075	-.249
5	-.041	.073	.427	-.342	15	-.086	.040	.058	-.244
6	-.028	.083	.416	-.373	16	-.090	.039	.047	-.243
7	-.014	.094	.483	-.350	17	-.087	.037	.039	-.241
8	-.013	.099	.585	-.355	18	-.088	.038	.041	-.276
9	-.015	.096	.554	-.428	19	-.089	.038	.022	-.290
10	-.027	.090	.554	-.418	20	-.093	.040	.033	-.303

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.451	.125	1.069	.143	11	-.372	.058	-.171	-.599
2	.431	.115	1.010	.146	12	-.371	.057	-.173	-.604
3	.395	.104	.922	.131	13	-.377	.057	-.164	-.563
4	.353	.097	.851	.105	14	-.371	.058	-.161	-.575
5	.293	.09	.617	.061	15	-.376	.058	-.184	-.625
6	.214	.076	.580	.004	16	-.366	.061	-.169	-.644
7	.109	.064	.429	-.077	17	-.360	.063	-.141	-.661
8	.022	.057	.294	-.134	18	-.354	.064	-.137	-.612
9	-.066	.054	.179	-.289	19	-.354	.061	-.148	-.615
10	-.183	.051	.004	-.427	20	-.350	.065	-.139	-.641

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.035	.082	.271	-.386	11	-.179	.047	.018	-.398
2	-.038	.079	.238	-.377	12	-.178	.045	.026	-.399
3	-.039	.075	.268	-.428	13	-.190	.044	.041	-.356
4	-.031	.079	.330	-.399	14	-.194	.045	.070	-.365
5	-.030	.091	.428	-.396	15	-.201	.048	.019	-.401
6	-.025	.107	.508	-.589	16	-.200	.055	.021	-.437
7	-.033	.118	.636	-.525	17	-.209	.071	.017	-.506
8	-.043	.121	.584	-.501	18	-.209	.081	.022	-.600
9	-.067	.119	.510	-.506	19	-.215	.082	.001	-.584
10	-.097	.105	.343	-.562	20	-.213	.084	.020	-.763

DATA FOR PROJECT 6022 CONFIG. J WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.064	.055	.271	-.253	11	-.096	.038	.050	-.263
2	-.054	.059	.346	-.260	12	-.098	.038	.056	-.258
3	-.043	.062	.415	-.280	13	-.095	.038	.032	-.224
4	-.032	.068	.437	-.288	14	-.096	.038	.031	-.229
5	-.006	.077	.622	-.280	15	-.100	.037	.027	-.233
6	.006	.085	.542	-.294	16	-.103	.038	.026	-.238
7	.010	.086	.623	-.354	17	-.102	.040	.032	-.342
8	-.001	.084	.484	-.262	18	-.102	.042	.024	-.327
9	-.009	.080	.416	-.280	19	-.105	.043	.014	-.334
10	-.037	.069	.383	-.317	20	-.109	.046	.019	-.422

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.106	.051	.051	-.340	11	-.208	.088	.130	-.778
2	-.079	.048	.086	-.269	12	-.190	.087	.134	-.782
3	-.067	.043	.070	-.227	13	-.205	.082	.097	-.758
4	-.036	.043	.093	-.200	14	-.202	.079	.083	-.788
5	-.026	.042	.107	-.204	15	-.201	.067	.047	-.615
6	-.021	.044	.107	-.218	16	-.185	.061	.045	-.506
7	-.020	.052	.160	-.244	17	-.197	.055	.028	-.463
8	-.003	.056	.188	-.285	18	-.192	.055	.019	-.594
9	-.012	.059	.204	-.648	19	-.202	.060	-.023	-.825
10	-.033	.073	.232	-.744	20	-.186	.077	.004	-1.24

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.087	.044	.057	-.229	11	-.183	.115	.126	-1.171
2	-.080	.043	.059	-.220	12	-.164	.106	.181	-1.038
3	-.075	.048	.119	-.255	13	-.168	.098	.222	-1.035
4	-.057	.050	.157	-.225	14	-.161	.090	.221	-1.110
5	-.056	.052	.146	-.282	15	-.163	.092	.249	-.809
6	-.068	.056	.140	-.372	16	-.146	.084	.218	-.817
7	-.087	.061	.169	-.428	17	-.146	.074	.193	-.746
8	-.087	.065	.161	-.569	18	-.143	.074	.137	-.938
9	-.095	.069	.189	-.815	19	-.151	.069	.050	-.531
10	-.121	.085	.265	-1.376	20	-.147	.077	.062	-.644

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.000	.051	.169	-.202	11	-.127	.138	.221	-1.323
2	.008	.049	.177	-.169	12	-.110	.125	.214	-1.051
3	.009	.052	.195	-.227	13	-.103	.109	.233	-.807
4	.020	.053	.217	-.262	14	-.093	.101	.223	-.657
5	.021	.055	.243	-.269	15	-.074	.081	.214	-.477
6	.018	.059	.243	-.235	16	-.059	.074	.197	-.425
7	.014	.070	.347	-.279	17	-.053	.068	.172	-.498
8	.018	.075	.377	-.468	18	-.051	.067	.157	-.466
9	.016	.082	.368	-.781	19	-.057	.071	.217	-.600
10	-.000	.105	.394	-.881	20	-.054	.078	.227	-.608

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 90 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.051	.059	.259	-.197	11	-.331	.050	-.133	-.636
2	.097	.054	.309	-.148	12	-.334	.049	-.133	-.547
3	.112	.053	.326	-.116	13	-.347	.045	-.193	-.486
4	.123	.056	.344	-.136	14	-.335	.044	-.183	-.479
5	.129	.060	.446	-.149	15	-.329	.042	-.187	-.457
6	.143	.075	.536	-.151	16	-.336	.042	-.184	-.475
7	.169	.112	.826	-.089	17	-.351	.047	-.197	-.560
8	.190	.158	.973	-.174	18	-.341	.049	-.179	-.566
9	.191	.195	1.082	-.220	19	-.326	.048	-.167	-.552
10	.121	.204	.930	-.492	20	-.341	.051	-.181	-.582

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 91 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.095	.104	.307	-.377	11	-.180	.071	.074	-.608
2	-.130	.089	.182	-.403	12	-.176	.066	.047	-.526
3	-.193	.074	.131	-.420	13	-.189	.063	.028	-.498
4	-.246	.063	.009	-.474	14	-.176	.056	.027	-.442
5	-.297	.055	-.120	-.491	15	-.170	.049	-.005	-.386
6	-.275	.058	-.054	-.456	16	-.173	.048	-.022	-.426
7	-.243	.066	.063	-.686	17	-.186	.049	.028	-.360
8	-.227	.077	.179	-.738	18	-.176	.052	.055	-.375
9	-.231	.089	.155	-.865	19	-.164	.052	.050	-.383
10	-.222	.108	.351	-1.464	20	-.171	.054	.054	-.384

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 92 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.049	.046	.109	-.252	11	-.058	.058	.106	-.347
2	-.039	.048	.120	-.281	12	-.056	.052	.089	-.321
3	-.045	.050	.119	-.305	13	-.063	.052	.116	-.321
4	-.042	.054	.122	-.295	14	-.054	.048	.103	-.274
5	-.039	.057	.270	-.282	15	-.052	.044	.083	-.217
6	-.020	.066	.292	-.274	16	-.058	.043	.082	-.231
7	.001	.077	.429	-.252	17	-.065	.044	.112	-.203
8	.017	.089	.559	-.288	18	-.056	.044	.134	-.217
9	.018	.105	.612	-.515	19	-.052	.044	.119	-.236
10	.024	.113	.845	-.594	20	-.062	.046	.125	-.285

DATA FOR PROJECT 6022 CONFIG. K WIND DIR 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.050	.050	.109	-.227	11	-.184	.040	-.061	-.360
2	-.057	.050	.096	-.226	12	-.190	.040	-.068	-.344
3	-.052	.049	.116	-.228	13	-.197	.043	-.052	-.340
4	-.057	.052	.156	-.269	14	-.205	.043	-.058	-.366
5	-.060	.056	.171	-.424	15	-.192	.042	-.051	-.369
6	-.073	.068	.273	-.450	16	-.196	.043	-.055	-.390
7	-.068	.076	.504	-.411	17	-.195	.039	-.052	-.334
8	-.083	.081	.498	-.492	18	-.200	.041	-.058	-.346
9	-.102	.078	.404	-.463	19	-.187	.039	-.04	-.331
10	-.137	.071	.267	-.484	20	-.192	.041	-.	.357

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.137	.050	.076	-.309	11	-.154	.040	.003	-.299
2	-.140	.051	.064	-.323	12	-.159	.040	-.005	-.306
3	-.133	.053	.053	-.345	13	-.160	.041	-.004	-.309
4	-.133	.060	.123	-.457	14	-.166	.042	-.012	-.309
5	-.123	.061	.284	-.431	15	-.160	.040	-.007	-.296
6	-.115	.074	.345	-.446	16	-.166	.041	-.012	-.306
7	-.097	.082	.467	-.408	17	-.167	.039	-.027	-.299
8	-.097	.085	.399	-.457	18	-.173	.042	-.022	-.412
9	-.105	.080	.347	-.392	19	-.165	.042	-.016	-.434
10	-.123	.072	.262	-.457	20	-.170	.044	-.019	-.474

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.055	.044	.112	-.219	11	-.053	.039	.072	-.223
2	-.057	.048	.101	-.261	12	-.056	.038	.062	-.214
3	-.044	.050	.164	-.230	13	-.055	.037	.056	-.206
4	-.033	.057	.273	-.261	14	-.060	.037	.047	-.207
5	-.013	.071	.462	-.245	15	-.048	.036	.059	-.190
6	.003	.082	.642	-.241	16	-.052	.036	.062	-.190
7	.025	.086	.590	-.299	17	-.051	.038	.102	-.166
8	.022	.084	.573	-.291	18	-.036	.039	.094	-.172
9	.003	.078	.492	-.308	19	-.046	.038	.105	-.167
10	-.022	.067	.375	-.323	20	-.054	.040	.105	-.177

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.113	.049	.033	-.342	11	-.141	.039	-.019	-.289
2	-.105	.048	.050	-.296	12	-.142	.038	-.027	-.275
3	-.115	.048	.054	-.322	13	-.147	.042	-.004	-.302
4	-.114	.050	.058	-.370	14	-.142	.041	.006	-.293
5	-.116	.048	.046	-.372	15	-.151	.041	-.016	-.295
6	-.110	.055	.083	-.402	16	-.158	.041	-.031	-.292
7	-.118	.054	.097	-.425	17	-.170	.044	-.031	-.312
8	-.120	.055	.102	-.418	18	-.169	.046	-.011	-.358
9	-.132	.053	.106	-.516	19	-.174	.045	-.013	-.362
10	-.129	.051	.064	-.394	20	-.177	.046	.010	-.370

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 161 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.097	.051	.161	-.338	11	-.100	.040	.030	-.265
2	-.089	.052	.155	-.303	12	-.101	.040	.027	-.279
3	-.095	.054	.162	-.305	13	-.106	.039	.022	-.239
4	-.093	.057	.168	-.306	14	-.098	.039	.029	-.228
5	-.096	.059	.161	-.401	15	-.102	.038	.024	-.229
6	-.085	.063	.192	-.435	16	-.105	.038	.027	-.225
7	-.089	.061	.227	-.433	17	-.108	.041	.032	-.275
8	-.089	.060	.205	-.343	18	-.105	.044	.043	-.269
9	-.092	.057	.118	-.323	19	-.111	.045	.037	-.328
10	-.090	.053	.087	-.442	20	-.117	.047	.037	-.360

DATA FOR PROJECT 6022 CONFIG. K WIND DIR. 162 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.019	.056	.342	-.250	11	-.036	.038	.083	-.161
2	-.004	.060	.446	-.250	12	-.036	.038	.085	-.162
3	.001	.064	.520	-.228	13	-.038	.039	.109	-.177
4	.012	.070	.504	-.206	14	-.032	.038	.108	-.175
5	.023	.070	.389	-.204	15	-.035	.038	.106	-.175
6	.032	.067	.368	-.189	16	-.037	.038	.112	-.173
7	.023	.061	.361	-.205	17	-.039	.039	.103	-.174
8	.013	.057	.240	-.220	18	-.033	.040	.108	-.185
9	.000	.054	.346	-.220	19	-.036	.040	.100	-.195
10	-.011	.046	.221	-.220	20	-.043	.043	.101	-.264

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.049	.047	.081	-.296	11	-.175	.107	.113	-1.177
2	-.076	.045	.087	-.269	12	-.158	.102	.137	-.824
3	-.072	.044	.070	-.260	13	-.169	.095	.104	-.640
4	-.045	.044	.086	-.221	14	-.168	.090	.093	-.631
5	-.041	.045	.094	-.237	15	-.171	.079	.177	-.600
6	-.040	.049	.110	-.282	16	-.152	.069	.154	-.446
7	-.043	.061	.180	-.333	17	-.158	.062	.077	-.491
8	-.026	.070	.246	-.350	18	-.156	.065	.049	-.567
9	-.028	.075	.306	-.412	19	-.163	.069	.020	-.794
10	-.043	.107	.446	-.885	20	-.153	.084	.035	-1.155

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.067	.046	.077	-.347	11	-.174	.130	.209	-1.169
2	-.061	.044	.096	-.297	12	-.152	.121	.214	-1.174
3	-.064	.045	.099	-.321	13	-.154	.110	.172	-1.053
4	-.046	.046	.123	-.270	14	-.144	.101	.167	-.858
5	-.045	.049	.129	-.281	15	-.138	.081	.119	-.788
6	-.046	.054	.160	-.300	16	-.116	.072	.092	-.569
7	-.052	.059	.172	-.364	17	-.114	.064	.047	-.455
8	-.039	.064	.221	-.399	18	-.115	.063	.062	-.428
9	-.044	.069	.264	-.531	19	-.121	.071	.060	-.579
10	-.068	.095	.355	-.942	20	-.113	.080	.069	-.673

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.006	.048	.153	-.234	11	-.116	.123	.227	-.939
2	.013	.047	.187	-.167	12	-.100	.116	.251	-.945
3	.016	.047	.231	-.205	13	-.099	.106	.214	-.750
4	.029	.048	.257	-.222	14	-.091	.098	.204	-.765
5	.030	.049	.272	-.260	15	-.084	.087	.175	-.724
6	.027	.054	.286	-.186	16	-.067	.080	.181	-.682
7	.027	.067	.276	-.435	17	-.060	.070	.172	-.395
8	.032	.070	.317	-.389	18	-.060	.071	.204	-.540
9	.030	.075	.356	-.399	19	-.058	.069	.166	-.503
10	.009	.101	.494	-.993	20	-.054	.078	.164	-.785

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 90 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.003	.059	.192	-.282	11	-.251	.052	-.072	-.493
2	.038	.056	.250	-.287	12	-.251	.050	-.074	-.475
3	.044	.056	.256	-.269	13	-.268	.051	-.095	-.466
4	.057	.060	.282	-.302	14	-.255	.048	-.085	-.423
5	.064	.064	.308	-.228	15	-.252	.045	-.093	-.397
6	.087	.078	.487	-.231	16	-.255	.045	-.098	-.399
7	.106	.103	.689	-.235	17	-.273	.045	-.115	-.773
8	.121	.135	.897	-.202	18	-.261	.047	-.095	-.475
9	.100	.161	.928	-.313	19	-.251	.047	-.089	-.475
10	.057	.168	.940	-.353	20	-.262	.051	-.084	-.571

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 91 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.115	.069	.287	-.313	11	-.154	.064	.065	-.494
2	-.128	.062	.211	-.315	12	-.151	.061	.073	-.468
3	-.160	.055	.071	-.325	13	-.163	.057	.027	-.446
4	-.181	.050	.036	-.356	14	-.150	.051	.023	-.374
5	-.195	.049	-.013	-.436	15	-.145	.045	.012	-.315
6	-.177	.056	.016	-.637	16	-.148	.043	-.009	-.329
7	-.173	.066	.061	-.586	17	-.163	.047	-.009	-.433
8	-.174	.077	.205	-.606	18	-.155	.049	.006	-.418
9	-.180	.093	.401	-.643	19	-.144	.049	.019	-.398
10	-.165	.108	.501	-.814	20	-.154	.053	.029	-.414

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 92 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.042	.044	.114	-.214	11	-.049	.036	.153	-.382
2	-.031	.045	.132	-.224	12	-.050	.034	.137	-.341
3	-.036	.047	.128	-.227	13	-.057	.048	.134	-.389
4	-.034	.051	.140	-.288	14	-.052	.045	.115	-.331
5	-.030	.057	.205	-.399	15	-.045	.042	.105	-.337
6	-.014	.065	.288	-.480	16	-.051	.041	.091	-.196
7	.012	.077	.499	-.475	17	-.061	.040	.072	-.207
8	.026	.090	.737	-.414	18	-.059	.041	.072	-.244
9	.036	.106	.751	-.292	19	-.048	.041	.086	-.259
10	.036	.111	.831	-.334	20	-.058	.043	.075	-.315

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.051	.053	.136	-.338	11	-.147	.040	-.023	-.287
2	-.054	.053	.133	-.357	12	-.153	.039	-.025	-.296
3	-.047	.054	.158	-.297	13	-.157	.037	-.020	-.286
4	-.049	.059	.203	-.286	14	-.166	.038	-.025	-.290
5	-.044	.067	.373	-.315	15	-.157	.038	-.016	-.274
6	-.047	.081	.677	-.364	16	-.162	.039	-.012	-.300
7	-.036	.087	.612	-.496	17	-.162	.045	-.007	-.367
8	-.047	.089	.530	-.488	18	-.168	.047	.002	-.408
9	-.060	.092	.551	-.361	19	-.154	.046	.016	-.384
10	-.093	.080	.489	-.394	20	-.160	.049	.018	-.415

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.118	.053	.082	-.418	11	-.139	.039	-.016	-.299
2	-.117	.055	.118	-.391	12	-.140	.038	-.016	-.291
3	-.110	.058	.144	-.384	13	-.144	.039	-.001	-.289
4	-.104	.063	.169	-.415	14	-.147	.039	-.008	-.282
5	-.095	.067	.301	-.395	15	-.140	.038	-.003	-.260
6	-.084	.080	.327	-.401	16	-.143	.038	-.009	-.264
7	-.064	.086	.391	-.342	17	-.148	.042	-.011	-.289
8	-.064	.088	.465	-.348	18	-.153	.044	-.008	-.340
9	-.076	.083	.363	-.352	19	-.145	.043	-.007	-.306
10	-.099	.073	.252	-.360	20	-.149	.046	.008	-.318

DATA FOR PROJECT 6022 CONFIG. L WIND DIR 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.04[illegible]	.044	.122	-.236	11	-.045	.036	.083	-.167
2	-.049	.047	.149	-.292	12	-.048	.036	.074	-.166
3	-.039	.050	.173	-.343	13	-.047	.037	.064	-.185
4	-.030	.056	.251	-.390	14	-.052	.037	.059	-.188
5	-.006	.063	.355	-.217	15	-.041	.035	.064	-.170
6	.008	.073	.476	-.198	16	-.044	.035	.067	-.173
7	.029	.076	.510	-.167	17	-.046	.041	.116	-.162
8	.023	.076	.537	-.173	18	-.052	.042	.116	-.178
9	.020	.077	.587	-.207	19	-.042	.041	.115	-.170
10	-.007	.064	.396	-.245	20	-.049	.042	.116	-.193

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.089	.051	.068	-.381	11	-.108	.041	.023	-.266
2	-.082	.052	.110	-.381	12	-.110	.041	.027	-.256
3	-.090	.054	.131	-.416	13	-.115	.038	.019	-.253
4	-.092	.056	.183	-.390	14	-.109	.038	.022	-.243
5	-.089	.063	.317	-.430	15	-.116	.037	.020	-.243
6	-.083	.068	.396	-.438	16	-.122	.039	.007	-.273
7	-.086	.066	.352	-.468	17	-.129	.043	.016	-.279
8	-.088	.064	.333	-.386	18	-.127	.047	.019	-.317
9	-.097	.060	.232	-.420	19	-.132	.046	.027	-.299
10	-.097	.055	.120	-.408	20	-.135	.047	.027	-.333

DATA FOR PROJECT 6022 CONFIG. L WIND DIR. 161 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.074	.054	.158	-.584	11	-.079	.039	.053	-.229
2	-.063	.055	.182	-.370	12	-.079	.039	.054	-.218
3	-.070	.057	.197	-.314	13	-.081	.039	.065	-.222
4	-.065	.061	.345	-.315	14	-.071	.039	.073	-.214
5	-.054	.066	.395	-.518	15	-.078	.038	.063	-.209
6	-.040	.067	.412	-.424	16	-.080	.039	.070	-.208
7	-.046	.064	.358	-.261	17	-.086	.041	.049	-.264
8	-.047	.061	.355	-.335	18	-.081	.044	.050	-.302
9	-.061	.058	.352	-.314	19	-.088	.047	.046	-.334
10	-.060	.052	.246	-.353	20	-.095	.050	.040	-.369

DATA FOR PROJECT 6022 CONFIG. L WIND DIR 162 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.008	.053	.332	-.212	11	-.030	.038	.114	-.166
2	.009	.057	.374	-.207	12	-.029	.038	.112	-.174
3	.010	.060	.367	-.183	13	-.034	.036	.073	-.148
4	.022	.065	.467	-.222	14	-.029	.036	.078	-.142
5	.032	.067	.483	-.195	15	-.030	.036	.074	-.143
6	.039	.065	.419	-.170	16	-.033	.036	.075	-.150
7	.028	.060	.337	-.209	17	-.035	.039	.107	-.168
8	.018	.056	.273	-.232	18	-.029	.040	.119	-.176
9	.010	.055	.278	-.205	19	-.033	.040	.114	-.206
10	-.002	.047	.198	-.180	20	-.039	.043	.106	-.242

DATA FOR PROJECT 6022 CONFIG. M WIND DIR 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.036	.050	.142	-.312	11	-.139	.117	.158	-1.164
2	-.027	.048	.165	-.285	12	-.117	.108	.195	-.770
3	-.028	.050	.270	-.207	13	-.126	.099	.184	-.720
4	-.006	.050	.272	-.197	14	-.118	.093	.162	-.768
5	-.010	.052	.239	-.230	15	-.116	.082	.125	-.891
6	-.012	.057	.259	-.265	16	-.092	.072	.128	-.558
7	-.017	.063	.303	-.312	17	-.092	.062	.115	-.436
8	.002	.069	.349	-.324	18	-.089	.059	.115	-.428
9	.006	.076	.383	-.374	19	-.098	.066	.168	-.437
10	-.004	.104	.549	-.642	20	-.082	.072	.165	-.461

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.017	.049	.188	-.274	11	-.133	.116	.192	-1.011
2	-.008	.047	.190	-.263	12	-.113	.108	.204	-.887
3	-.011	.047	.182	-.205	13	-.118	.100	.208	-.792
4	.009	.048	.166	-.249	14	-.111	.096	.213	-.729
5	.010	.050	.178	-.382	15	-.105	.011	.152	-.535
6	.009	.056	.220	-.518	16	-.081	.073	.220	-.556
7	.005	.066	.261	-.651	17	-.078	.067	.188	-.543
8	.018	.071	.322	-.553	18	-.077	.067	.176	-.534
9	.015	.076	.355	-.667	19	-.083	.071	.162	-.463
10	-.007	.106	.518	-1.262	20	-.072	.078	.177	-.485

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.017	.057	.240	-.263	11	-.122	.132	.171	-1.261
2	.028	.056	.310	-.613	12	-.104	.119	.207	-1.240
3	.035	.056	.326	-.201	13	-.103	.109	.165	-.838
4	.030	.057	.369	-.195	14	-.095	.102	.193	-.730
5	.055	.060	.439	-.165	15	-.077	.083	.184	-.856
6	.052	.065	.540	-.179	16	-.058	.075	.176	-.640
7	.047	.075	.365	-.352	17	-.054	.070	.158	-.560
8	.053	.080	.477	-.377	18	-.052	.071	.166	-.550
9	.052	.085	.550	-.459	19	-.062	.083	.240	-.589
10	.031	.109	.644	-.687	20	-.056	.092	.247	-.751

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 90 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.022	.061	.215	-.271	11	-.179	.053	-.002	-.429
2	.021	.062	.242	-.227	12	-.180	.051	-.001	-.418
3	.026	.064	.282	-.230	13	-.200	.049	-.040	-.403
4	.045	.070	.322	-.239	14	-.185	.046	-.019	-.376
5	.062	.077	.469	-.247	15	-.181	.043	-.018	-.365
6	.098	.092	.627	-.185	16	-.187	.044	-.008	-.376
7	.116	.113	.844	-.190	17	-.201	.043	-.037	-.370
8	.127	.133	.872	-.225	18	-.189	.047	-.008	-.352
9	.115	.160	.931	-.349	19	-.178	.046	-.005	-.348
10	.085	.161	.900	-.341	20	-.191	.050	.002	-.407

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 91 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.090	.058	.174	-.470	11	-.107	.056	.108	-.498
2	-.085	.055	.129	-.695	12	-.106	.053	.100	-.414
3	-.099	.052	.081	-.405	13	-.120	.051	.021	-.373
4	-.102	.053	.060	-.356	14	-.108	.046	.030	-.319
5	-.110	.058	.081	-.554	15	-.102	.040	.022	-.260
6	-.105	.066	.132	-.527	16	-.109	.038	.019	-.238
7	-.106	.075	.327	-.538	17	-.124	.046	.031	-.337
8	-.098	.086	.374	-.495	18	-.116	.048	.040	-.319
9	-.093	.108	.632	-.710	19	-.106	.047	.042	-.303
10	-.070	.127	.713	-1.020	20	-.118	.050	.036	-.354

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 92 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.035	.045	.162	-.247	11	-.044	.053	.136	-.279
2	-.023	.047	.171	-.238	12	-.045	.051	.122	-.282
3	-.026	.049	.185	-.240	13	-.048	.046	.159	-.230
4	-.022	.052	.199	-.356	14	-.039	.044	.148	-.214
5	-.020	.057	.245	-.323	15	-.037	.042	.130	-.221
6	.002	.065	.439	-.255	16	-.045	.042	.112	-.245
7	.027	.079	.558	-.410	17	-.060	.042	.080	-.233
8	.043	.095	.634	-.403	18	-.053	.043	.090	-.224
9	.051	.107	.753	-.326	19	-.044	.043	.087	-.214
10	.058	.115	.841	-.329	20	-.052	.045	.092	-.235

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 145 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.012	.072	.563	-.286	11	-.113	.041	.016	-.280
2	-.003	.075	.579	-.276	12	-.122	.042	.011	-.293
3	.012	.078	.547	-.280	13	-.120	.040	.006	-.266
4	.021	.086	.636	-.253	14	-.128	.041	-.005	-.286
5	.033	.088	.658	-.220	15	-.123	.042	.013	-.306
6	.029	.094	.565	-.296	16	-.130	.045	.015	-.396
7	.031	.090	.599	-.225	17	-.130	.045	.022	-.351
8	.011	.087	.526	-.256	18	-.136	.050	.029	-.381
9	.003	.093	.540	-.299	19	-.127	.051	.029	-.362
10	-.043	.078	.433	-.378	20	-.136	.055	.028	-.423

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.133	.051	.061	-.309	11	-.112	.038	.029	-.254
2	-.101	.055	.072	-.330	12	-.112	.038	.024	-.256
3	-.093	.058	.093	-.322	13	-.120	.040	.042	-.283
4	-.084	.063	.113	-.338	14	-.121	.040	.032	-.283
5	-.068	.072	.360	-.335	15	-.114	.039	.039	-.271
6	-.046	.084	.408	-.357	16	-.116	.040	.037	-.269
7	-.022	.093	.586	-.319	17	-.123	.039	.019	-.260
8	-.021	.095	.844	-.344	18	-.126	.040	.022	-.283
9	-.042	.080	.408	-.356	19	-.118	.040	.015	-.277
10	-.065	.069	.280	-.326	20	-.123	.042	.021	-.302

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.028	.045	.165	-.193	11	-.029	.038	.105	-.184
2	-.027	.048	.136	-.224	12	-.027	.038	.102	-.180
3	-.014	.050	.204	-.227	13	-.031	.036	.122	-.179
4	.001	.056	.307	-.234	14	-.032	.035	.122	-.183
5	.019	.065	.459	-.259	15	-.026	.034	.125	-.158
6	.036	.076	.563	-.274	16	-.027	.035	.129	-.160
7	.052	.080	.559	-.124	17	-.029	.036	.102	-.150
8	.051	.079	.532	-.177	18	-.031	.037	.098	-.162
9	.041	.074	.489	-.216	19	-.025	.036	.108	-.151
10	.018	.062	.375	-.258	20	-.030	.037	.112	-.174

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 160 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.036	.065	.446	-.266	11	-.066	.039	.066	-.197
2	-.025	.066	.336	-.260	12	-.067	.039	.061	-.199
3	-.029	.067	.307	-.266	13	-.072	.037	.066	-.189
4	-.023	.071	.340	-.270	14	-.066	.037	.064	-.188
5	-.027	.073	.496	-.319	15	-.070	.037	.066	-.226
6	-.018	.074	.458	-.307	16	-.076	.040	.067	-.266
7	-.026	.069	.376	-.279	17	-.083	.048	.082	-.368
8	-.032	.065	.384	-.259	18	-.082	.054	.101	-.389
9	-.042	.058	.264	-.249	19	-.087	.054	.099	-.375
10	-.048	.051	.169	-.317	20	-.092	.057	.101	-.421

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 161 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.033	.063	.305	-.296	11	-.050	.039	.089	-.192
2	-.018	.066	.417	-.264	12	-.052	.039	.093	-.190
3	-.017	.068	.356	-.257	13	-.055	.038	.111	-.198
4	-.008	.072	.387	-.304	14	-.046	.039	.117	-.190
5	.004	.073	.394	-.234	15	-.052	.038	.105	-.182
6	.013	.073	.380	-.230	16	-.053	.039	.097	-.190
7	.006	.068	.379	-.215	17	-.056	.038	.105	-.198
8	-.004	.063	.304	-.204	18	-.051	.041	.114	-.210
9	-.019	.055	.321	-.293	19	-.058	.044	.089	-.375
10	-.027	.048	.201	-.230	20	-.064	.049	.080	-.394

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 162 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.010	.055	.275	-.209	11	-.015	.035	.131	-.136
2	.027	.057	.314	-.162	12	-.014	.035	.133	-.140
3	.033	.061	.395	-.197	13	-.019	.036	.143	-.161
4	.048	.068	.676	-.179	14	-.011	.036	.150	-.152
5	.059	.067	.505	-.164	15	-.016	.035	.147	-.162
6	.067	.066	.469	-.136	16	-.018	.037	.143	-.166
7	.053	.060	.411	-.123	17	-.021	.038	.118	-.177
8	.042	.056	.345	-.163	18	-.015	.039	.130	-.182
9	.028	.052	.281	-.135	19	-.019	.039	.115	-.187
10	.015	.044	.226	-.136	20	-.025	.042	.120	-.231

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 11 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.008	.069	.229	-.332	11	-.155	.093	.134	-.750
2	.039	.065	.285	-.237	12	-.170	.094	.104	-.670
3	.071	.062	.321	-.176	13	-.159	.090	.096	-.504
4	.075	.062	.319	-.139	14	-.170	.090	.094	-.582
5	.100	.062	.335	-.130	15	-.168	.079	.068	-.644
6	.094	.069	.347	-.176	16	-.186	.076	.020	-.570
7	.113	.088	.545	-.457	17	-.166	.070	.030	-.535
8	.129	.108	.711	-.254	18	-.164	.075	.077	-.766
9	.194	.126	.724	-.229	19	-.155	.088	.144	-.887
10	.238	.180	1.094	-.384	20	-.172	.111	.079	-1.441

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 12 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.109	.058	.101	-.382	11	-.204	.141	.198	-1.125
2	-.111	.058	.099	-.387	12	-.198	.136	.252	-1.213
3	-.120	.056	.076	-.354	13	-.171	.123	.215	-.949
4	-.137	.059	.092	-.453	14	-.160	.113	.209	-.882
5	-.130	.061	.150	-.460	15	-.142	.092	.231	-.751
6	-.160	.069	.106	-.708	16	-.142	.082	.143	-.596
7	-.173	.077	.086	-.551	17	-.121	.069	.108	-.486
8	-.192	.087	.085	-.644	18	-.121	.065	.096	-.487
9	-.165	.103	.143	-.750	19	-.115	.068	.103	-.547
10	-.226	.190	.316	-1.247	20	-.130	.078	.095	-.944

DATA FOR PROJECT 6022 CONFIG. M WIND DIR. 13 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.284	.072	-.062	-.661	11	-.253	.096	.152	-.855
2	-.289	.070	-.065	-.673	12	-.254	.092	.156	-.679
3	-.288	.061	-.058	-.573	13	-.242	.088	.147	-.782
4	-.294	.058	-.068	-.561	14	-.241	.087	.149	-1.448
5	-.268	.053	-.049	-.524	15	-.240	.074	.079	-.658
6	-.277	.052	-.042	-.506	16	-.248	.072	.047	-.727
7	-.276	.059	-.094	-.750	17	-.236	.064	.016	-.547
8	-.288	.067	-.085	-.822	18	-.237	.062	-.005	-.459
9	-.264	.074	-.059	-.860	19	-.231	.064	-.009	-.573
10	-.291	.090	-.028	-1.151	20	-.241	.070	-.031	-.904

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 14 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.341	.066	-.146	-.889	11	-.311	.064	-.055	-.604
2	-.346	.066	-.147	-.681	12	-.311	.065	-.061	-.670
3	-.352	.069	-.191	-.757	13	-.301	.065	-.052	-.659
4	-.355	.065	-.175	-.720	14	-.298	.065	-.041	-.538
5	-.329	.057	-.175	-.585	15	-.292	.061	-.074	-.530
6	-.335	.055	-.177	-.605	16	-.296	.061	-.091	-.576
7	-.334	.050	-.175	-.546	17	-.280	.058	-.094	-.527
8	-.339	.052	-.175	-.586	18	-.278	.057	-.104	-.578
9	-.312	.053	-.145	-.575	19	-.283	.057	-.068	-.517
10	-.332	.060	-.161	-.648	20	-.290	.060	-.061	-.586

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 15 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.383	.063	-.194	-.858	11	-.367	.052	-.182	-.557
2	-.390	.063	-.210	-.949	12	-.368	.053	-.179	-.551
3	-.391	.061	-.236	-.756	13	-.359	.054	-.179	-.535
4	-.393	.056	-.228	-.701	14	-.360	.055	-.175	-.532
5	-.371	.049	-.207	-.620	15	-.344	.056	-.163	-.541
6	-.378	.047	-.217	-.593	16	-.346	.056	-.170	-.554
7	-.381	.047	-.242	-.611	17	-.333	.053	-.150	-.517
8	-.384	.048	-.241	-.635	18	-.335	.052	-.156	-.506
9	-.357	.047	-.216	-.620	19	-.337	.055	-.125	-.607
10	-.377	.051	-.223	-.683	20	-.345	.057	-.124	-.756

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 21 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.133	.137	.834	-.213	11	-.250	.048	-.100	-.422
2	.180	.136	.848	-.150	12	-.263	.048	-.105	-.438
3	.220	.132	.845	-.100	13	-.288	.049	-.129	-.531
4	.242	.129	.815	-.119	14	-.296	.051	-.126	-.547
5	.243	.109	.811	-.089	15	-.262	.052	-.090	-.515
6	.202	.101	.686	-.081	16	-.275	.059	-.088	-.564
7	.137	.086	.507	-.190	17	-.285	.069	-.059	-.604
8	.071	.078	.455	-.173	18	-.291	.077	-.060	-.699
9	.006	.074	.343	-.286	19	-.249	.075	-.027	-.621
10	-.101	.060	.202	-.357	20	-.269	.083	-.044	-.659

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.209	.061	.123	-.516	11	-.173	.044	-.034	-.323
2	-.206	.069	.204	-.511	12	-.180	.043	-.034	-.330
3	-.189	.077	.211	-.500	13	-.183	.042	-.046	-.347
4	-.171	.088	.327	-.547	14	-.182	.042	-.044	-.330
5	-.131	.105	.454	-.604	15	-.146	.040	-.021	-.289
6	-.098	.119	.518	-.504	16	-.158	.040	-.014	-.309
7	-.064	.119	.566	-.500	17	-.173	.040	-.026	-.340
8	-.070	.119	.578	-.495	18	-.180	.041	-.026	-.350
9	-.090	.111	.387	-.469	19	-.150	.040	-.004	-.306
10	-.125	.094	.312	-.452	20	-.184	.044	-.027	-.351

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 23 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.375	.055	-.206	-.621	11	-.243	.054	-.024	-.451
2	-.377	.057	-.205	-.673	12	-.243	.052	-.040	-.445
3	-.373	.060	-.187	-.706	13	-.248	.046	-.081	-.434
4	-.372	.064	-.154	-.790	14	-.243	.046	-.076	-.412
5	-.361	.070	.005	-.691	15	-.207	.043	-.053	-.350
6	-.341	.076	.009	-.626	16	-.217	.044	-.060	-.351
7	-.303	.078	.225	-.703	17	-.242	.045	-.084	-.397
8	-.291	.081	.131	-.643	18	-.259	.046	-.103	-.436
9	-.288	.089	.097	-.677	19	-.240	.044	-.099	-.406
10	-.291	.095	.087	-.877	20	-.296	.047	-.144	-.469

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 24 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.407	.052	-.245	-.681	11	-.313	.050	-.158	-.556
2	-.410	.053	-.238	-.688	12	-.312	.047	-.155	-.533
3	-.408	.054	-.225	-.707	13	-.316	.049	-.070	-.468
4	-.413	.057	-.221	-.754	14	-.309	.050	-.062	-.468
5	-.409	.056	-.245	-.629	15	-.264	.048	-.042	-.427
6	-.412	.063	-.212	-.678	16	-.272	.049	-.066	-.451
7	-.401	.070	-.196	-.726	17	-.284	.046	-.125	-.445
8	-.414	.084	-.171	-.790	18	-.298	.047	-.128	-.462
9	-.420	.096	-.089	-1.069	19	-.277	.045	-.107	-.437
10	-.430	.109	-.095	-1.209	20	-.332	.048	-.138	-.497

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 25 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.450	.047	-.286	-.642	11	-.382	.046	-.230	-.545
2	-.452	.047	-.291	-.648	12	-.384	.045	-.232	-.534
3	-.451	.048	-.289	-.646	13	-.387	.043	-.223	-.533
4	-.454	.050	-.285	-.665	14	-.381	.043	-.199	-.546
5	-.452	.053	-.269	-.665	15	-.341	.043	-.174	-.482
6	-.457	.058	-.260	-.709	16	-.340	.045	-.161	-.493
7	-.457	.065	-.240	-.787	17	-.342	.048	-.147	-.497
8	-.464	.072	-.238	-.990	18	-.351	.048	-.161	-.505
9	-.462	.075	-.273	-.989	19	-.329	.045	-.161	-.473
10	-.467	.079	-.257	-.927	20	-.378	.047	-.218	-.534

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 111 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.015	.047	.224	-.148	11	-.173	.060	.050	-.499
2	.051	.046	.279	-.117	12	-.188	.061	.037	-.513
3	.092	.055	.358	-.108	13	-.178	.059	.046	-.468
4	.104	.057	.399	-.097	14	-.185	.060	.039	-.489
5	.141	.057	.431	-.049	15	-.185	.060	.004	-.453
6	.148	.063	.438	-.100	16	-.202	.059	-.007	-.472
7	.182	.075	.574	-.085	17	-.182	.056	-.003	-.398
8	.207	.095	.664	-.128	18	-.184	.057	-.002	-.397
9	.277	.117	.761	-.099	19	-.171	.054	.007	-.397
10	.322	.168	.983	-.201	20	-.185	.058	.013	-.513

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 112 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.047	.054	.152	-.302	11	-.170	.101	.177	-.942
2	-.031	.049	.169	-.250	12	-.184	.104	.169	-1.094
3	-.010	.049	.181	-.189	13	-.173	.103	.126	-1.169
4	-.008	.049	.166	-.211	14	-.182	.101	.111	-.983
5	.023	.049	.212	-.202	15	-.176	.083	.064	-.722
6	.018	.054	.233	-.233	16	-.190	.078	.031	-.679
7	.040	.068	.324	-.236	17	-.166	.069	.026	-.643
8	.043	.079	.401	-.350	18	-.166	.069	.029	-.581
9	.090	.084	.513	-.315	19	-.157	.074	.027	-.776
10	.092	.121	.707	-.550	20	-.174	.090	.045	-1.070

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 114 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.113	.047	.039	-.300	11	-.182	.070	.040	-.907
2	-.107	.046	.049	-.275	12	-.187	.068	.040	-.919
3	-.101	.045	.047	-.258	13	-.182	.065	.046	-.831
4	-.099	.046	.047	-.251	14	-.183	.063	.042	-.673
5	-.074	.046	.075	-.228	15	-.181	.058	.024	-.491
6	-.077	.048	.075	-.245	16	-.187	.056	.013	-.455
7	-.079	.048	.066	-.275	17	-.174	.052	.006	-.404
8	-.085	.052	.078	-.343	18	-.177	.054	.015	-.499
9	-.064	.054	.098	-.417	19	-.180	.062	.001	-.763
10	-.088	.061	.102	-.529	20	-.190	.071	-.004	-.923

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 115 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.085	.045	.066	-.236	11	-.180	.045	-.019	-.372
2	-.069	.046	.076	-.217	12	-.185	.045	-.021	-.372
3	-.053	.045	.087	-.224	13	-.183	.045	-.013	-.358
4	-.048	.047	.105	-.215	14	-.187	.046	-.008	-.372
5	-.023	.048	.134	-.187	15	-.184	.043	-.039	-.376
6	-.022	.051	.143	-.203	16	-.188	.044	-.055	-.372
7	-.016	.057	.179	-.174	17	-.178	.043	-.043	-.358
8	-.014	.061	.198	-.185	18	-.177	.045	-.049	-.361
9	.011	.063	.236	-.167	19	-.183	.048	-.026	-.379
10	-.016	.068	.234	-.203	20	-.188	.050	-.021	-.417

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 121 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.253	.137	.937	-.103	11	-.295	.049	-.147	-.564
2	.283	.131	.942	-.036	12	-.305	.049	-.164	-.553
3	.299	.123	.913	-.004	13	-.327	.054	-.180	-.557
4	.295	.117	.863	-.031	14	-.333	.055	-.185	-.553
5	.278	.113	.839	-.046	15	-.302	.056	-.137	-.548
6	.213	.101	.702	-.078	16	-.309	.062	-.133	-.624
7	.131	.083	.536	-.117	17	-.330	.071	-.096	-.665
8	.052	.072	.403	-.177	18	-.331	.077	-.088	-.723
9	-.036	.058	.203	-.244	19	-.288	.073	-.071	-.698
10	-.145	.050	.050	-.345	20	-.306	.080	-.072	-.778

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.014	.081	.532	-.254	11	-.201	.041	-.072	-.342
2	.039	.085	.572	-.221	12	-.213	.041	-.086	-.353
3	.061	.090	.672	-.173	13	-.235	.045	-.064	-.399
4	.079	.101	.712	-.183	14	-.242	.047	-.056	-.397
5	.099	.108	.660	-.225	15	-.212	.047	-.023	-.368
6	.096	.112	.680	-.177	16	-.224	.052	-.023	-.456
7	.076	.104	.539	-.199	17	-.237	.058	-.064	-.527
8	.035	.096	.496	-.226	18	-.239	.063	-.042	-.545
9	-.019	.088	.365	-.329	19	-.198	.061	-.007	-.524
10	-.093	.070	.248	-.332	20	-.218	.066	.003	-.562

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 124 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.134	.049	.018	-.348	11	-.168	.040	-.030	-.331
2	-.135	.049	.012	-.378	12	-.178	.040	-.040	-.338
3	-.133	.049	.012	-.402	13	-.192	.040	-.064	-.341
4	-.137	.052	.023	-.431	14	-.195	.040	-.059	-.341
5	-.133	.056	.044	-.537	15	-.169	.038	-.033	-.305
6	-.138	.062	.119	-.609	16	-.186	.039	-.060	-.318
7	-.133	.062	.297	-.444	17	-.204	.040	-.067	-.380
8	-.143	.064	.176	-.551	18	-.207	.043	-.075	-.374
9	-.153	.067	.481	-.494	19	-.175	.041	-.036	-.353
10	-.167	.062	.311	-.522	20	-.194	.043	-.063	-.352

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 125 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.084	.051	.076	-.245	11	-.185	.041	-.041	-.332
2	-.093	.050	.054	-.259	12	-.197	.041	-.055	-.340
3	-.100	.049	.046	-.265	13	-.212	.037	-.073	-.346
4	-.110	.050	.041	-.281	14	-.214	.038	-.071	-.370
5	-.119	.046	.032	-.299	15	-.186	.037	-.037	-.336
6	-.130	.048	.037	-.339	16	-.198	.039	-.051	-.364
7	-.134	.047	.036	-.352	17	-.207	.042	-.026	-.373
8	-.152	.047	.010	-.367	18	-.207	.042	-.022	-.377
9	-.166	.048	.062	-.431	19	-.170	.040	.013	-.319
10	-.182	.047	.026	-.467	20	-.191	.041	-.003	-.357

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 234 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.138	.044	.016	-.302	11	-.293	.067	-.071	-.634
2	-.117	.044	.035	-.264	12	-.291	.066	-.081	-.701
3	-.112	.044	.050	-.299	13	-.288	.063	-.063	-.658
4	-.100	.046	.093	-.239	14	-.284	.060	-.074	-.590
5	-.092	.050	.069	-.253	15	-.286	.053	-.113	-.585
6	-.092	.054	.083	-.376	16	-.285	.047	-.115	-.557
7	-.097	.066	.129	-.485	17	-.281	.046	-.093	-.472
8	-.103	.067	.123	-.389	18	-.280	.047	-.091	-.498
9	-.108	.072	.142	-.439	19	-.289	.051	-.118	-.553
10	-.134	.079	327	-.509	20	-.286	.055	-.101	-.677

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 244 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.174	.049	.016	-.461	11	-.219	.063	-.027	-.622
2	-.170	.049	.011	-.439	12	-.216	.063	-.024	-.555
3	-.173	.045	.016	-.398	13	-.213	.062	-.010	-.541
4	-.181	.042	.046	-.351	14	-.206	.058	-.026	-.517
5	-.187	.044	.076	-.355	15	-.209	.052	-.063	-.458
6	-.189	.043	.113	-.382	16	-.209	.050	-.054	-.401
7	-.194	.060	.043	-.527	17	-.211	.049	-.060	-.388
8	-.197	.066	.103	-.545	18	-.211	.049	-.074	-.385
9	-.193	.076	.268	-.613	19	-.214	.047	-.077	-.456
10	-.188	.092	.489	-.687	20	-.216	.047	-.067	-.505

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 254 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.091	.030	.084	-.512	11	-.134	.068	.074	-.664
2	-.089	.051	.094	-.537	12	-.131	.066	.077	-.535
3	-.085	.053	.162	-.569	13	-.130	.065	.067	-.532
4	-.084	.055	.155	-.346	14	-.129	.062	.073	-.433
5	-.083	.059	.141	-.394	15	-.126	.054	.070	-.528
6	-.083	.064	.177	-.540	16	-.124	.052	.057	-.383
7	-.069	.072	.292	-.491	17	-.124	.053	.056	-.391
8	-.056	.090	.361	-.576	18	-.127	.054	.056	-.389
9	-.045	.103	.444	-.592	19	-.132	.053	.042	-.468
10	-.042	.123	.721	-.940	20	-.132	.058	.033	-.678

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 334 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.109	.048	.039	-.273	11	-.274	.046	-.112	-.491
2	-.105	.049	.102	-.287	12	-.282	.043	-.138	-.469
3	-.100	.050	.092	-.300	13	-.277	.039	-.140	-.443
4	-.106	.051	.072	-.361	14	-.278	.039	-.137	-.416
5	-.104	.052	.095	-.397	15	-.274	.039	-.132	-.416
6	-.116	.059	.149	-.473	16	-.284	.040	-.151	-.439
7	-.119	.069	.260	-.600	17	-.277	.044	-.109	-.485
8	-.136	.077	.380	-.503	18	-.284	.050	-.074	-.513
9	-.157	.077	.349	-.628	19	-.279	.053	-.076	-.488
10	-.184	.087	.565	-.696	20	-.289	.054	-.100	-.517

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 344 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.197	.049	-.024	-.418	11	-.209	.048	-.037	-.495
2	-.202	.045	-.039	-.360	12	-.219	.045	-.065	-.428
3	-.201	.045	-.037	-.389	13	-.213	.043	-.079	-.377
4	-.213	.047	-.047	-.472	14	-.212	.043	-.048	-.370
5	-.201	.054	.053	-.557	15	-.207	.041	-.054	-.346
6	-.205	.058	.074	-.462	16	-.220	.039	-.089	-.365
7	-.194	.068	.191	-.493	17	-.212	.039	-.101	-.342
8	-.198	.077	.250	-.538	18	-.219	.039	-.096	-.401
9	-.186	.091	.371	-.590	19	-.213	.041	-.084	-.396
10	-.183	.103	.589	-.797	20	-.223	.041	-.089	-.410

DATA FOR PROJECT 6022 CONFIG. N WIND DIR. 354 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.097	.043	.048	-.258	11	-.092	.041	.087	-.293
2	-.093	.045	.074	-.307	12	-.105	.049	.071	-.292
3	-.082	.049	.096	-.354	13	-.099	.047	.038	-.239
4	-.091	.053	.107	-.342	14	-.098	.034	.012	-.219
5	-.060	.059	.244	-.280	15	-.091	.034	.022	-.203
6	-.054	.068	.316	-.438	16	-.108	.032	.018	-.219
7	-.023	.083	.379	-.361	17	-.095	.036	.016	-.213
8	-.025	.092	.523	-.382	18	-.106	.034	.019	-.226
9	-.013	.094	.590	-.305	19	-.097	.035	.032	-.229
10	-.023	.090	.573	-.428	20	-.112	.036	.011	-.239

DATA FOR PROJECT 6022 CONFIG. O WIND DIR. 11 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.024	.067	.253	-.259	11	-.196	.200	.278	-1.747
2	.046	.062	.356	-.169	12	-.188	.193	.283	-1.412
3	.066	.064	.386	-.231	13	-.176	.179	.302	-1.328
4	.079	.067	.401	-.185	14	-.164	.162	.306	-1.129
5	.099	.075	.557	-.331	15	-.138	.123	.196	-.756
6	.095	.088	.637	-.430	16	-.126	.103	.191	-.643
7	.085	.096	.649	-.444	17	-.103	.083	.159	-.508
8	.066	.110	.700	-.544	18	-.100	.084	.139	-.775
9	.061	.119	.681	-.701	19	-.106	.104	.202	-.878
10	.006	.159	.631	-1.082	20	-.120	.131	.212	-1.117

DATA FOR PROJECT 6022 CONFIG. O WIND DIR. 12 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.016	.056	.225	-.244	11	-.147	.138	.239	-.871
2	-.011	.055	.203	-.239	12	-.138	.131	.226	-.881
3	-.013	.056	.236	-.228	13	-.122	.119	.205	-.796
4	-.018	.058	.210	-.230	14	-.105	.110	.226	-.724
5	-.012	.059	.238	-.253	15	-.095	.097	.194	-.498
6	-.020	.065	.249	-.282	16	-.087	.089	.159	-.516
7	-.023	.077	.304	-.449	17	-.069	.077	.150	-.405
8	-.026	.086	.351	-.452	18	-.065	.075	.143	-.453
9	-.007	.094	.322	-.515	19	-.067	.074	.161	-.420
10	-.029	.144	.460	-.866	20	-.074	.080	.159	-.432

DATA FOR PROJECT 6022 CONFIG. O WIND DIR. 13 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.149	.075	.093	-.523	11	-.183	.112	.191	-.765
2	-.148	.070	.084	-.494	12	-.174	.101	.173	-.706
3	-.149	.066	.039	-.495	13	-.159	.091	.167	-.722
4	-.156	.062	.050	-.475	14	-.147	.085	.153	-.569
5	-.145	.059	.069	-.463	15	-.136	.086	.205	-.694
6	-.156	.060	.064	-.439	16	-.137	.083	.152	-1.056
7	-.169	.064	.107	-.471	17	-.123	.076	.164	-1.035
8	-.183	.072	.064	-.513	18	-.123	.073	.139	-.607
9	-.169	.081	.096	-.705	19	-.128	.073	.114	-.589
10	-.201	.107	.170	-.903	20	-.138	.078	.117	-.629

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 14 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.277	.091	-.050	-.742	11	-.225	.094	.274	-.862
2	-.280	.091	-.041	-.796	12	-.227	.092	.223	-.853
3	-.280	.082	-.017	-.733	13	-.215	.087	.156	-.707
4	-.285	.076	-.032	-.686	14	-.208	.086	.127	-.790
5	-.262	.067	-.024	-.543	15	-.212	.080	.151	-.694
6	-.266	.065	-.018	-.526	16	-.216	.078	.129	-.582
7	-.270	.067	.018	-.594	17	-.203	.073	.076	-.494
8	-.282	.073	.005	-.753	18	-.199	.073	.068	-.486
9	-.260	.076	-.011	-.729	19	-.187	.073	.034	-.542
10	-.283	.083	-.041	-.779	20	-.197	.077	.068	-.619

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 15 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.339	.084	-.064	-.765	11	-.289	.070	.062	-.686
2	-.343	.086	-.073	-.834	12	-.291	.072	.060	-.650
3	-.354	.091	-.137	-.835	13	-.273	.072	.032	-.630
4	-.365	.088	-.143	-.802	14	-.267	.073	.015	-.645
5	-.335	.079	-.127	-.772	15	-.253	.070	.012	-.546
6	-.337	.073	-.127	-.706	16	-.259	.070	-.002	-.533
7	-.322	.064	-.061	-.583	17	-.240	.067	-.018	-.520
8	-.335	.065	-.068	-.592	18	-.236	.065	-.019	-.492
9	-.304	.065	-.048	-.577	19	-.232	.063	-.012	-.636
10	-.323	.068	-.066	-.601	20	-.247	.068	-.019	-.768

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 21 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.124	.049	.038	-.322	11	-.099	.043	.044	-.278
2	-.124	.048	.021	-.372	12	-.105	.042	.039	-.284
3	-.115	.047	.027	-.357	13	-.109	.040	.025	-.239
4	-.112	.053	.052	-.325	14	-.114	.039	.021	-.237
5	-.104	.065	.198	-.436	15	-.096	.038	.034	-.218
6	-.090	.086	.345	-.438	16	-.108	.038	.018	-.230
7	-.056	.098	.415	-.493	17	-.115	.041	.021	-.265
8	-.044	.106	.576	-.441	18	-.124	.043	.011	-.306
9	-.047	.105	.468	-.409	19	-.106	.045	.030	-.308
10	-.069	.095	.383	-.441	20	-.128	.050	.032	-.468

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.137	.050	.062	-.314	11	-.081	.038	.034	-.225
2	-.141	.056	.116	-.357	12	-.089	.038	.029	-.227
3	-.128	.062	.199	-.363	13	-.092	.038	.066	-.216
4	-.115	.073	.306	-.372	14	-.096	.038	.053	-.217
5	-.064	.083	.378	-.358	15	-.073	.036	.065	-.188
6	-.027	.097	.628	-.343	16	-.085	.036	.053	-.210
7	.012	.101	.661	-.377	17	-.092	.036	.045	-.212
8	.009	.102	.624	-.410	18	-.105	.037	.022	-.231
9	.001	.094	.486	-.300	19	-.084	.036	.048	-.212
10	-.034	.077	.337	-.301	20	-.113	.039	.025	-.251

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 23 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.171	.054	.048	-.385	11	-.106	.043	.050	-.315
2	-.178	.057	.076	-.410	12	-.114	.044	.042	-.323
3	-.165	.061	.158	-.407	13	-.112	.045	.044	-.273
4	-.162	.068	.183	-.427	14	-.116	.045	.045	-.287
5	-.133	.075	.358	-.392	15	-.088	.042	.043	-.272
6	-.122	.083	.363	-.407	16	-.099	.042	.028	-.252
7	-.091	.083	.329	-.390	17	-.102	.040	.031	-.230
8	-.092	.085	.372	-.394	18	-.118	.041	.007	-.253
9	-.093	.085	.414	-.504	19	-.099	.040	.037	-.229
10	-.110	.080	.298	-.451	20	-.134	.043	.008	-.286

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 24 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.265	.053	-.165	-.516	11	-.168	.051	.036	-.392
2	-.277	.056	-.109	-.555	12	-.172	.049	.008	-.385
3	-.266	.057	-.092	-.519	13	-.165	.052	.008	-.403
4	-.271	.062	-.061	-.546	14	-.170	.051	.004	-.399
5	-.257	.067	-.015	-.618	15	-.135	.047	.026	-.338
6	-.257	.071	.040	-.585	16	-.146	.047	.034	-.323
7	-.226	.075	.093	-.637	17	-.154	.051	.005	-.333
8	-.231	.083	.132	-.641	18	-.176	.052	-.026	-.352
9	-.233	.094	.098	-.833	19	-.159	.049	-.025	-.350
10	-.250	.106	.077	-1.001	20	-.206	.052	.035	-.412

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 25 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.354	.053	-.126	-.600	11	-.255	.055	-.077	-.452
2	-.369	.055	-.125	-.645	12	-.256	.054	-.082	-.444
3	-.355	.057	-.100	-.633	13	-.246	.053	-.070	-.422
4	-.362	.061	-.022	-.677	14	-.249	.053	-.077	-.432
5	-.348	.068	-.126	-.640	15	-.205	.050	-.006	-.391
6	-.362	.077	-.104	-.760	16	-.215	.049	-.039	-.414
7	-.344	.091	-.058	-.798	17	-.225	.048	-.048	-.490
8	-.361	.106	-.022	-1.075	18	-.251	.049	-.054	-.554
9	-.376	.119	.132	-1.148	19	-.229	.046	-.032	-.494
10	-.397	.129	.048	-1.131	20	-.284	.049	-.055	-.514

DATA FOR PROJECT 6022 CONFIG 0 WIND DIR. 111 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.039	.065	.369	-.284	11	-.175	.155	.290	-.971
2	.063	.066	.424	-.274	12	-.166	.145	.295	-1.051
3	.083	.074	.391	-.311	13	-.154	.131	.252	-1.146
4	.093	.080	.440	-.248	14	-.143	.120	.261	-.817
5	.092	.085	.477	-.219	15	-.124	.090	.165	-.700
6	.056	.089	.461	-.208	16	-.118	.078	.116	-.585
7	.009	.086	.381	-.282	17	-.103	.066	.090	-.476
8	-.018	.087	.383	-.430	18	-.100	.065	.088	-.464
9	-.022	.089	.392	-.431	19	-.098	.073	.094	-.749
10	-.068	.114	.368	-.813	20	-.101	.082	.103	-1.024

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 112 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.026	.053	.127	-.280	11	-.184	.166	.301	-1.873
2	-.011	.049	.156	-.408	12	-.180	.160	.284	-1.894
3	-.004	.046	.185	-.207	13	-.167	.146	.245	-1.848
4	.003	.047	.198	-.258	14	-.156	.134	.323	-1.177
5	.022	.051	.242	-.331	15	-.131	.099	.179	-.789
6	.022	.059	.280	-.224	16	-.124	.086	.141	-.557
7	.020	.075	.375	-.352	17	-.104	.073	.101	-.504
8	.009	.085	.410	-.414	18	-.101	.071	.120	-.431
9	.016	.091	.415	-.475	19	-.110	.089	.198	-.628
10	-.017	.125	.414	-.742	20	-.125	.110	.244	-.903

DATA FOR PROJECT 6022 CONFIG 0 WIND DIR. 114 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.094	.043	.060	-.236	11	-.158	.089	.202	-.985
2	-.092	.043	.074	-.298	12	-.162	.085	.202	-.654
3	-.091	.045	.073	-.327	13	-.152	.078	.162	-.544
4	-.094	.046	.072	-.319	14	-.150	.076	.137	-.735
5	-.074	.046	.082	-.290	15	-.140	.061	.073	-.450
6	-.083	.050	.077	-.327	16	-.145	.059	.049	-.503
7	-.090	.052	.109	-.382	17	-.130	.054	.040	-.418
8	-.105	.055	.118	-.366	18	-.132	.054	.031	-.337
9	-.089	.055	.140	-.479	19	-.139	.062	.063	-.527
10	-.116	.062	.120	-.844	20	-.152	.070	.058	-.607

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 115 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.085	.043	.045	-.252	11	-.152	.054	.045	-.529
2	-.078	.043	.063	-.245	12	-.164	.054	.029	-.498
3	-.071	.046	.085	-.210	13	-.152	.051	.045	-.398
4	-.075	.047	.081	-.226	14	-.152	.051	.039	-.381
5	-.045	.048	.098	-.206	15	-.148	.053	.058	-.416
6	-.054	.050	.097	-.228	16	-.157	.051	.026	-.337
7	-.067	.050	.122	-.240	17	-.139	.050	.041	-.325
	-.092	.051	.098	-.261	18	-.142	.053	.0[illegible]	-.343
	-.075	.049	.101	-.233	19	-.142	.054		-.342
	-.110	.051	.073	-.357	20	-.157	.058	.042	-.568

DATA FOR PROJECT 6022 CONFIG. 0 WIND DIR. 121 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.166	.069	.094	-.466	11	-.097	.046	.086	-.283
2	-.157	.063	.072	-.433	12	-.103	.045	.078	-.275
3	-.144	.061	.059	-.354	13	-.109	.041	.036	-.280
4	-.137	.066	.071	-.404	14	-.114	.041	.029	-.269
5	-.117	.070	.211	-.428	15	-.098	.039	.025	-.228
6	-.105	.093	.370	-.568	16	-.111	.040	.015	-.254
7	-.069	.109	.393	-.477	17	-.122	.045	.039	-.200
8	-.057	.117	.505	-.534	18	-.133	.050	.043	-.394
9	-.053	.125	.65[illegible]	-.462	19	-.120	.054	.045	-.419
10	-.069	.114	.625	-.568	20	-.153	.069	.068	-.555

DATA FOR PROJECT 6022 CONFIG. O WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.100	.044	.035	-.265	11	-.095	.040	.024	-.227
2	-.104	.044	.035	-.272	12	-.106	.040	.022	-.240
3	-.095	.046	.051	-.274	13	-.104	.039	.049	-.231
4	-.098	.052	.077	-.374	14	-.113	.039	.035	-.240
5	-.080	.065	.234	-.410	15	-.090	.037	.058	-.204
6	-.059	.083	.388	-.366	16	-.105	.038	.049	-.226
7	-.022	.099	.406	-.402	17	-.115	.036	.062	-.258
8	-.018	.094	.369	-.388	18	-.127	.038	.049	-.265
9	-.021	.096	.483	-.369	19	-.100	.037	.064	-.221
10	-.033	.084	.475	-.359	20	-.124	.040	.053	-.274

DATA FOR PROJECT 6022 CONFIG. O WIND DIR. 124 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.114	.047	.057	-.357	11	-.098	.039	.046	-.254
2	-.124	.049	.055	-.422	12	-.109	.039	.035	-.257
3	-.113	.051	.079	-.427	13	-.115	.039	.002	-.252
4	-.117	.055	.099	-.741	14	-.124	.038	.013	-.255
5	-.104	.062	.294	-.964	15	-.096	.036	.010	-.218
6	-.108	.068	.406	-.965	16	-.112	.036	-.005	-.234
7	-.087	.069	.458	-.[illegible]	17	-.119	.037	.015	-.245
8	-.094	.070	.421	-.[illegible]	18	-.131	.039	.011	-.262
9	-.089	.065	.406	-.[illegible]	19	-.099	.038	.014	-.218
10	-.105	.061	.307	-.388	20	-.122	.040	-.002	-.311

DATA FOR PROJECT 6022 CONFIG. O WIND DIR. 125 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.150	.046	.021	-.364	11	-.139	.043	-.019	-.310
2	-.162	.047	.018	-.341	12	-.151	.043	-.029	-.315
3	-.149	.047	.033	-.323	13	-.159	.039	-.012	-.315
4	-.135	.050	.028	-.345	14	-.171	.039	-.034	-.328
5	-.147	.050	.054	-.407	15	-.139	.037	-.016	-.274
6	-.158	.054	.059	-.423	16	-.158	.037	-.029	-.291
7	-.142	.053	.069	-.395	17	-.163	.036	-.022	-.305
8	-.149	.054	.062	-.409	18	-.178	.038	-.030	-.324
9	-.147	.058	.097	-.463	19	-.138	.036	-.010	-.271
10	-.163	.058	.059	-.509	20	-.163	.038	-.009	-.298

DATA FOR PROJECT 6022 CONFIG. P WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.124	.04[illegible]	.009	-.320	11	-.226	.117	.083	-.991
2	-.114	.046	.011	-.338	12	-.240	.114	.101	-.914
3	-.13[illegible]	.047	.028	-.331	13	-.217	.100	.080	-.766
4	-.14[illegible]	.048	.012	-.372	14	-.196	.090	.066	-.673
5	-.097	.048	.066	-.347	15	-.201	.076	.096	-.642
6	-.095	.052	.070	-.389	16	-.209	.069	.055	-.496
7	-.117	.062	.110	-.554	17	-.176	.061	.050	-.451
8	-.130	.073	.122	-.676	18	-.160	.057	.059	-.420
9	-.069	.076	.217	-.501	19	-.171	.060	.018	-.409
10	-.084	.114	.408	-.984	20	-.196	.072	.023	-.824

DATA FOR PROJECT 6022 CONFIG. P WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.082	.048	.102	-.335	11	-.207	.138	.111	-1.089
2	-.072	.047	.106	-.307	12	-.194	.126	.129	-1.002
3	-.088	.052	.105	-.442	13	-.171	.109	.142	-1.010
4	-.090	.054	.119	-.407	14	-.151	.097	.268	-1.044
5	-.060	.054	.138	-.312	15	-.149	.082	.118	-.646
6	-.065	.058	.180	-.340	16	-.139	.074	.098	-.521
7	-.079	.064	.208	-.579	17	-.125	.066	.085	-.491
8	-.079	.073	.253	-.693	18	-.114	.064	.086	-.496
9	-.035	.079	.281	-.941	19	-.114	.059	.085	-.459
10	-.055	.121	.334	-1.412	20	-.118	.062	.081	-.538

DATA FOR PROJECT 6022 CONFIG. P WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.019	.054	.222	-.280	11	-.219	.178	.122	-1.504
2	-.012	.054	.252	-.301	12	-.201	.163	.122	-1.344
3	-.015	.061	.312	-.343	13	-.173	.135	.152	-1.309
4	-.011	.062	.287	-.280	14	-.143	.111	.185	-.814
5	.016	.063	.271	-.253	15	-.128	.095	.125	-.901
6	.015	.070	.307	-.260	16	-.112	.087	.184	-.779
7	.006	.077	.339	-.310	17	-.096	.075	.169	-.485
8	.014	.085	.401	-.305	18	-.086	.072	.164	-.488
9	.060	.089	.471	-.293	19	-.085	.070	.175	-.437
10	.049	.129	.616	-.756	20	-.085	.072	.208	-.456

DATA FOR PROJECT 6022 CONFIG. P WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.122	.060	.058	-.336	11	-.151	.046	.008	-.323
2	-.128	.060	.061	-.369	12	-.155	.045	.006	-.315
3	-.127	.060	.096	-.528	13	-.171	.046	-.020	-.346
4	-.125	.065	.140	-.463	14	-.176	.046	-.026	-.370
5	-.120	.076	.554	-.499	15	-.151	.045	-.009	-.366
6	-.111	.093	.542	-.454	16	-.157	.046	-.015	-.384
7	-.086	.102	.440	-.518	17	-.176	.048	-.010	-.376
8	-.080	.104	.413	-.515	18	-.181	.050	-.040	-.436
9	-.082	.107	.493	-.427	19	-.147	.050	-.015	-.424
10	-.108	.091	.373	-.461	20	-.161	.054	-.015	-.515

DATA FOR PROJECT 6022 CONFIG. P WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.115	.057	.120	-.388	11	-.126	.049	.057	-.365
2	-.149	.060	.153	-.486	12	-.118	.048	.060	-.345
3	-.113	.061	.331	-.444	13	-.135	.046	.011	-.345
4	-.106	.065	.306	-.426	14	-.162	.047	-.009	-.374
5	-.094	.070	.323	-.378	15	-.104	.043	.041	-.322
6	-.106	.090	.567	-.419	16	-.113	.043	.029	-.345
7	-.065	.098	.543	-.388	17	-.132	.043	.004	-.299
8	-.057	.101	.495	-.375	18	-.145	.046	-.005	-.314
9	-.059	.102	.619	-.415	19	-.104	.043	.024	-.296
10	-.113	.089	.386	-.447	20	-.120	.045	.023	-.355

DATA FOR PROJECT 6022 CONFIG. P WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.024	.087	.569	-.394	11	-.093	.058	.094	-.347
2	.023	.085	.585	-.371	12	-.090	.059	.094	-.367
3	.026	.095	.698	-.361	13	-.105	.058	.091	-.454
4	.034	.071	.776	-.286	14	-.111	.062	.092	-.512
5	.046	.109	.706	-.320	15	-.090	.066	.114	-.596
6	.052	.117	.647	-.285	16	-.101	.075	.101	-.744
7	.051	.113	.762	-.241	17	-.130	.080	.074	-.631
8	.047	.109	.606	-.245	18	-.138	.087	.078	-.623
9	.015	.098	.559	-.289	19	-.113	.085	.091	-.593
10	-.023	.079	.437	-.402	20	-.127	.090	.087	-.818

DATA FOR PROJECT 6022 CONFIG. Q WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.118	.062	.089	-.364	11	-.324	.079	-.048	-.651
2	-.045	.063	.192	-.279	12	-.322	.078	-.053	-.654
3	.009	.072	.253	-.271	13	-.330	.077	-.071	-.675
4	.064	.075	.323	-.222	14	-.336	.078	-.074	-.692
5	.127	.078	.403	-.154	15	-.339	.077	-.063	-.694
6	.198	.087	.551	-.095	16	-.345	.080	-.052	-.795
7	.257	.093	.542	-.059	17	-.356	.079	.009	-.738
8	.334	.110	.716	-.047	18	-.356	.079	.063	-.737
9	.418	.124	.847	-.014	19	-.359	.082	.069	-.715
10	.449	.159	.968	-.129	20	-.352	.082	.050	-.709

DATA FOR PROJECT 6022 CONFIG. Q WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.050	.095	.418	-.375	11	-.427	.255	.232	-2.411
2	-.033	.100	.395	-.368	12	-.352	.231	.284	-2.087
3	-.042	.098	.453	-.335	13	-.273	.167	.222	-1.266
4	-.038	.098	.468	-.426	14	-.218	.141	.246	-.948
5	-.036	.098	.384	-.372	15	-.205	.131	.222	-.947
6	-.061	.097	.422	-.638	16	-.183	.120	.332	-1.297
7	-.092	.113	.443	-.522	17	-.172	.109	.182	-.804
8	-.097	.125	.604	-.600	18	-.155	.092	.177	-1.052
9	-.075	.129	.418	-.659	19	-.153	.091	.154	-.648
10	-.148	.222	.605	-1.511	20	-.141	.092	.155	-.795

DATA FOR PROJECT 6022 CONFIG. Q WIND DIR. 37 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.026	.071	.236	-.329	11	-.330	.243	.177	-2.460
2	-.012	.073	.281	-.302	12	-.305	.222	.259	-1.830
3	-.009	.078	.336	-.277	13	-.284	.197	.226	-1.230
4	.006	.082	.408	-.306	14	-.239	.159	.186	-1.070
5	.026	.084	.469	-.382	15	-.193	.134	.170	-.923
6	.024	.093	.553	-.524	16	-.157	.120	.188	-.895
7	.024	.111	.551	-.433	17	-.142	.105	.160	-.855
8	.052	.124	.564	-.476	18	-.130	.099	.166	-.824
9	.104	.134	.594	-.487	19	-.133	.095	.130	-.711
10	.109	.203	.792	-.992	20	-.121	.094	.134	-.594

DATA FOR PROJECT 6022 CONFIG. Q WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.383	.128	.857	.021	11	-.394	.079	-.186	-.789
2	.323	.117	.768	.026	12	-.401	.080	-.202	-.734
3	.266	.105	.702	-.009	13	-.416	.081	-.204	-.815
4	.212	.099	.650	-.062	14	-.415	.081	-.213	-.778
5	.152	.095	.672	-.097	15	-.369	.078	-.169	-.726
6	.092	.092	.601	-.161	16	-.364	.079	-.141	-.697
7	.031	.082	.495	-.202	17	-.374	.085	-.127	-.802
8	-.030	.075	.367	-.287	18	-.370	.085	-.130	-.827
9	-.100	.065	.162	-.345	19	-.329	.080	-.122	-.743
10	-.221	.062	.023	-.494	20	-.347	.082	-.113	-.761

DATA FOR PROJECT 6022 CONFIG. Q WIND DIR. 146 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.065	.143	.734	-.513	11	-.154	.062	.031	-.455
2	.023	.121	.581	-.490	12	-.158	.064	.027	-.461
3	-.000	.108	.508	-.378	13	-.178	.073	.051	-.618
4	-.011	.109	.559	-.385	14	-.192	.079	.040	-.641
5	-.020	.105	.528	-.540	15	-.179	.083	.055	-.673
6	-.020	.123	.777	-.494	16	-.205	.095	.061	-.646
7	-.017	.128	.669	-.465	17	-.243	.101	.116	-.763
8	-.021	.135	.679	-.554	18	-.277	.107	.096	-.808
9	-.044	.137	.541	-.604	19	-.252	.104	.132	-.905
10	-.088	.121	.491	-.627	20	-.270	.110	.013	-.995

DATA FOR PROJECT 6022 CONFIG. Q WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.149	.146	.764	-.359	11	-.165	.077	.028	-.538
2	.103	.128	.617	-.270	12	-.166	.079	.060	-.552
3	.071	.115	.610	-.270	13	-.185	.088	.067	-.816
4	.049	.113	.652	-.315	14	-.196	.095	.084	-.830
5	.023	.106	.547	-.326	15	-.185	.097	.071	-.763
6	.002	.105	.518	-.335	16	-.209	.104	.080	-.719
7	-.008	.096	.428	-.303	17	-.234	.108	.057	-.836
8	-.024	.093	.476	-.292	18	-.242	.109	.064	-.796
9	-.049	.089	.424	-.403	19	-.203	.097	.061	-.760
10	-.096	.075	.356	-.425	20	-.209	.099	.070	-.802

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 11 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.043	.069	.221	-.347	11	-1.618	.760	.064	-4.264
2	.010	.074	.290	-.329	12	-.515	.178	-.077	-2.169
3	.048	.083	.333	-.335	13	-.491	.155	-.081	-1.555
4	.074	.087	.381	-.390	14	-.600	.203	-.039	-1.461
5	.101	.084	.396	-.309	15	-.590	.166	-.054	-1.279
6	.103	.089	.460	-.182	16	-.470	.155	.129	-1.263
7	.119	.103	.543	-.254	17	-.383	.142	.123	-.987
8	.160	.115	.620	-.326	18	-.358	.144	.147	-1.234
9	.227	.123	.685	-.341	19	-.351	.153	.104	-1.197
10	.304	.156	.886	-.435	20	-.334	.153	.125	-1.121

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 21 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.174	.171	.938	-.306	11	-.394	.102	-.074	-.939
2	.248	.173	1.004	-.364	12	-.419	.103	-.079	-.928
3	.281	.175	.945	-.305	13	-.439	.105	-.146	-.913
4	.330	.177	1.060	-.209	14	-.461	.115	-.160	-.948
5	.375	.158	.987	-.204	15	-.563	.136	-.155	-1.178
6	.395	.147	.984	-.120	16	-.655	.173	-.192	-1.408
7	.342	.129	.821	-.187	17	-.659	.217	-.054	-1.752
8	.275	.115	.780	-.149	18	-.532	.202	-.113	-1.454
9	.185	.093	.543	-.198	19	-.649	.221	-.057	-1.925
10	.041	.074	.350	-.274	20	-.735	.237	-.152	-1.941

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 12 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.084	.055	.083	-.299	11	-.509	.288	.066	-2.389
2	-.081	.057	.118	-.296	12	-.311	.167	.086	-1.348
3	-.086	.060	.149	-.363	13	-.257	.118	.083	-.978
4	-.078	.064	.189	-.359	14	-.259	.117	.092	-.859
5	-.055	.067	.232	-.391	15	-.227	.107	.085	-.822
6	-.059	.074	.278	-.533	16	-.200	.099	.162	-.926
7	-.052	.090	.313	-.444	17	-.176	.083	.079	-.823
8	-.035	.102	.360	-.520	18	-.167	.076	.079	-.563
9	-.005	.109	.432	-.511	19	-.155	.073	.082	-.626
10	-.004	.150	.600	-.862	20	-.151	.077	.103	-.610

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.034	.099	.619	-.317	11	-.185	.081	.073	-.684
2	-.003	.102	.698	-.304	12	-.196	.080	.048	-.670
3	.000	.106	.742	-.310	13	-.201	.072	.024	-.544
4	.017	.116	.772	-.254	14	-.199	.074	.030	-.534
5	.039	.115	.674	-.340	15	-.217	.079	-.005	-.625
6	.067	.130	.661	-.344	16	-.239	.094	.011	-.898
7	.061	.131	.702	-.297	17	-.240	.110	.031	-1.105
8	.050	.127	.705	-.318	18	-.230	.114	.054	-.881
9	.032	.119	.550	-.380	19	-.285	.136	.041	-1.054
10	-.014	.096	.418	-.365	20	-.341	.155	.051	-1.492

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 13 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.105	.052	.090	-.339	11	-.516	.273	.041	-2.598
2	-.102	.054	.153	-.313	12	-.344	.164	.044	-1.846
3	-.104	.057	.093	-.408	13	-.277	.113	.081	-1.051
4	-.102	.060	.132	-.487	14	-.280	.115	.097	-.974
5	-.066	.061	.180	-.564	15	-.248	.097	.062	-.717
6	-.071	.067	.183	-.643	16	-.225	.091	.216	-.870
7	-.063	.077	.314	-.620	17	-.196	.078	.113	-.690
8	-.054	.087	.367	-.544	18	-.187	.072	.057	-.670
9	-.013	.091	.403	-.442	19	-.179	.072	.041	-.629
10	-.012	.122	.539	-.706	20	-.183	.074	.058	-.709

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 23 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.061	.083	.463	-.349	11	-.154	.063	.034	-.622
2	-.050	.088	.586	-.376	12	-.160	.062	.031	-.647
3	-.038	.092	.609	-.342	13	-.161	.059	.073	-.549
4	-.021	.100	.879	-.320	14	-.166	.060	.064	-.471
5	.016	.111	.728	-.369	15	-.169	.061	.034	-.472
6	.036	.121	.752	-.329	16	-.181	.068	-.013	-.647
7	.044	.121	.667	-.280	17	-.179	.074	.031	-.628
8	.036	.119	.649	-.313	18	-.175	.077	.027	-.644
9	.016	.107	.443	-.319	19	-.182	.082	.014	-.733
10	-.033	.087	.447	-.346	20	-.198	.091	-.009	-.884

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 14 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.155	.059	.142	-.387	11	-1.179	.439	-.110	-2.976
2	-.144	.063	.192	-.377	12	-.466	.112	-.168	-1.090
3	-.140	.070	.096	-.457	13	-.421	.095	-.121	-.818
4	-.128	.067	.099	-.459	14	-.365	.106	-.053	-1.043
5	-.111	.067	.130	-.520	15	-.474	.153	-.064	-1.101
6	-.116	.068	.159	-.478	16	-.424	.139	-.026	-1.000
7	-.095	.080	.193	-.489	17	-.326	.105	.019	-.812
8	-.092	.080	.208	-.412	18	-.296	.090	.002	-.740
9	-.053	.096	.288	-.457	19	-.280	.088	.012	-.736
10	-.034	.120	.391	-.684	20	-.262	.079	-.023	-.630

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 24 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.034	.097	.539	-.386	11	-.342	.074	-.126	-.610
2	.015	.113	.780	-.444	12	-.349	.074	-.133	-.673
3	.066	.134	.856	-.333	13	-.369	.075	-.151	-.712
4	.144	.160	.919	-.313	14	-.403	.083	-.158	-.910
5	.273	.178	.954	-.404	15	-.479	.109	-.167	-1.047
6	.357	.170	.981	-.206	16	-.536	.133	-.203	-1.199
7	.380	.144	.822	-.119	17	-.465	.157	-.113	-1.230
8	.342	.124	.708	-.151	18	-.389	.130	-.060	-1.025
9	.261	.107	.642	-.154	19	-.415	.121	-.092	-1.118
10	.107	.084	.433	-.267	20	-.440	.125	-.071	-1.134

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 111 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.057	.064	.319	-.253	11	-.689	.189	-.177	-1.798
2	.063	.065	.319	-.215	12	-.637	.179	-.079	-1.586
3	.066	.064	.347	-.156	13	-.661	.187	-.119	-1.718
4	.066	.065	.338	-.191	14	-.596	.214	.058	-1.370
5	.041	.067	.331	-.203	15	-.236	.167	.096	-.958
6	.014	.074	.298	-.250	16	-.095	.086	.179	-.603
7	-.001	.091	.431	-.366	17	-.057	.063	.231	-.357
8	.023	.105	.531	-.448	18	-.036	.063	.204	-.339
9	.058	.116	.619	-.387	19	-.028	.072	.242	-.387
10	.090	.155	.756	-.694	20	-.010	.073	.252	-.384

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 121 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.029	116	528	- 295	11	-.176	.067	049	-.500
2	.077	119	.598	-.285	12	-.187	071	.123	-.536
3	.113	.119	.687	-.226	13	-.199	.077	.071	-.666
4	.142	120	.625	-.295	14	-.221	085	.077	-.574
5	.178	.118	.784	-.221	15	-.265	092	056	- 704
6	.184	.114	.736	-.277	16	-.328	100	- 014	- 777
7	.161	.098	.671	-.355	17	-.356	.107	-.067	-.863
8	.116	.089	.629	-.371	18	-.366	.127	-.012	-1.151
9	.069	076	.433	-.209	19	-.363	.141	029	-1.146
10	-.017	.064	.289	-.240	20	-.379	165	.083	-1.279

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 112 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.028	058	.240	-.225	11	-.256	.135	.117	-1.308
2	-.027	.058	.247	-.208	12	-.235	.131	.127	-1.307
3	-.024	.050	.182	-.209	13	-.235	.123	.143	-1.048
4	-.014	.051	.210	-.243	14	-.214	.111	.127	-.887
5	-.013	.053	.224	-.330	15	-.169	.095	.174	-.748
6	-.026	.059	.243	-.382	16	-.119	.079	.144	-.729
7	-.023	.073	.421	-.313	17	-.099	.069	.135	-.455
8	-.004	.083	.443	-.392	18	-.097	.069	.127	-.448
9	.014	.092	531	-.346	19	-.086	.068	.275	-.447
10	.014	.125	.656	-.775	20	-.077	.074	.227	-.467

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	033	.102	.673	-.263	11	-.114	.049	.067	-.329
2	060	.103	.764	-.224	12	-.124	050	070	-.316
3	.071	.103	.724	- 207	13	-.129	049	061	-.332
4	077	104	.693	-.211	14	-.135	052	.106	-.351
5	.099	104	.751	-.189	15	-.163	056	022	-.411
6	.099	.103	.823	-.211	16	-.206	062	.049	-.571
7	079	.098	.655	-.256	17	-.224	069	- 029	- 709
8	050	093	.496	- 253	18	-.214	073	- 013	- 824
9	.019	084	349	- 291	19	-.212	074	014	- 794
10	-.023	072	.329	-.338	20	-.224	081	065	- 772

DATA FOR PROJECT 6022 CONFIG. R WIND DI . 113 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.049	045	.129	-.219	11	-.233	.113	.186	-1.160
2	-.052	.045	.142	-.216	12	-.219	.108	.187	-1.143
3	-.053	.049	167	-.223	13	-.216	.100	.199	-1.010
4	-.047	050	147	-.258	14	-.20	091	150	-.887
5	-.043	.051	176	-.259	15	-.17	.077	093	-.586
6	-.058	.056	.177	-.299	16	-.12	.067	.095	-.422
7	-.062	.065	.214	-.458	17	-.106	.061	.102	-.413
8	-.056	072	259	-.574	18	-.101	.059	114	-.390
9	-.037	078	281	-.495	19	-.094	054	155	- 333
10	-.043	106	431	-.843	20	-.086	056	091	- 390

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 123 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- 040	084	490	- 307	11	-.118	.045	042	-.287
2	-.019	.089	.548	-.262	12	-.129	.045	036	-.294
3	- 003	.091	.517	- 275	13	-.134	.042	012	- 286
4	005	.096	.680	- 307	14	-.137	.043	004	-.291
5	.021	.096	.670	-.323	15	-.136	.044	.006	-.307
6	026	095	662	-.312	16	-.135	.047	- 010	-.361
7	019	089	09	-.266	17	-.156	.049	004	-.474
8	-.002	085	54	-.282	18	-.154	.053	013	-.532
9	- 019	.078	.68	-.352	19	-.150	.055	.010	-.534
10	-.052	.066	.274	-.321	20	-.164	.061	.011	-.708

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 211 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.043	059	.158	-.295	11	-.767	.268	- 089	-1 934
2	-.026	.064	.207	-.266	12	-.471	.219	.071	-1 713
3	-.034	.072	.218	-.300	13	-.326	.117	- 023	-1 101
4	-.036	.071	.211	- 511	14	-.290	.098	.013	-.932
5	-.054	.074	.236	-.513	15	-.250	.080	.028	-.577
6	-.087	.082	.220	-.463	16	-.244	.079	.037	-.579
7	-.101	.098	.340	-.677	17	-.211	.075	.058	-.550
8	-.112	105	252	-.473	18	-.201	.072	.062	-.560
9	-.080	.121	.303	-.594	19	-.190	.070	.103	-.504
10	-.103	.189	441	-1.315	20	-.182	.070	.088	-.490

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 221 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.109	.108	.396	-.523	11	-.378	.084	-.149	-.840
2	-.052	.119	.547	-.418	12	-.387	.083	-.139	-.801
3	.015	.130	.688	-.390	13	-.406	.080	-.190	-.819
4	.077	.150	.738	-.329	14	-.429	.092	-.186	-.826
5	.188	.160	.788	-.255	15	-.442	.097	-.159	-.847
6	.225	.159	.820	-.324	16	-.453	.124	-.139	-.985
7	.233	.130	.798	-.274	17	-.398	.130	-.106	-.963
8	.182	.111	.671	-.285	18	-.416	.130	-.099	-1.017
9	.099	.096	.504	-.298	19	-.482	.165	-.069	-1.280
10	-.068	.077	.285	-.395	20	-.572	.189	-.115	-1.471

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 311 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.117	.066	.065	-.260	11	-.822	.293	-.130	-2.377
2	-.095	.048	.097	-.250	12	-.525	.141	-.147	-1.116
3	-.075	.047	.099	-.230	13	-.458	.119	-.125	-.923
4	-.072	.055	.149	-.306	14	-.428	.102	-.099	-.981
5	-.072	.060	.167	-.375	15	-.388	.092	-.105	-.789
6	-.086	.067	.221	-.500	16	-.330	.088	-.103	-.747
7	-.093	.079	.253	-.398	17	-.324	.090	-.069	-.831
8	-.102	.099	.378	-.442	18	-.325	.090	-.065	-.732
9	-.055	.117	.483	-.506	19	-.308	.089	-.099	-.661
10	.021	.152	.673	-.867	20	-.298	.076	-.093	-.598

DATA FOR PROJECT 6022 CONFIG. R WIND DIR. 321 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.014	.114	.650	-.395	11	-.319	.051	-.150	-.537
2	.016	.105	.752	-.270	12	-.323	.050	-.168	-.512
3	.027	.088	.608	-.234	13	-.324	.048	-.158	-.503
4	.036	.081	.597	-.225	14	-.329	.051	-.148	-.533
5	.048	.067	.351	-.195	15	-.340	.055	-.160	-.537
6	.046	.065	.279	-.211	16	-.355	.061	-.165	-.616
7	.027	.057	.211	-.208	17	-.371	.071	-.160	-.745
8	-.010	.051	.163	-.235	18	-.369	.075	-.112	-.674
9	-.062	.048	.153	-.315	19	-.394	.091	-.134	-.817
10	-.142	.046	.029	-.316	20	-.445	.116	-.121	-1.043

DATA FOR PROJECT 6022 CONFIG. S WIND DIR 11 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.109	.075	.180	-.387	11	-.973	.515	-.032	-4.320
2	-.073	.080	.250	-.351	12	-.457	.207	.021	-1.674
3	-.051	.093	.359	-.543	13	-.440	.171	.010	-1.554
4	-.020	.095	.386	-.571	14	-.442	.177	.110	-1.311
5	.006	.091	.453	-.370	15	-.416	.169	.130	-1.239
6	.018	.098	.517	-.371	16	-.359	.153	.162	-1.164
7	.042	.114	.570	-.422	17	-.339	.126	.063	-.934
8	.075	.123	.690	-.392	18	-.323	.114	.216	-.781
9	.110	.129	.643	-.330	19	-.306	.107	.042	-.876
10	.122	.169	.858	-.798	20	-.287	.106	.049	-1.050

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 21 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.263	.182	1.067	-.356	11	-.390	.121	-.089	-1.057
2	.284	.174	1.012	-.251	12	-.403	.119	-.052	-.978
3	.270	.167	.890	-.227	13	-.459	.124	-.095	-1.046
4	.274	.168	1.048	-.209	14	-.462	.126	-.093	-1.032
5	.268	.175	1.084	-.279	15	-.521	.144	-.089	-1.141
6	.271	.165	.992	-.383	16	-.564	.173	-.104	-1.511
7	.229	.148	.877	-.182	17	-.601	.197	-.140	-1.410
8	.184	.135	.770	-.248	18	-.624	.215	-.079	-1.559
9	.103	.108	.513	-.279	19	-.745	.251	-.198	-1.910
10	-.013	.092	.428	-.416	20	-.767	.274	-.097	-1.985

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 12 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.088	.069	.189	-.345	11	-.677	.360	.156	-2.764
2	-.071	.071	.201	-.342	12	-.341	.167	.136	-1.508
3	-.078	.077	.239	-.366	13	-.296	.109	.120	-.889
4	-.060	.079	.264	-.337	14	-.326	.132	.144	-1.032
5	-.032	.079	.277	-.310	15	-.329	.134	.094	-.997
6	-.024	.085	.351	-.302	16	-.278	.129	.200	-1.002
7	-.018	.091	.413	-.363	17	-.244	.113	.130	-.876
8	.005	.100	.426	-.408	18	-.225	.106	.164	-.832
9	.034	.106	.485	-.329	19	-.206	.107	.183	-.806
10	.033	.137	.657	-.645	20	-.192	.106	.159	-.695

DATA FOR PROJECT 6022 CONFIG. 8 WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.065	.119	.770	-.270	11	-.236	.086	-.014	-.709
2	.102	.119	.829	-.231	12	-.241	.083	-.013	-.667
3	.100	.121	.809	-.184	13	-.272	.085	.027	-.725
4	.119	.128	.944	-.192	14	-.274	.088	.020	-.716
5	.135	.131	.790	-.218	15	-.326	.104	-.048	-.934
6	.159	.138	.732	-.201	16	-.356	.131	.027	-1.129
7	.137	.134	.633	-.250	17	-.334	.139	.021	-1.314
8	.117	.126	.582	-.272	18	-.299	.131	.050	-1.405
9	.065	.111	.476	-.293	19	-.379	.162	-.028	-1.351
10	.001	.091	.361	-.351	20	-.422	.182	-.046	-1.521

DATA FOR PROJECT 6022 CONFIG. 8 WIND DIR. 13 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.106	.057	.133	-.405	11	-.521	.290	-.004	-2.681
2	-.035	.058	.160	-.330	12	-.309	.152	.038	-1.290
3	-.087	.057	.165	-.324	13	-.260	.097	.026	-.874
4	-.081	.060	.152	-.333	14	-.264	.106	.090	-.958
5	-.051	.060	.181	-.324	15	-.239	.099	.100	-.751
6	-.044	.065	.252	-.373	16	-.216	.090	.112	-.677
7	-.041	.076	.276	-.314	17	-.194	.079	.159	-.631
8	-.030	.087	.358	-.387	18	-.179	.074	.107	-.575
9	.006	.092	.463	-.427	19	-.184	.082	.136	-.562
10	.003	.118	.599	-.594	20	-.185	.087	.172	-.774

DATA FOR PROJECT 6022 CONFIG. 8 WIND DIR 23 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.044	.111	.773	-.268	11	-.194	.073	-.001	-.772
2	.073	.108	.819	-.245	12	-.200	.071	-.006	-.714
3	.064	.108	.701	-.231	13	-.219	.074	.014	-.572
4	.075	.112	.752	-.315	14	-.209	.077	.049	-.645
5	.077	.108	.614	-.226	15	-.244	.089	.008	-.785
6	.095	.111	.618	-.215	16	-.259	.105	-.016	-.941
7	.074	.111	.759	-.257	17	-.267	.111	.001	-1.412
8	.055	.106	.623	-.246	18	-.246	.115	.006	-.913
9	.019	.099	.555	-.329	19	-.296	.134	-.015	-1.336
10	-.023	.083	.383	-.361	20	-.310	.144	-.016	-1.360

DATA FOR PROJECT 6022 CONFIG. 8 WIND DIR. 14 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.171	.061	.137	-.403	11	-.821	.377	-.037	-3.096
2	-.154	.063	.180	-.438	12	-.419	.165	.039	-1.357
3	-.144	.063	.126	-.342	13	-.356	.115	.052	-.917
4	-.129	.068	.152	-.356	14	-.363	.125	.076	-1.030
5	-.107	.071	.239	-.357	15	-.357	.112	.036	-.963
6	-.101	.078	.265	-.435	16	-.330	.097	.069	-.783
7	-.080	.088	.252	-.416	17	-.295	.079	.072	-.704
8	-.070	.098	.308	-.458	18	-.287	.073	.070	-.731
9	-.041	.105	.393	-.439	19	-.287	.072	-.008	-.552
10	-.038	.129	.480	-.704	20	-.278	.075	-.034	-.790

DATA FOR PROJECT 6022 CONFIG. 8 WIND DIR. 24 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.098	.128	.803	-.283	11	-.361	.089	-.108	-.755
2	.110	.128	.632	-.240	12	-.362	.082	-.108	-.733
3	.106	.124	.750	-.241	13	-.373	.075	-.119	-.786
4	.111	.131	.780	-.289	14	-.369	.072	-.106	-.656
5	.119	.140	.923	-.318	15	-.393	.074	-.161	-.728
6	.144	.155	.816	-.324	16	-.383	.082	-.149	-.787
7	.144	.159	.743	-.348	17	-.386	.102	-.098	-.955
8	.124	.154	.688	-.302	18	-.375	.105	-.106	-1.058
9	.063	.137	.606	-.350	19	-.374	.106	-.128	-1.119
10	-.031	.122	.401	-.505	20	-.371	.107	-.115	-1.060

DATA FOR PROJECT 6022 CONFIG 8 WIND DIR. 111 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.036	.071	.370	-.207	11	-.568	.259	-.003	-1.780
2	.063	.072	.413	-.169	12	-.550	.244	-.002	-1.580
3	.098	.083	.423	-.269	13	-.574	.261	-.023	-1.751
4	.128	.085	.443	-.230	14	-.480	.241	.053	-1.576
5	.150	.087	.538	-.170	15	-.211	.123	.114	-.924
6	.154	.093	.505	-.194	16	-.132	.088	.214	-.793
7	.170	.115	.699	-.174	17	-.122	.083	.206	-.555
8	.192	.129	.773	-.260	18	-.113	.080	.145	-.542
9	.212	.144	.788	-.207	19	-.114	.082	.201	-.495
10	.218	.179	.874	-.341	20	-.104	.085	.197	-.683

DATA FOR PROJECT 6022 CONFIG. S WIND DIR 121 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.192	.116	.608	-.276	11	-.202	.078	.041	-.583
2	.226	.116	.637	-.174	12	-.236	.083	-.002	-.567
3	.250	.114	.642	-.102	13	-.275	.095	.004	-.692
4	.254	.119	.679	-.125	14	-.316	.099	-.021	-.736
5	.260	.117	.688	-.084	15	-.348	.099	-.078	-.806
6	.223	.116	.641	-.141	16	-.389	.113	-.079	-.952
7	.167	.095	.583	-.221	17	-.384	.133	-.004	-1.080
8	.101	.085	.523	-.268	18	-.384	.160	.062	-1.236
9	.056	.074	.348	-.212	19	-.372	.161	.085	-1.459
10	-.032	.064	.306	-.281	20	-.393	.182	.097	-1.780

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 112 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.003	.059	.392	-.255	11	-.274	.130	.108	.935
2	.003	.059	.396	-.247	12	-.251	.125	.135	-1.028
3	.012	.060	.425	-.271	13	-.248	.117	.118	-.883
4	.028	.061	.432	-.232	14	-.221	.106	.113	-.760
5	.035	.063	.358	-.219	15	-.157	.088	.180	-.629
6	.024	.071	.450	-.231	16	-.096	.075	.159	-.410
7	.021	.080	.370	-.315	17	-.075	.067	.174	-.343
8	.034	.087	.403	-.307	18	-.069	.067	.204	-.338
9	.040	.095	.450	-.359	19	-.059	.067	.241	-.436
10	.021	.123	.519	-.850	20	-.045	.070	.233	-.587

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.037	.100	.483	-.332	11	-.116	.049	.177	-.337
2	.063	.105	.569	-.374	12	-.131	.050	.070	-.362
3	.092	.109	.674	-.259	13	-.139	.051	.070	-.352
4	.107	.117	.732	-.186	14	-.155	.054	.068	-.344
5	.122	.102	.631	-.217	15	-.168	.056	-.007	-.398
6	.113	.102	.624	-.200	16	-.213	.065	-.039	-.626
7	.097	.093	.528	-.235	17	-.222	.077	-.008	-.688
8	.059	.085	.439	-.278	18	-.231	.093	.038	-1.053
9	.036	.080	.426	-.221	19	-.221	.102	.042	-.997
10	-.023	.066	.259	-.293	20	-.242	.117	.091	-1.025

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 113 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.028	.047	.208	-.188	11	-.241	.135	.162	-1.351
2	-.027	.048	.251	-.194	12	-.219	.132	.173	-1.299
3	-.022	.055	.247	-.314	13	-.220	.118	.200	-.911
4	-.006	.055	.306	-.272	14	-.206	.108	.173	-.768
5	-.000	.057	.305	-.245	15	-.158	.080	.064	-.749
6	-.008	.062	.318	-.233	16	-.108	.065	.132	-.459
7	-.016	.067	.389	-.326	17	-.093	.057	.127	-.382
8	-.007	.075	.414	-.314	18	-.091	.056	.119	-.304
9	.017	.082	.422	-.366	19	-.085	.057	.145	-.416
10	.009	.110	.491	-.677	20	-.070	.060	.148	-.517

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 123 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.003	.080	.367	-.302	11	-.116	.047	.058	-.348
2	.008	.082	.424	-.267	12	-.130	.048	.032	-.348
3	.035	.084	.485	-.218	13	-.132	.046	.024	-.326
4	.047	.091	.587	-.216	14	-.151	.048	.034	-.327
5	.078	.106	.604	-.237	15	-.147	.048	.018	-.323
6	.072	.109	.590	-.238	16	-.173	.053	-.006	-.477
7	.067	.101	.518	-.291	17	-.183	.072	.033	-.681
8	.035	.092	.545	-.273	18	-.199	.091	.047	-.836
9	.006	.074	.318	-.220	19	-.186	.101	.107	-.807
10	-.049	.060	.204	-.293	20	-.205	.114	.157	-.870

DATA FOR PROJECT 6022 CONFIG. S WIND DIR 211 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.017	.078	.290	-.316	11	-1.310	.574	-.052	-3.648
2	.038	.084	.396	-.240	12	-.620	.358	.117	-2.943
3	.096	.091	.493	-.198	13	-.462	.222	.144	-1.923
4	.137	.096	.536	-.208	14	-.430	.181	.144	-1.647
5	.159	.098	.554	-.157	15	-.384	.143	.045	-1.215
6	.163	.103	.597	-.247	16	-.363	.123	.077	-.939
7	.186	.115	.600	-.236	17	-.345	.101	.065	-.835
8	.219	.129	.646	-.232	18	-.334	.090	.080	-.857
9	.255	.148	.739	-.250	19	-.313	.088	.049	-.769
10	.292	.182	.863	-.302	20	-.283	.088	.154	-.750

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 221 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.401	.133	.924	-.047	11	-.621	.142	-.169	-1.222
2	.437	.135	.852	-.087	12	-.624	.134	-.248	-1.316
3	.463	.131	.927	.033	13	-.609	.118	-.269	-1.069
4	.452	.111	.940	.011	14	-.632	.112	-.309	-1.046
5	.432	.126	.904	.033	15	-.660	.122	-.292	-1.135
6	.366	.118	.812	-.097	16	-.710	.144	-.289	-1.289
7	.280	.101	.699	-.114	17	-.675	.153	-.175	-1.287
8	.165	.086	.489	-.154	18	-.726	.172	-.200	-1.608
9	.041	.074	.354	-.221	19	-.715	.169	-.270	-1.551
10	-.160	.076	.144	-.464	20	-.733	.170	-.279	-1.595

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 311 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.131	.041	.010	-.272	11	-.409	.076	-.169	-.685
2	-.117	.041	.029	-.260	12	-.395	.072	-.179	-.771
3	-.102	.041	.033	-.242	13	-.362	.065	-.158	-.617
4	-.095	.041	.066	-.242	14	-.319	.061	-.132	-.519
5	-.080	.043	.091	-.233	15	-.284	.051	-.105	-.482
6	-.078	.044	.103	-.230	16	-.266	.054	-.093	-.476
7	-.069	.049	.137	-.230	17	-.248	.047	-.076	-.426
8	-.072	.051	.095	-.252	18	-.237	.045	-.092	-.421
9	-.064	.055	.114	-.249	19	-.229	.045	-.092	-.414
10	-.069	.065	.133	-.307	20	-.233	.048	-.093	-.503

DATA FOR PROJECT 6022 CONFIG. S WIND DIR. 321 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.100	.047	.068	-.263	11	-.268	.044	-.134	-.432
2	-.092	.046	.078	-.267	12	-.270	.043	-.125	-.418
3	-.081	.046	.071	-.277	13	-.272	.041	-.125	-.444
4	-.075	.047	.086	-.271	14	-.267	.041	-.115	-.414
5	-.063	.047	.126	-.205	15	-.260	.042	-.098	-.413
6	-.061	.050	.105	-.221	16	-.263	.043	-.121	-.408
7	-.057	.053	.130	-.254	17	-.259	.047	-.101	-.426
8	-.073	.054	.129	-.278	18	-.259	.041	-.119	-.401
9	-.099	.055	.099	-.288	19	-.256	.042	-.121	-.416
10	-.148	.056	.029	-.352	20	-.261	.042	-.125	-.421

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 11 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.121	.075	.183	-.448	11	-.567	.305	146	-2.399
2	-.100	.082	.270	-.587	12	-.426	.188	140	-1.374
3	-.085	.092	.350	-.365	13	-.387	.150	.150	-1.159
4	-.054	.098	.427	-.364	14	-.391	.156	.128	-1.169
5	-.022	.096	.430	-.367	15	-.348	.128	.134	-.967
6	-.016	.106	.438	-.448	16	-.317	.113	.137	-.931
7	-.000	.116	.525	-.427	17	-.303	.098	.019	-.937
8	.027	.126	.560	-.444	18	-.300	.094	-.001	-.914
9	.049	.125	.649	-.383	19	-.286	.095	-.006	-.734
10	.028	.155	.792	-.663	20	-.275	.102	.026	-1.028

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 21 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.114	.130	.843	-.293	11	-.314	.094	-.060	-.860
2	.137	.130	.924	-.228	12	-.320	.090	-.071	-.767
3	.130	.134	.990	-.297	13	-.333	.085	-.086	-.692
4	.142	.143	.995	-.350	14	-.331	.086	-.076	-.694
5	.160	.145	.853	-.205	15	-.362	.094	-.041	-.798
6	.175	.150	.851	-.241	16	-.380	.107	-.062	-.802
7	.150	.143	.685	-.352	17	-.360	.118	-.066	-.928
8	.119	.136	.621	-.252	18	-.346	.124	-.007	-1.004
9	.066	.121	.504	-.337	19	-.358	.122	-.018	-1.100
10	-.026	.100	.336	-.373	20	-.359	.125	-.006	-1.174

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 12 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.136	.080	.272	-.488	11	-1.082	.535	105	-3.406
2	-.107	.088	.286	-.489	12	-.452	.182	.135	-1.532
3	-.077	.096	.312	-.490	13	-.416	.146	.012	-1.291
4	-.054	.103	.401	-.483	14	-.476	.188	.025	-1.460
5	-.015	.106	.464	-.430	15	-.485	.180	.086	-1.325
6	-.004	.115	.506	-.509	16	-.406	.158	.131	-1.154
7	.035	.134	.505	-.520	17	-.349	.133	.084	-1.061
8	.068	.144	.607	-.527	18	-.328	.125	.099	-1.040
9	.117	.148	.682	-.511	19	-.299	.122	.187	-1.357
10	.142	.184	.783	-.626	20	-.289	.119	.158	-.918

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 22 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.168	.140	.783	-.440	11	-.312	.092	-.050	-.731
2	.208	.142	.773	-.701	12	-.326	.090	-.062	-.715
3	.216	.143	.802	-.506	13	-.361	.095	-.070	-.783
4	.234	.148	.829	-.375	14	-.374	.103	-.027	-.850
5	.270	.141	.847	-.102	15	-.434	.126	-.073	-.977
6	.280	.144	.949	-.183	16	-.489	.160	-.082	-1.345
7	.247	.132	.727	-.199	17	-.470	.168	-.096	-1.269
8	.204	.121	.670	-.224	18	-.443	.171	-.040	-1.441
9	.136	.110	.585	-.226	19	-.519	.190	-.096	-1.574
10	.024	.089	.401	-.339	20	-.548	.205	-.042	-1.563

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 13 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.093	.061	.164	-.298	11	-.634	.385	.166	-2.592
2	-.074	.063	.191	-.333	12	-.332	.176	.090	-1.628
3	-.063	.064	.222	-.448	13	-.282	.129	.145	-.956
4	-.056	.069	.224	-.509	14	-.297	.145	.138	-1.458
5	-.047	.074	.267	-.543	15	-.235	.116	.134	-.838
6	-.032	.080	.340	-.479	16	-.208	.105	.214	-.801
7	-.023	.097	.397	-.379	17	-.188	.091	.154	-.717
8	-.009	.107	.449	-.419	18	-.178	.084	.158	-.655
9	.016	.114	.506	-.459	19	-.178	.088	.248	-.773
10	.019	.149	.646	-.901	20	-.178	.092	.228	-.817

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 23 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.047	.117	.843	-.295	11	-.214	.089	.057	-.918
2	.073	.119	.819	-.230	12	-.220	.087	.064	-.807
3	.075	.122	.806	-.244	13	-.249	.097	.041	-.804
4	.094	.130	.768	-.550	14	-.258	.104	.033	-.789
5	.114	.135	.820	-.314	15	-.298	.122	.011	-.954
6	.130	.143	.843	-.260	16	-.325	.140	.074	-1.174
7	.113	.139	.777	-.221	17	-.291	.146	.070	-1.228
8	.096	.130	.652	-.296	18	-.260	.139	.047	-1.231
9	.052	.112	.547	-.295	19	-.353	.181	.034	-1.537
10	-.011	.091	.371	-.321	20	-.416	.195	-.006	-1.618

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 14 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.167	.060	.040	-.433	11	-.429	.178	-.001	-1.873
2	-.144	.061	.089	-.378	12	-.367	.141	-.004	-1.118
3	-.135	.060	.208	-.404	13	-.327	.117	.071	-.927
4	-.126	.067	.133	-.489	14	-.316	.110	.072	-.842
5	-.113	.073	.267	-.433	15	-.304	.091	.017	-.889
6	-.103	.081	.293	-.517	16	-.287	.083	.023	-.639
7	-.098	.088	.240	-.514	17	-.263	.075	.006	-.653
8	-.104	.103	.307	-.506	18	-.252	.074	.065	-.680
9	-.095	.111	.378	-.504	19	-.260	.076	-.005	-.597
10	-.105	.128	.439	-.797	20	-.270	.086	.027	-.875

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 24 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.073	.121	.759	-.352	11	-.352	.081	-.112	-.839
2	.085	.117	.686	-.316	12	-.348	.075	-.143	-.826
3	.085	.116	.742	-.296	13	-.352	.070	-.121	-.677
4	.097	.122	.678	-.291	14	-.344	.065	-.151	-.657
5	.104	.134	.699	-.267	15	-.341	.067	-.149	-.704
6	.128	.151	.838	-.372	16	-.328	.076	-.126	-.806
7	.128	.152	.854	-.346	17	-.331	.090	-.040	-.878
8	.109	.147	.664	-.281	18	-.321	.096	-.058	-.799
9	.057	.139	.607	-.328	19	-.321	.094	-.066	-.760
10	-.052	.114	.425	-.501	20	-.316	.095	-.049	-.799

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 111 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.021	.067	.284	-.331	11	-.324	.145	.080	-1.108
2	-.003	.069	.296	-.291	12	-.307	.140	.081	-1.264
3	.014	.082	.364	-.255	13	-.310	.127	.063	-.923
4	.038	.085	.526	-.269	14	-.299	.113	.042	-.951
5	.046	.085	.410	-.289	15	-.259	.097	.076	-.754
6	.034	.088	.464	-.283	16	-.202	.088	.105	-.792
7	.017	.092	.591	-.278	17	-.174	.076	.200	-.495
8	.020	.101	.750	-.426	18	-.165	.074	.132	-.545
9	.018	.109	.647	-.522	19	-.149	.074	.157	-.551
10	-.015	.140	.648	-.556	20	-.132	.078	.215	-.584

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 121 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.163	.114	.639	-.161	11	-.192	.060	.053	-.504
2	.193	.118	.689	-.150	12	-.207	.061	.023	-.489
3	.214	.120	.694	-.154	13	-.228	.060	-.001	-.453
4	.227	.126	.771	-.160	14	-.246	.062	-.030	-.534
5	.213	.119	.739	-.101	15	-.259	.065	-.062	-.524
6	.187	.115	.688	-.138	16	-.271	.080	-.054	-.635
7	.137	.100	.555	-.154	17	-.286	.122	.027	-.973
8	.091	.089	.482	-.172	18	-.284	.152	.081	-1.187
9	.036	.077	.351	-.269	19	-.284	.155	.125	-1.304
10	-.040	.065	.238	-.307	20	-.292	.169	.161	-1.696

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 112 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.021	.066	.268	-.201	11	-.428	.176	.123	-1.339
2	.029	.067	.299	-.192	12	-.401	.171	.113	-1.373
3	.040	.073	.327	-.213	13	-.394	.168	.141	-1.270
4	.052	.075	.343	-.241	14	-.321	.150	.112	-1.179
5	.058	.076	.371	-.197	15	-.179	.111	.107	-.976
6	.050	.081	.352	-.208	16	-.112	.083	.163	-.691
7	.042	.092	.486	-.321	17	-.083	.069	.236	-.440
8	.057	.100	.577	-.355	18	-.069	.069	.230	-.420
9	.071	.107	.649	-.388	19	-.061	.072	.211	-.416
10	.068	.138	.880	-.643	20	-.048	.075	.212	-.617

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 122 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.078	.105	.622	-.270	11	-.138	.059	.091	-.382
2	.122	.106	.607	-.202	12	-.150	.062	.098	-.403
3	.136	.105	.629	-.188	13	-.179	.064	.052	-.436
4	.153	.108	.694	-.208	14	-.196	.066	.053	-.456
5	.167	.110	.703	-.139	15	-.225	.067	.030	-.544
6	.168	.107	.670	-.214	16	-.261	.074	-.063	-.655
7	.131	.095	.629	-.176	17	-.286	.100	-.009	-.933
8	.092	.088	.520	-.221	18	-.276	.124	.040	-1.282
9	.050	.077	.483	-.229	19	-.283	.134	.034	-1.288
10	-.003	.065	.328	-.243	20	-.296	.152	.131	-1.657

DATA FOR PROJECT 6022 CONFIG. T WIND DIR 113 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.017	.051	.186	-.191	11	-.226	.133	.157	-1.266
2	-.012	.051	.207	-.238	12	-.220	.129	.162	-1.141
3	-.009	.057	.232	-.171	13	-.202	.119	.167	-1.076
4	-.006	.058	.256	-.226	14	-.177	.105	.127	-.929
5	.007	.060	.265	-.195	15	-.136	.079	.114	-.689
6	.003	.065	.292	-.331	16	-.103	.070	.199	-.451
7	-.006	.069	.244	-.258	17	-.077	.063	.233	-.372
8	-.004	.077	.317	-.312	18	-.068	.062	.232	-.391
9	.010	.083	.332	-.380	19	-.069	.060	.145	-.361
10	-.002	.109	.484	-.732	20	-.071	.064	.141	-.369

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 123 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.007	.088	.473	-.220	11	-.092	.046	.110	-.260
2	.044	.089	.614	-.204	12	-.098	.046	.097	-.249
3	.047	.093	.649	-.184	13	-.112	.050	.076	-.346
4	.062	.099	.596	-.183	14	-.101	.051	.118	-.332
5	.093	.103	.562	-.212	15	-.123	.054	.034	-.385
6	.108	.103	.573	-.192	16	-.156	.062	.019	-.557
7	.080	.095	.541	-.244	17	-.181	.069	.044	-.548
8	.056	.088	.468	-.240	18	-.164	.079	.073	-.812
9	.027	.079	.469	-.204	19	-.173	.085	.078	-.928
10	-.001	.065	.342	-.237	20	-.185	.096	.118	-.949

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 211 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.060	.081	.259	-.391	11	-.485	.229	.063	-1.697
2	-.013	.088	.377	-.311	12	-.419	.189	.194	-1.369
3	-.002	.091	.349	-.265	13	-.348	.148	.182	-1.177
4	.044	.108	.638	-.261	14	-.307	.124	.164	-.967
5	.056	.109	.508	-.307	15	-.302	.105	.039	-.810
6	.048	.104	.627	-.300	16	-.293	.087	.014	-.713
7	.030	.107	.574	-.538	17	-.272	.076	-.017	-.625
8	.027	.113	.603	-.371	18	-.249	.072	.003	-.539
9	.030	.118	.619	-.412	19	-.241	.076	.103	-.578
10	.014	.142	.613	-.653	20	-.240	.080	.018	-.699

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 221 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.167	.145	.776	-.305	11	-.357	.078	-.093	-.706
2	.222	.160	.868	-.250	12	-.380	.076	-.134	-.731
3	.271	.160	.900	-.130	13	-.397	.074	-.172	-.724
4	.279	.162	.948	-.138	14	-.402	.075	-.192	-.737
5	.299	.141	.934	-.144	15	-.401	.083	-.170	-.823
6	.249	.140	.742	-.178	16	-.438	.098	-.166	-1.009
7	.204	.125	.670	-.180	17	-.454	.121	-.114	-1.074
8	.123	.113	.525	-.235	18	-.493	.140	-.124	-1.133
9	.045	.100	.414	-.277	19	-.489	.145	-.100	-1.134
10	-.086	.083	.271	-.390	20	-.519	.151	-.041	-1.248

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 311 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.113	.043	.104	-.249	11	-.369	.076	-.126	-.767
2	-.100	.044	.092	-.232	12	-.357	.075	-.136	-.662
3	-.093	.041	.044	-.225	13	-.321	.065	-.128	-.587
4	-.084	.042	.067	-.228	14	-.291	.058	-.077	-.508
5	-.075	.043	.057	-.215	15	-.270	.056	-.061	-.467
6	-.079	.044	.071	-.215	16	-.262	.051	-.034	-.445
7	-.080	.047	.080	-.242	17	-.225	.047	-.031	-.379
8	-.093	.049	.111	-.306	18	-.215	.047	-.039	-.387
9	-.097	.051	.094	-.336	19	-.219	.049	-.056	-.405
10	-.132	.058	.095	-.405	20	-.232	.050	-.058	-.472

DATA FOR PROJECT 6022 CONFIG. T WIND DIR. 321 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.152	.041	.012	-.310	11	-.267	.040	-.131	-.402
2	-.142	.042	.014	-.271	12	-.267	.039	-.133	-.403
3	-.138	.042	.025	-.275	13	-.264	.036	-.097	-.380
4	-.133	.045	.033	-.310	14	-.261	.039	-.120	-.386
5	-.125	.048	.062	-.291	15	-.261	.040	-.127	-.381
6	-.115	.050	.069	-.290	16	-.264	.040	-.112	-.384
7	-.116	.052	.079	-.296	17	-.266	.041	-.096	-.420
8	-.126	.053	.074	-.376	18	-.269	.041	-.134	-.407
9	-.150	.054	.055	-.331	19	-.271	.041	-.146	-.412
10	-.180	.054	-.000	-.413	20	-.273	.041	-.150	-.403

DATA FOR PROJECT 6022 CONFIG. U WIND DIR. 35 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.007	.074	.216	-.306	11	-.983	.400	-.141	-3.094
2	.120	.068	.390	-.138	12	-.981	.364	-.243	-3.000
3	.207	.077	.503	-.034	13	-.979	.318	-.297	-2.298
4	.282	.088	.616	.007	14	-.954	.289	-.267	-2.260
5	.352	.096	.754	.081	15	-.865	.245	-.265	-2.115
6	.398	.108	.846	.073	16	-.793	.263	-.226	-2.367
7	.449	.123	.961	.109	17	-.816	.314	-.119	-2.810
8	.485	.136	.973	.124	18	-.834	.332	-.108	-2.653
9	.509	.146	1.025	.132	19	-.844	.343	-.148	-2.531
10	.471	.170	1.070	.004	20	-.798	.326	-.093	-2.364

DATA FOR PROJECT 6022 CONFIG. U WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.009	.062	.234	-.241	11	-.837	.296	-.168	-2.308
2	.117	.061	.380	-.084	12	-.822	.275	-.170	-2.418
3	.192	.069	.505	-.048	13	-.815	.244	-.185	-2.047
4	.259	.078	.598	.014	14	-.801	.226	-.189	-1.949
5	.322	.085	.647	.056	15	-.720	.190	-.211	-1.548
6	.361	.095	.722	.085	16	-.624	.168	-.211	-1.581
7	.412	.115	.899	.092	17	-.612	.185	-.205	-1.747
8	.439	.126	1.008	.076	18	-.631	.209	-.168	-1.729
9	.459	.135	1.043	.096	19	-.662	.232	-.155	-1.761
10	.429	.159	1.087	-.036	20	-.639	.229	-.122	-1.591

DATA FOR PROJECT 6022 CONFIG. U WIND DIR. 37 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.003	.057	.190	-.223	11	-.825	.292	-.181	-3.044
2	.106	.056	.305	-.092	12	-.814	.253	-.191	-2.688
3	.190	.071	.540	-.022	13	-.809	.229	-.220	-2.672
4	.253	.082	.645	.020	14	-.806	.212	-.262	-2.085
5	.324	.089	.751	.053	15	-.714	.169	-.165	-1.503
6	.359	.100	.829	.061	16	-.633	.164	-.181	-1.530
7	.391	.102	.754	.087	17	-.617	.183	-.128	-1.904
8	.415	.113	.806	.075	18	-.639	.209	-.086	-1.841
9	.443	.120	.875	.085	19	-.641	.216	-.149	-1.598
10	.409	.146	1.018	-.050	20	-.629	.212	-.109	-1.527

DATA FOR PROJECT 6022 CONFIG. U WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.416	.135	.968	.090	11	-.539	.146	-.058	-1.286
2	.420	.126	.926	.100	12	-.572	.147	-.090	-1.364
3	.388	.120	.899	.080	13	-.600	.170	-.222	-1.354
4	.367	.117	.833	.064	14	-.626	.182	-.222	-1.537
5	.331	.122	.751	.074	15	-.742	.211	-.280	-1.636
6	.313	.117	.779	.020	16	-.879	.243	-.311	-2.176
7	.243	.105	.666	-.012	17	-.849	.240	-.193	-2.018
8	.173	.093	.514	-.076	18	-.652	.238	-.171	-1.836
9	.079	.077	.399	-.183	19	-1.089	.510	-.153	-3.176
10	-.073	.068	.157	-.349	20	-1.918	.494	-.710	-4.085

DATA FOR PROJECT 6022 CONFIG. U WIND DIR. 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.379	.141	.997	.028	11	-.581	.162	-.125	-1.560
2	.395	.133	.919	.078	12	-.603	.162	-.135	-1.578
3	.372	.127	.866	.084	13	-.653	.165	-.225	-1.294
4	.361	.124	.870	.058	14	-.670	.175	-.214	-1.347
5	.349	.127	.847	.008	15	-.784	.199	-.251	-1.610
6	.329	.121	.773	-.004	16	-.912	.226	-.349	-2.029
7	.253	.110	.664	-.058	17	-.983	.251	-.262	-1.911
8	.180	.098	.564	-.108	18	-.795	.288	-.139	-2.31
9	.071	.082	.418	-.199	19	-1.129	.443	-.241	-2.885
10	-.089	.075	.183	-.391	20	-1.676	.474	-.566	-3.438

DATA FOR PROJECT 6022 CONFIG. U WIND DIR. 147 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.372	.146	.969	.025	11	-.592	.155	-.181	-1.485
2	.383	.140	.943	.044	12	-.606	.155	-.181	-1.599
3	.366	.135	.915	.038	13	-.691	.173	-.198	-1.465
4	.358	.132	.875	.041	14	-.716	.182	-.232	-1.540
5	.338	.121	.866	.055	15	-.828	.208	-.257	-1.727
6	.312	.115	.865	.034	16	-.955	.238	-.367	-1.933
7	.239	.103	.670	-.022	17	-.967	.245	-.358	-2.163
8	.166	.091	.571	-.127	18	-.813	.295	-.126	-2.269
9	.058	.077	.354	-.153	19	-1.126	.448	-.135	-2.902
10	-.107	.068	.119	-.365	20	-1.660	.489	-.451	-4.356

DATA FOR PROJECT 6022 CONFIG V WIND DIR. 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.154	.064	.458	-.069	11	-.827	.225	-.111	-1.743
2	.187	.065	.478	-.025	12	-.878	.232	-.171	-2.058
3	.223	.072	.518	-.040	13	-1.009	.254	-.287	-2.126
4	.258	.076	.576	-.062	14	-.962	.299	-.001	-2.136
5	.285	.080	.622	.025	15	-.416	.296	.204	-1.574
6	.303	.089	.690	.019	16	-.132	.194	.370	-1.020
7	.325	.100	.896	.074	17	-.033	.123	.439	-.857
8	.351	.112	.960	.047	18	-.006	.108	.386	-.677
9	.358	.123	.946	.048	19	.011	.104	.609	-.418
10	.304	.146	1.066	-.105	20	.016	.101	.552	-.503

DATA FOR PROJECT 6022 CONFIG. V WIND DIR. 36 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.114	.060	.423	-.098	11	-.452	.144	-.049	-1.027
2	.148	.063	.435	-.079	12	-.451	.143	-.088	-.961
3	.186	.074	.469	-.281	13	-.477	.147	-.122	-1.068
4	.225	.080	.585	-.178	14	-.480	.150	-.079	-1.057
5	.260	.085	.654	-.162	15	-.405	.147	.031	-1.127
6	.266	.092	.700	-.054	16	-.242	.150	.208	-.863
7	.283	.097	.672	-.173	17	-.134	.127	.407	-.893
8	.284	.107	.716	-.116	18	-.092	.114	.394	-.670
9	.274	.114	.698	-.150	19	-.067	.098	.287	-.534
10	.211	.135	.789	-.258	20	-.051	.095	.327	-.453

DATA FOR PROJECT 6022 CONFIG. V WIND DIR. 37 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.096	.059	.302	-.135	11	-.470	.141	-.005	-1.368
2	.129	.060	.354	-.141	12	-.467	.140	-.022	-1.392
3	.166	.065	.478	-.080	13	-.494	.141	-.092	-1.328
4	.200	.070	.517	-.082	14	-.502	.146	-.065	-1.095
5	.235	.074	.563	-.049	15	-.387	.137	.019	-.959
6	.247	.082	.594	-.069	16	-.230	.141	.155	-.890
7	.265	.094	.686	-.087	17	-.134	.121	.181	-.833
8	.273	.107	.718	-.110	18	-.093	.107	.298	-.668
9	.270	.108	.719	-.113	19	-.084	.101	.297	-.579
10	.213	.129	.817	-.169	20	-.063	.099	.348	-.552

DATA FOR PROJECT 6022 CONFIG. V WIND DIR. 145 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.382	.131	.902	-.017	11	-.103	.067	.148	-.401
2	.369	.122	.919	.048	12	-.114	.073	.162	-.535
3	.344	.111	.872	.043	13	-.140	.093	.200	-.722
4	.308	.103	.801	.029	14	-.187	.125	.072	-1.009
5	.240	.085	.545	.017	15	-.323	.196	.031	-1.166
6	.192	.077	.501	-.017	16	-.609	.238	-.065	-1.464
7	.143	.065	.407	-.049	17	-.816	.185	-.311	-1.804
8	.094	.058	.308	-.090	18	-.760	.167	-.328	-1.503
9	.053	.056	.354	-.134	19	-.702	.155	-.318	-1.432
10	-.018	.053	.218	-.249	20	-.692	.160	-.253	-1.586

DATA FOR PROJECT 6022 CONFIG V WIND DIR 146 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.217	.106	.680	-.065	11	-.135	.074	.118	-.679
2	.229	.106	.698	-.046	12	-.153	.077	.115	-.677
3	.243	.102	.674	-.015	13	-.150	.080	.097	-.539
4	.234	.102	.654	-.022	14	-.191	.097	.117	-.753
5	.235	.093	.551	-.020	15	-.273	.142	.010	-1.005
6	.196	.090	.509	-.042	16	-.486	.178	-.085	-1.192
7	.154	.078	.517	-.047	17	-.657	.154	-.255	-1.402
8	.094	.069	.351	-.089	18	-.656	.154	-.257	-1.409
9	.052	.059	.283	-.178	19	-.598	.144	-.228	-1.343
10	-.039	.054	.172	-.261	20	-.607	.154	-.175	-1.320

DATA FOR PROJECT 6022 CONFIG. V WIND DIR 147 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.213	.107	.644	-.117	11	-.142	.073	.106	-.483
2	.223	.107	.668	-.076	12	-.152	.076	.068	-.451
3	.243	.103	.682	-.046	13	-.168	.083	.149	-.544
4	.233	.103	.674	-.047	14	-.215	.098	.060	-.794
5	.237	.097	.644	-.044	15	-.312	.153	.058	-1.000
6	.190	.092	.613	-.088	16	-.564	.201	-.014	-1.275
7	.146	.077	.474	-.119	17	-.720	.164	-.262	-1.619
8	.087	.069	.394	-.154	18	-.722	.160	-.298	-1.957
9	.042	.060	.290	-.133	19	-.657	.151	-.259	-1.548
10	-.052	.054	.214	-.244	20	-.667	.160	-.199	-1.650

DATA FOR PROJECT 6022 CONFIG. W WIND DIR 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.336	.071	-.126	-.784	11	1.124	.053	1.245	.977
2	-.358	.073	-.138	-.849	12	1.125	.059	1.259	.965
3	-.382	.065	-.107	-.544	13	1.126	.055	1.252	.974
4	-.450	.074	-.244	-.741	14	1.126	.057	1.252	.954
5	-.376	.072	-.198	-.681	15	1.279	.045	1.394	1.116
6	-.395	.074	-.170	-.711	16	1.305	.049	1.418	1.124
7	-.358	.075	-.126	-.792	17	1.288	.048	1.406	1.118
8	-.487	.086	-.187	-.911	18	1.292	.049	1.421	1.124
9	-.167	.064	.080	-.383	19	-.281	.066	-.097	-.604
10	-.087	.064	.159	-.287	20	-.414	.074	-.210	-.775

DATA FOR PROJECT 6022 CONFIG. W WIND DIR 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.273	.194	.218	-1.556	11	1.116	.026	1.191	1.021
2	-.237	.166	.284	-1.496	12	1.118	.030	1.213	1.010
3	-.167	.131	.376	-.845	13	.470	.116	.705	.287
4	-.251	.128	.183	-.872	14	1.115	.028	1.186	1.020
5	-.164	.108	.125	-.746	15	1.289	.051	1.406	1.134
6	-.155	.098	.166	-.594	16	1.316	.056	1.455	1.150
7	-.179	.098	.229	-.630	17	1.297	.053	1.436	1.146
8	-.204	.107	.120	-.872	18	1.294	.053	1.436	1.139
9	-.034	.133	.438	-.409	19	-.417	.294	.275	-1.999
10	-.020	.110	.640	-.333	20	-.442	.272	.247	-1.673

DATA FOR PROJECT 6022 CONFIG W WIND DIR 37 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.165	.399	.288	-1.434	11	-.362	.244	.181	-1.635
2	-.012	.098	.329	-.568	12	-.363	.247	.145	-1.593
3	-.185	.252	.181	-1.657	13	-.302	.201	.221	-1.501
4	-.388	.254	.133	-2.118	14	-.240	.159	.238	-1.136
5	-.313	.196	.151	-1.311	15	-.209	.132	.215	-1.312
6	-.239	.154	.136	-1.488	16	-.187	.119	.156	-1.535
7	1.115	.037	1.206	.956	17	-.151	.104	.165	-.765
8	1.109	.037	1.206	.938	18	-.130	.097	.193	-.602
9	1.117	.038	1.216	.936	19	-.147	.128	.159	-1.044
10	1.117	.037	1.214	.942	20	-.148	.128	.156	-1.430

DATA FOR PROJECT 6022 CONFIG. W WIND DIR 145 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.383	.103	.722	.10	11	-.398	.069	-.172	-.651
2	.325	.090	.632	.06	12	-.481	.073	-.265	-.778
3	.207	.081	.561	.032	13	-.395	.063	-.215	-.652
4	.156	.077	.456	-.068	14	-.363	.063	-.181	-.609
5	.153	.068	.396	-.052	15	-.377	.063	-.172	-.610
6	.100	.063	.361	-.077	16	-.444	.064	-.210	-.734
7	.021	.054	.235	-.162	17	-.359	.062	-.174	-.622
8	-.094	.053	.096	-.297	18	-.324	.062	-.129	-.609
9	-.095	.056	.152	-.286	19	-.351	.063	-.152	-.671
10	-.161	.054	.069	-.338	20	-.428	.066	.232	-.778

DATA FOR PROJECT 6022 CONFIG. W WIND DIR. 146 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.046	.118	.289	-.732	11	-.161	.062	.025	-.421
2	-.055	.090	.247	-.389	12	-.216	.066	.028	-.549
3	-.075	.084	.330	-.386	13	-.159	.066	.045	-.477
4	-.127	.083	.345	-.512	14	-.153	.070	.043	-.425
5	-.057	.079	.452	-.535	15	-.179	.073	.037	-.538
6	-.038	.082	.535	-.389	16	-.245	.081	.050	-.636
7	-.047	.095	.635	-.386	17	-.209	.085	.057	-.581
8	-.101	.106	.581	-.462	18	-.233	.094	.055	-.701
9	-.054	.099	.556	-.419	19	-.278	.105	.025	-.796
10	-.070	.092	.619	-.521	20	-.350	.115	-.028	-.922

DATA FOR PROJECT 6022 CONFIG. W WIND DIR. 147 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	.181	.139	.729	-.689	11	-.146	.070	.055	-.513
2	.130	.114	.558	-.291	12	-.157	.074	.086	-.533
3	.057	.100	.462	-.267	13	-.136	.073	.168	-.424
4	.041	.093	.440	-.334	14	-.135	.077	.159	-.467
5	.001	.090	.454	-.276	15	-.170	.084	.055	-.481
6		.087	.414	-.269	16	-.200	.092	.053	-.644
7		.088	.408	-.513	17	-.204	.104	.094	-.720
8		.082	.372	-.500	18	-.209	.108	.095	-.721
9	-.007	.079	.359	-.403	19	-.232	.116	.098	-.813
10	-.035	.070	.282	-.412	20	-.242	.116	.097	-.843

DATA FOR PROJECT 6022 CONFIG X WIND DIR. 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.224	.094	.099	-.614	11	1.139	.083	1.297	.913
2	-.221	.093	.198	-.641	12	1.147	.091	1.332	.898
3	-.183	.080	.058	-.578	13	1.141	.088	1.306	.903
4	-.270	.084	.005	-.776	14	1.143	.087	1.316	.908
5	-.182	.072	.054	-.456	15	1.277	.041	1.384	1.110
6	-.178	.068	.056	-.406	16	1.305	.045	1.431	1.109
7	-.147	.061	.058	-.414	17	1.287	.042	1.402	1.107
8	-.255	.078	-.032	-.640	18	1.292	.044	1.409	1.106
9	-.150	.049	.020	-.309	19	1.209	.112	.069	-1.050
10	-.145	.050	.023	-.393	20	1.307	.112	.005	-.937

DATA FOR PROJECT 6022 CONFIG. X WIND DIR. 36 TUBING NO. 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.181	.125	.175	-1.256	11	1.117	.021	1.203	1.040
2	-.162	.099	.107	-.751	12	1.119	.025	1.212	1.032
3	-.152	.081	.145	-.780	13	1.119	.023	1.199	1.032
4	-.175	.092	.095	-.797	14	1.118	.023	1.201	1.029
5	-.105	.089	.102	-.420	15	1.294	.048	1.406	1.091
6	-.101	.066	.085	-.429	16	1.313	.051	1.438	1.066
7	-.067	.067	.186	-.424	17	1.302	.050	1.418	1.084
8	-.161	.076	.072	-.740	18	1.305	.051	1.426	1.083
9	-.078	.052	.091	-.337	19	.208	.179	.287	-2.132
10	-.076	.052	.085	-.301	20	-.272	.166	.174	-1.440

DATA FOR PROJECT 6022 CONFIG. X WIND DIR. 145 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	-.101	.041	.029	-.250	11	-.146	.039	-.019	-.285
2	-.073	.040	.066	-.226	12	-.229	.040	-.088	-.378
3	-.098	.041	.070	-.295	13	-.165	.034	-.051	-.270
4	-.184	.047	.008	-.389	14	-.139	.033	-.034	-.276
5	-.120	.042	.189	-.350	15	-.156	.034	-.058	-.265
6	-.090	.035	.358	-.326	16	-.234	.035	-.121	-.368
7	-.107	.046	.327	-.453	17	-.168	.034	-.061	-.280
8	-.188	.075	.277	-.636	18	-.138	.033	-.034	-.256
9	-.117	.074	.339	-.460	19	-.152	.034	-.045	-.285
10	-.093	.068	.308	-.457	20	-.233	.036	-.131	-.378

DATA FOR PROJECT 6022 CONFIG X WIND DIR. 146 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- .104	.044	.071	- .277	11	- .109	.043	- .032	- .262
2	- .[illegible]	.046	.089	- .264	12	- .180	.044	- .024	- .353
3	- .093	.050	.092	- .313	13	- .108	.041	.030	- .247
4	- .165	.056	.063	- .386	14	- .075	.039	.058	- .202
5	- .097	.061	.265	- .462	15	- .089	.039	.032	- .232
6	- .064	.068	.276	- .274	16	- .159	.040	- .035	- .299
7	- .065	.077	.397	- .333	17	- .108	.057	.009	- .247
8	- .135	.086	.403	- .485	18	- .079	.036	.037	- .233
9	- .073	.086	.873	- .329	19	- .096	.037	.021	- .252
10	- .057	.074	.578	- .326	20	- .165	.040	- .046	- .342

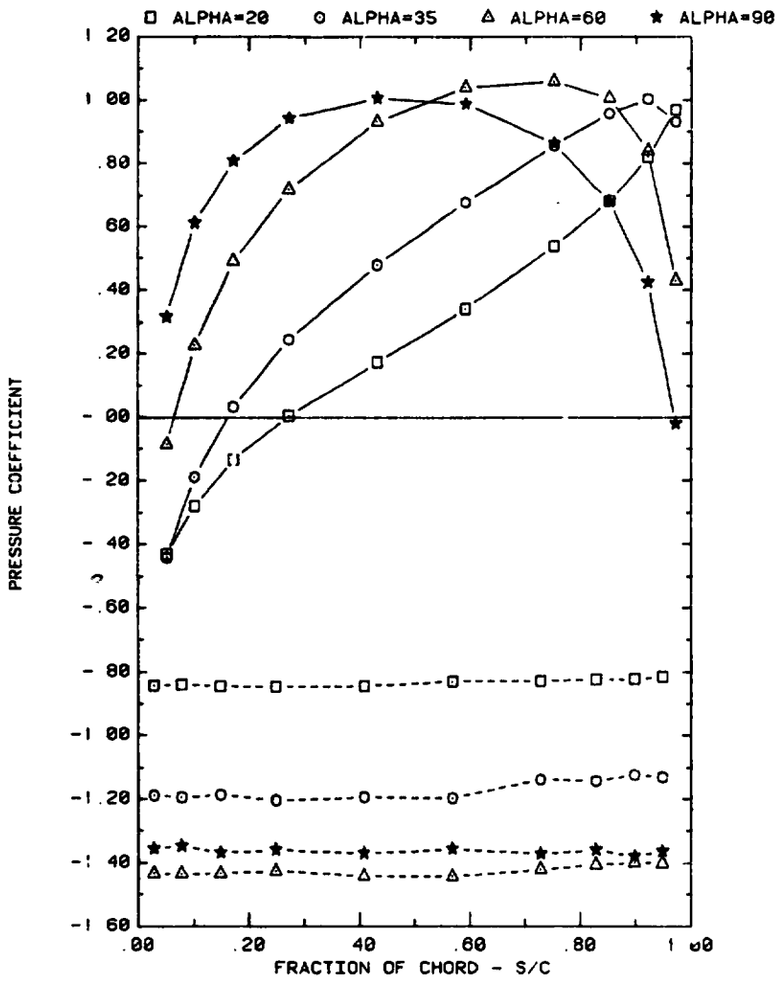
DATA FOR PROJECT 6022 CONFIG. 2 WIND DIR 35 TUBING NO 1

TAP	MEAN	RMS	MAX	MIN	TAP	MEAN	RMS	MAX	MIN
1	- .202	.024	- .116	- .295	11	- .707	.037	- .565	- .828
2	.011	.026	.083	- .064	12	- .714	.036	- .585	- .818
3	.180	.017	.241	.120	13	- .713	.034	- .589	- .815
4	.318	.016	.372	.264	14	- .713	.033	- .591	- .806
5	.456	.015	.509	.405	15	- .714	.031	- .622	- .823
6	.581	.015	.640	.522	16	- .726	.032	- .637	- .833
7	.729	.018	.785	.676	17	- .724	.035	- .603	- .862
8	.851	.018	.902	.772	18	- .721	.036	- .615	- .868
9	.942	.017	.994	.841	19	- .712	.035	- .561	- .840
10	.973	.015	1.018	.888	20	- .719	.038	- .543	- .876

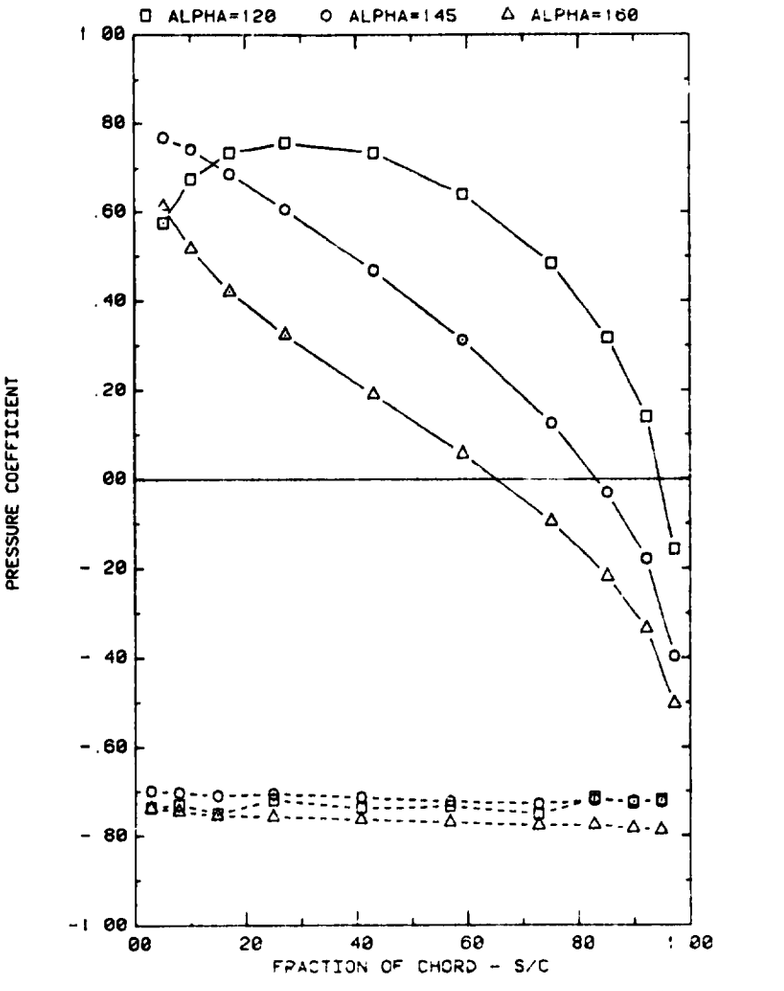
APPENDIX C

Plots of Pressure Distribution along Chord of Solar Array

LIST OF PLOTS

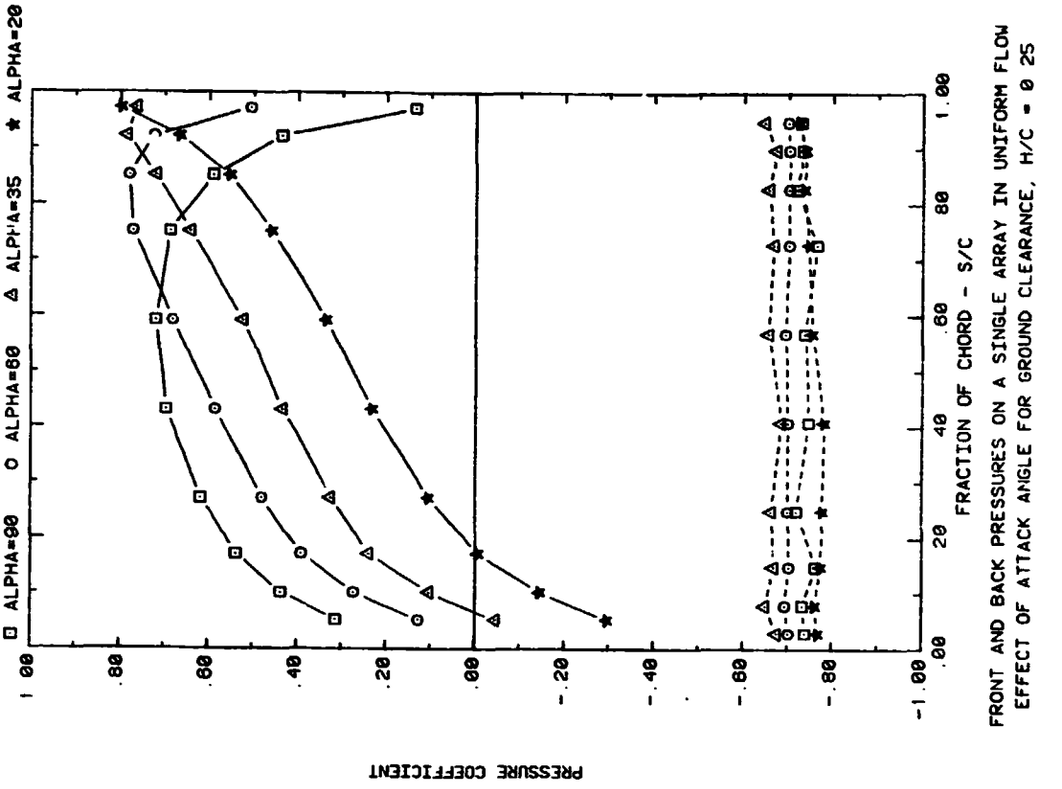


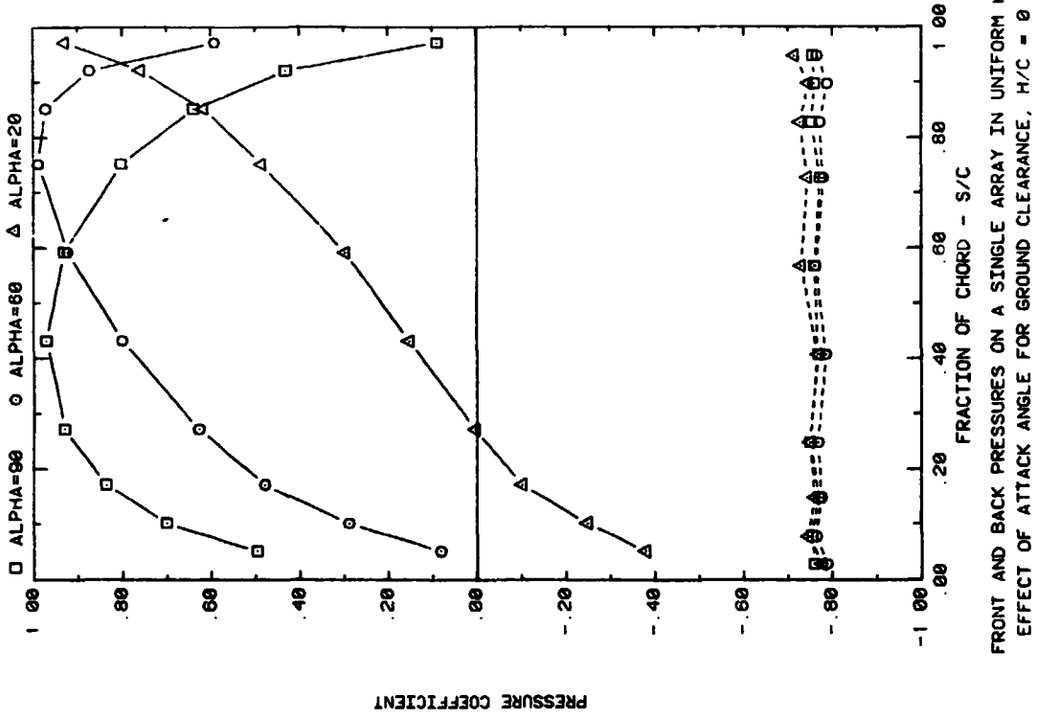
FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF ATTACK ANGLE FOR GROUND CLEARANCE, H/C = INFINITY



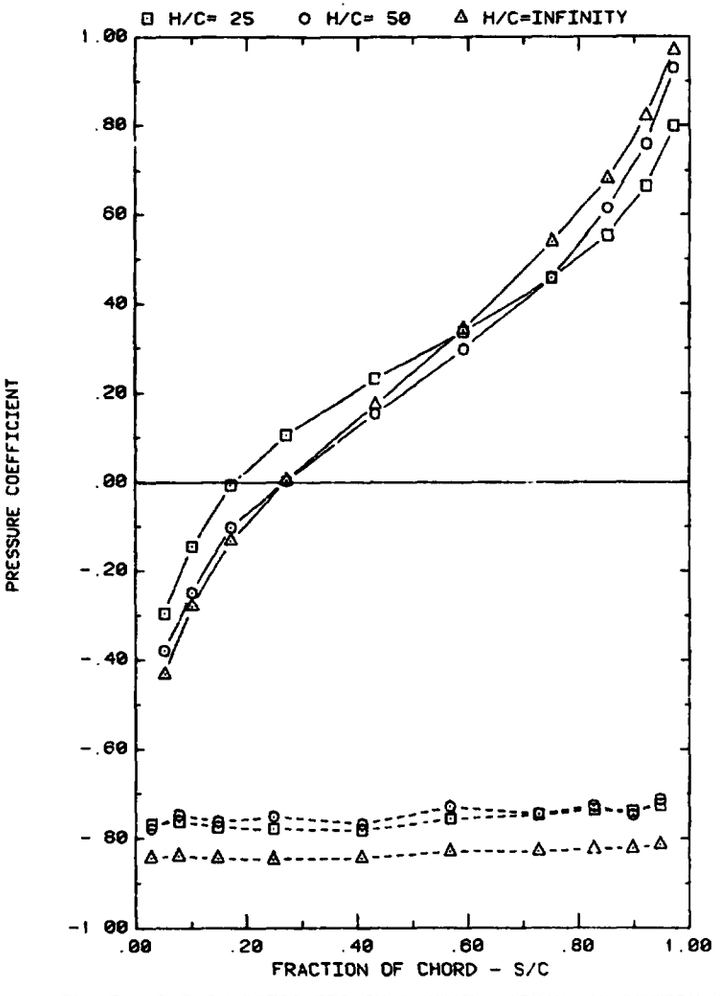
FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF ATTACK ANGLE FOR GROUND CLEARANCE, H/C = 0 25

Plot 1-1. Single Array, Uniform Flow Study Effects of Angle of Attack and Ground Clearance

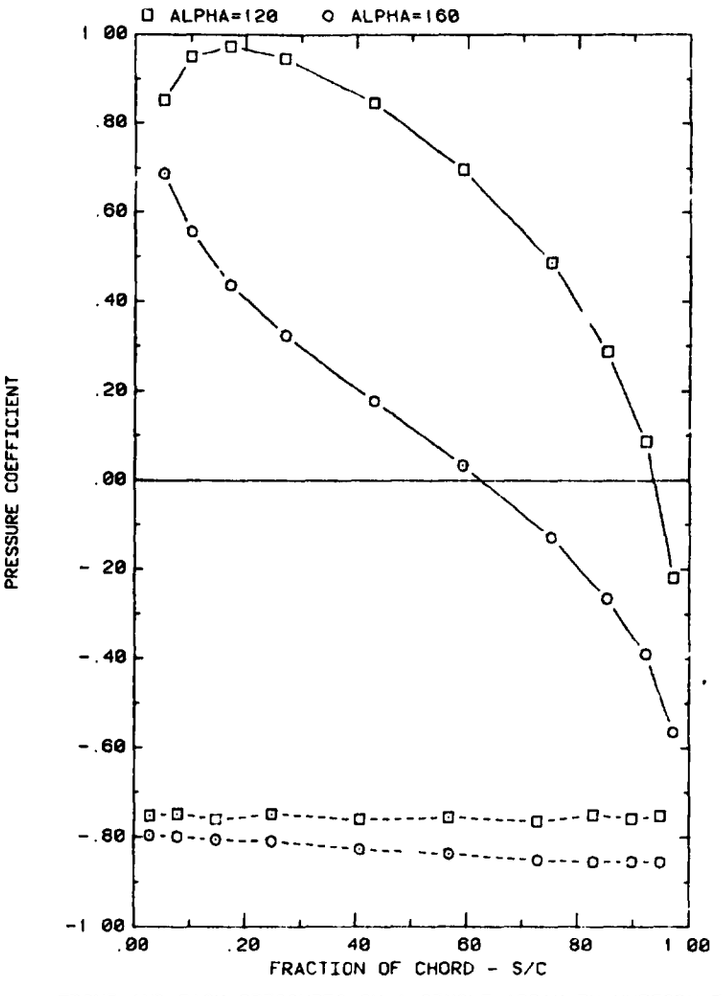




Plot 1-1. (Continued)

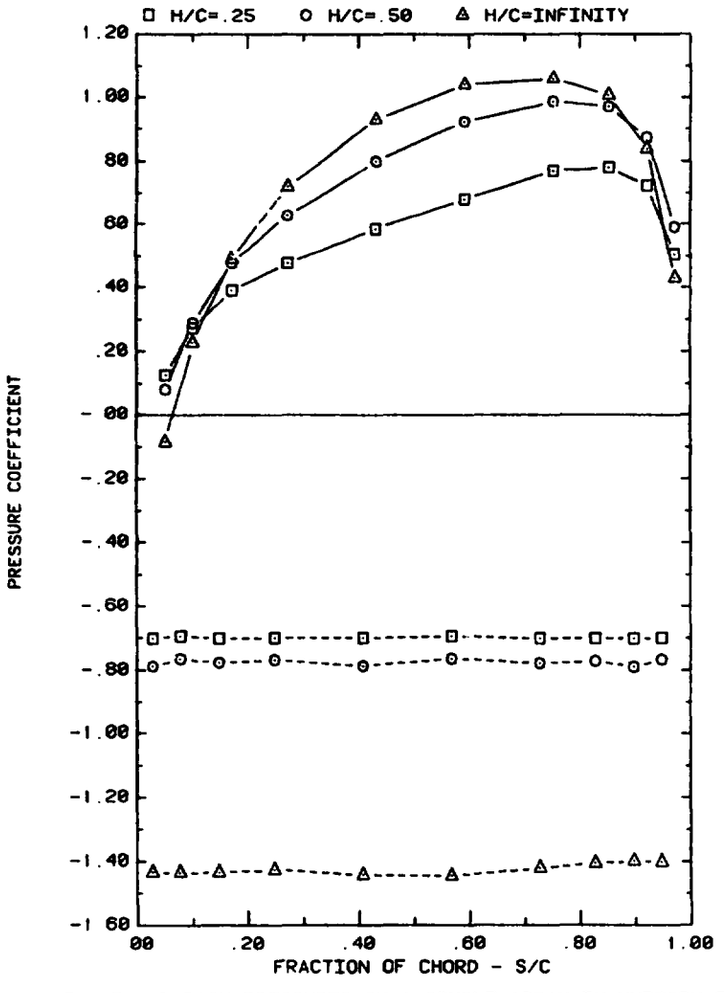


FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF GROUND CLEARANCE FOR ATTACK ANGLE, ALPHA = 20

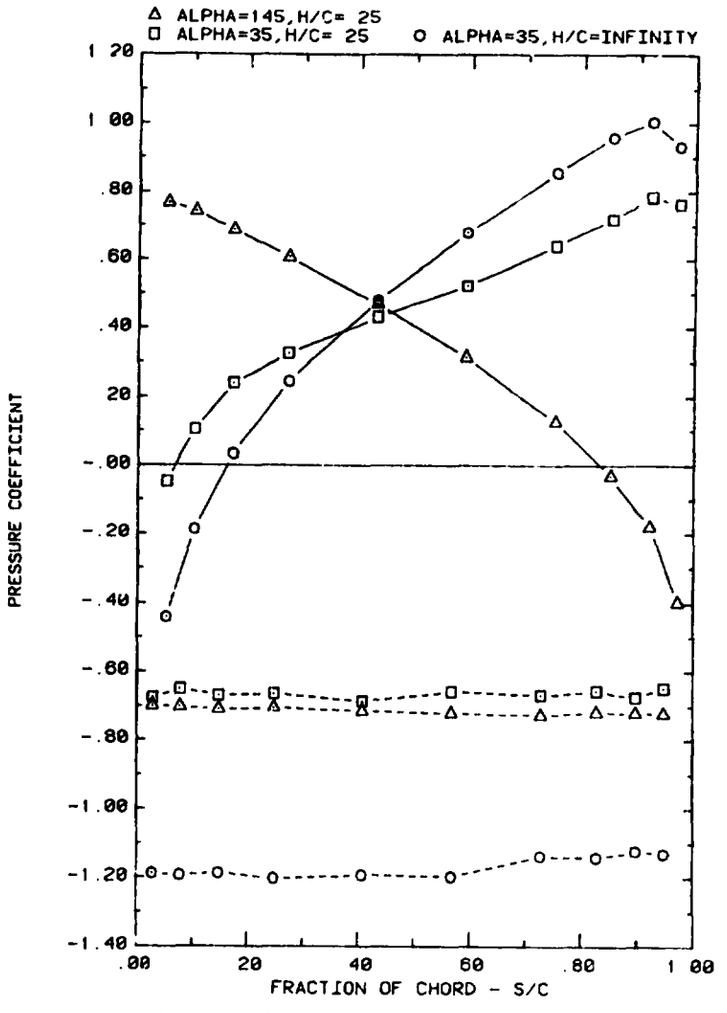


FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT ON ATTACK ANGLE FOR GROUND CLEARANCE, H/C = 0 50

Plot 1-1. (Continued)

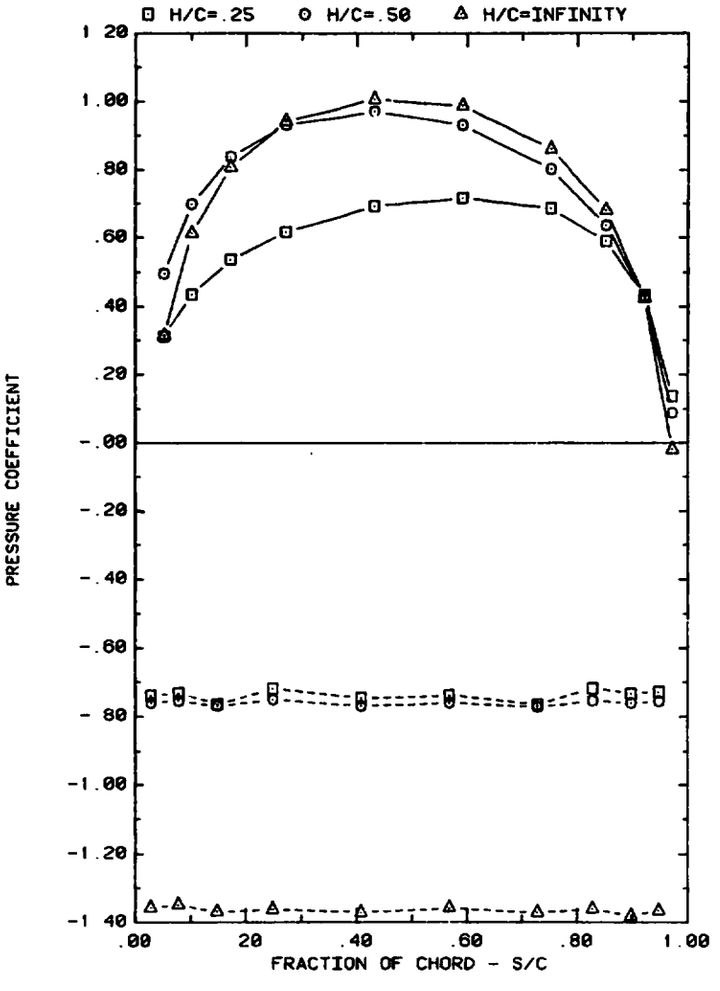


FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF GROUND CLEARANCE FOR ATTACK ANGLE, ALPHA = 60

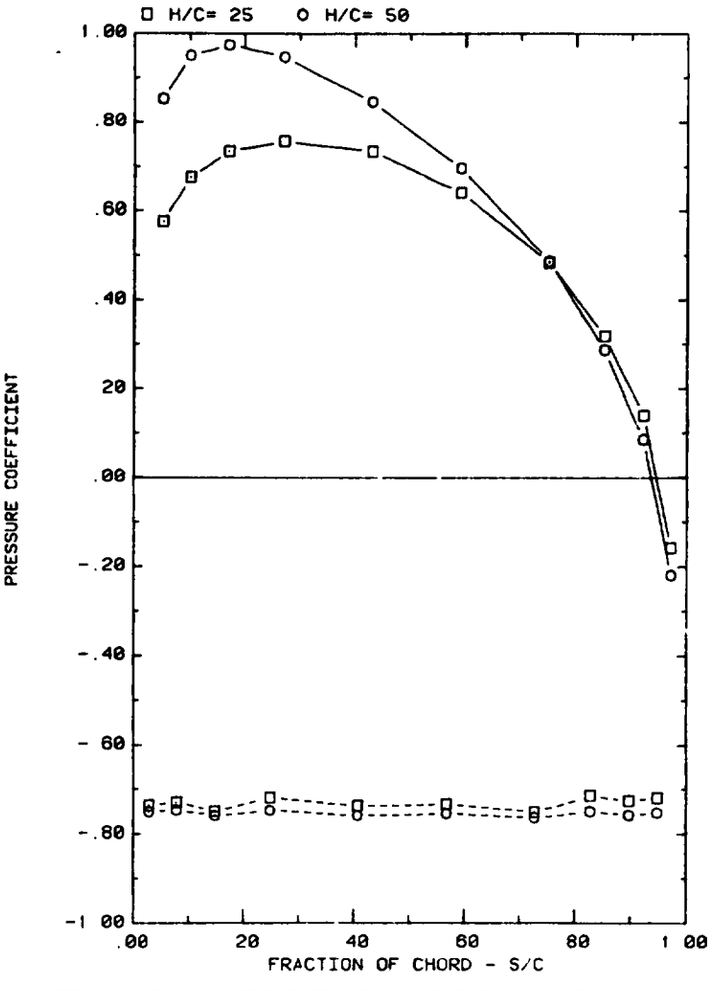


FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF GROUND CLEARANCE FOR ATTACK ANGLES

Plot 1-1. (Continued)

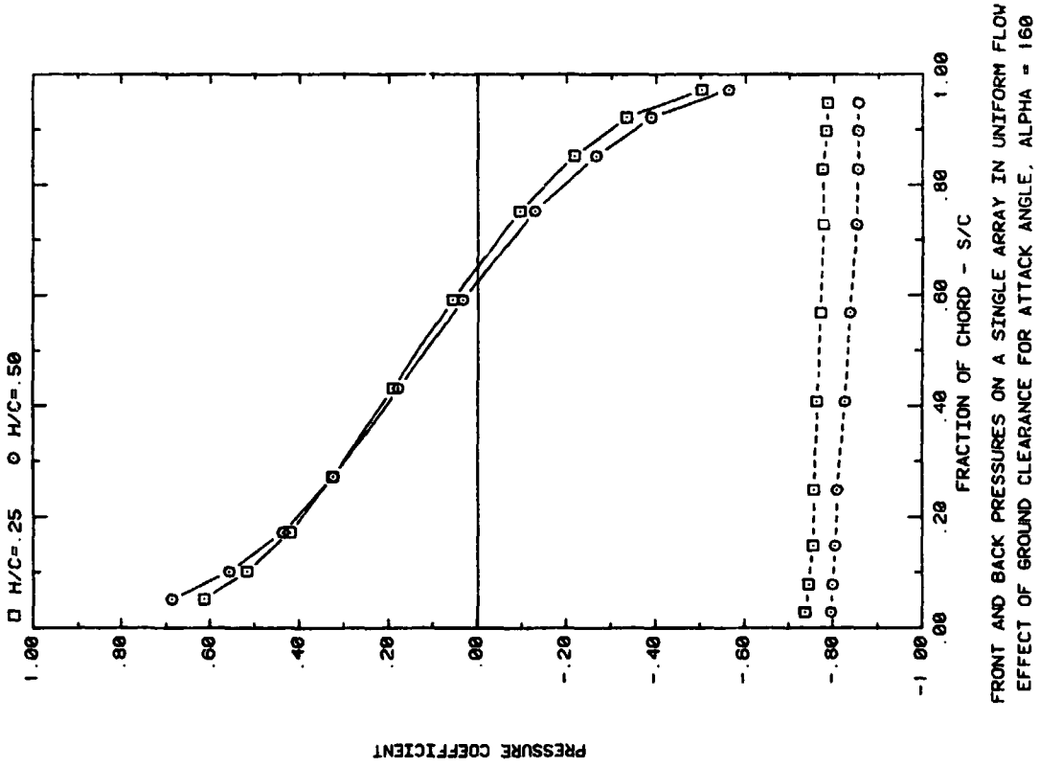


FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF GROUND CLEARANCE FOR ATTACK ANGLE, ALPHA = 90

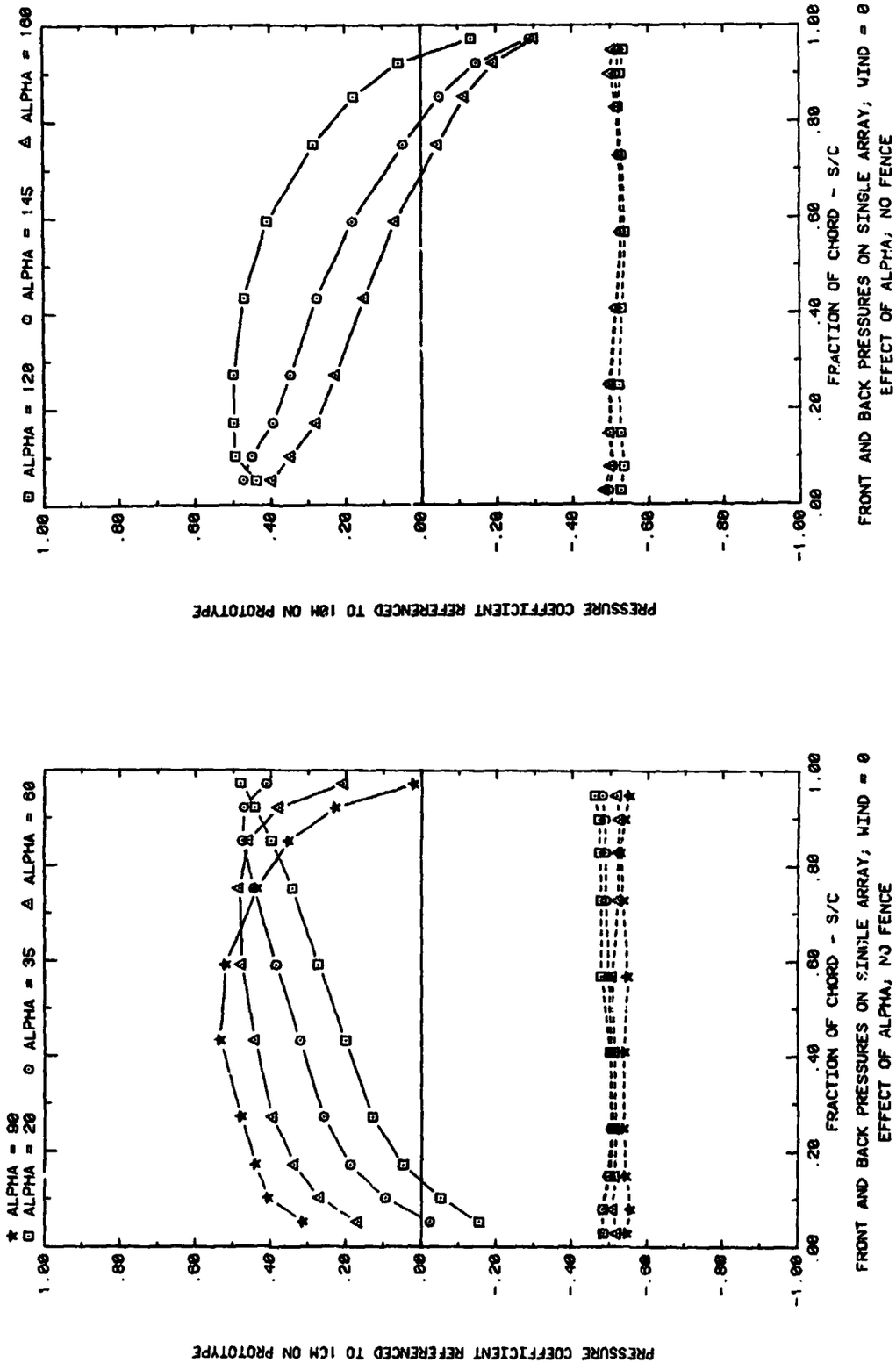


FRONT AND BACK PRESSURES ON A SINGLE ARRAY IN UNIFORM FLOW
EFFECT OF GROUND CLEARANCE FOR ATTACK ANGLE, ALPHA = 120

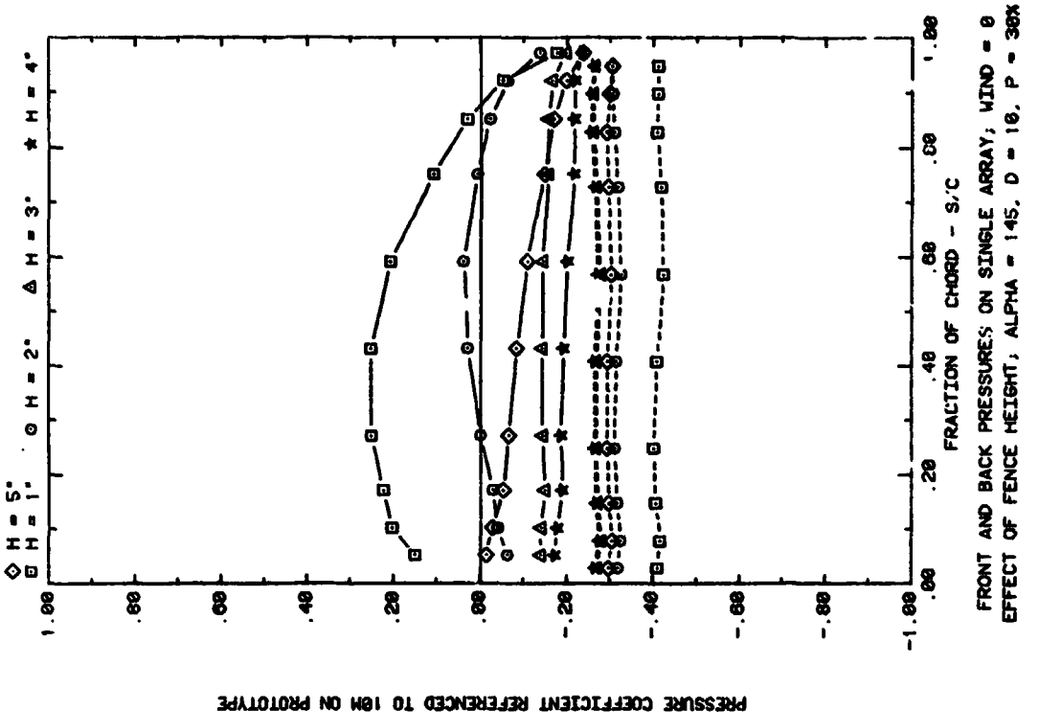
Plot 1-1. (Continued)

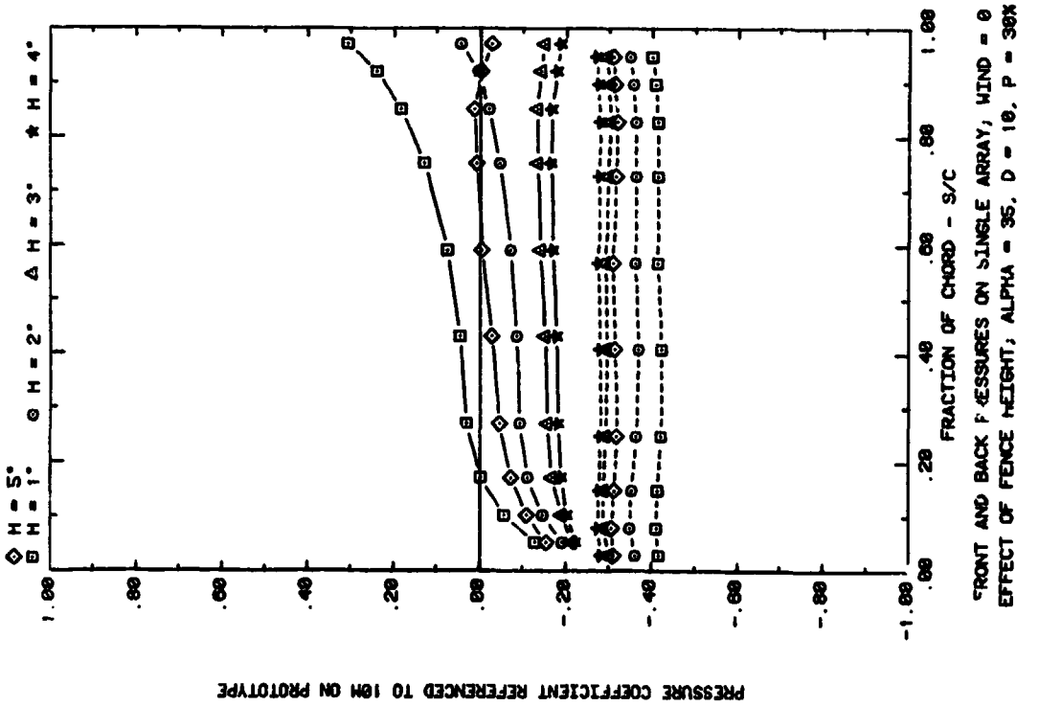


Plot 1-1. (Concluded)

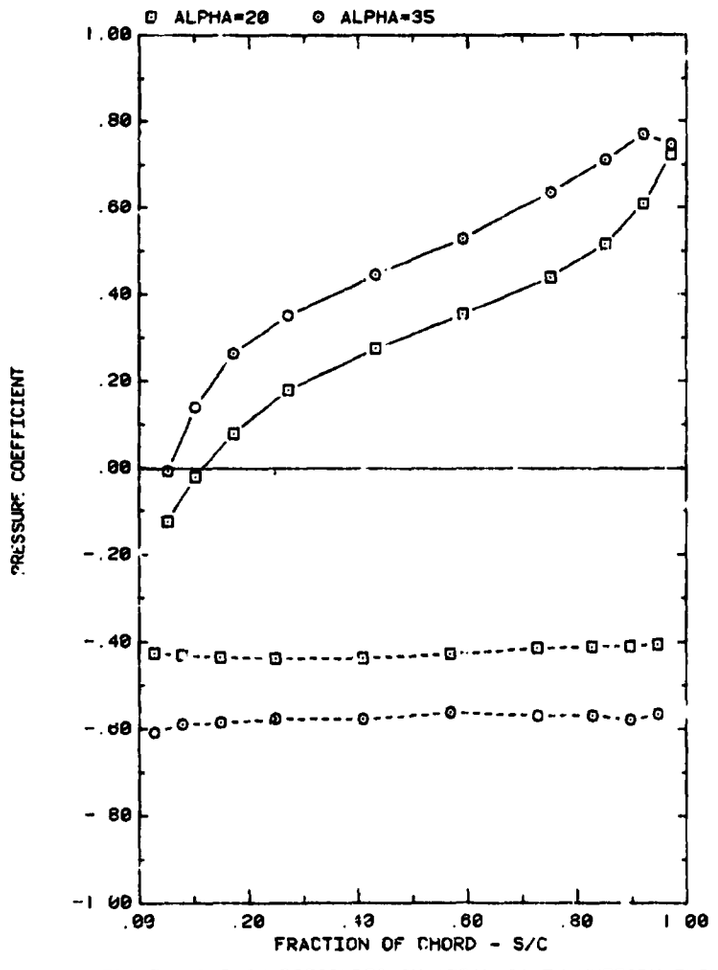


Plot 1-2. Single Array, Nonuniform Flow Study Effects of Angle of Attack and Fence Height

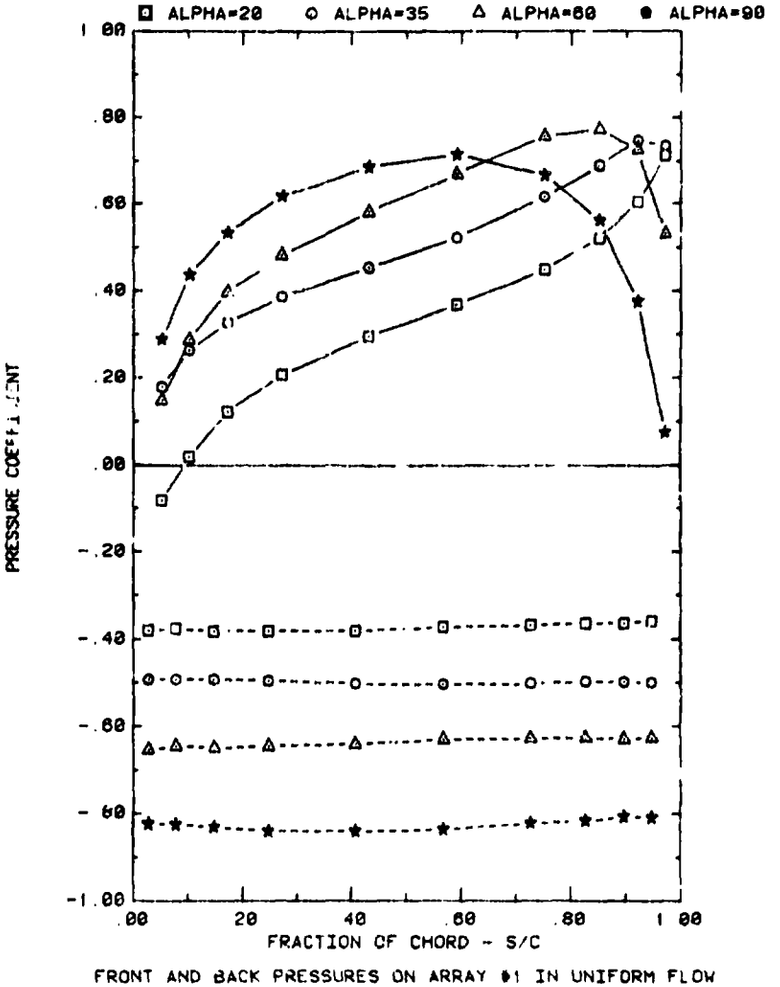




Plot 1-2. (Concluded)

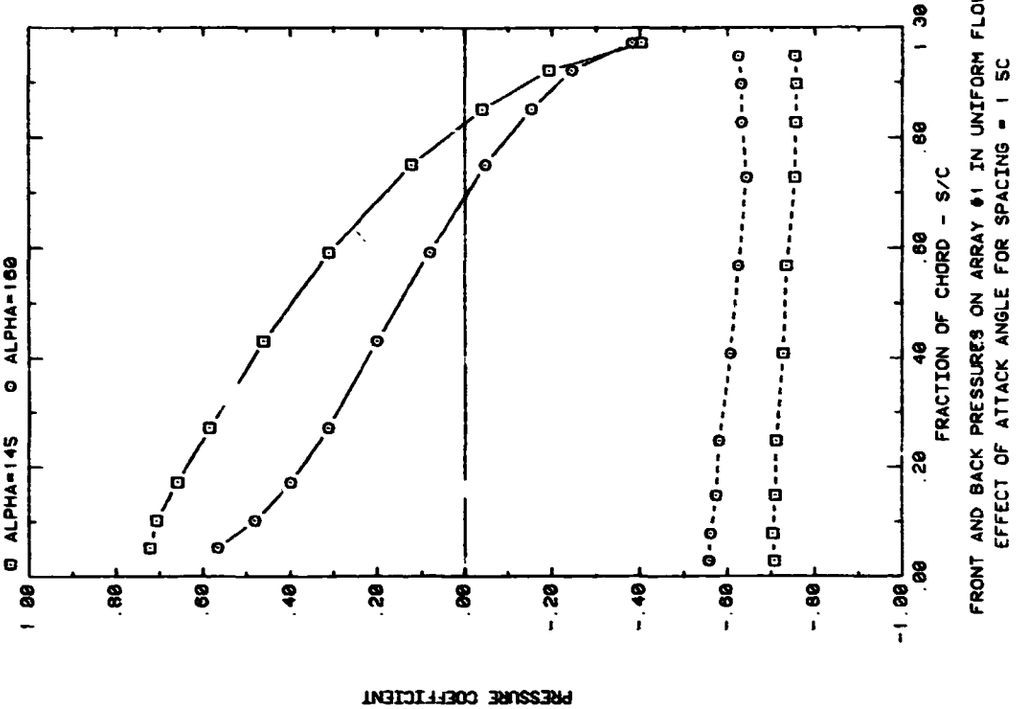


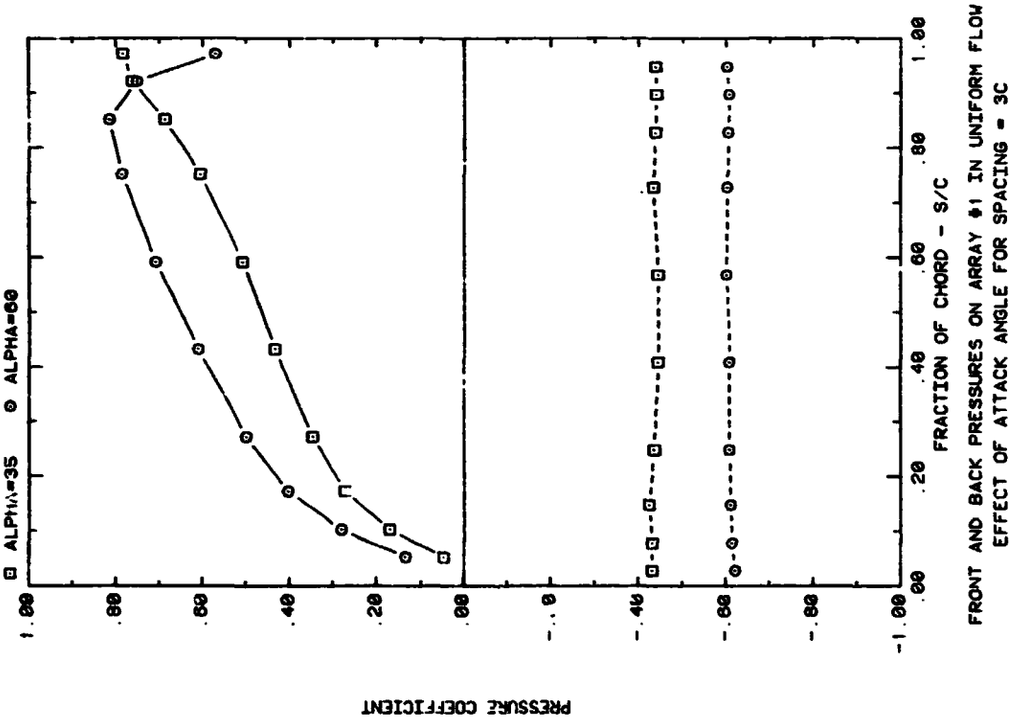
FRONT AND BACK PRESSURES ON ARRAY #1 IN UNIFORM FLOW
EFFECT OF ATTACK ANGLE FOR SPACING = 1.5C



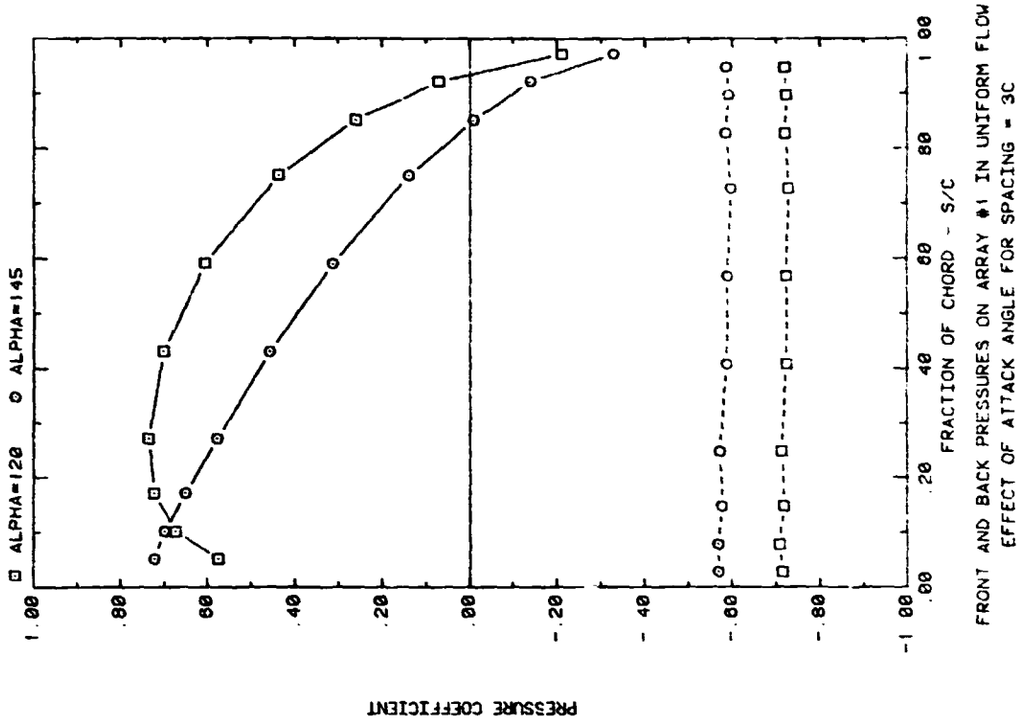
FRONT AND BACK PRESSURES ON ARRAY #1 IN UNIFORM FLOW
EFFECT OF ATTACK ANGLE FOR SPACING = 2C

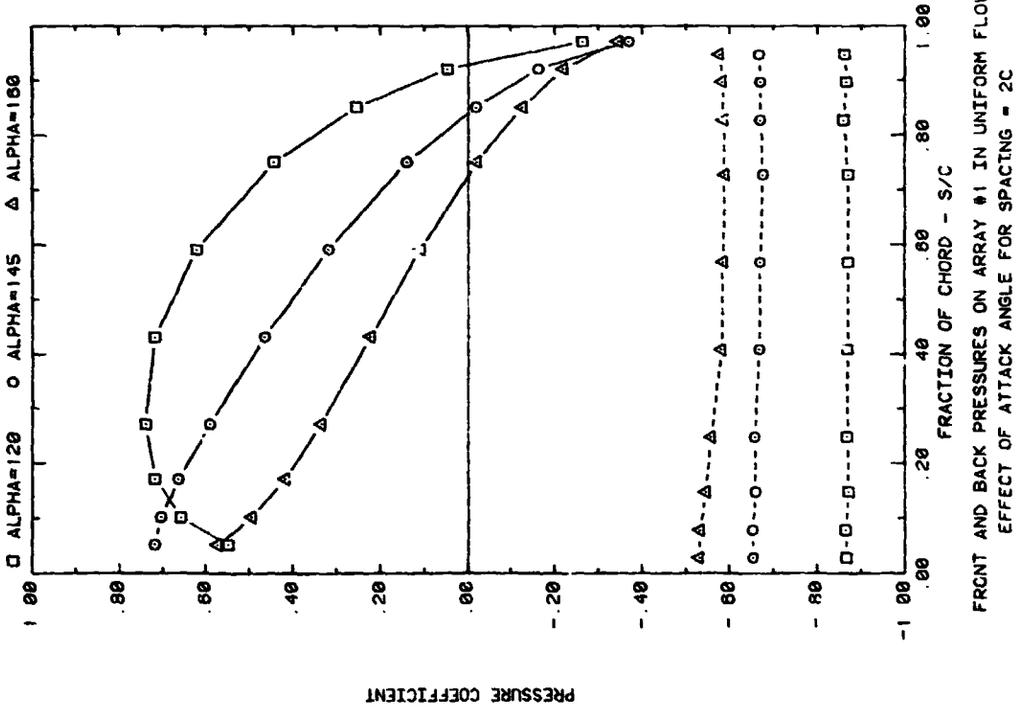
Plot 2-1-1. Multiple Arrays without Fence, Uniform Flow Study
Effect of Angle of Attack



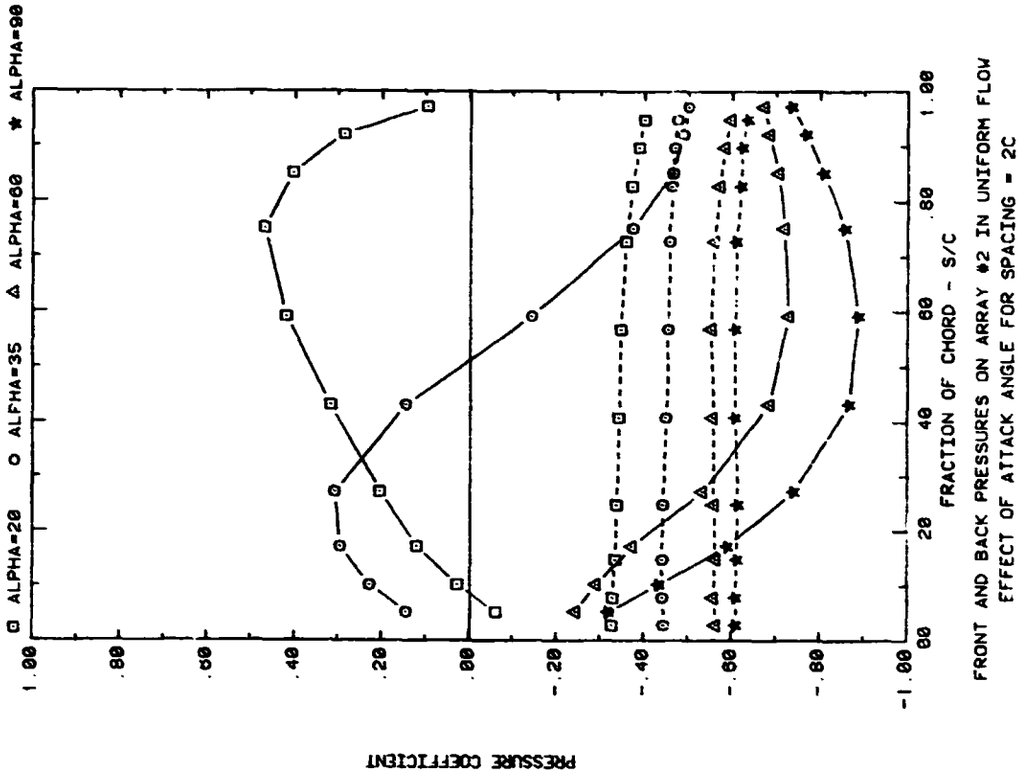


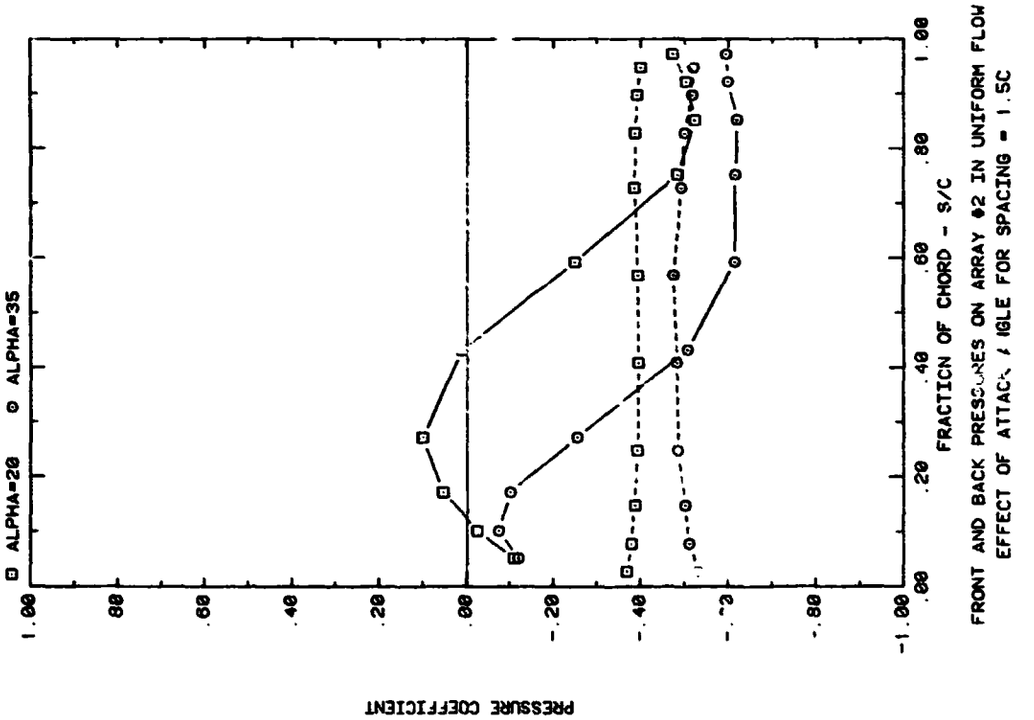
Plot 2-1-1. (Continued)



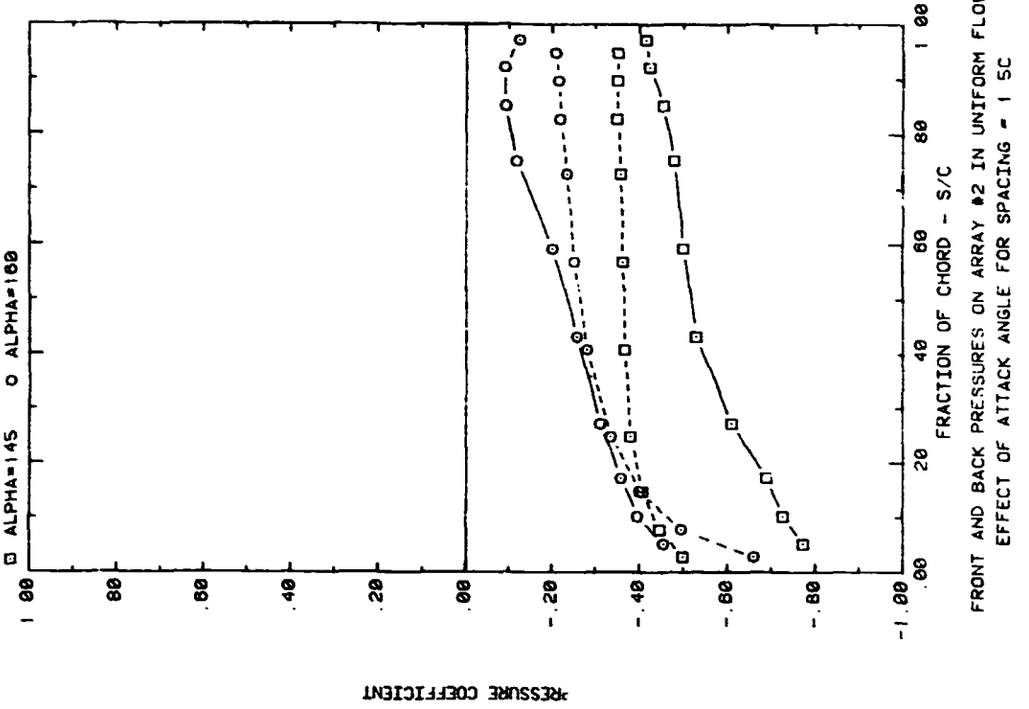


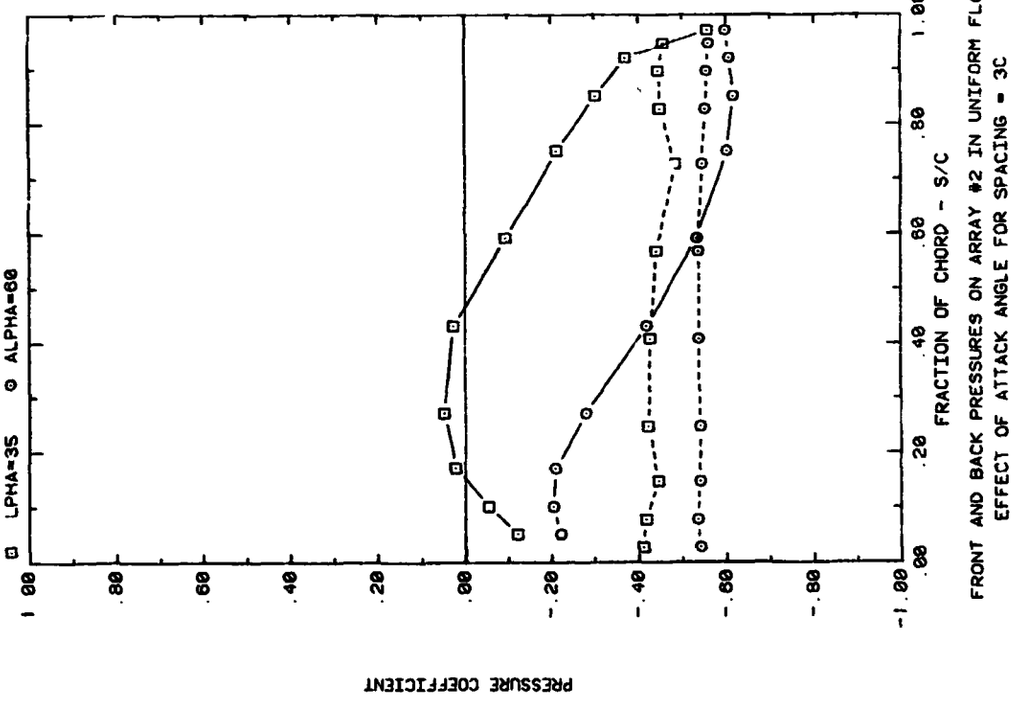
Plot 2-1-1. (Continued)



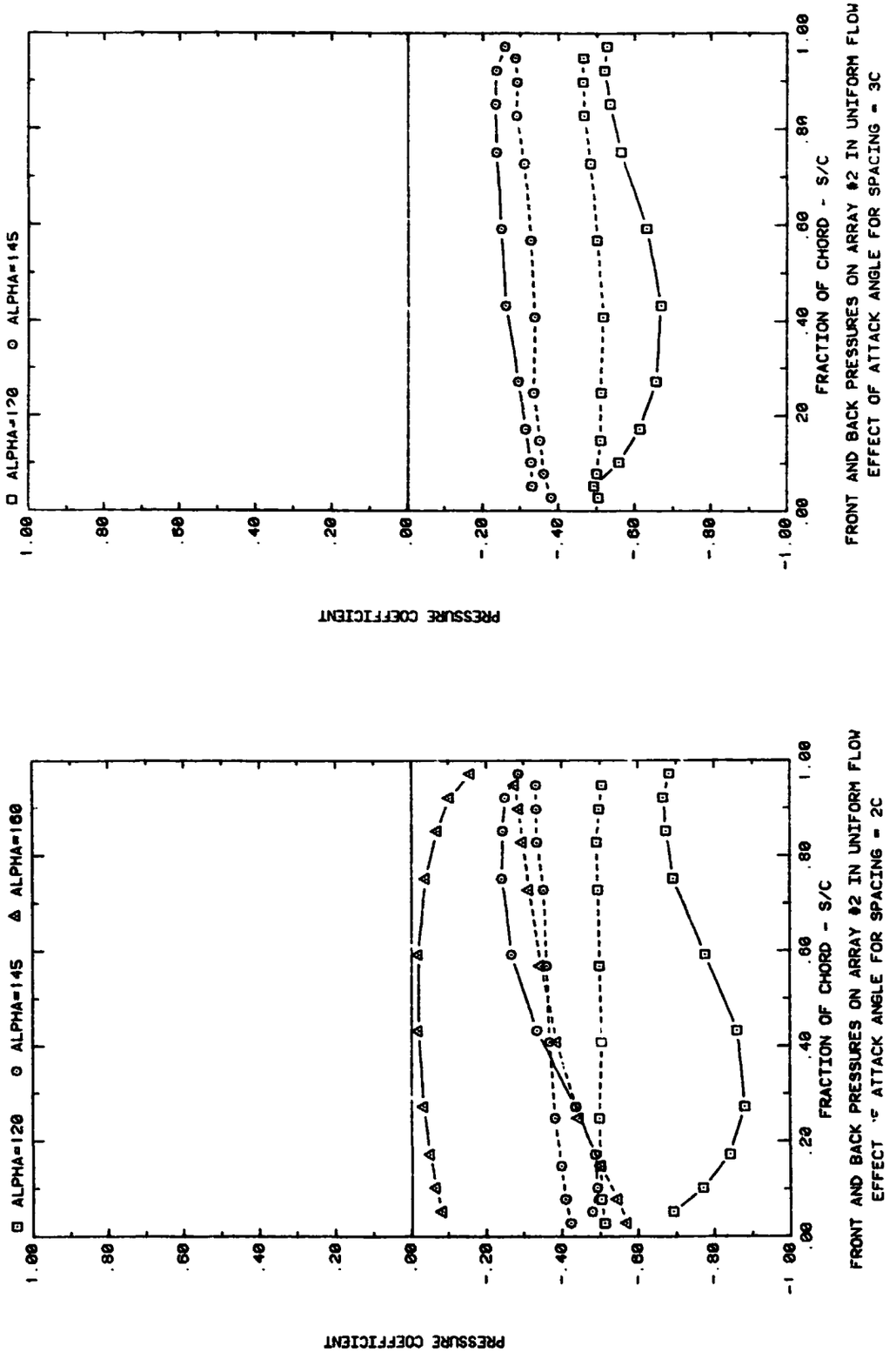


Plot 2-1-1. (Continued)

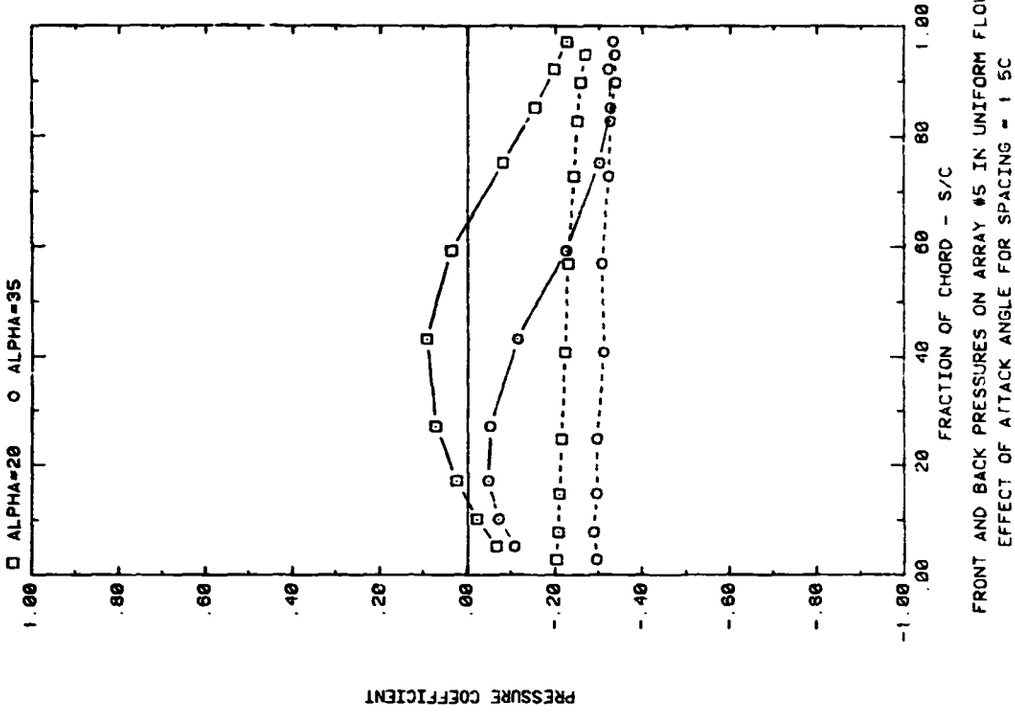


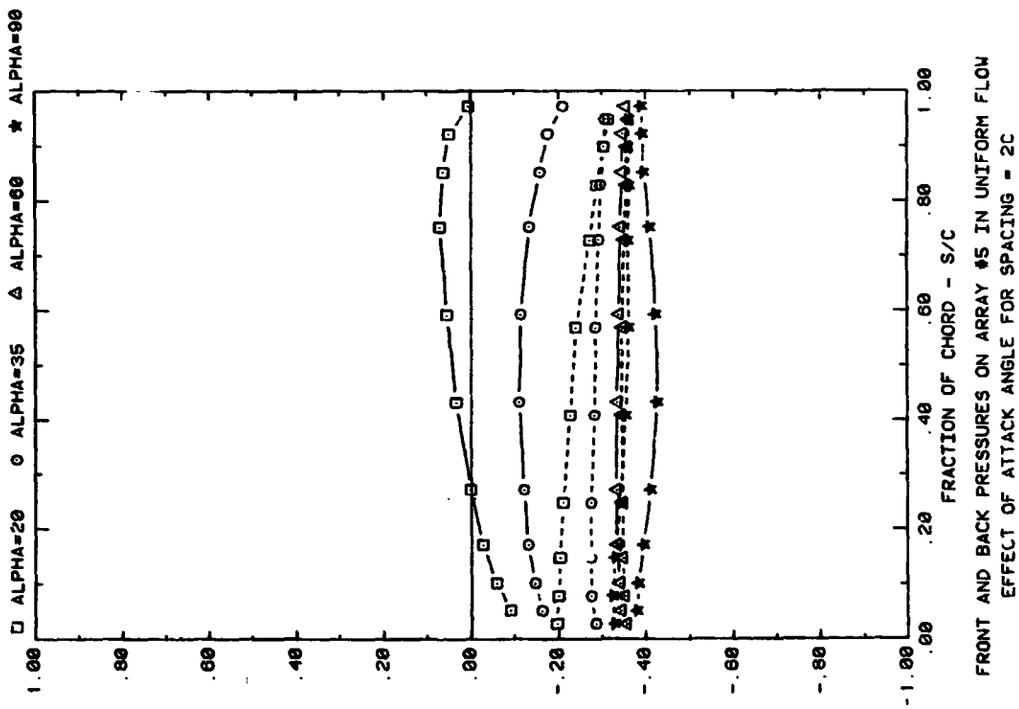


Plot 2-1-1. (Continued)

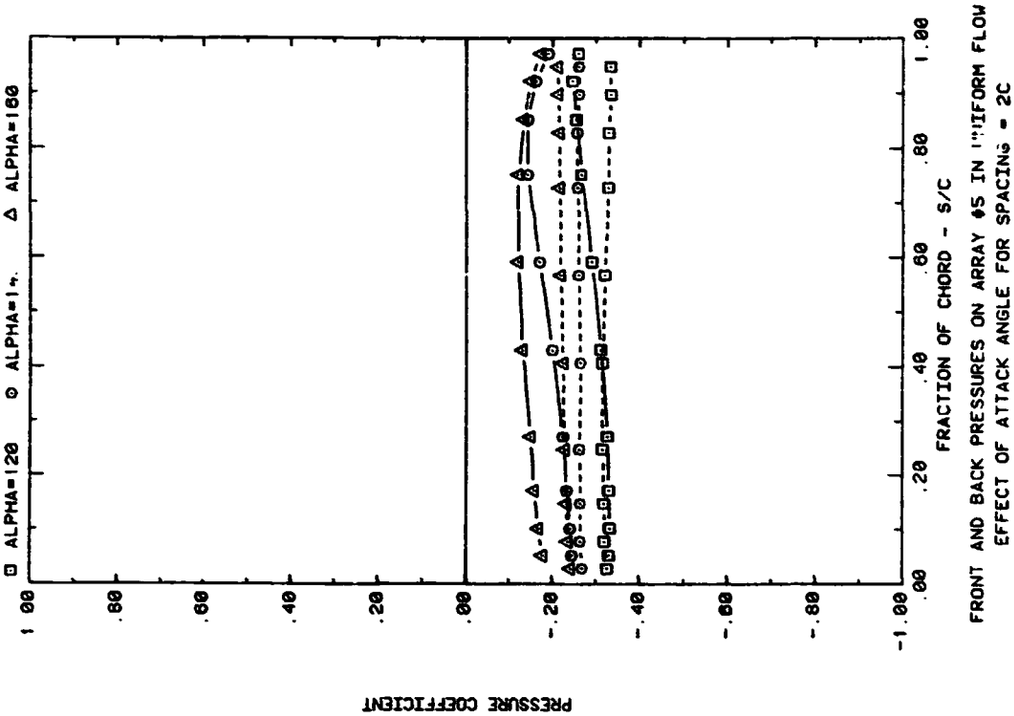


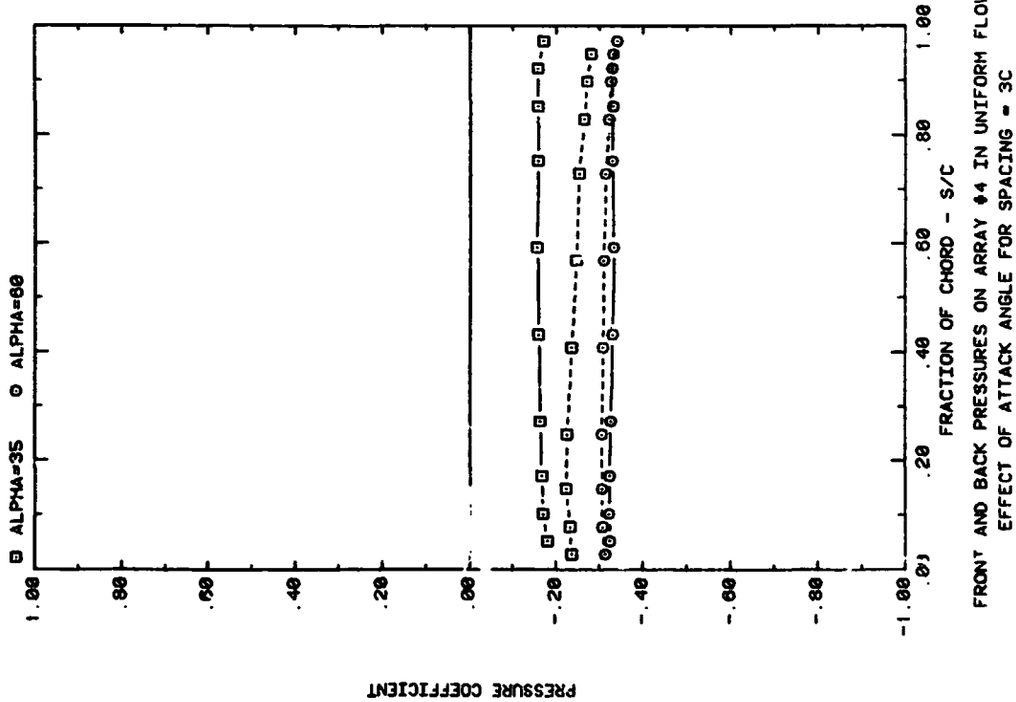
Plot 2-1-1. (Continued)



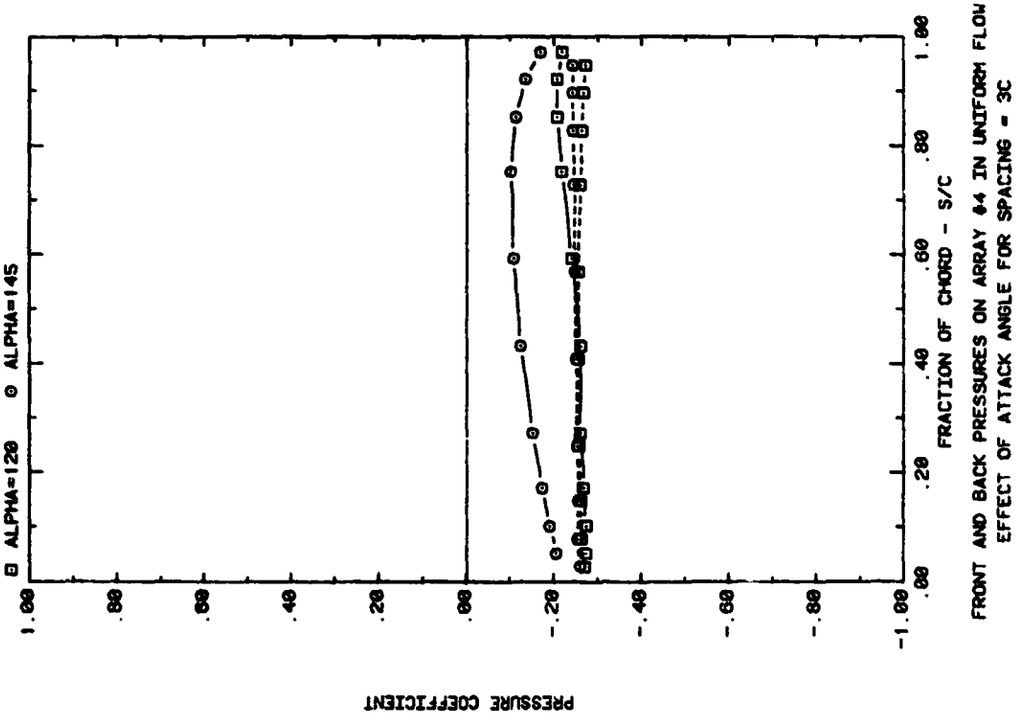


Plot 2-1-1. (Continued)

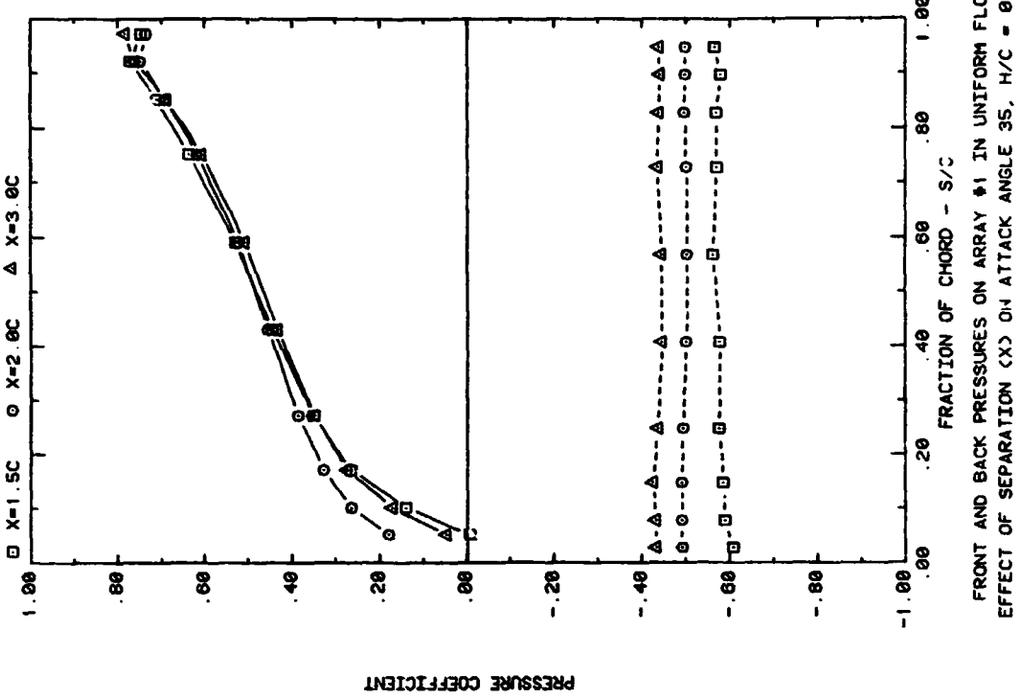


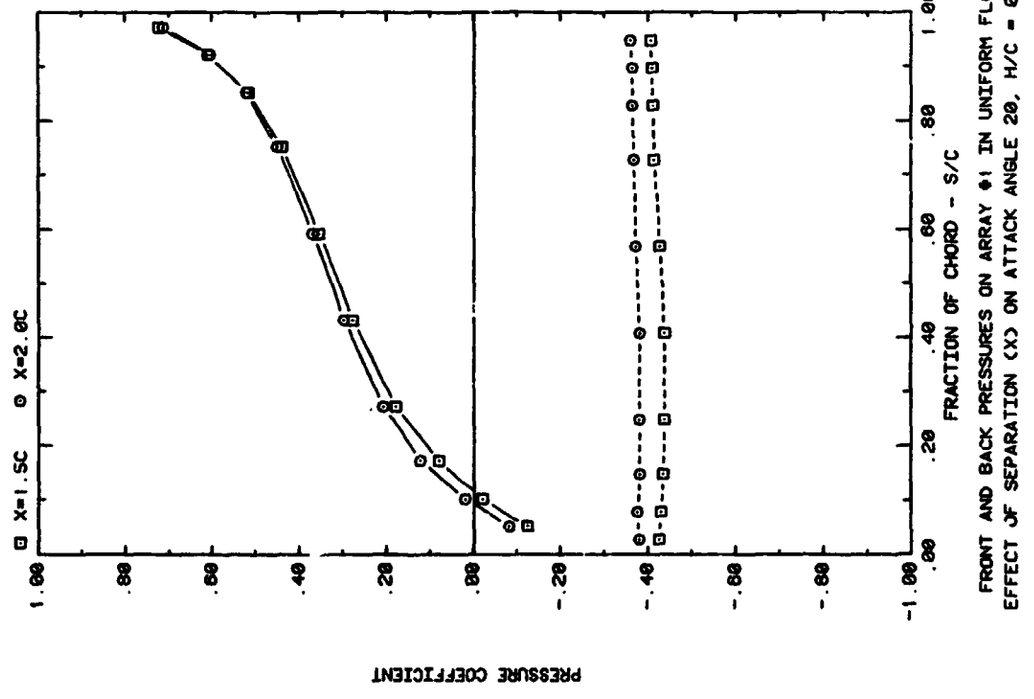


Plot 2-1-1. (Continued)

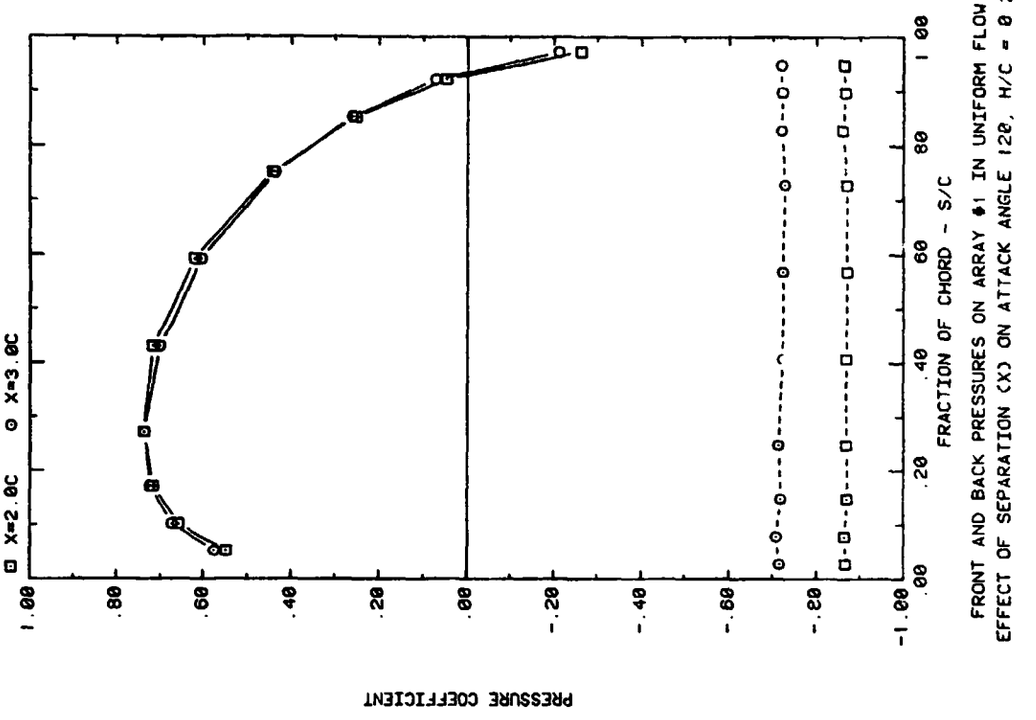


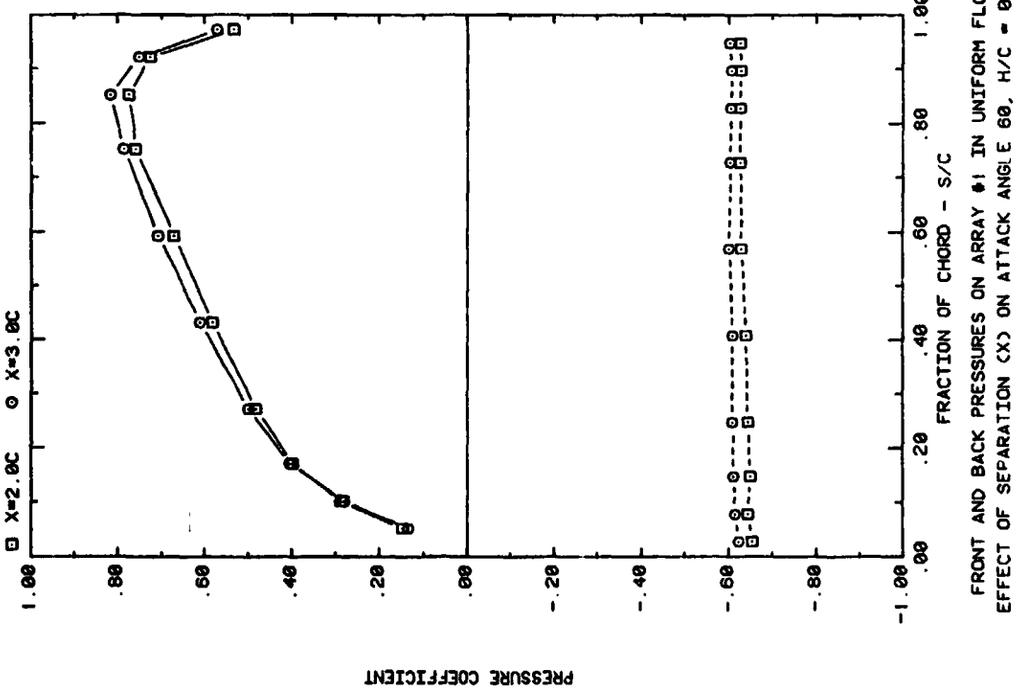
Plot 2-1-1. (Concluded)



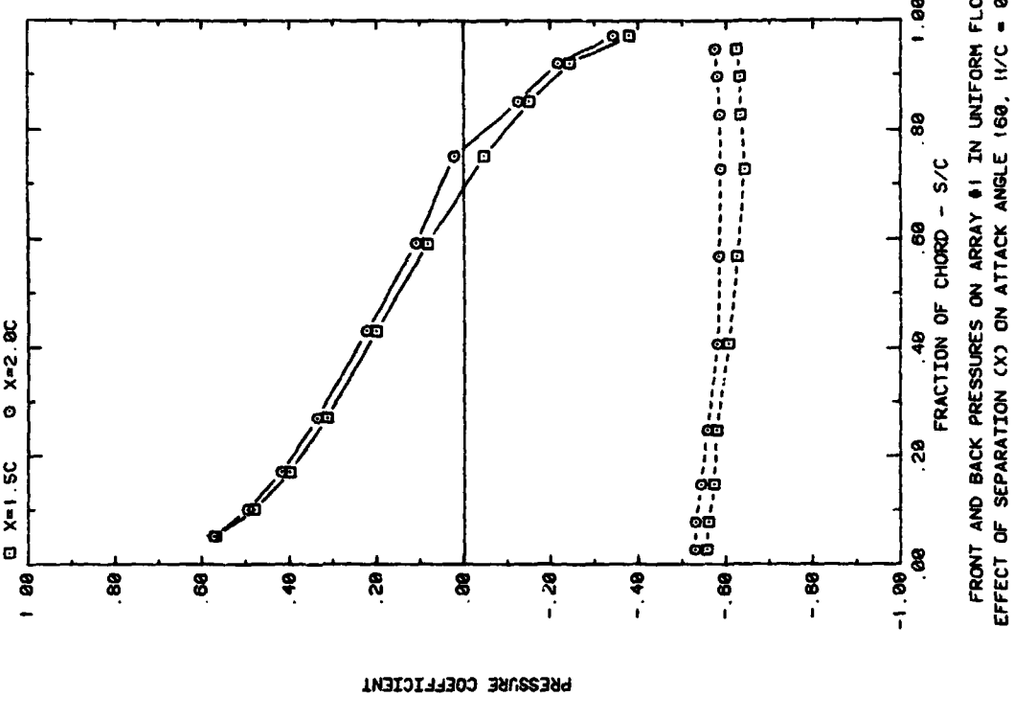


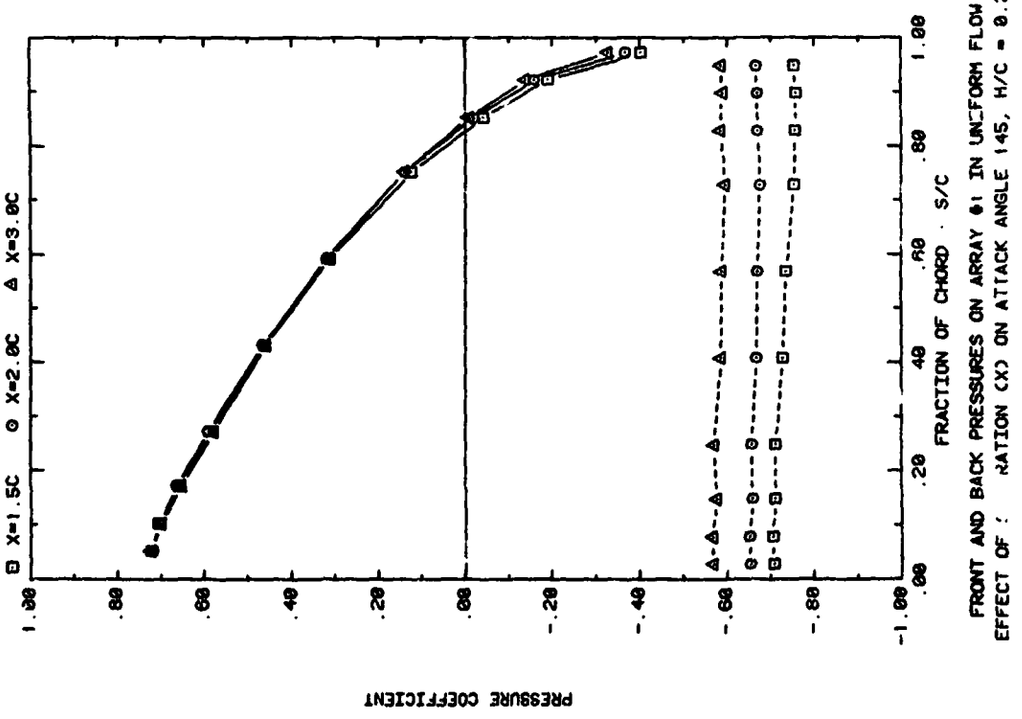
Plot 2-1-2. Multiple Arrays without Fence, Uniform Flow Study
Effect of Separation Distance



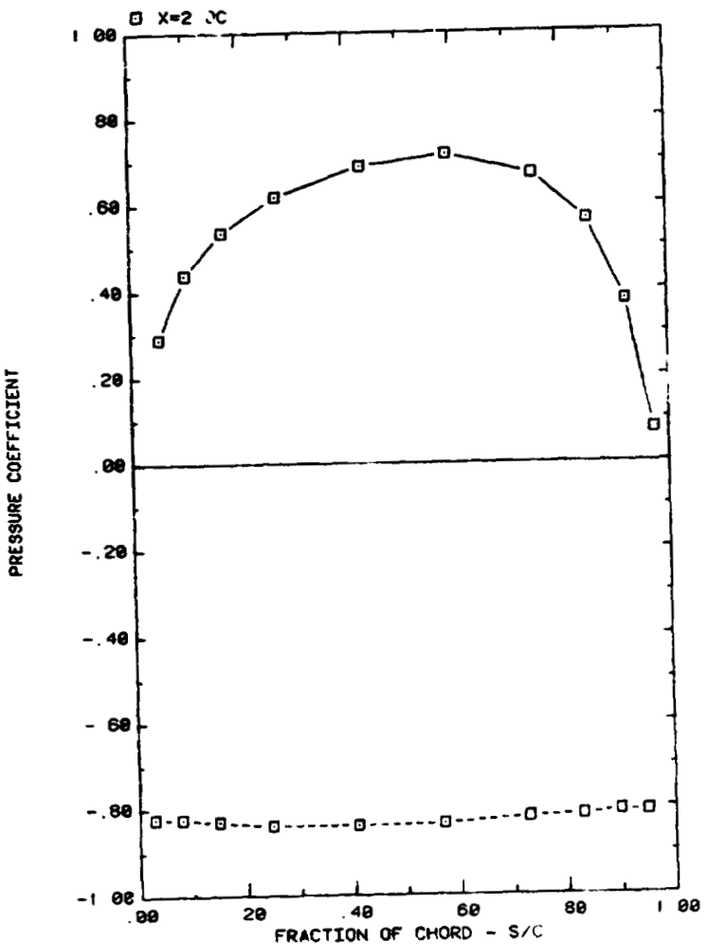


Plot 2-1-2. (Continued)

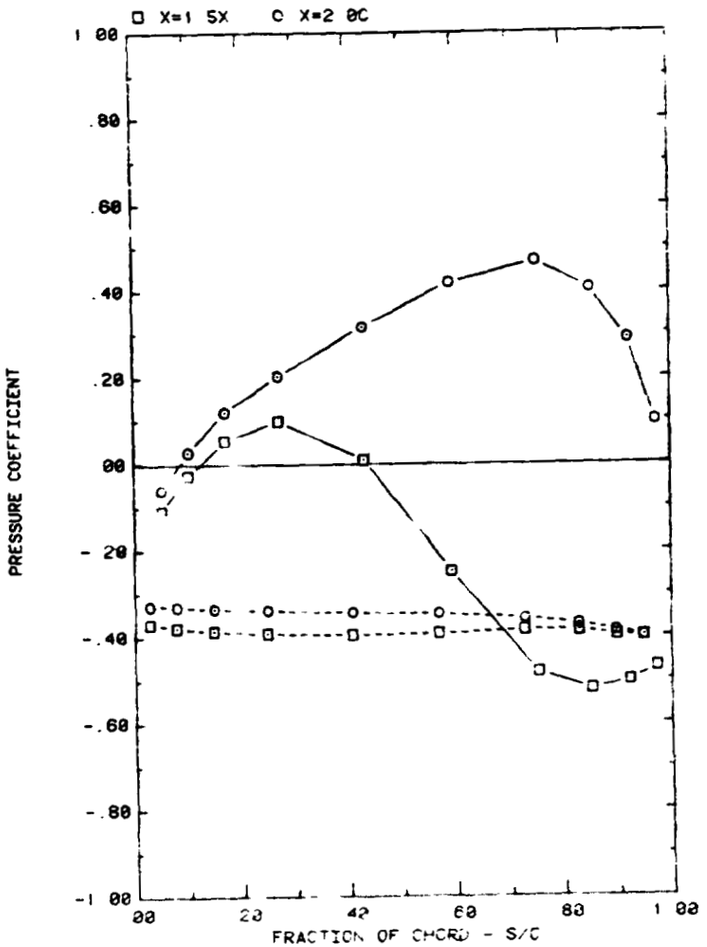




Plot 2-1-2. (Continued)

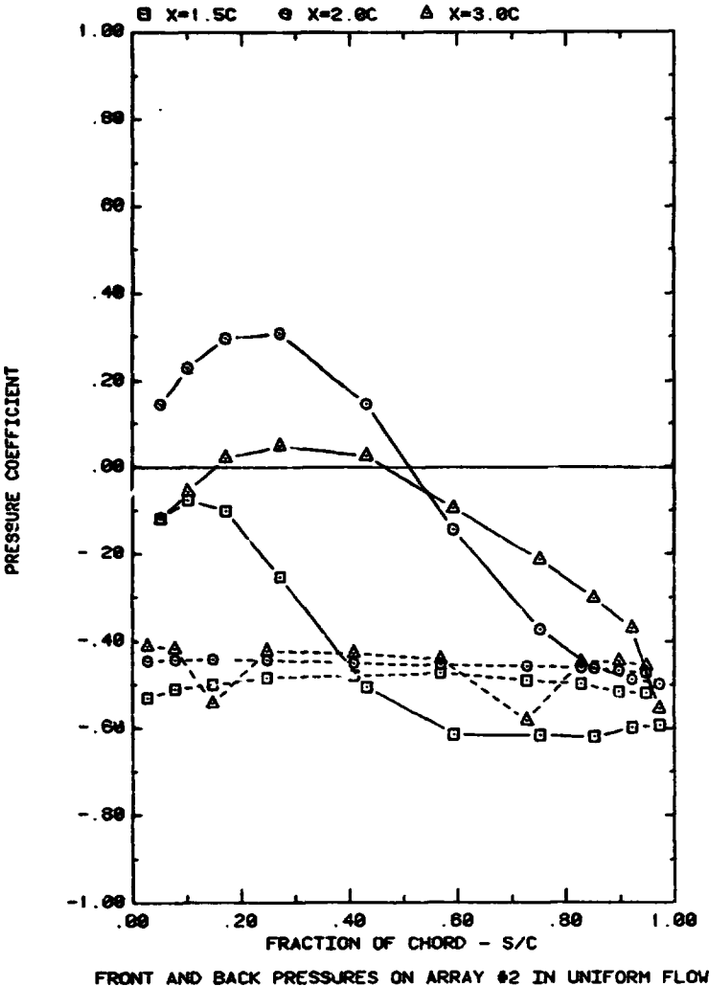


FRONT AND BACK PRESSURES ON ARRAY #1 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTTACK ANGLE 90, H/C = 0 25

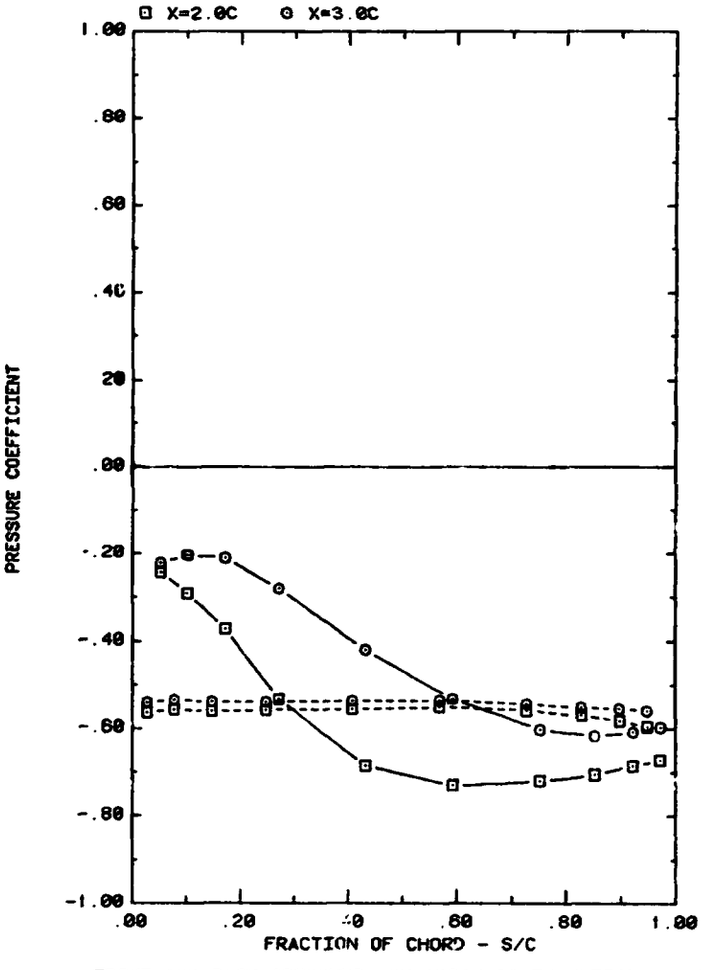


FRONT AND BACK PRESSURES ON ARRAY #2 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 2[illegible] H/C = 0 25

Plot 2-1-2. (Continued)

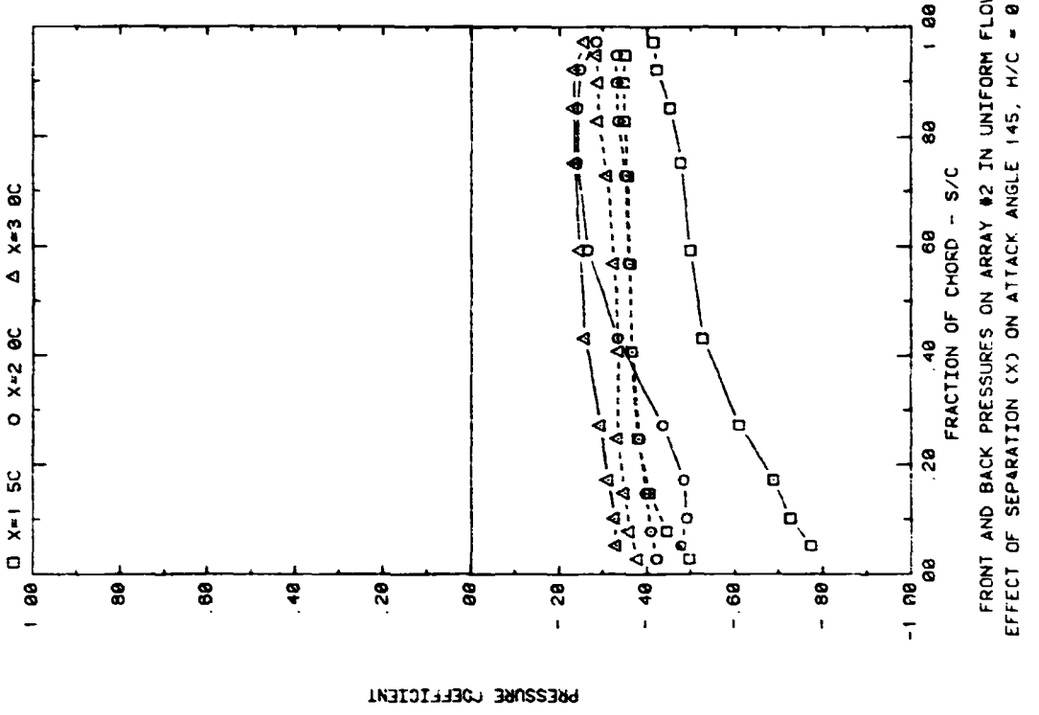


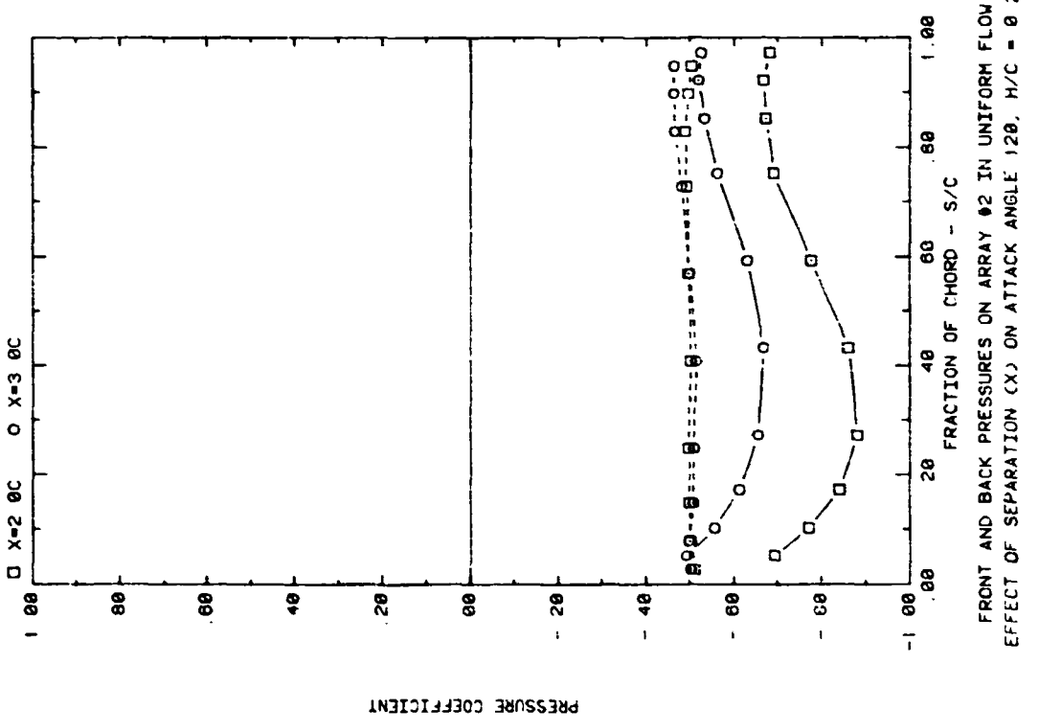
FRONT AND BACK PRESSURES ON ARRAY #2 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 35, H/C = 0.25



FPONT AND BACK PRESSURES ON ARRAY #2 IN UNIFORM FLOW
EFFECT OF SEPAR ON (X) ON ATTACK ANGLE 60, H/C = 0.25

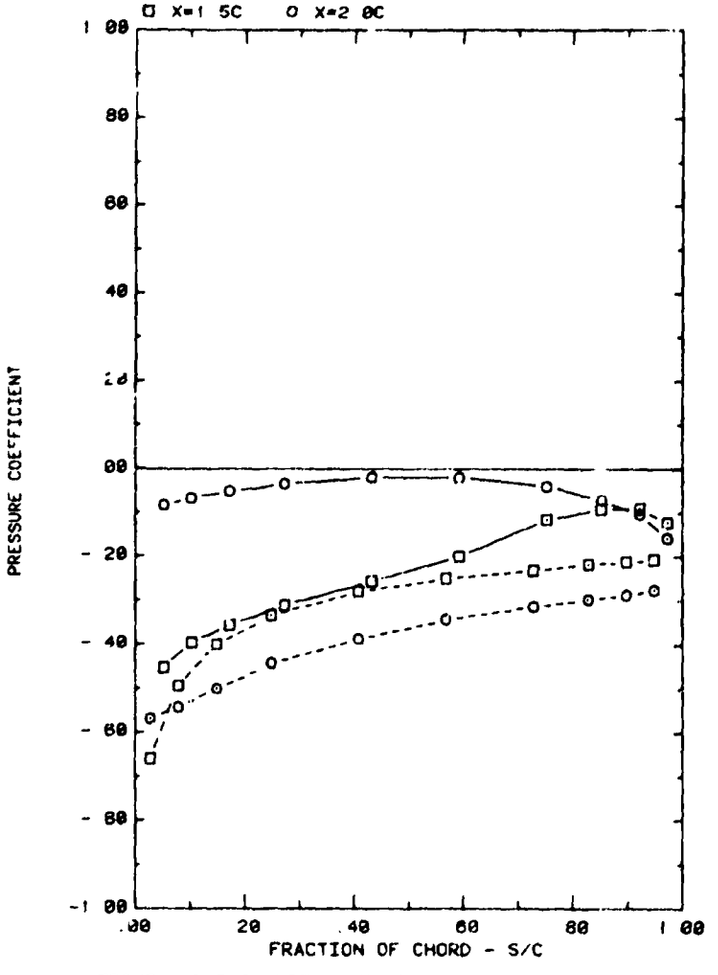
Plot 2-1-2. (Continued)



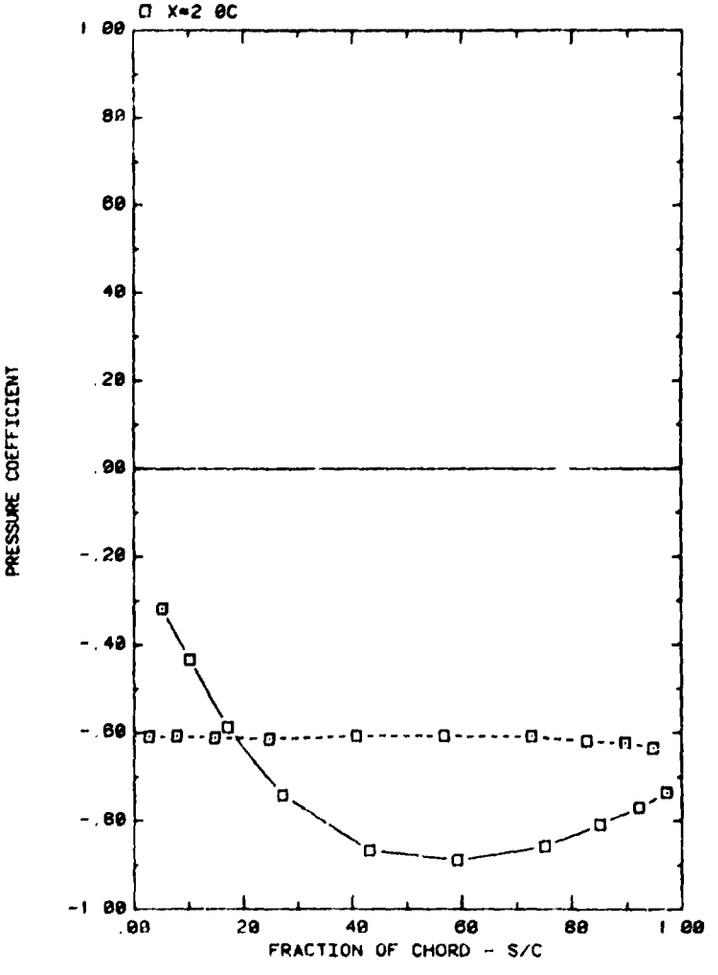


Plot 2-1-2. (Continued)

C 4

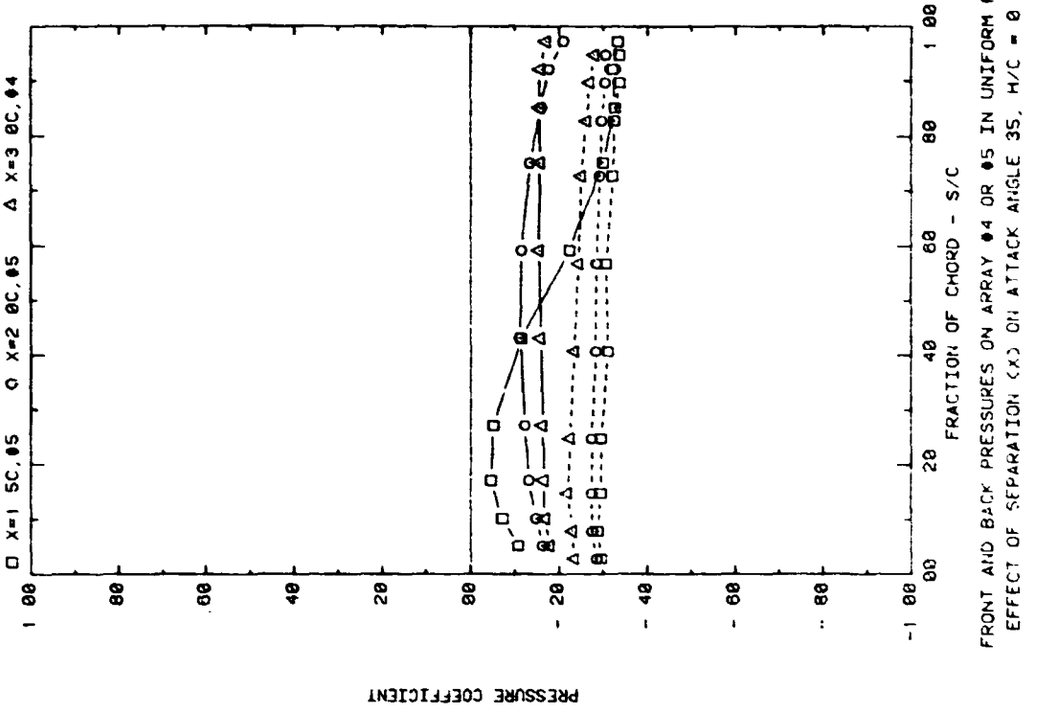


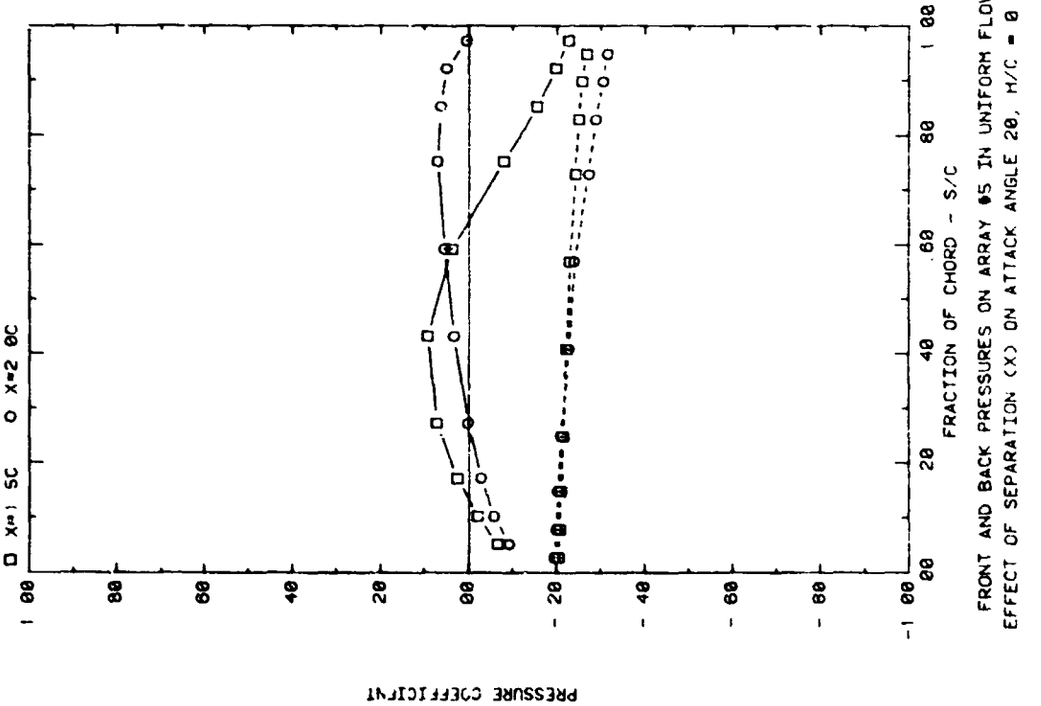
FRONT AND BACK PRESSURES ON ARRAY #2 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 160, H/C = 0 25



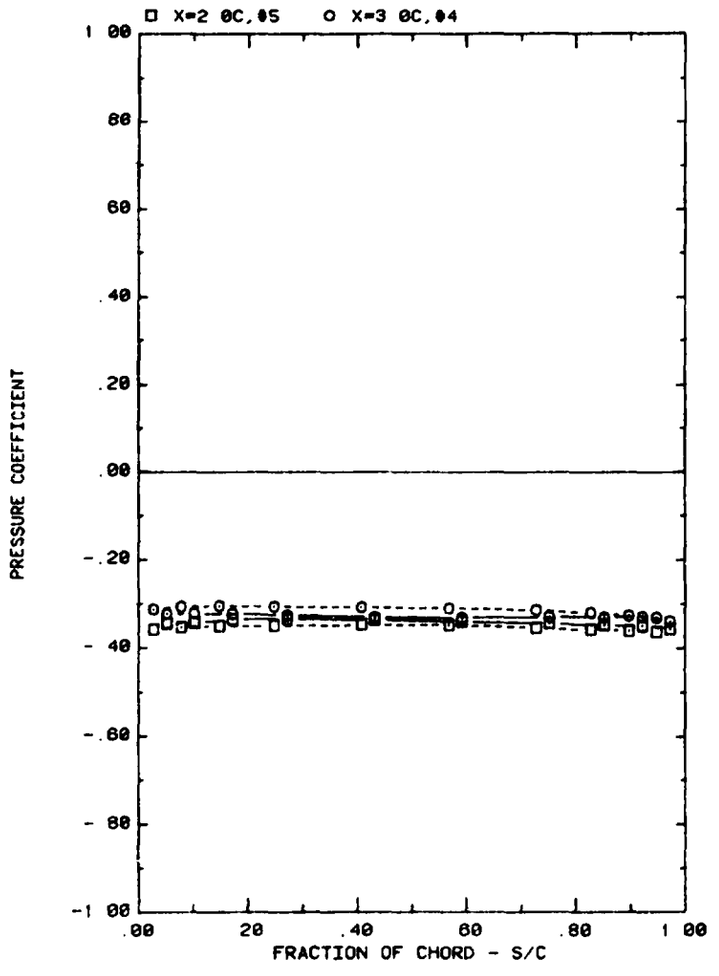
FRONT AND BACK PRESSURES ON ARRAY #2 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTTACK ANGLE 90, H/C = 0 25

Plot 2-1-2. (Continued)

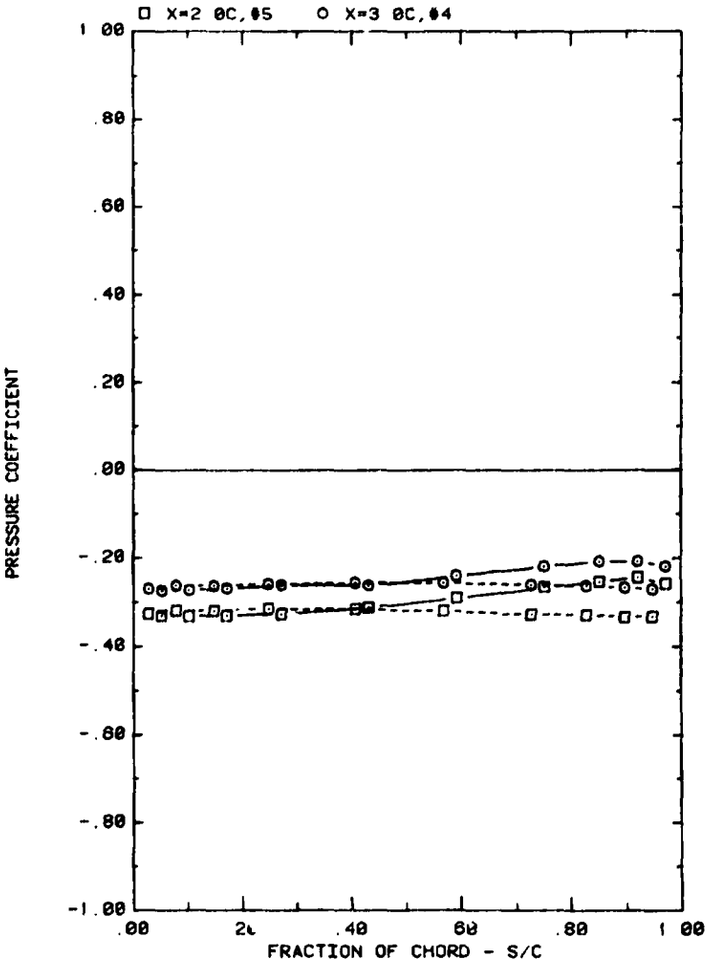




Plot 2-1-2. (Continued)

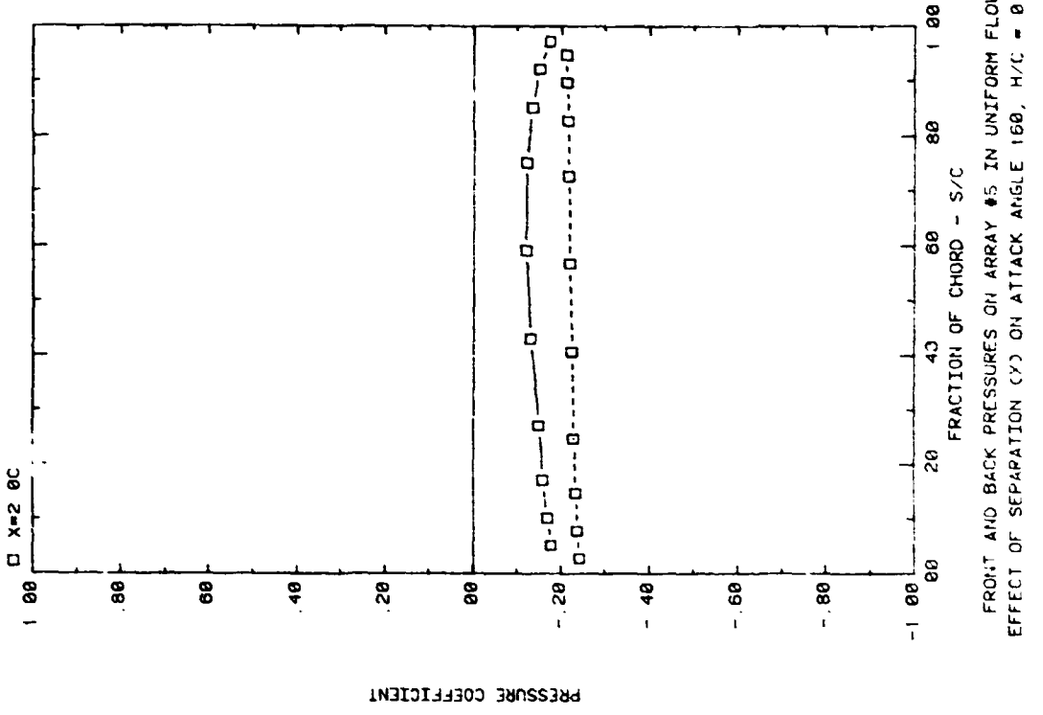


FRONT AND BACK PRESSURES ON ARRAY #4 OR #5 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 80, H/C = 0.25

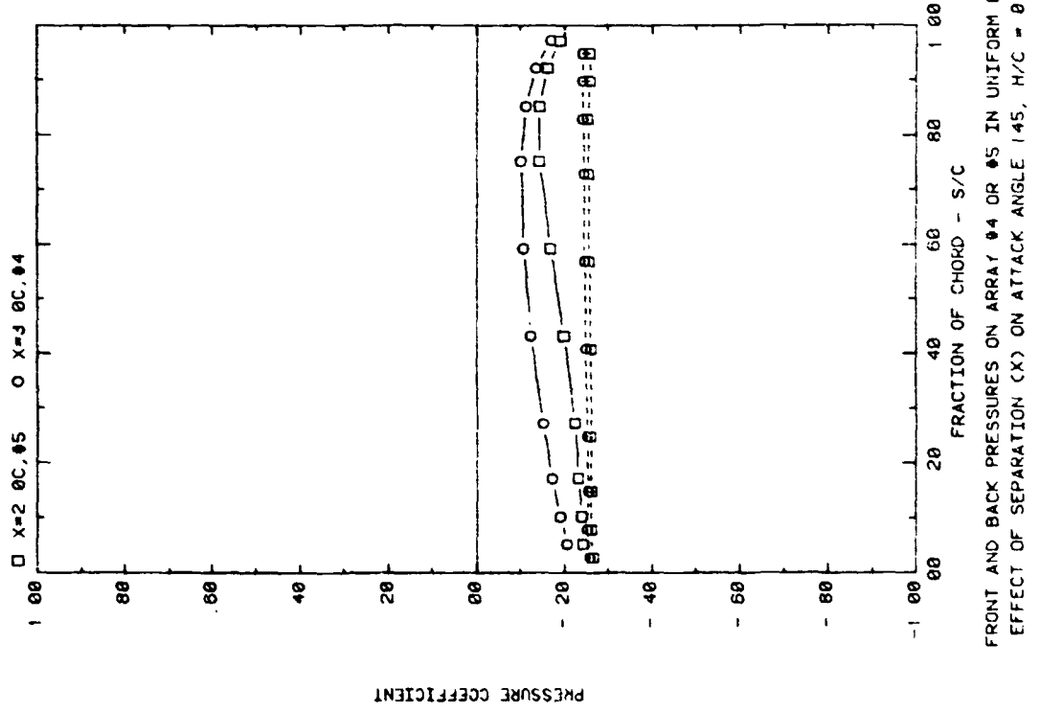


FRONT AND BACK PRESSURES ON ARRAY #4 OF #5 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 120, H/C = 0.25

Plot 2-1-2. (Continued)

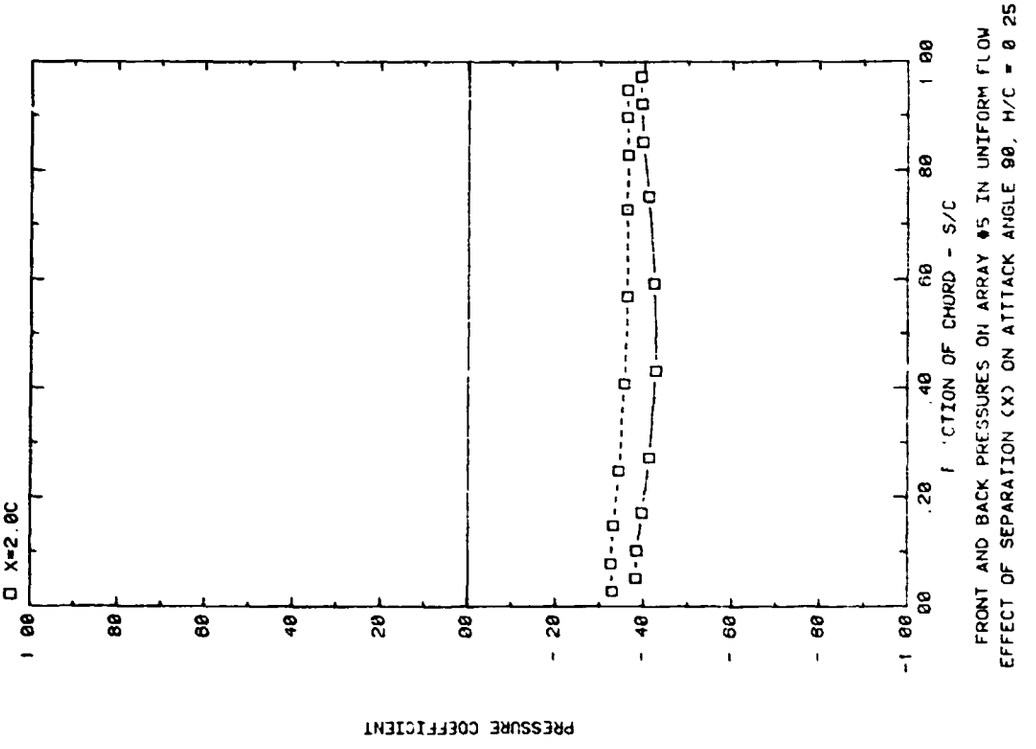


FRONT AND BACK PRESSURES ON ARRAY #5 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 160, H/C = 0 25



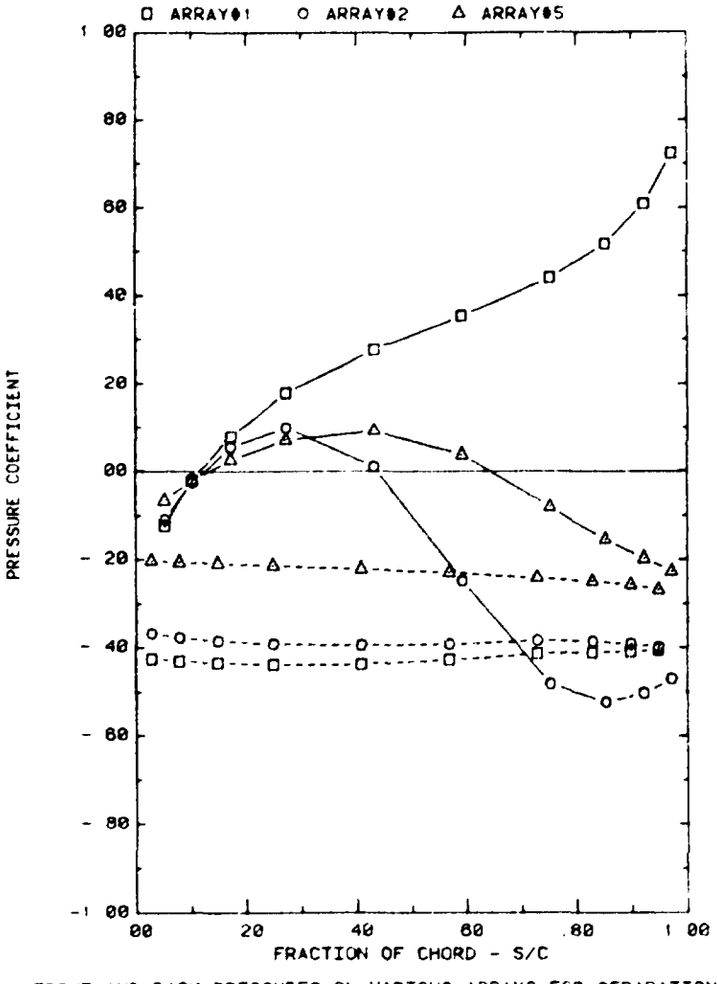
FRONT AND BACK PRESSURES ON ARRAY #4 OR #5 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 145, H/C = 0 25

Plot 2-1-2. (Continued)

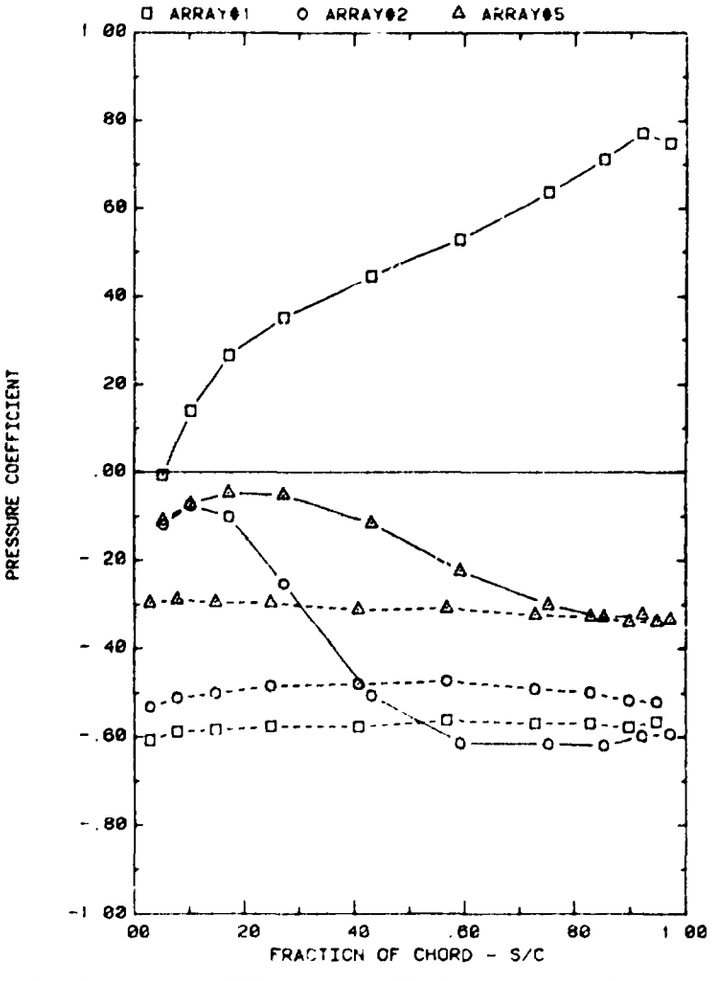


FRONT AND BACK PRESSURES ON ARRAY #5 IN UNIFORM FLOW
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 90, H/C = 0.25

Plot 2-1-2. (Concluded)

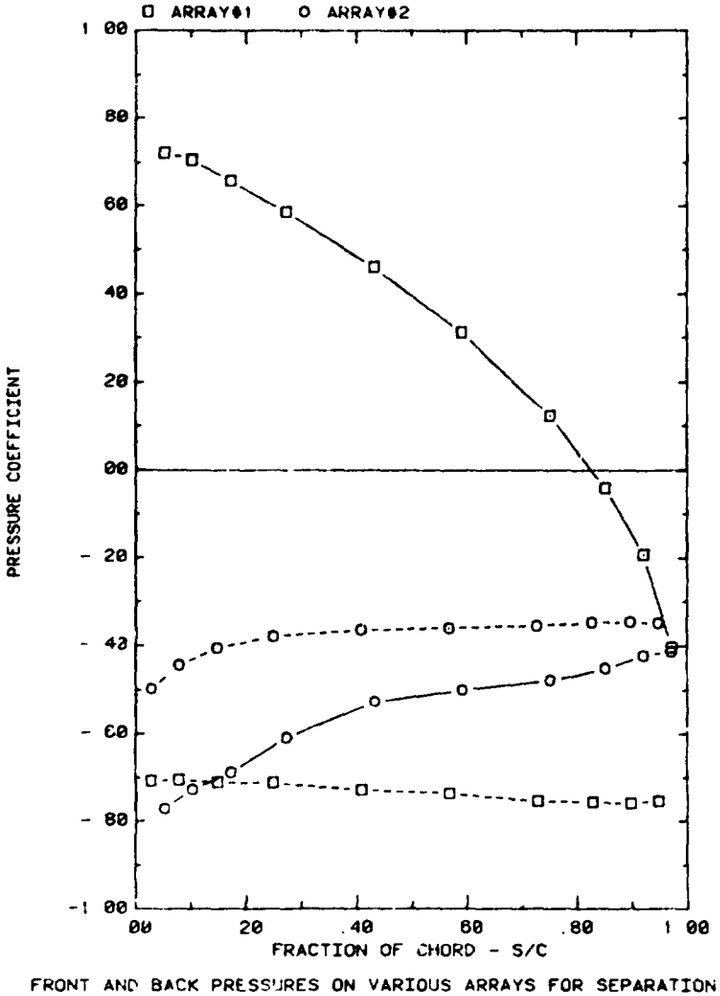


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION =1.5C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 20

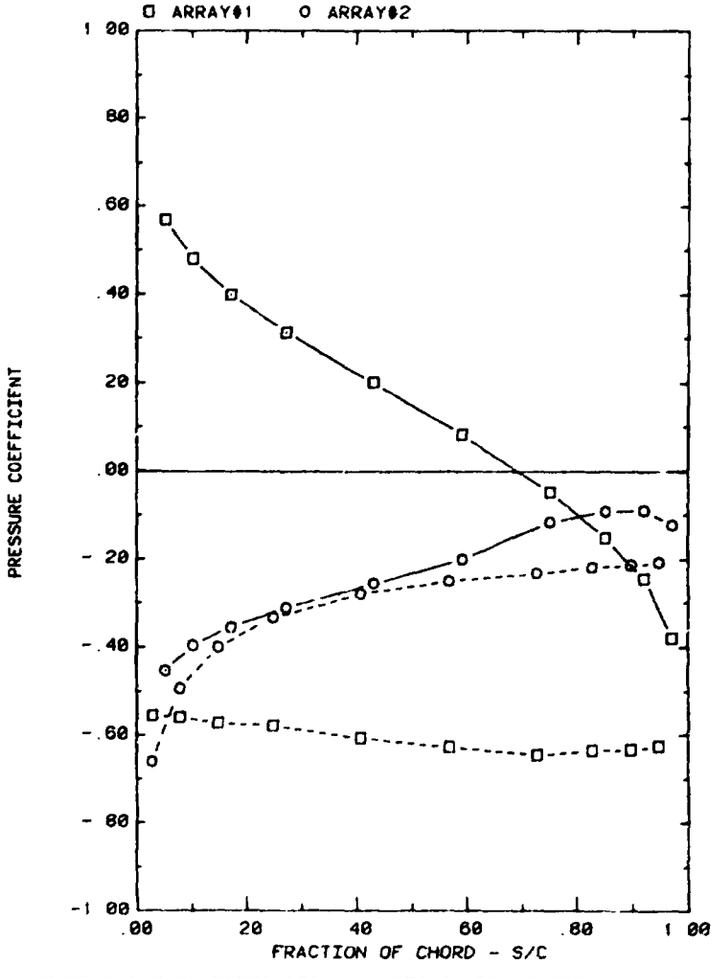


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION =1.5C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 35

Plot 2-13. Multiple Arrays without Fence, Uniform Flow Study
Effect of Array Position

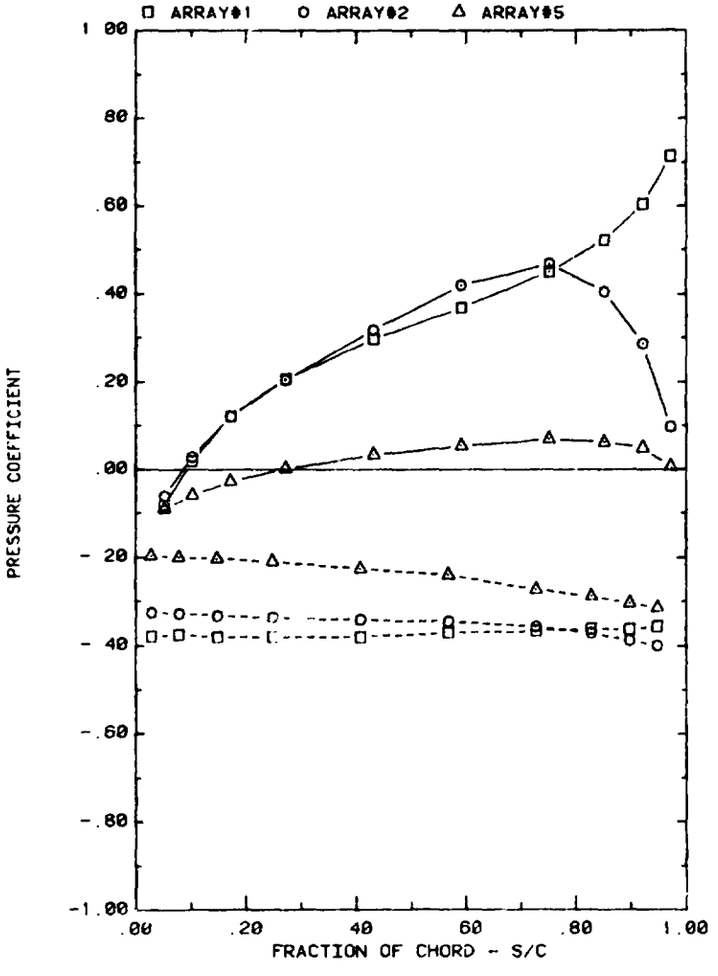


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION =1 SC
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 145

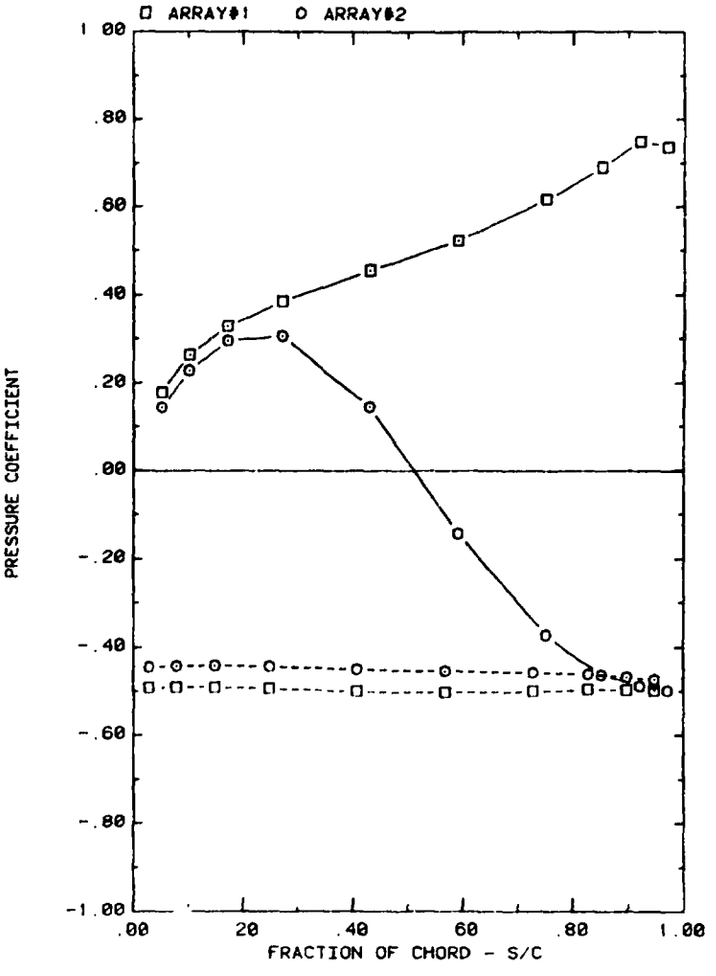


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION =1 SC
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 160

Plot 2-1-3. (Continued)

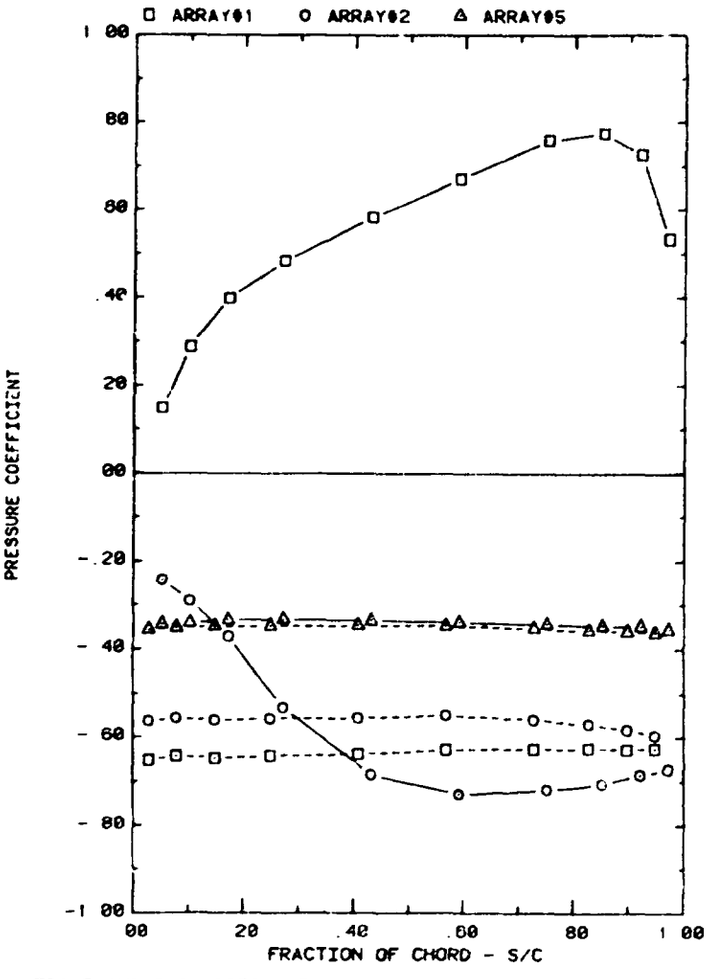


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 20

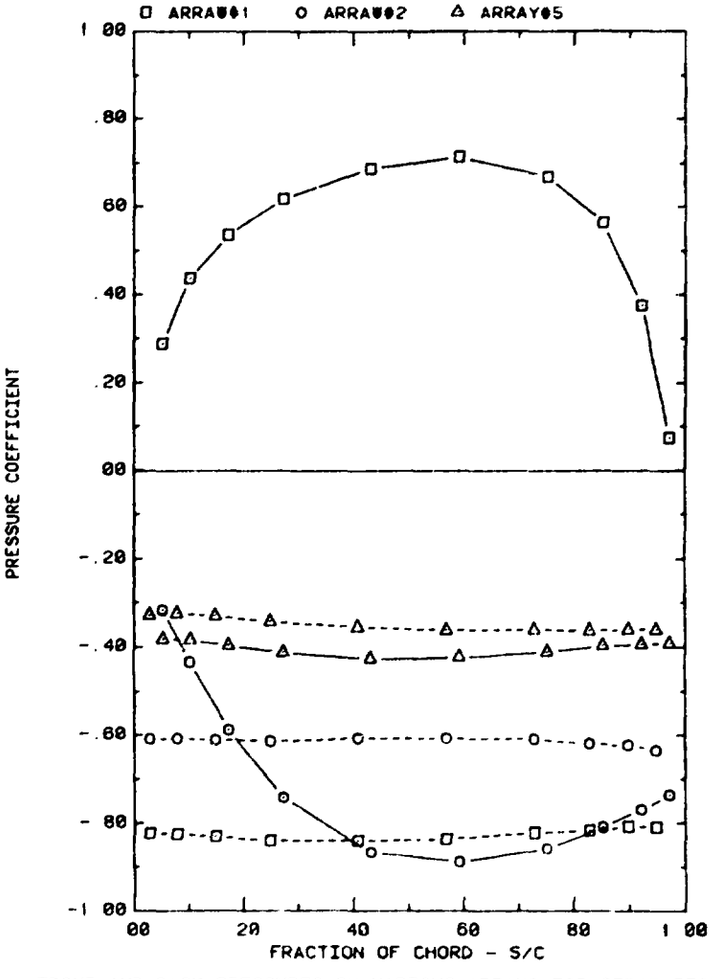


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 35

Plot 2-1-3. (Continued)

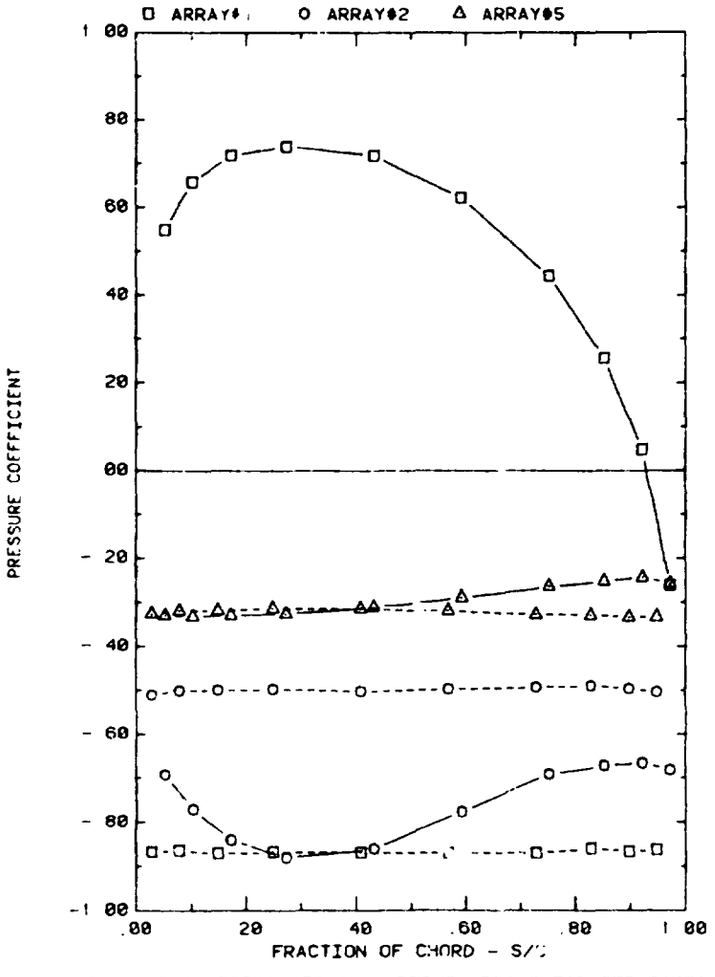


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 60

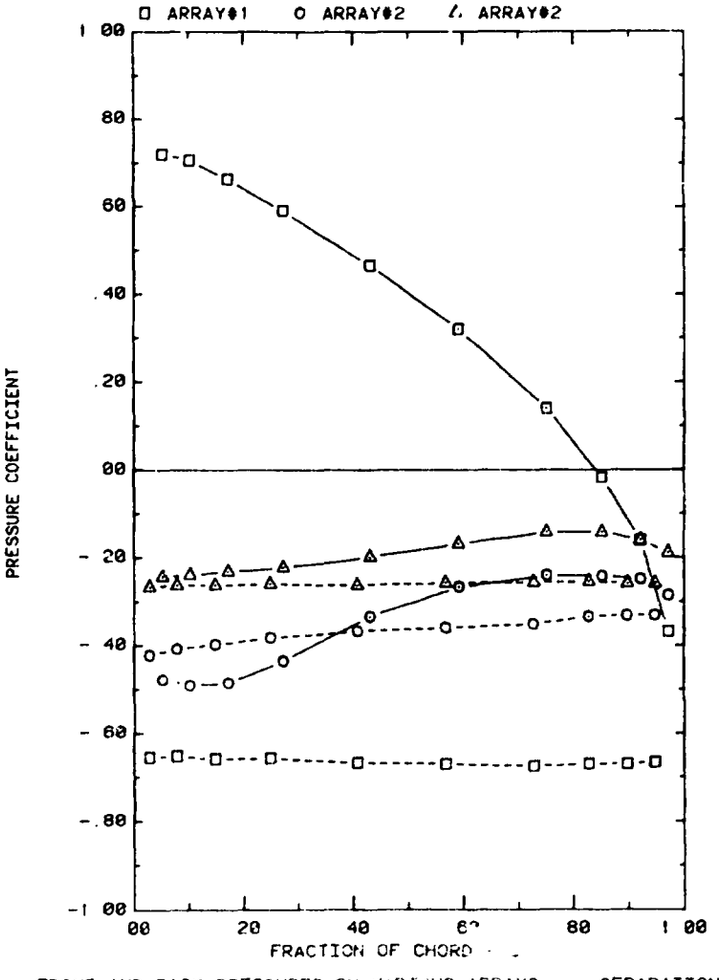


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 90

Plot 2-1-3. (Continued)

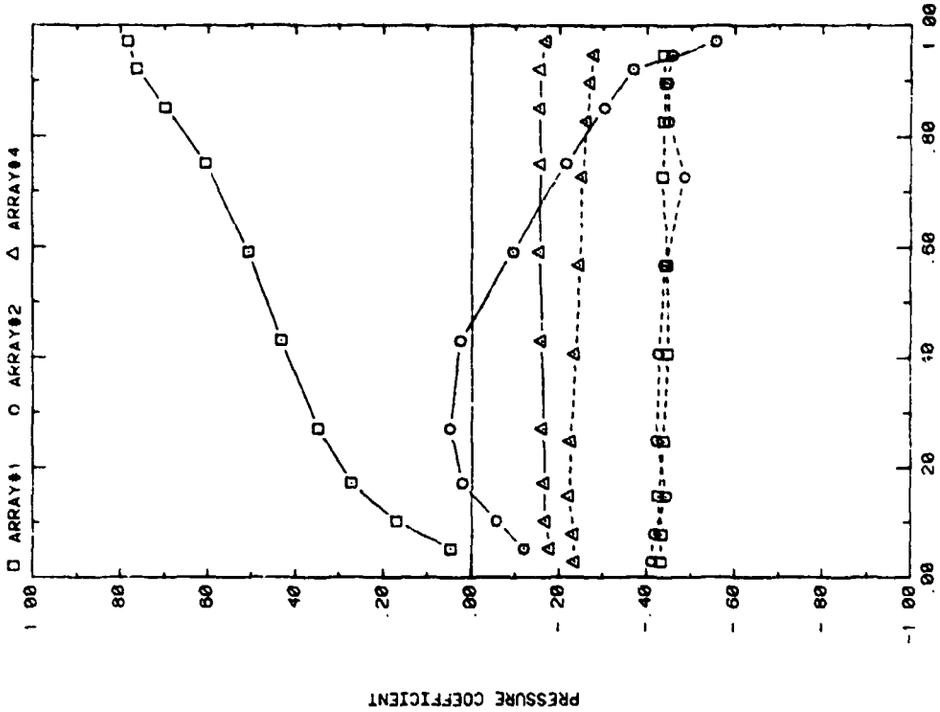


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 120

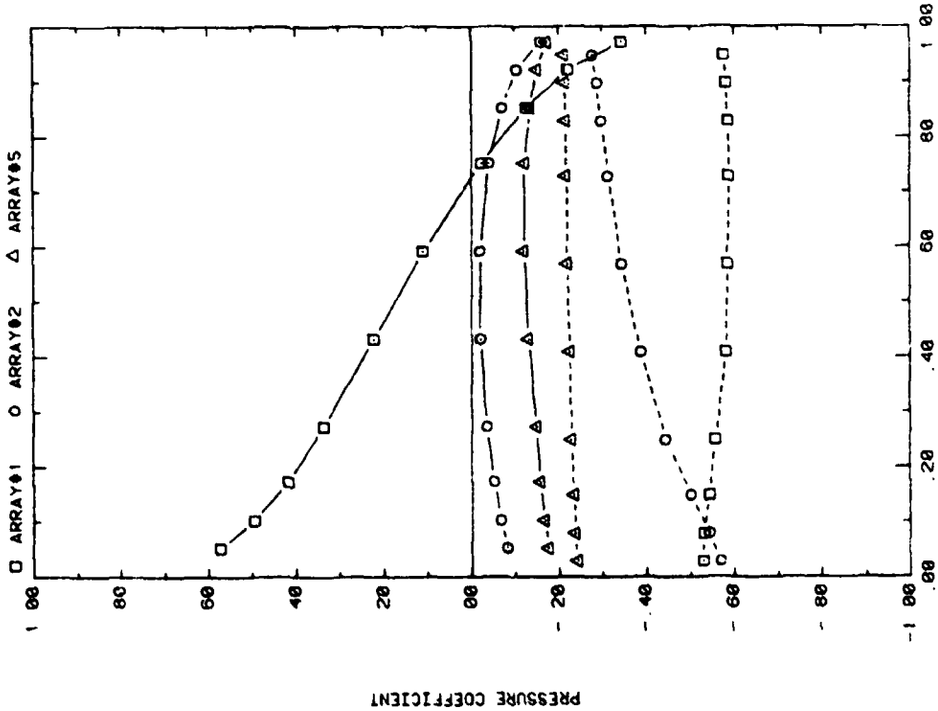


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS - SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 145

Plot 2-1-3. (Continued)

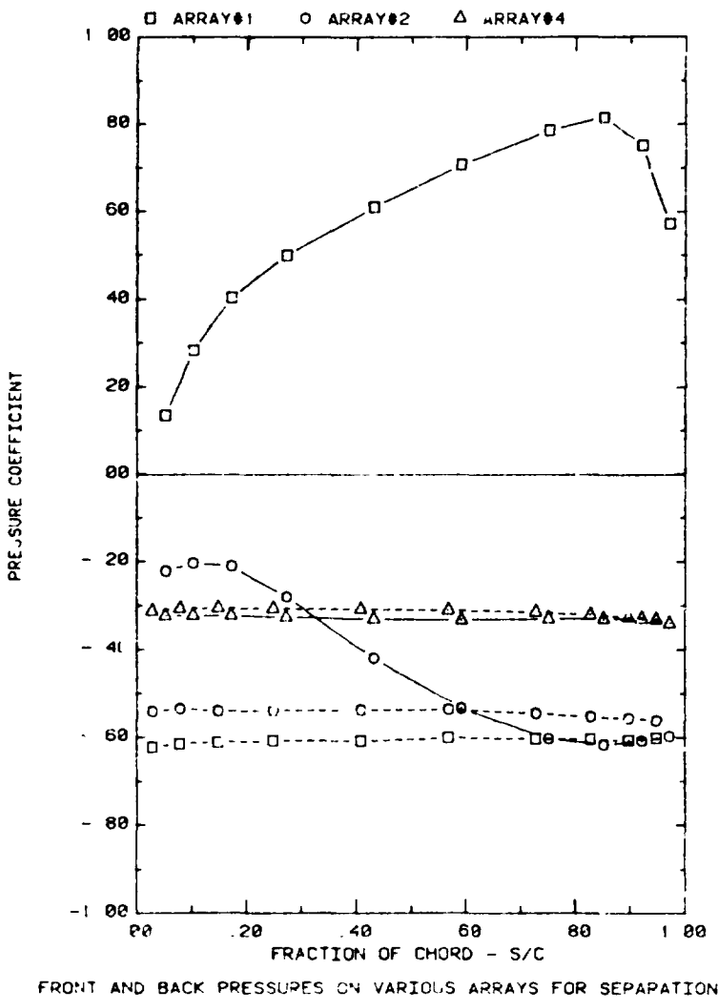


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 3C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 35

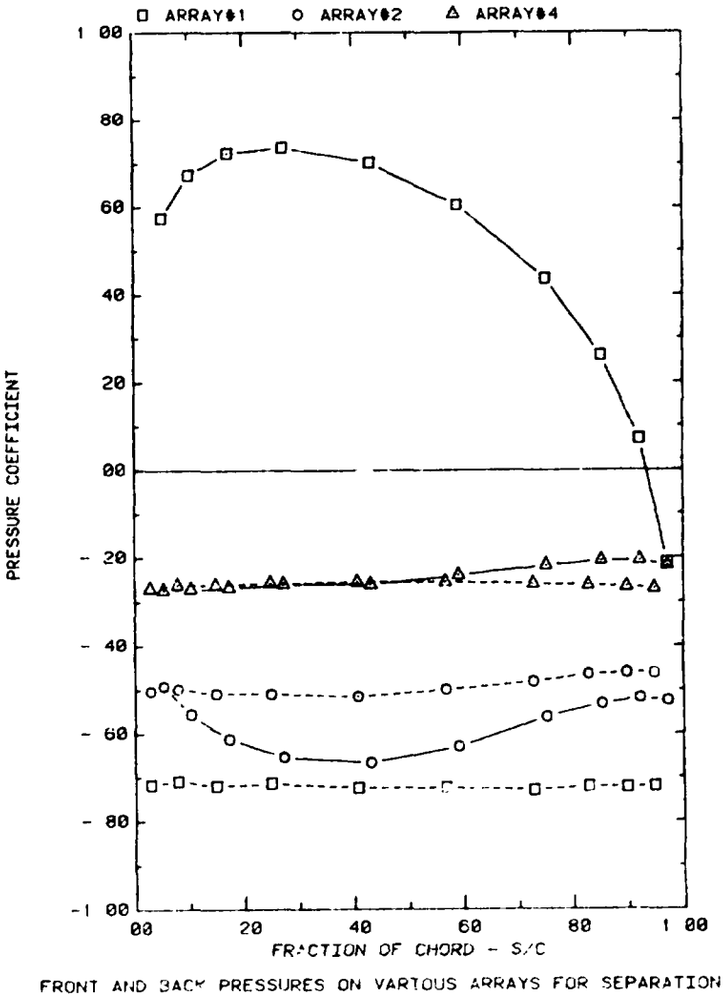


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 2C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 16C

Plot 1-3. (Continued)

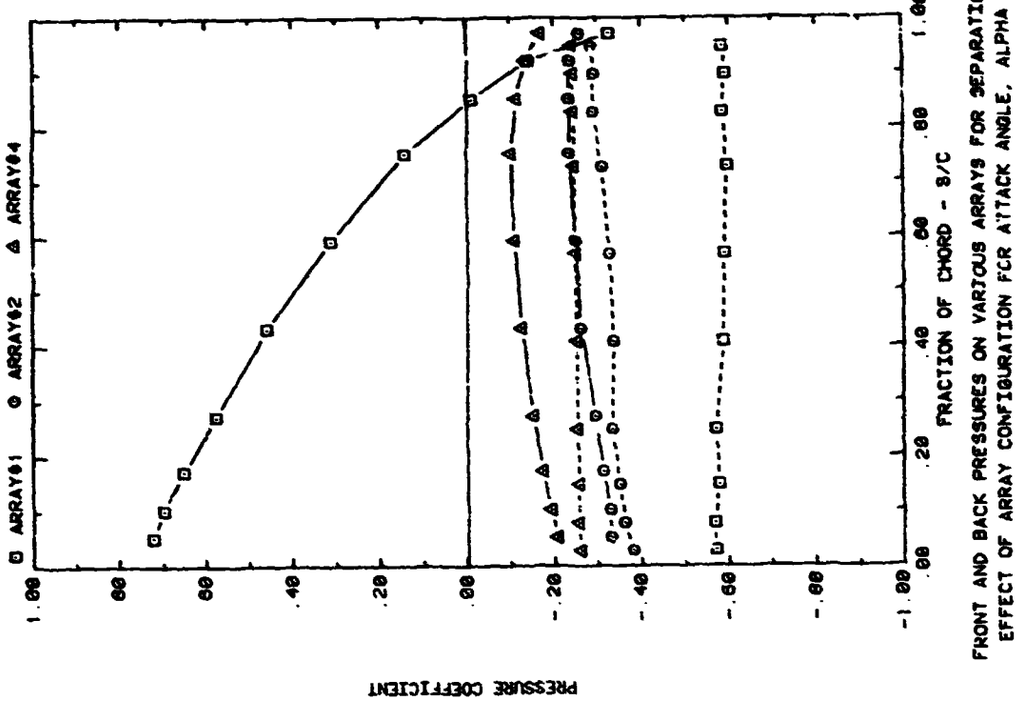


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 3C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 60



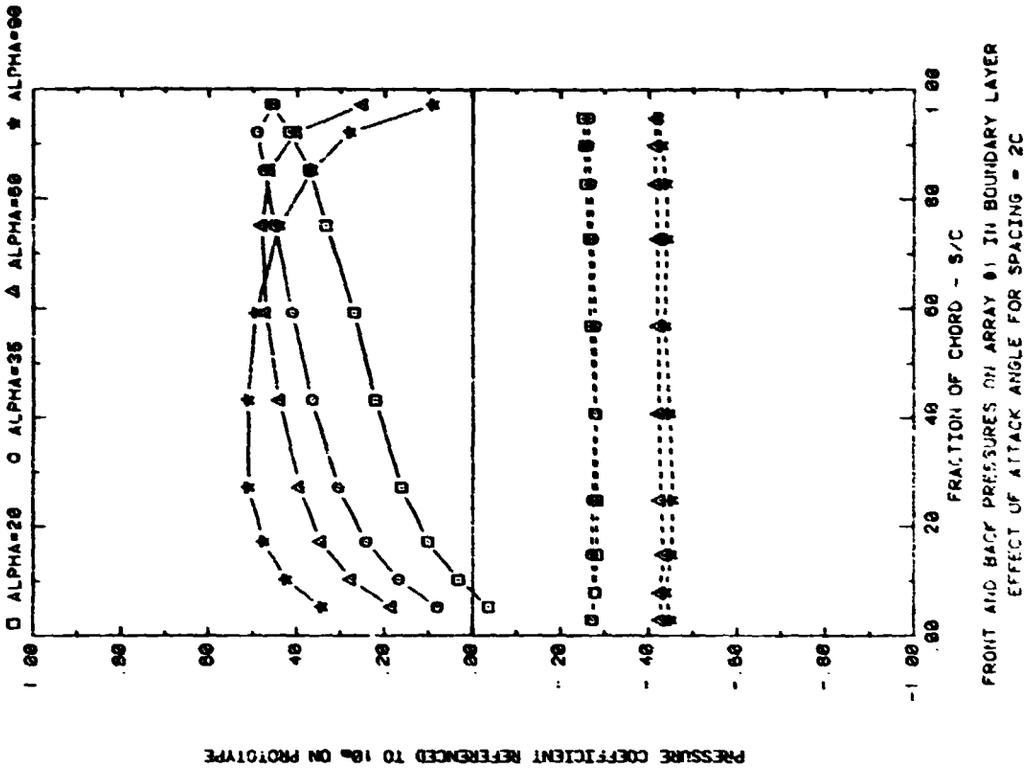
FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 3C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 120

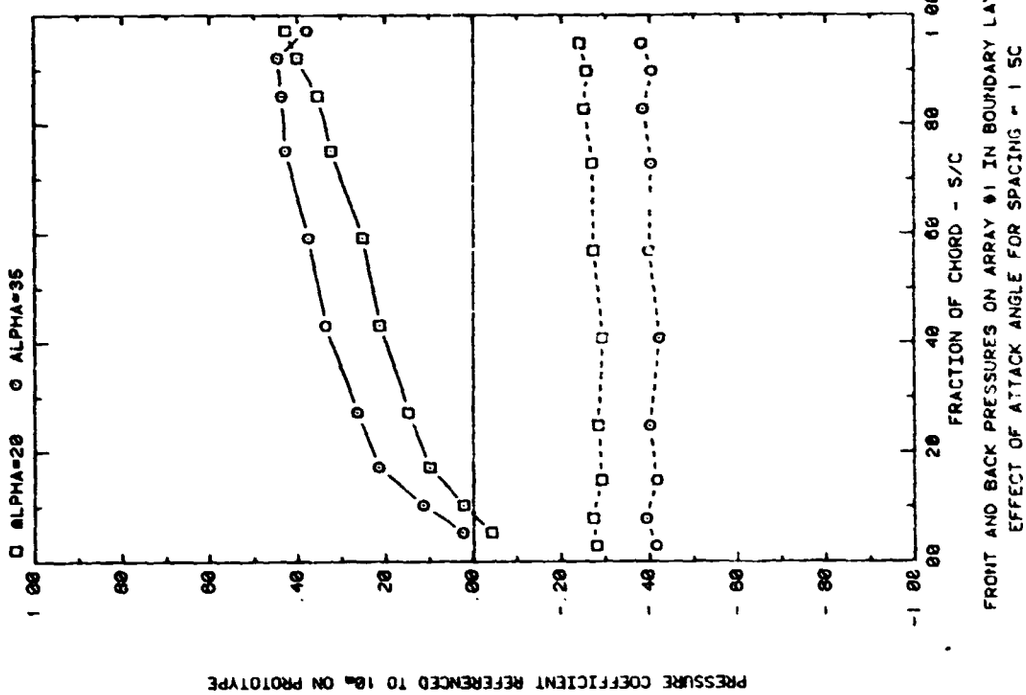
Plot 2-1-3. (Continued)



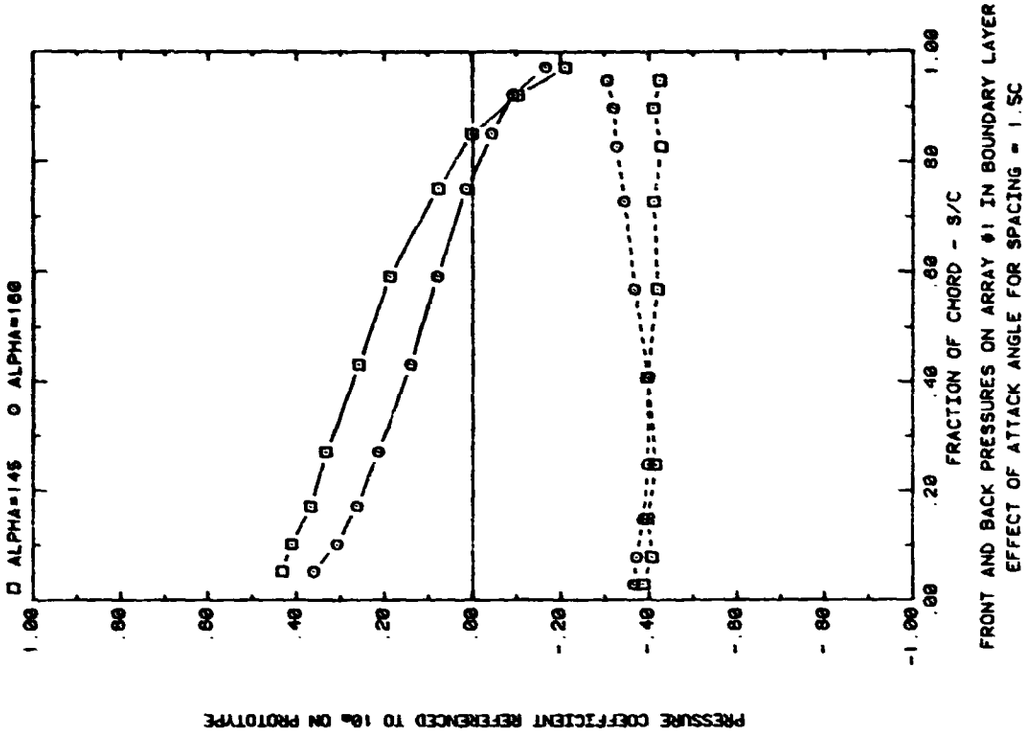
FRONT AND BACK PRESSURES ON VARIOUS ARRAYS FOR SEPARATION = 3C
EFFECT OF ARRAY CONFIGURATION FOR ATTACK ANGLE, ALPHA = 14.5

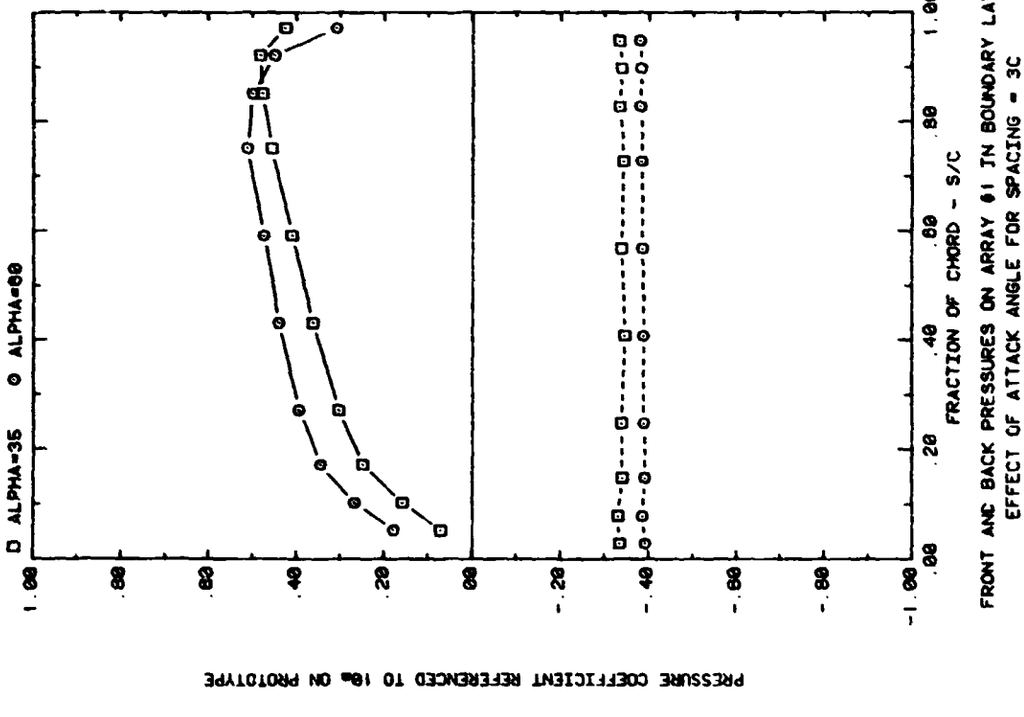
Plot 2-1-3. (Concluded)



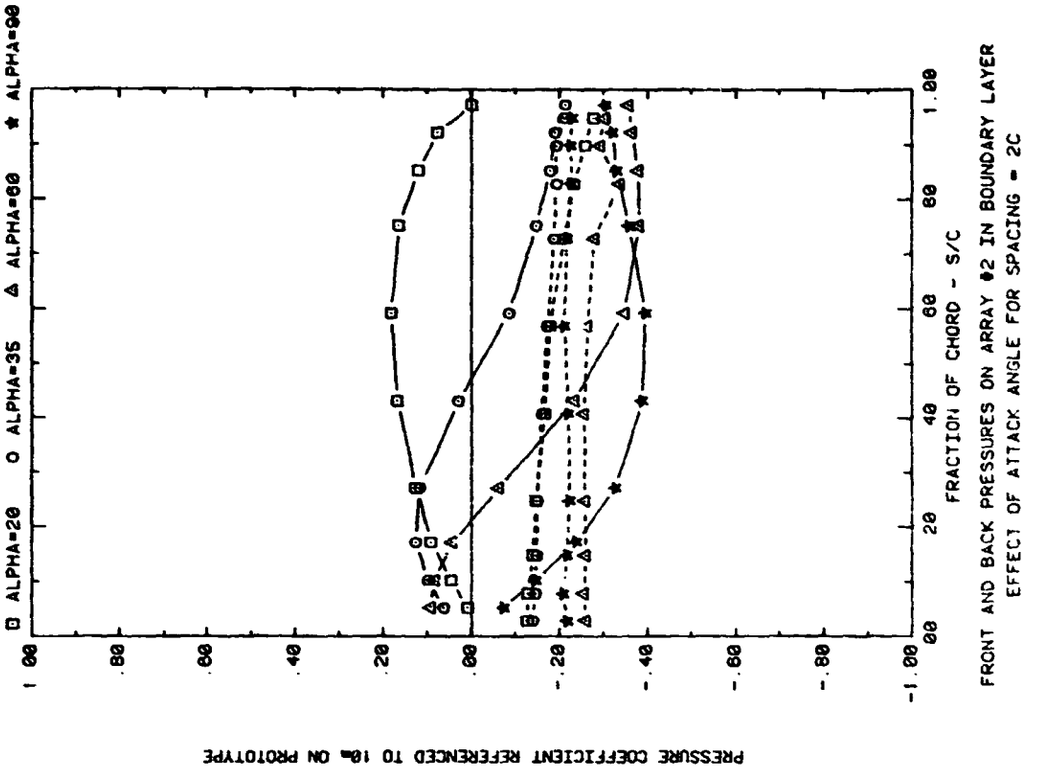


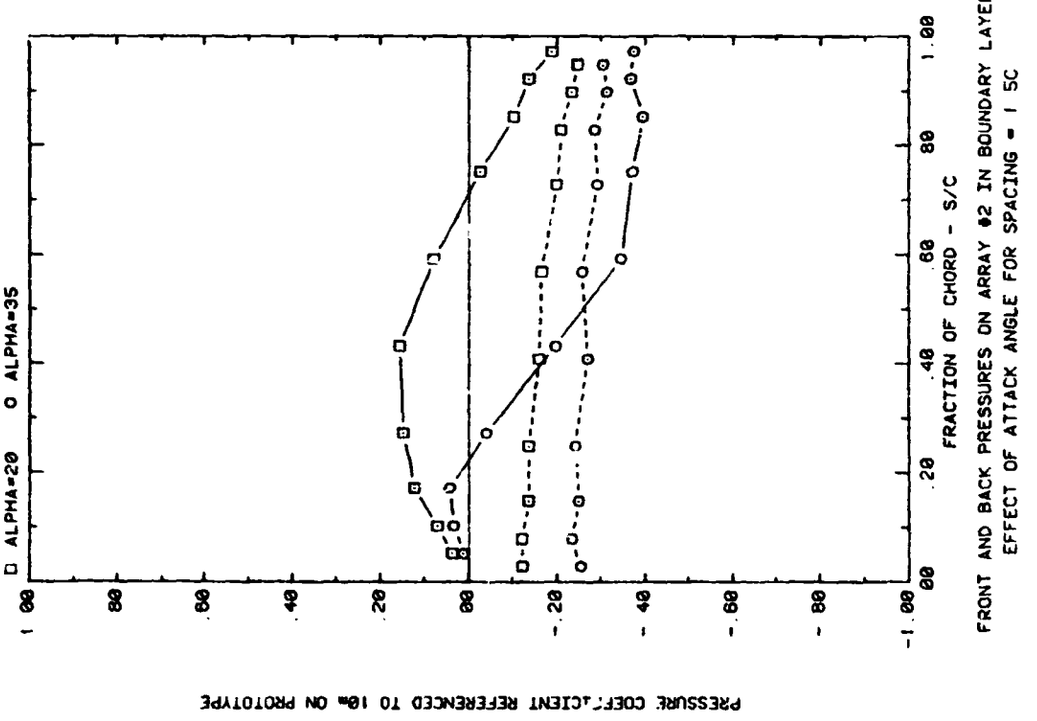
Plot 2-2-1. Multiple Arrays without Fence, Nonuniform Flow
Study Effect of Angle of Attack



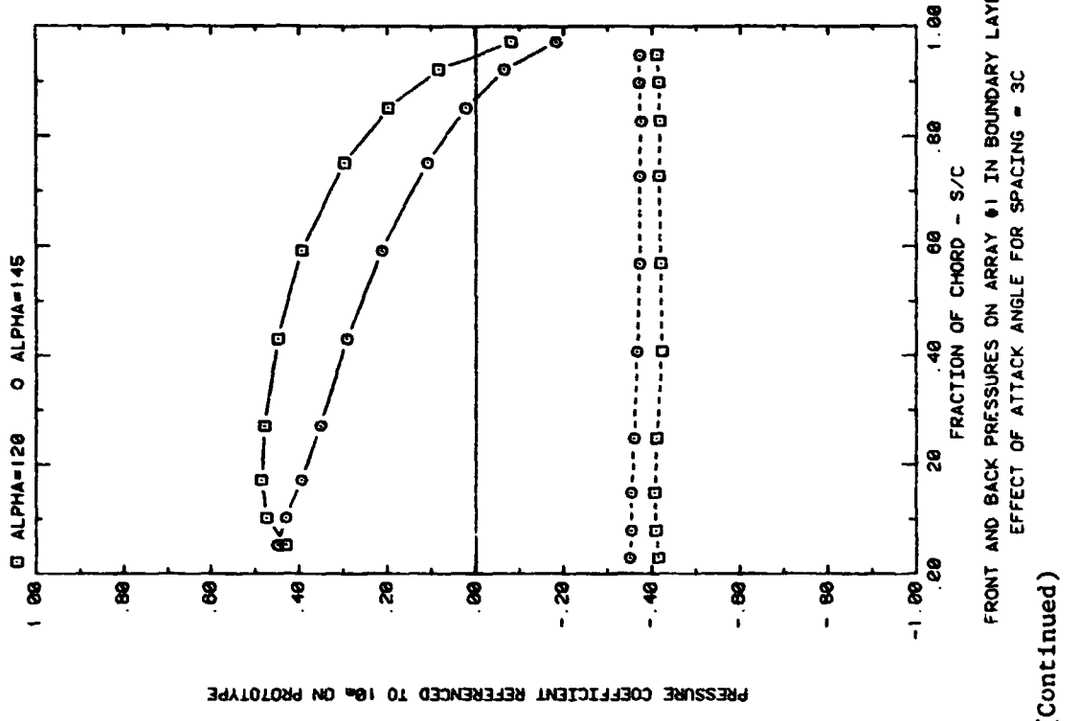


Plot 2-2-1. (Continued)

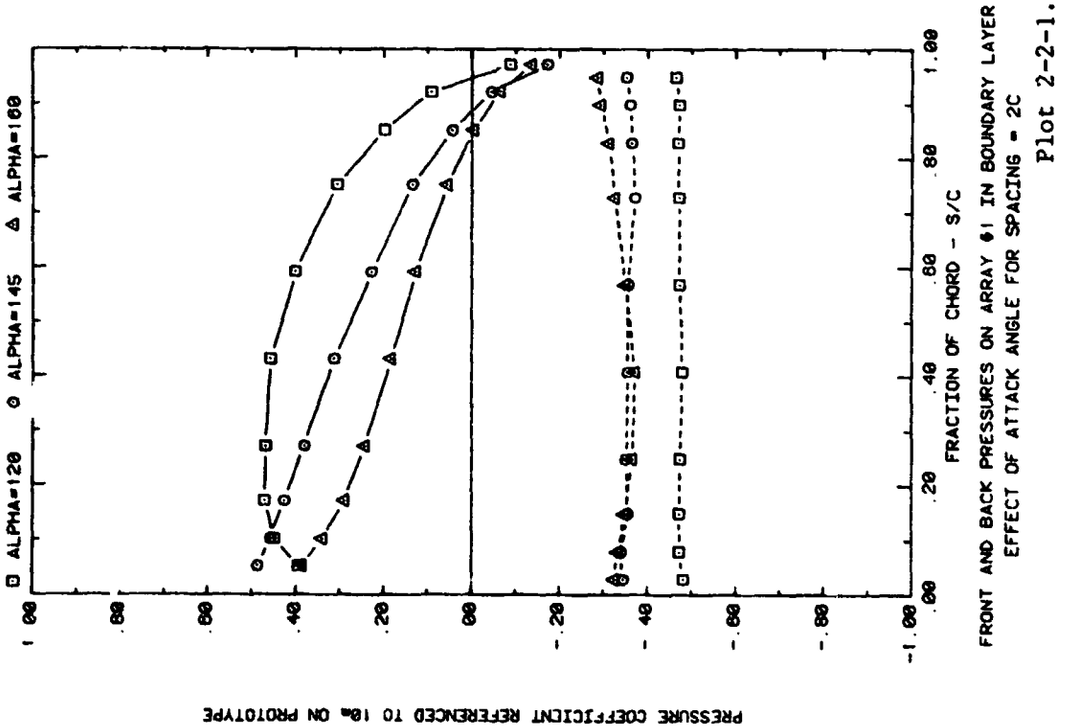




Plot 2-2-1. (Continued)

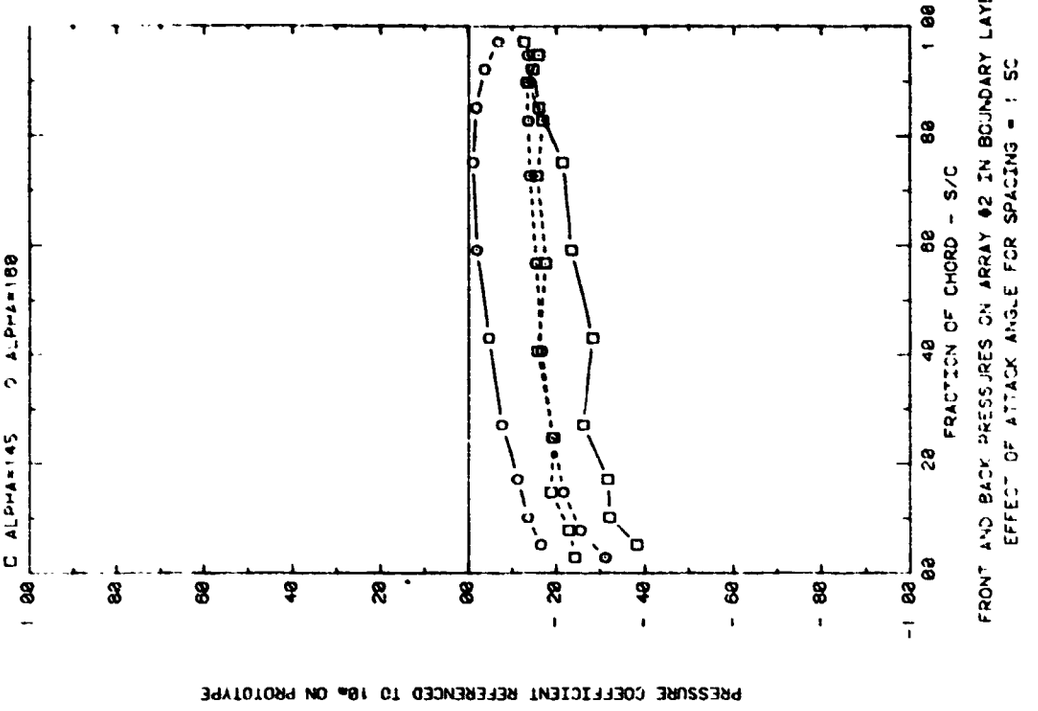


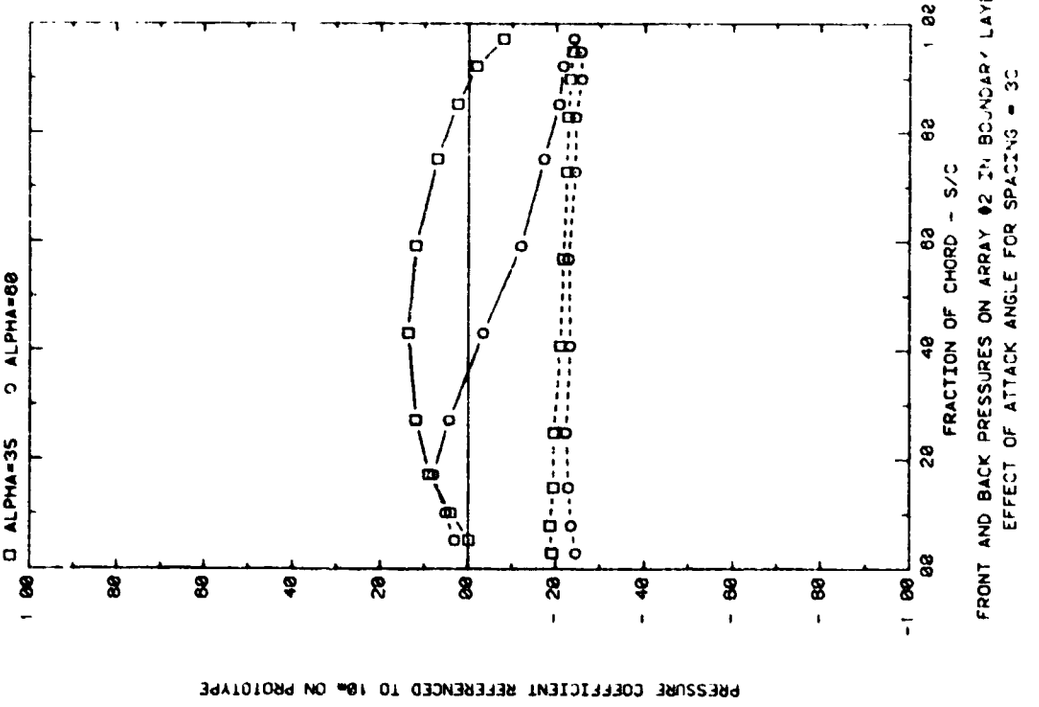
FRONT AND BACK PRESSURES ON ARRAY #1 IN BOUNDARY LAYER
EFFECT OF ATTACK ANGLE FOR SPACING = 3C



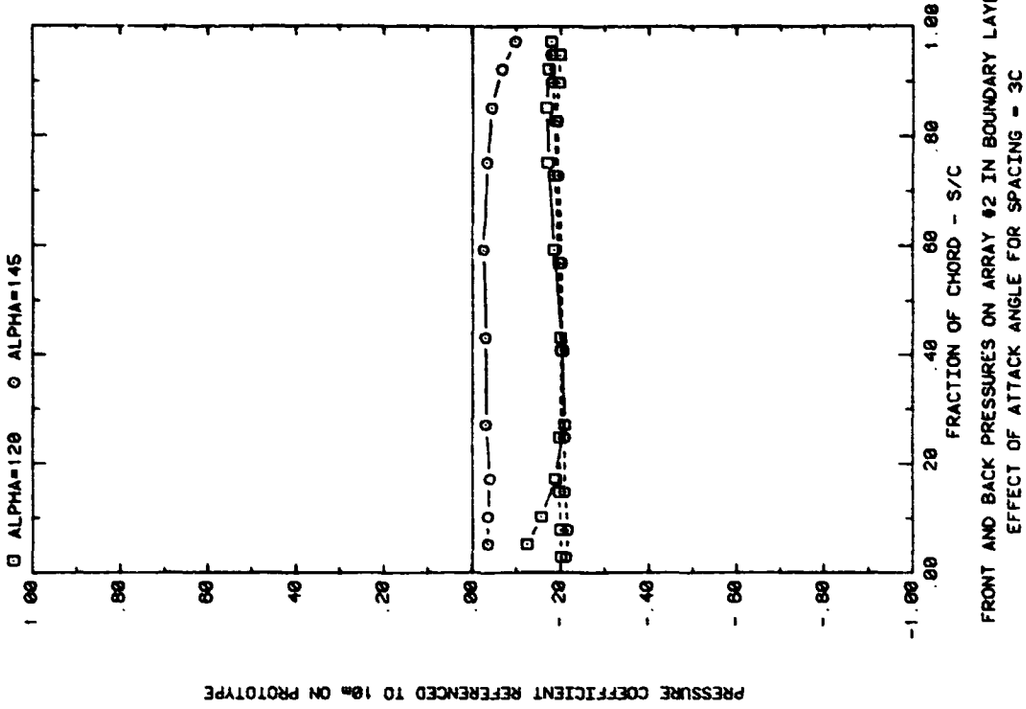
FRONT AND BACK PRESSURES ON ARRAY #1 IN BOUNDARY LAYER
EFFECT OF ATTACK ANGLE FOR SPACING = 2C

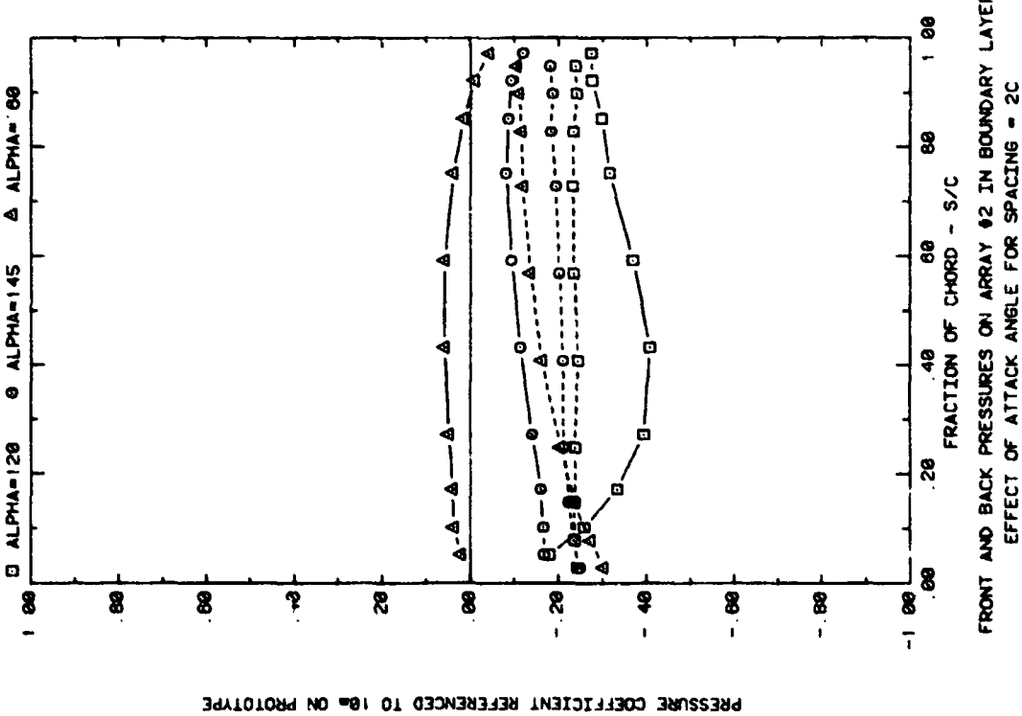
Plot 2-2-1. (Continued)



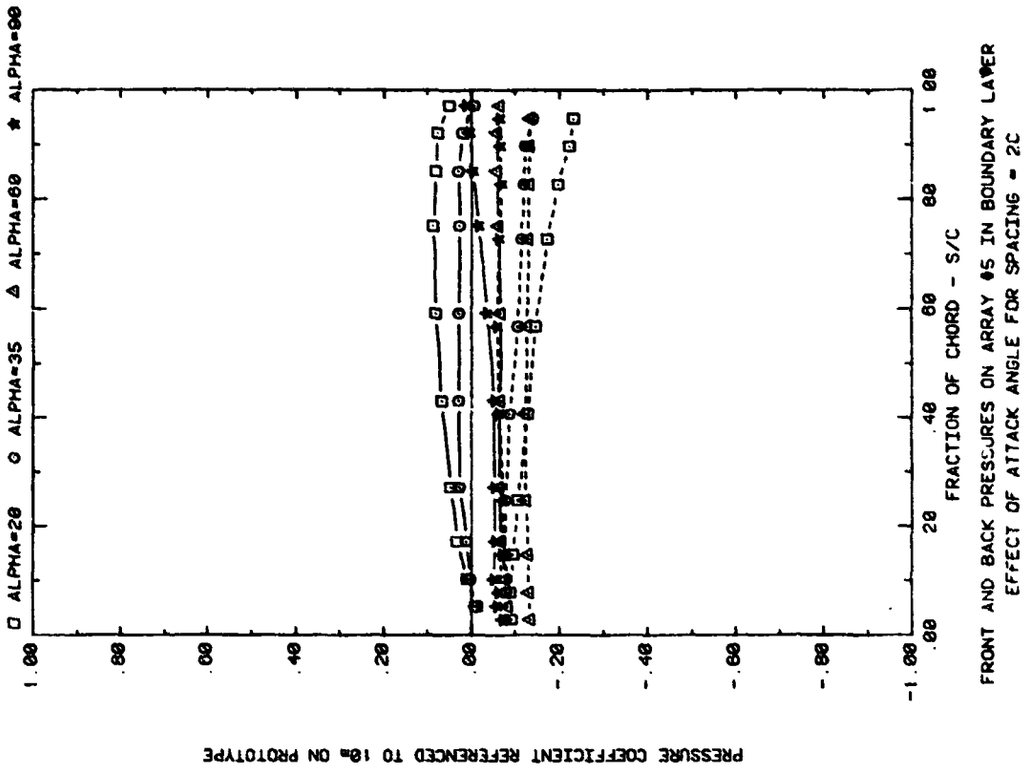


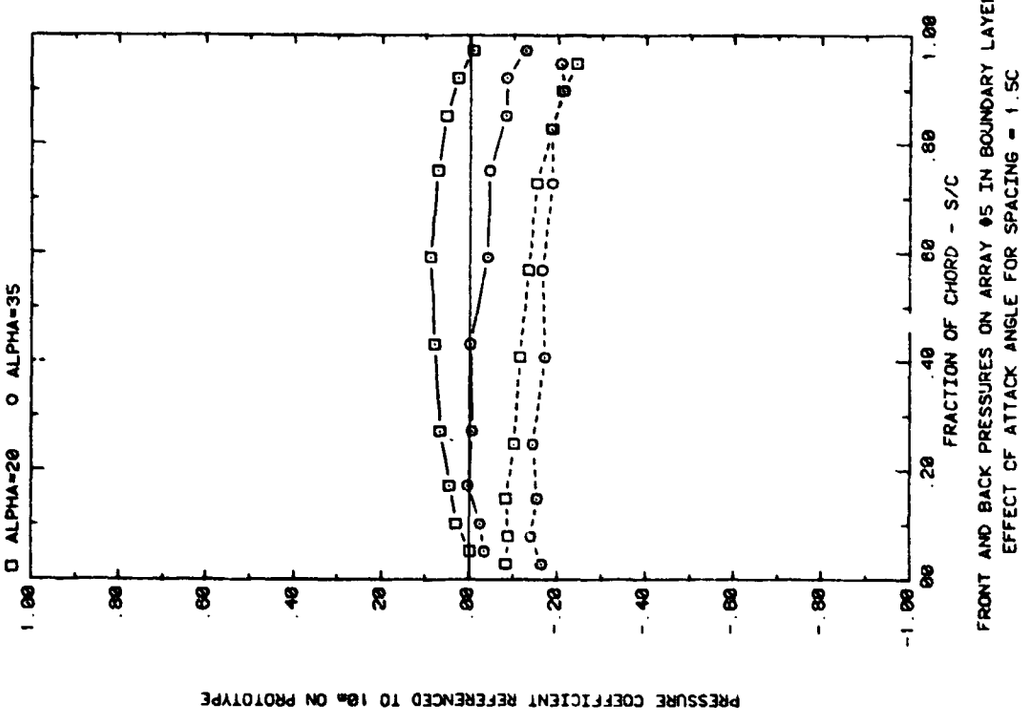
Plot 2-2-1. (Continued)



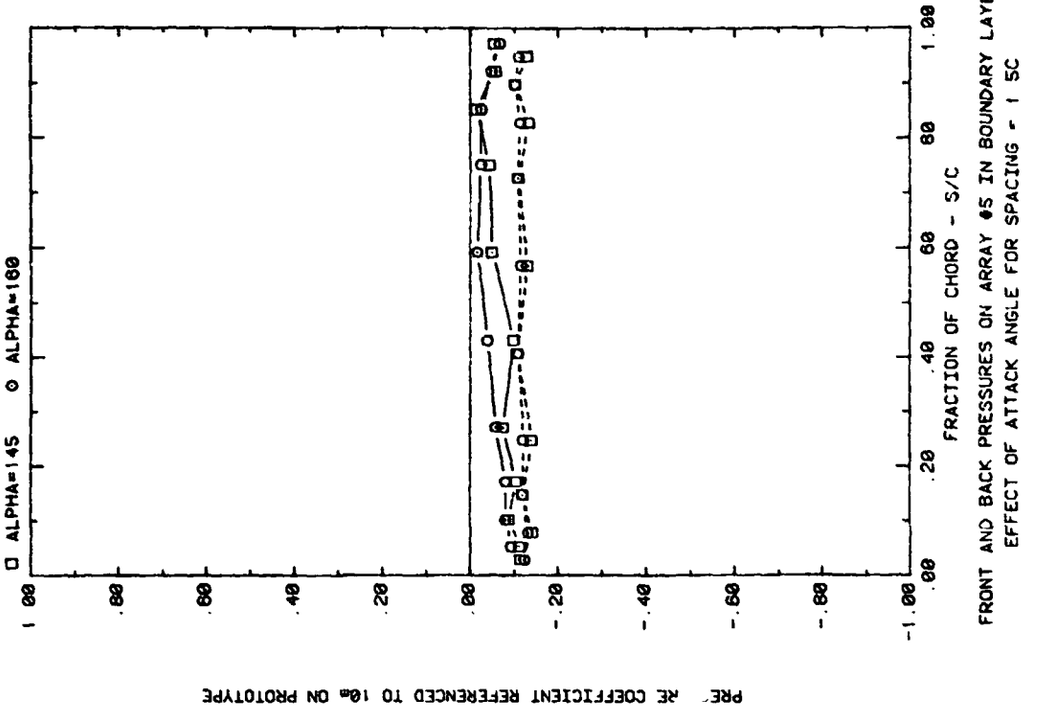


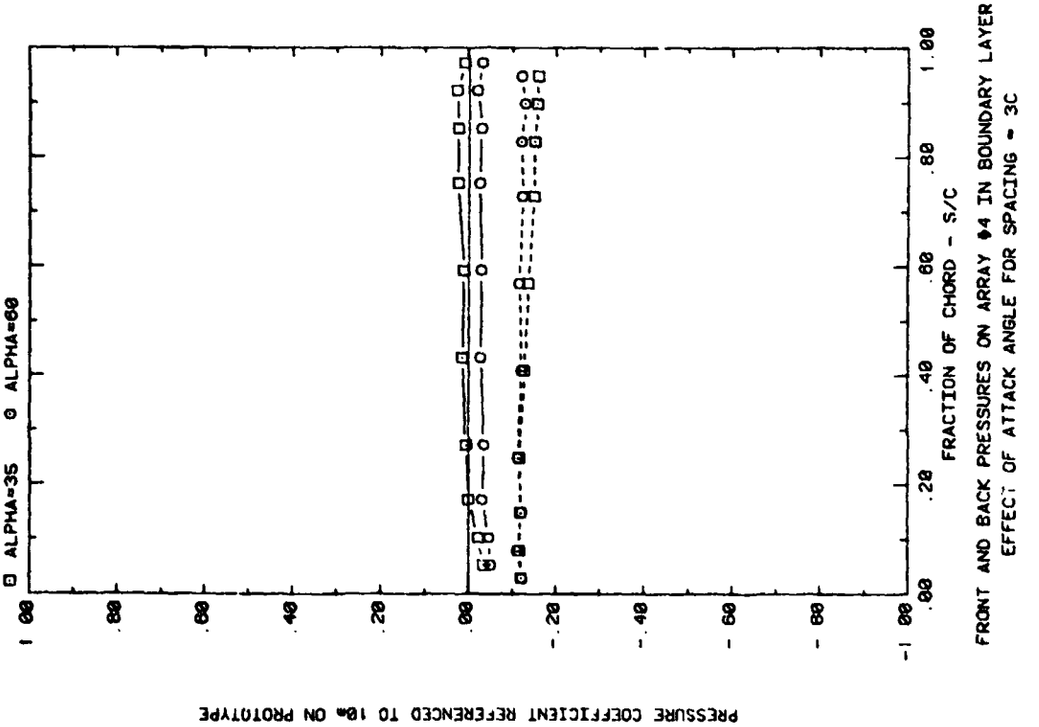
Plot 2-2-1. (Continued)



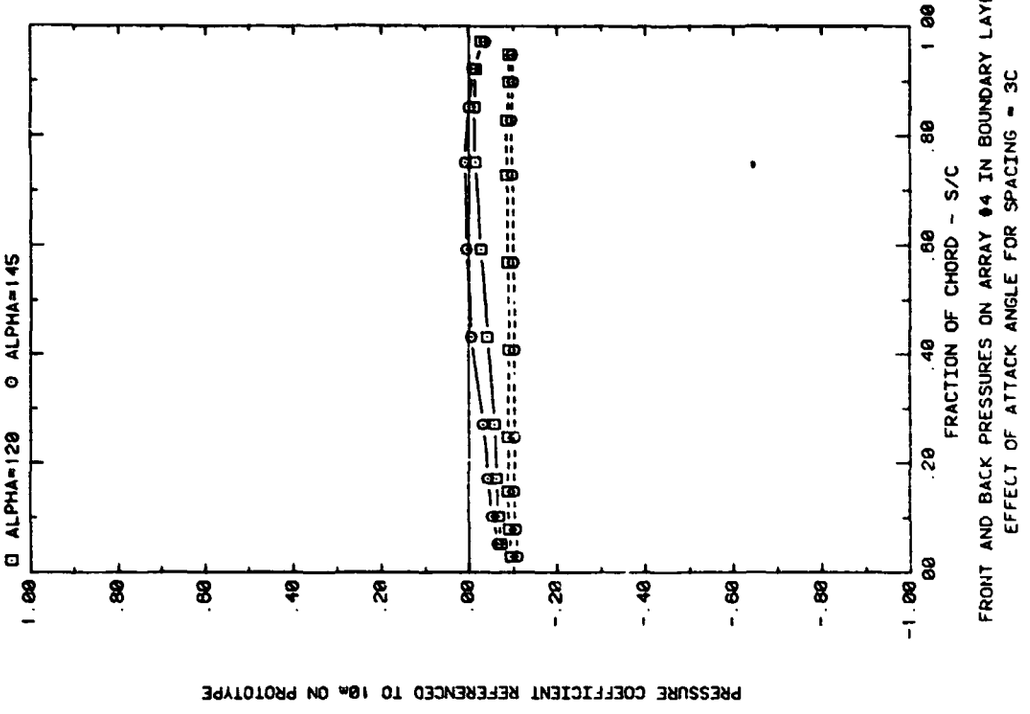


Plot 2-2-1. (Continued)

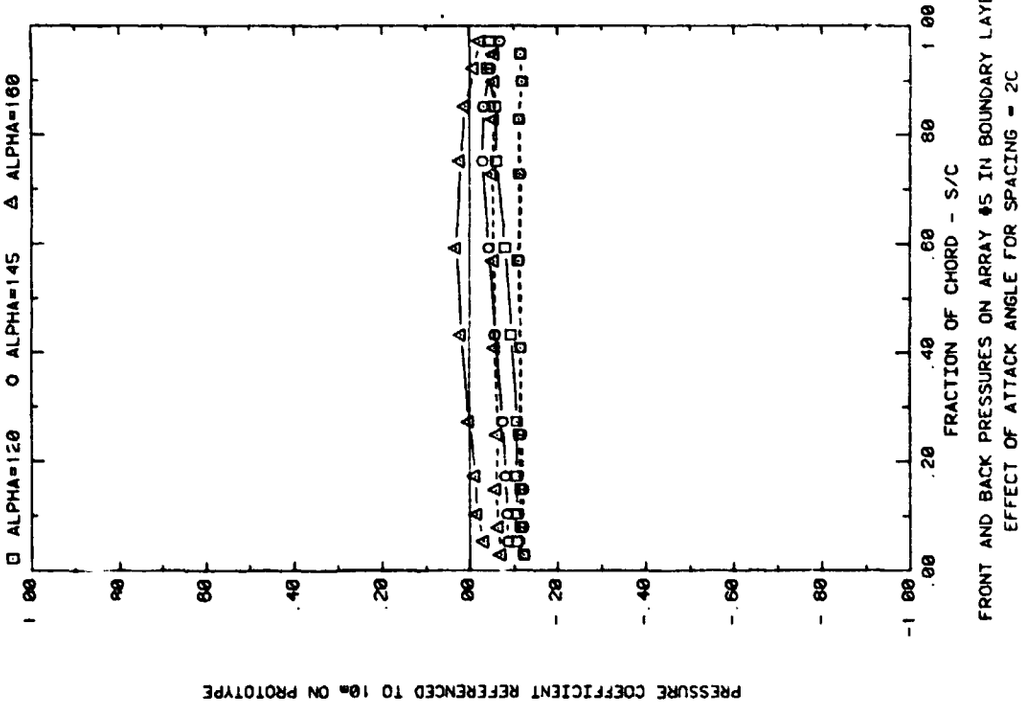




Plot 2-2-1. (Continued)

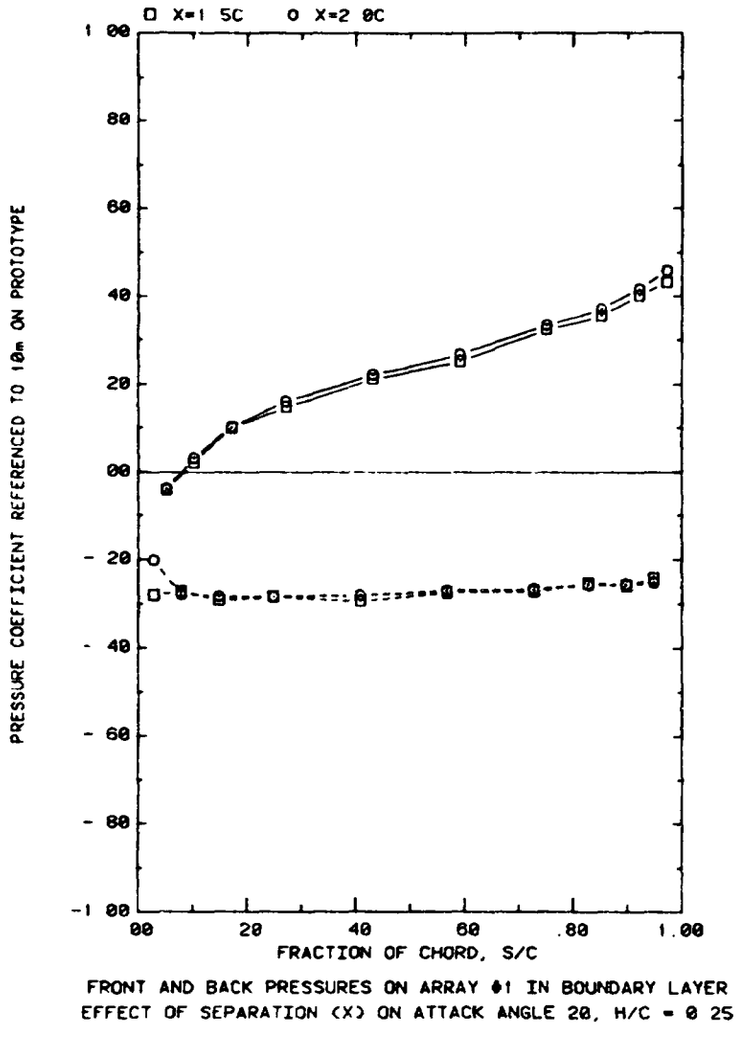


FRONT AND BACK PRESSURES ON ARRAY #4 IN BOUNDARY LAYER
EFFECT OF ATTACK ANGLE FOR SPACING = 3C

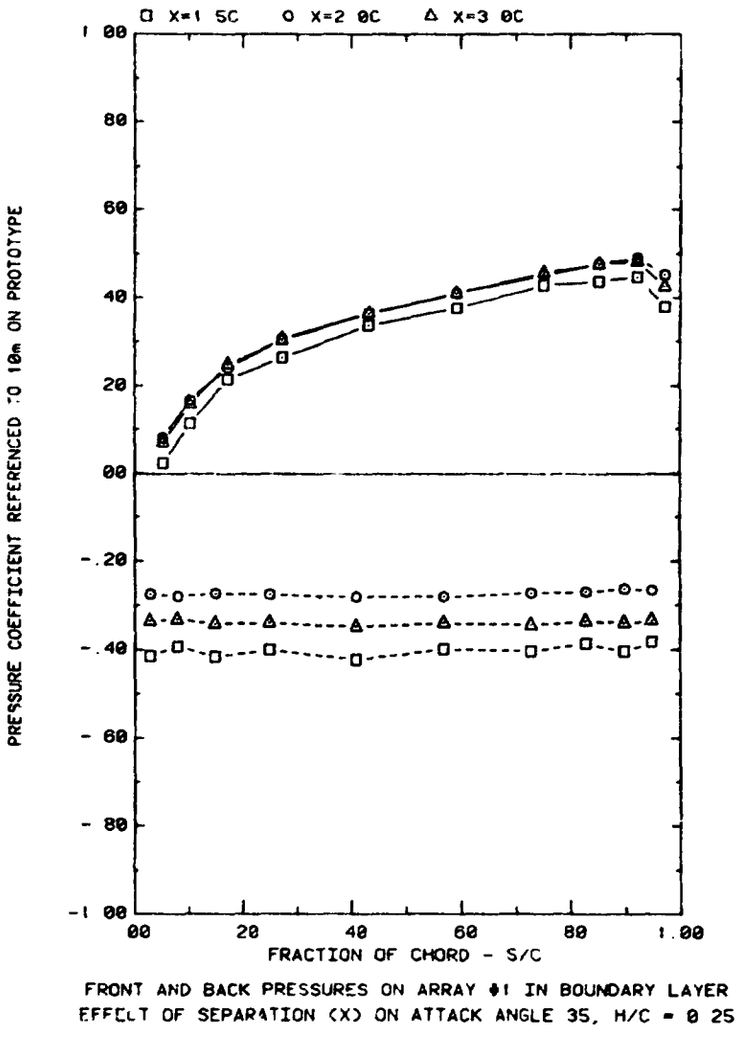


FRONT AND BACK PRESSURES ON ARRAY #5 IN BOUNDARY LAYER
EFFECT OF ATTACK ANGLE FOR SPACING = 2C

Plot 2-2-1. (Concluded)

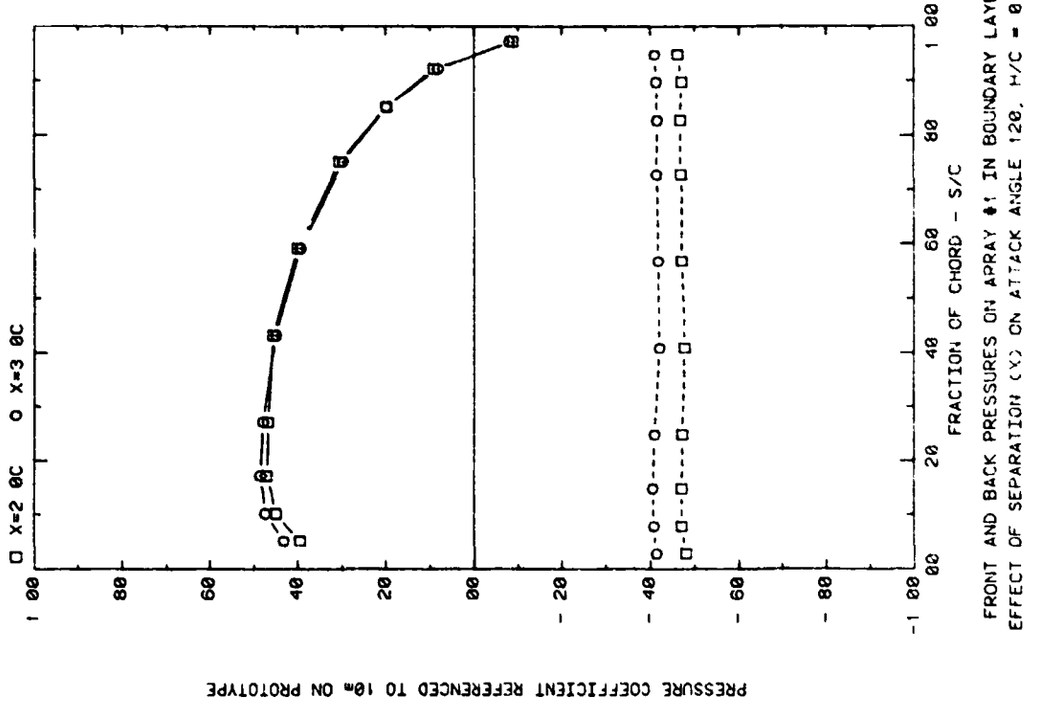


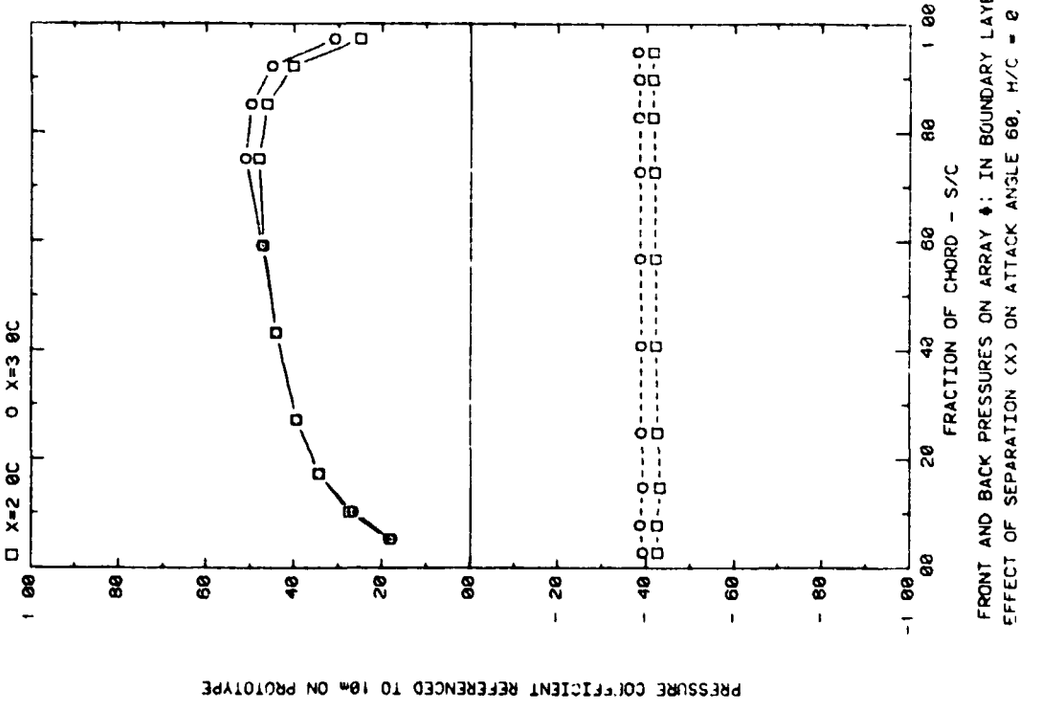
FRONT AND BACK PRESSURES ON ARRAY #1 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 20, H/C = 0 25



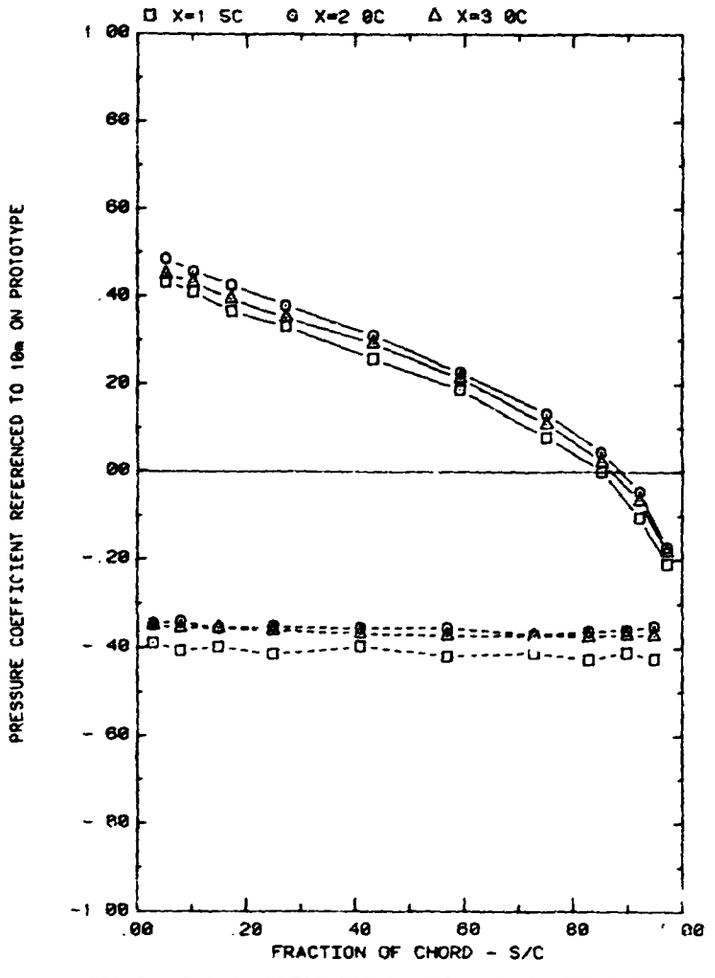
FRONT AND BACK PRESSURES ON ARRAY #1 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 35, H/C = 0 25

Plot 2-2-2. Multiple Arrays without Fence, Nonuniform Flow Study
Effect of Separation Distance

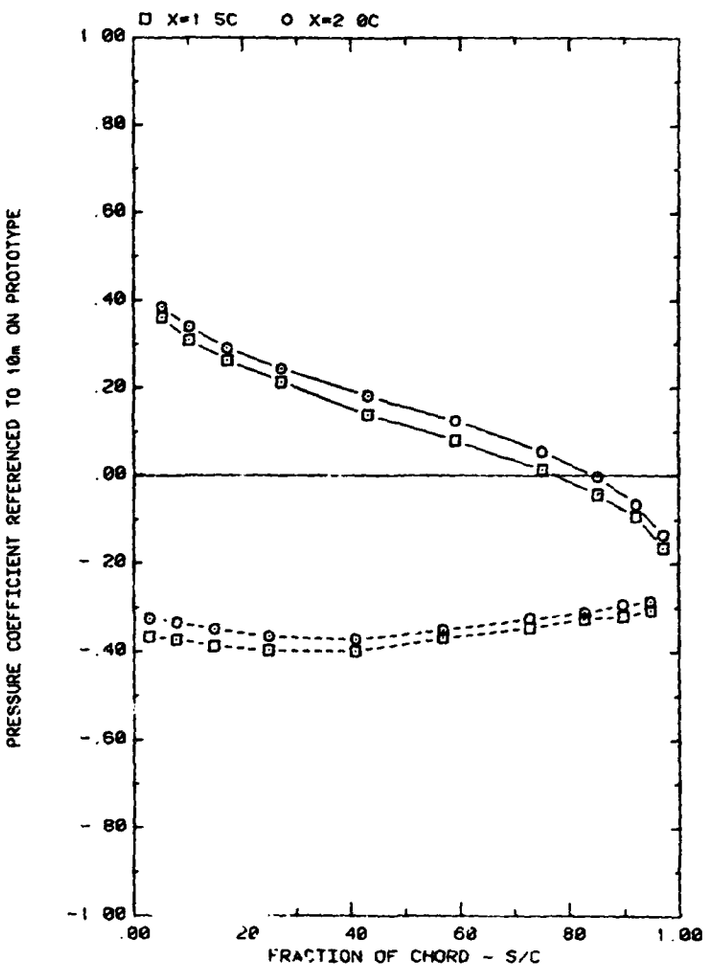




Plot 2-2-2. (Continued)

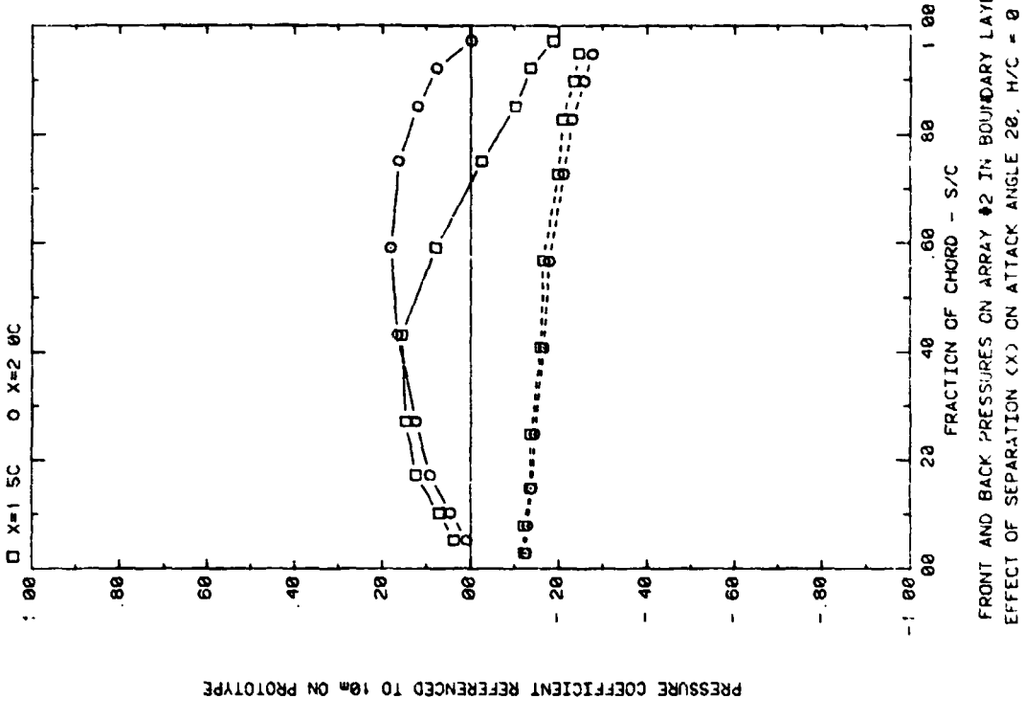


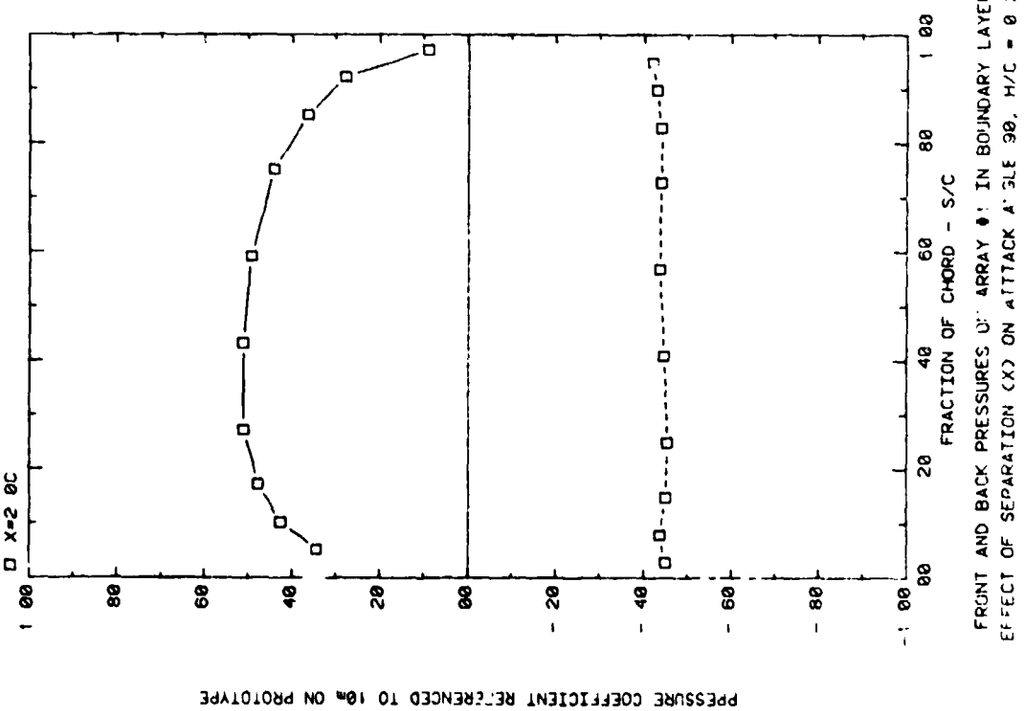
FRONT AND BACK PRESSURES ON ARRAY #1 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 145, H/C = 0 25



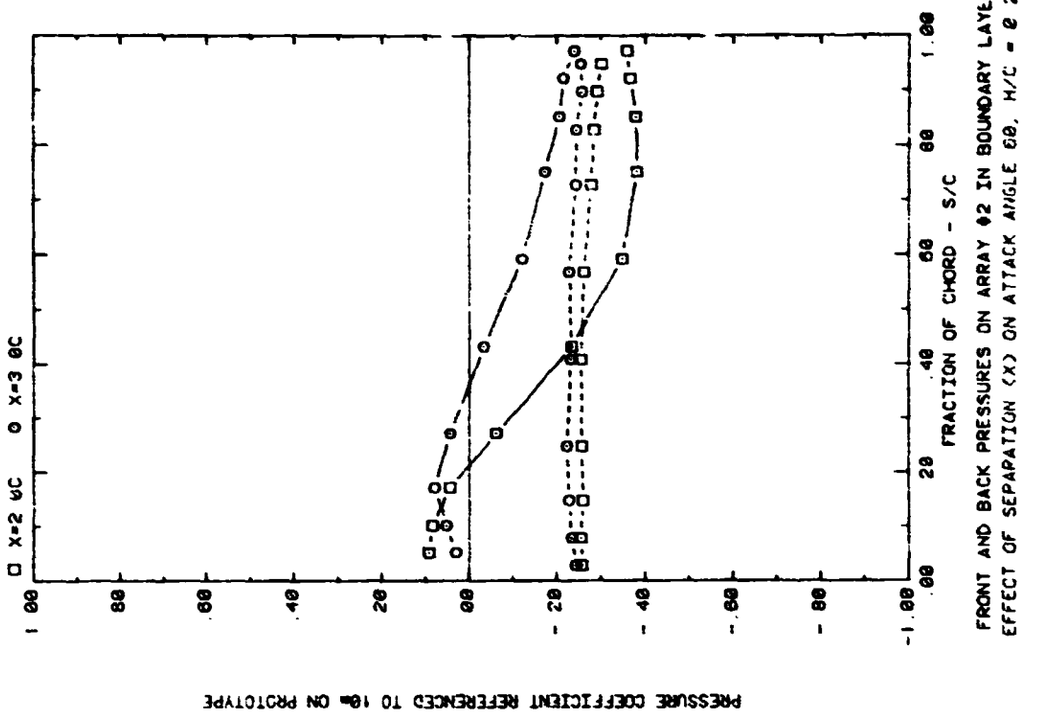
FRONT AND BACK PRESSURES ON ARRAY #1 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 160, H/C = 0 25

Plot 2-2-2. (Continued)

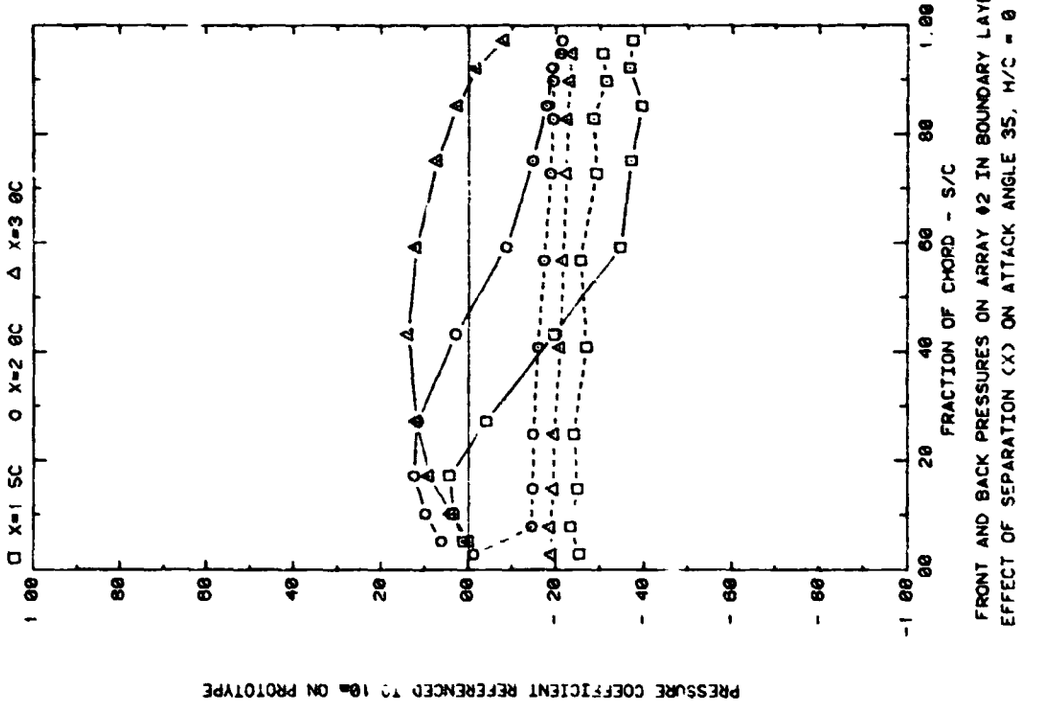




Plot 2-2-2. (Continued)

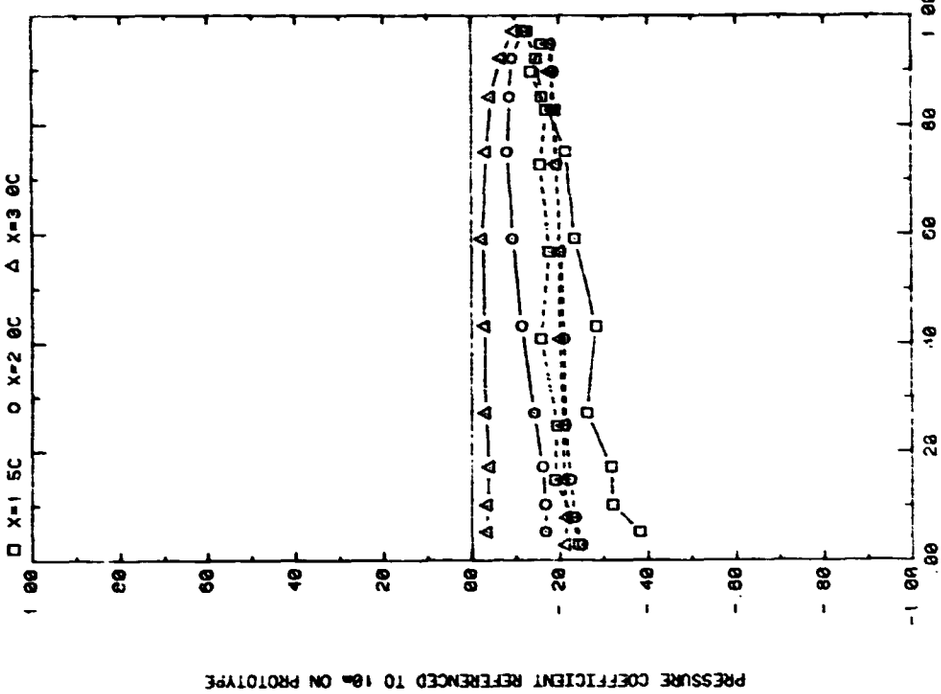


FRONT AND BACK PRESSURES ON ARRAY #2 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 60, H/C = 0 25

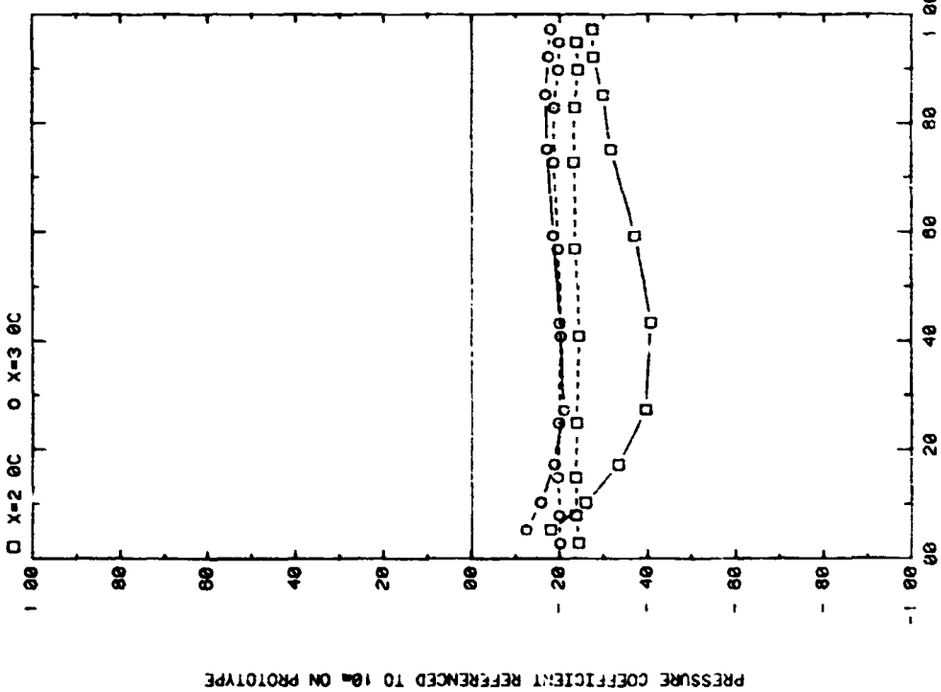


FRONT AND BACK PRESSURES ON ARRAY #2 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 35, H/C = 0 25

Plot 2-2-2. (Continued)

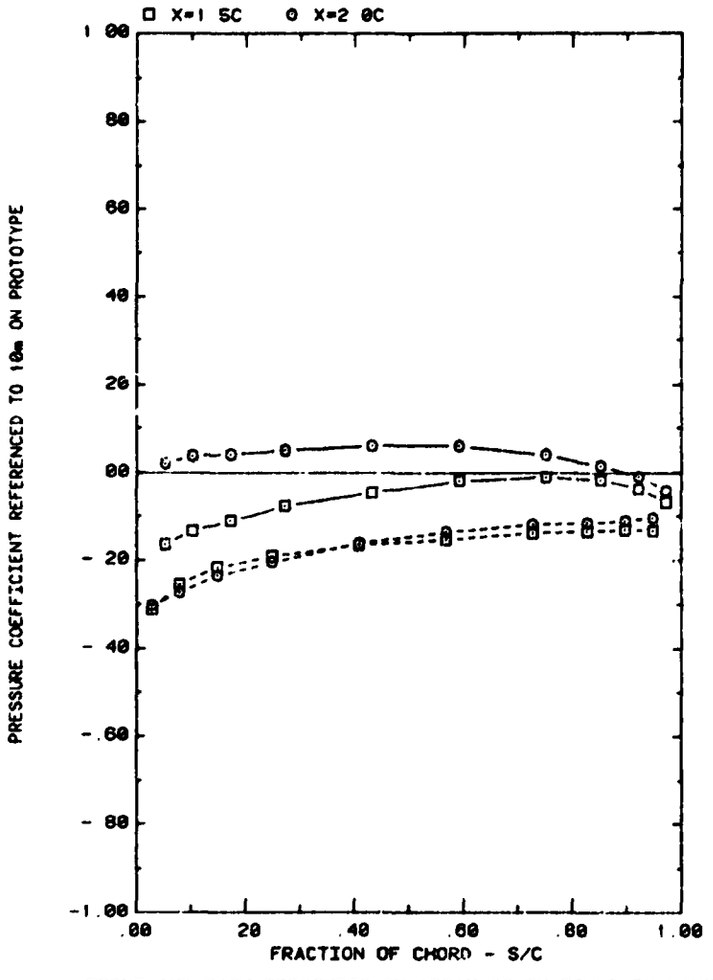


FRONT AND BACK PRESSURES ON ARRAY #2 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 145, H/C = 0 25

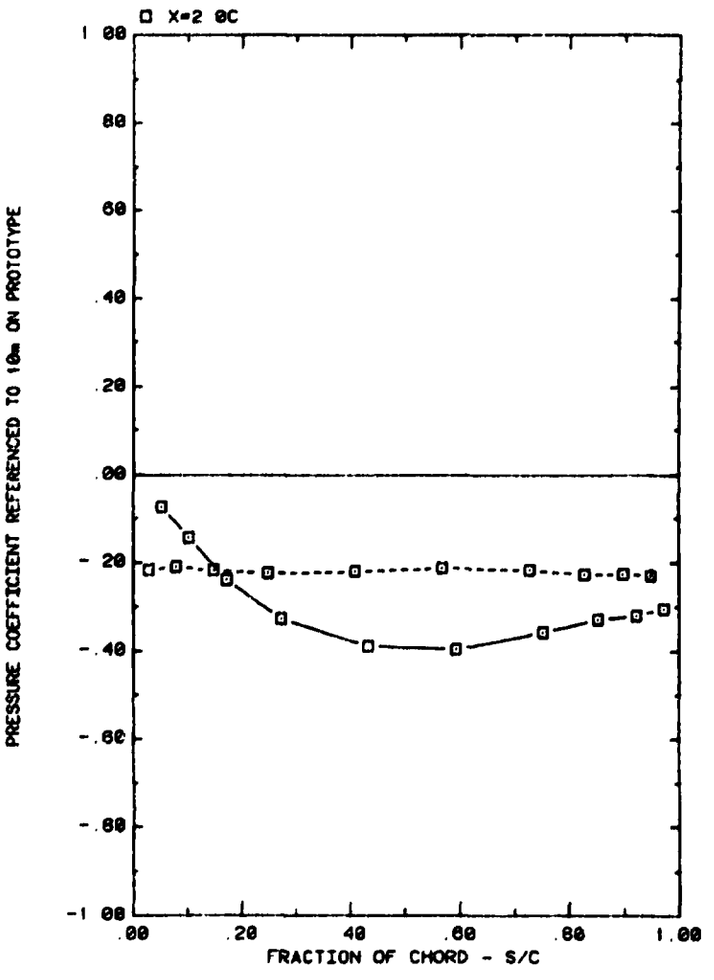


FRONT AND BACK PRESSURES ON ARRAY #2 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 120, H/C = 0 25

Plot 2-2-2. (Continued)

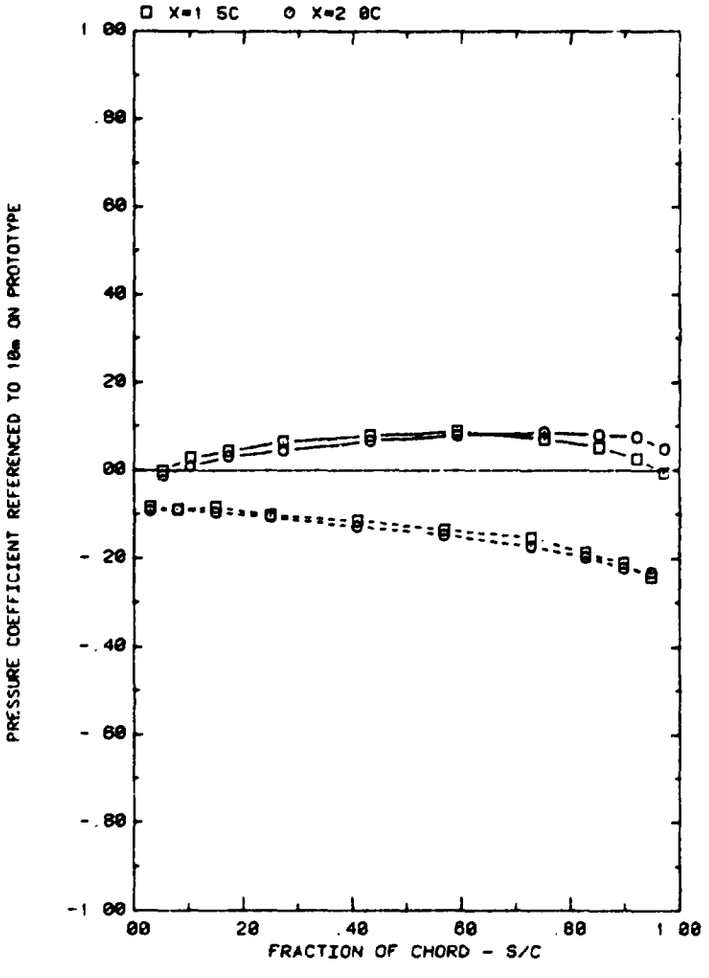


FRONT AND BACK PRESSURES ON ARRAY #2 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 180, H/C = 0 25

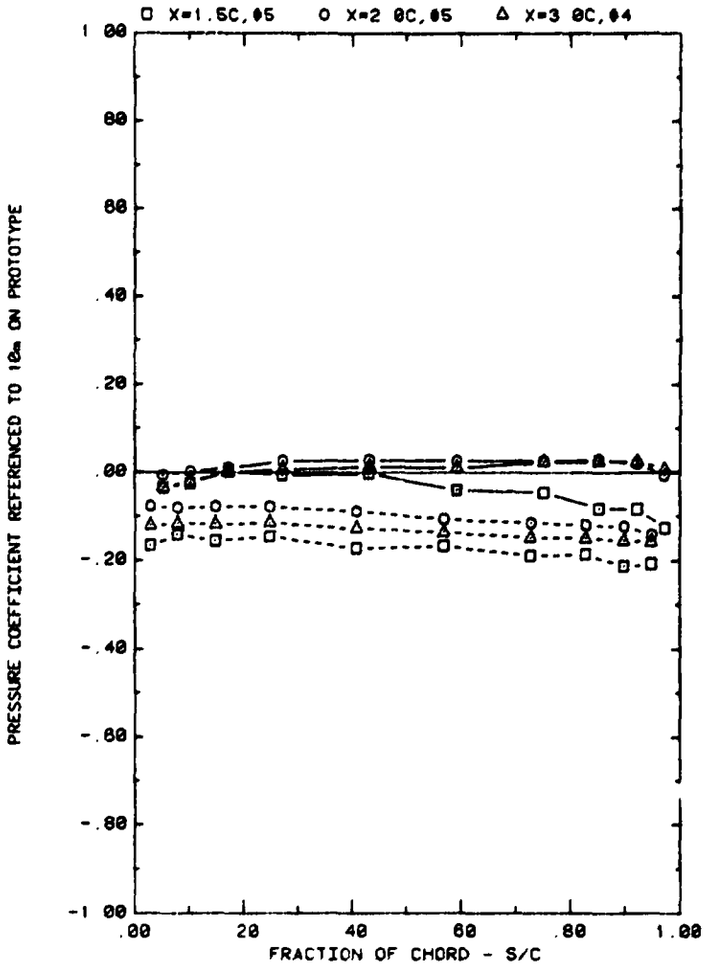


FRONT AND BACK PRESSURES ON ARRAY #2 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTTACK ANGLE 90, H/C = 0.25

Plot 2-2-2. (Continued)

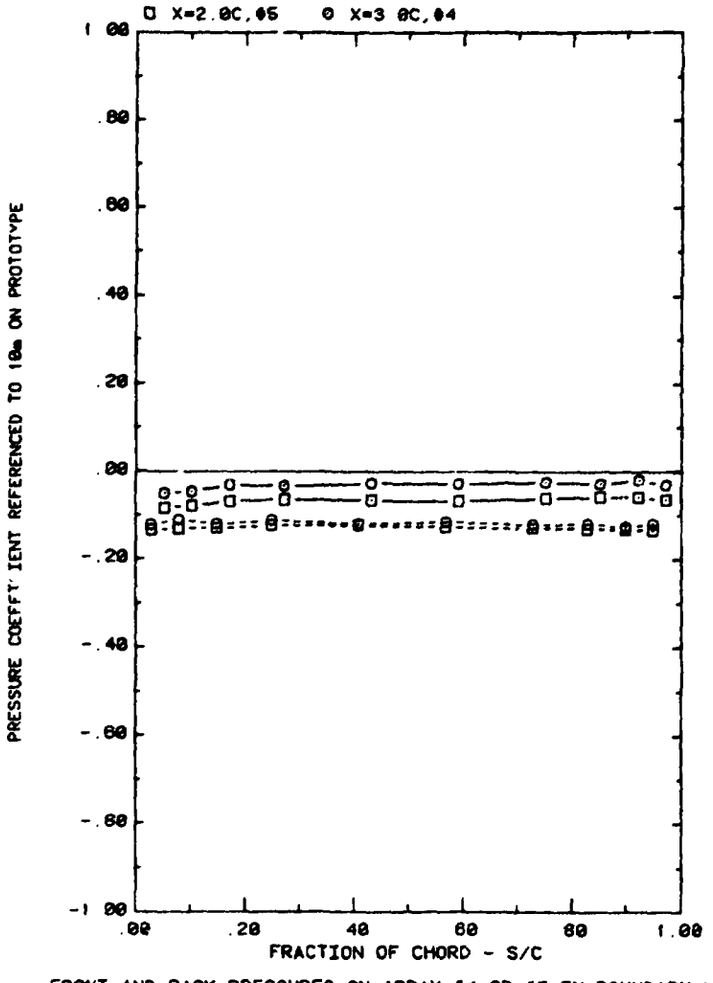


FRONT AND BACK PRESSURES ON ARRAY #5 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 20, H/C = 0 25

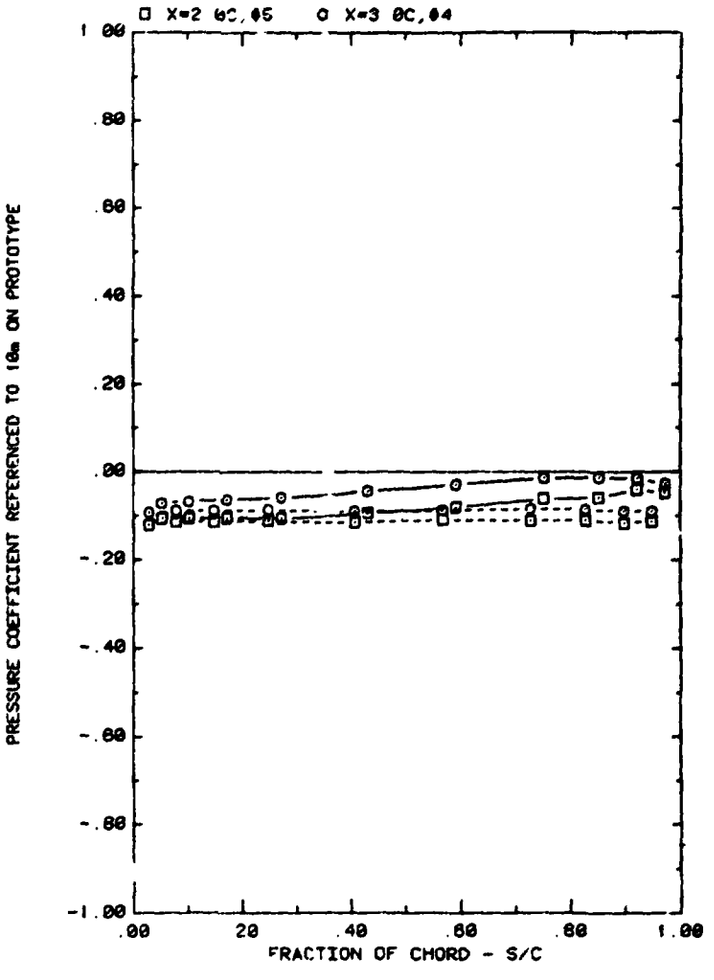


FRONT AND BACK PRESSURES ON ARRAY #4 OR #5 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 35, H/C = 0 25

Plot 2-2-2. (Continued)

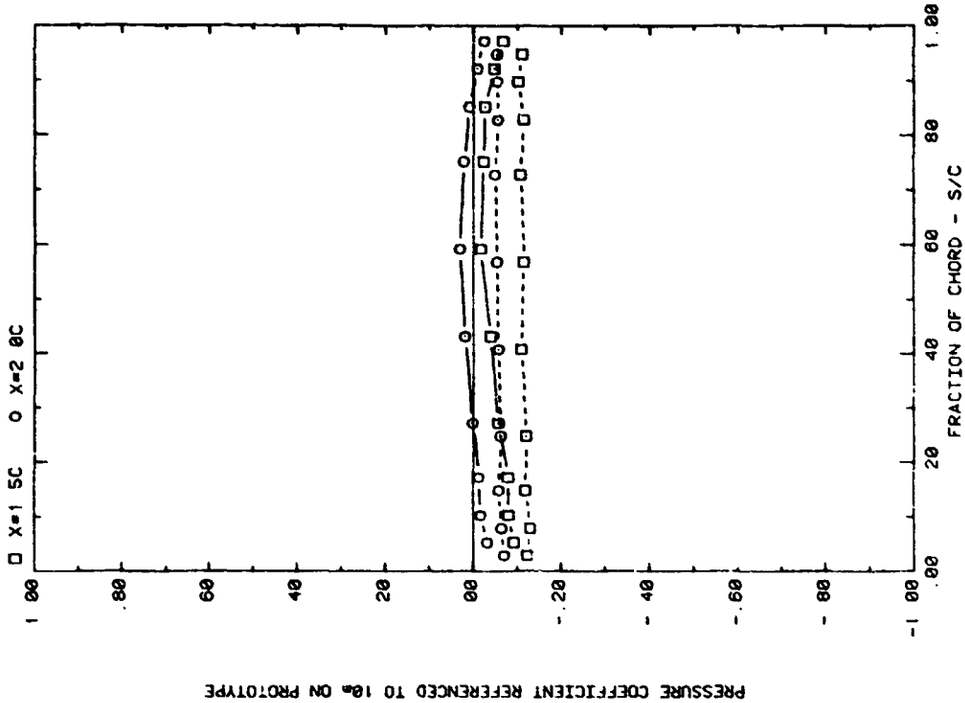


FRONT AND BACK PRESSURES ON ARRAY #4 OR #5 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 60, H/C = 0.25

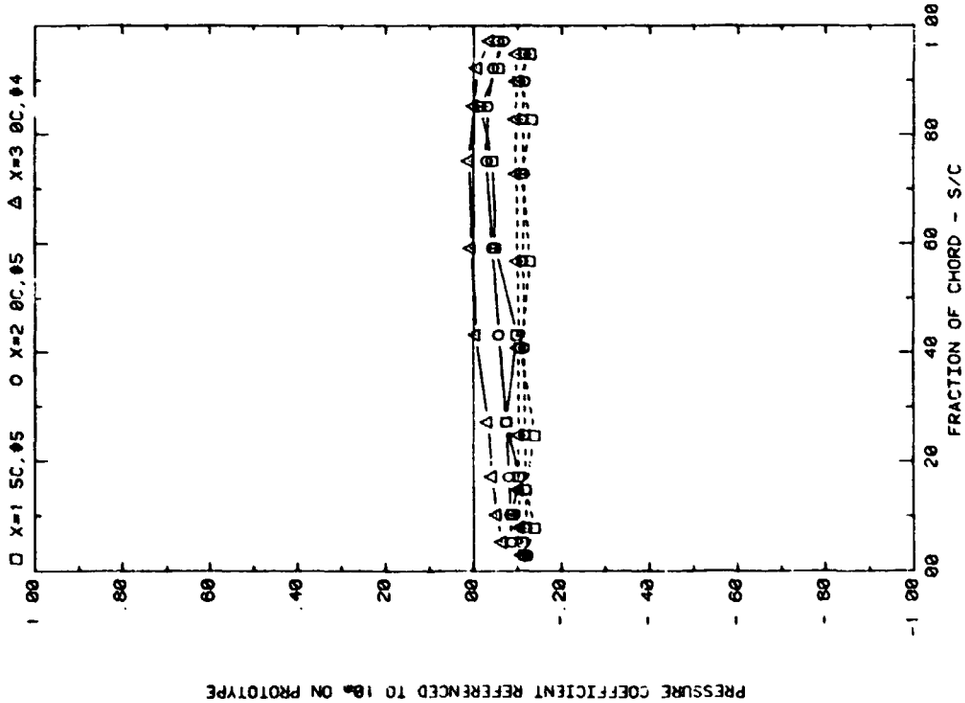


FRONT AND BACK PRESSURES ON ARRAY #4 OR #5 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 120, H/C = 0.25

Plot 2-2-2. (Continued)



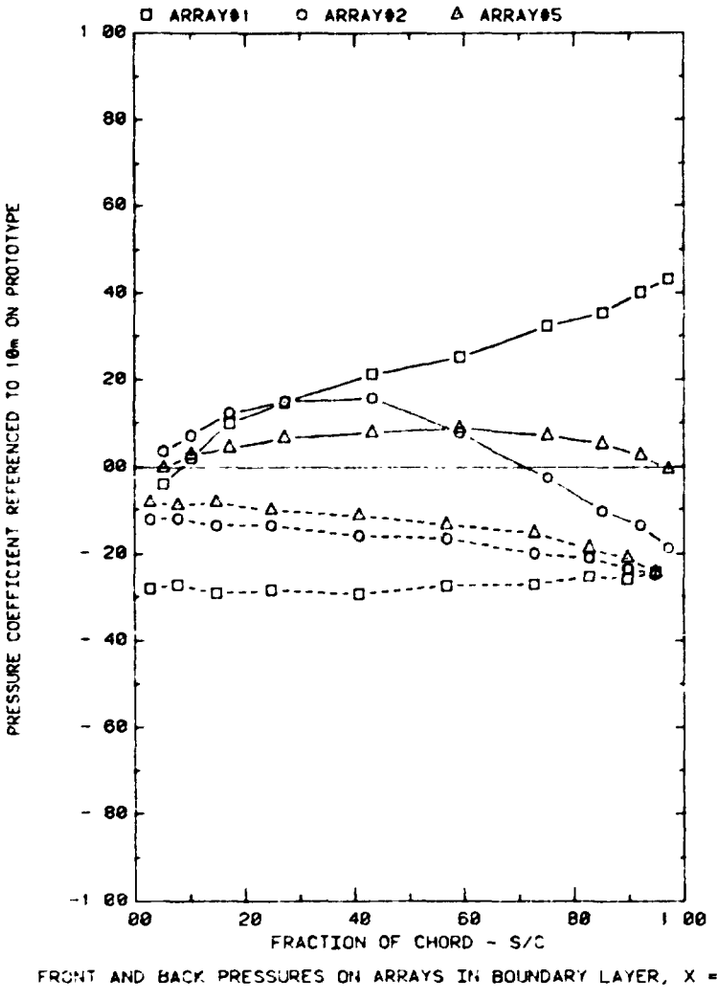
FRONT AND BACK PRESSURES ON ARRAY #5 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 160, H/C = 0 25



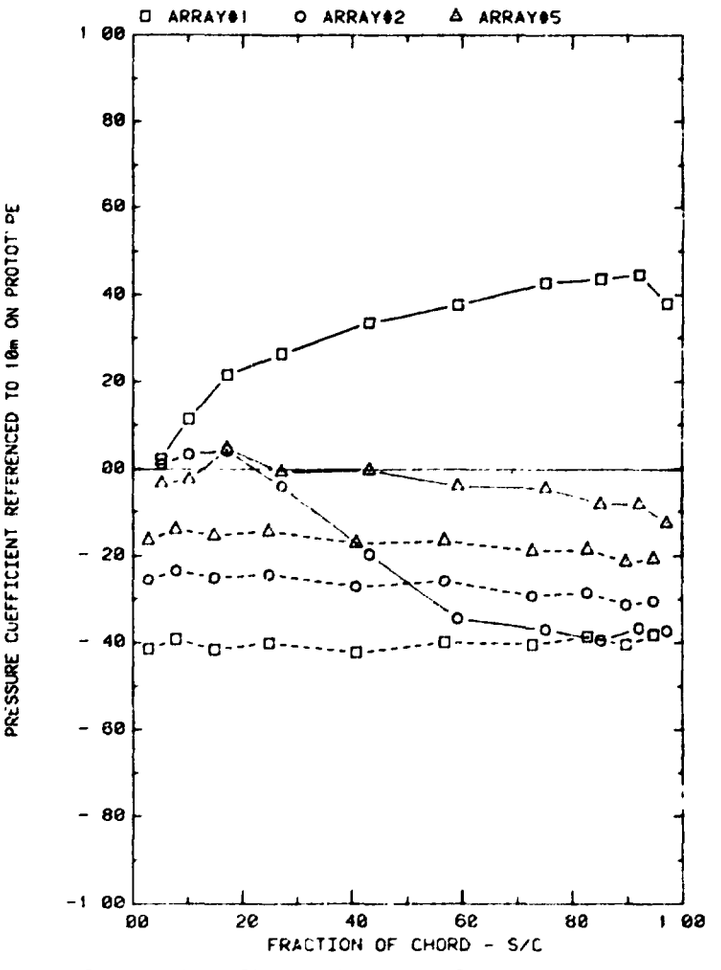
FRONT AND BACK PRESSURES ON ARRAY #4 OR #5 IN BOUNDARY LAYER
EFFECT OF SEPARATION (X) ON ATTACK ANGLE 145, H/C = 0 25

Plot 2-2-2. (Continued)

Plot 2-2-2. (Concluded)

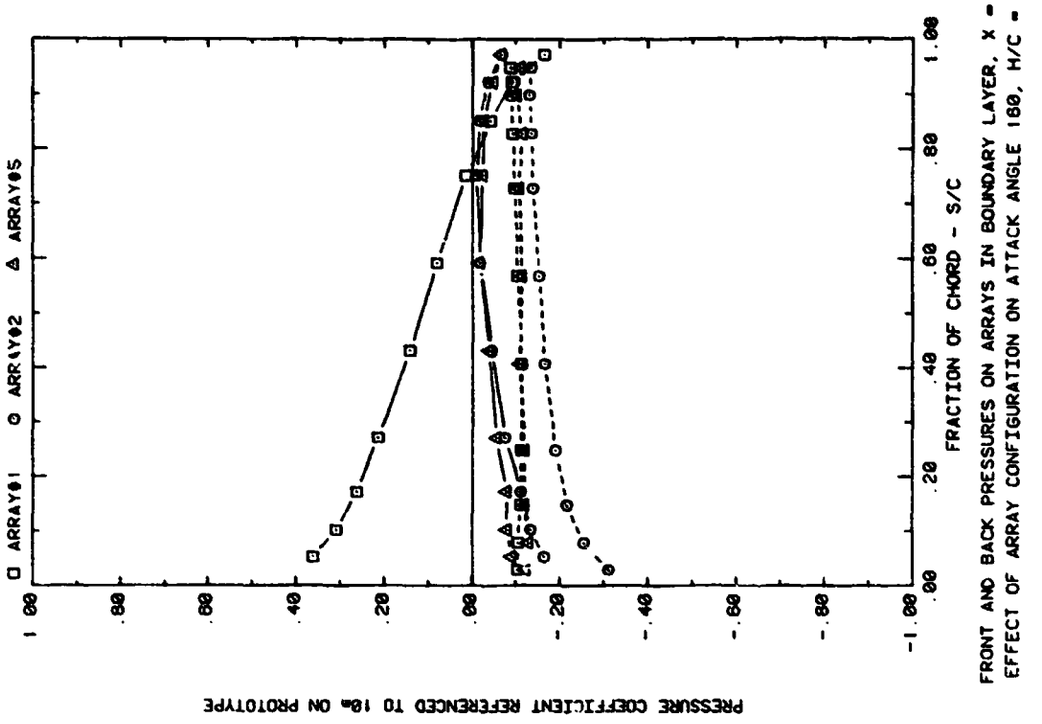


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 1 5C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 20, H/C = 0 25

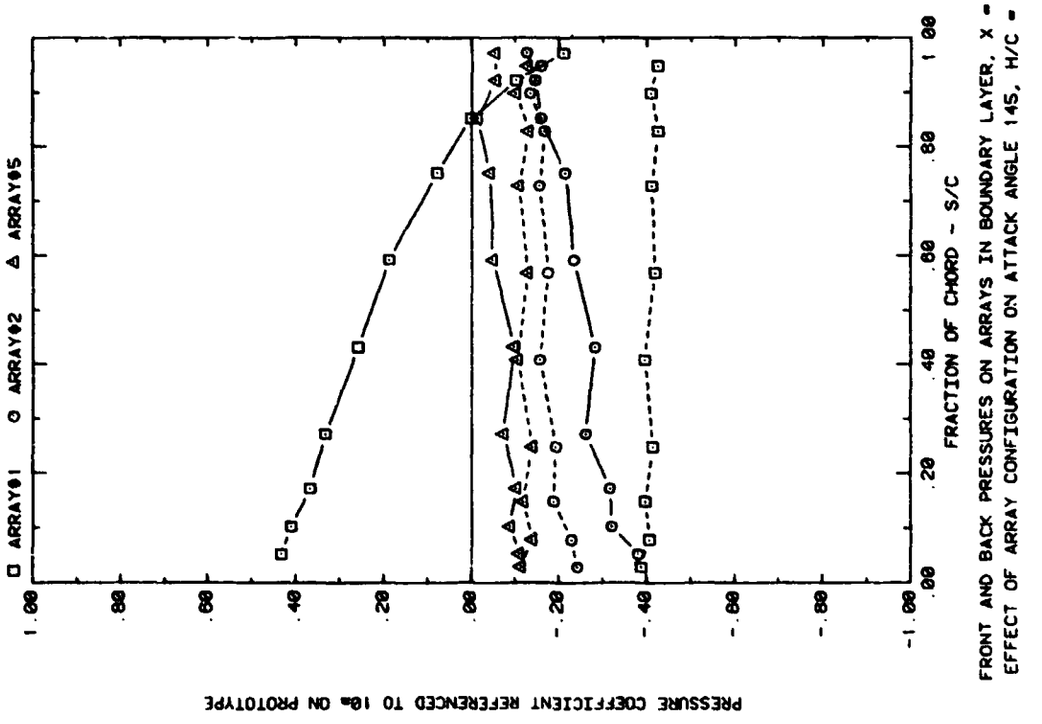


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 1 5C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 35, H/C = 0 25

Plot 2-2-3. Multiple Arrays without Fence, Nonuniform Flow Study
Effect of Array Position

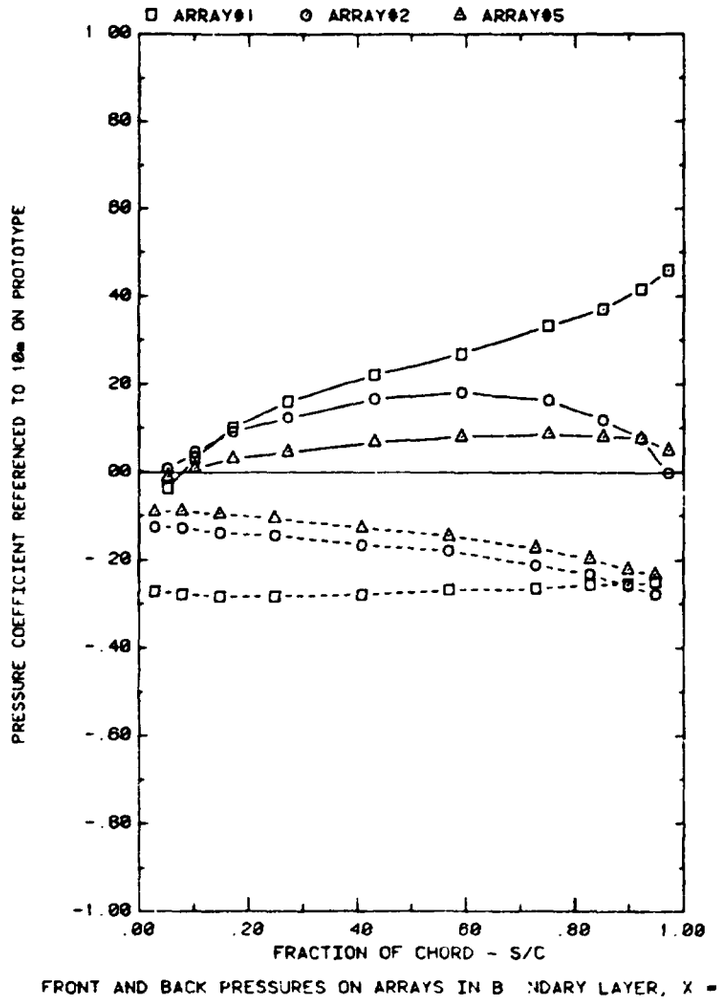


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 1.5C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 180, H/C = 0.25

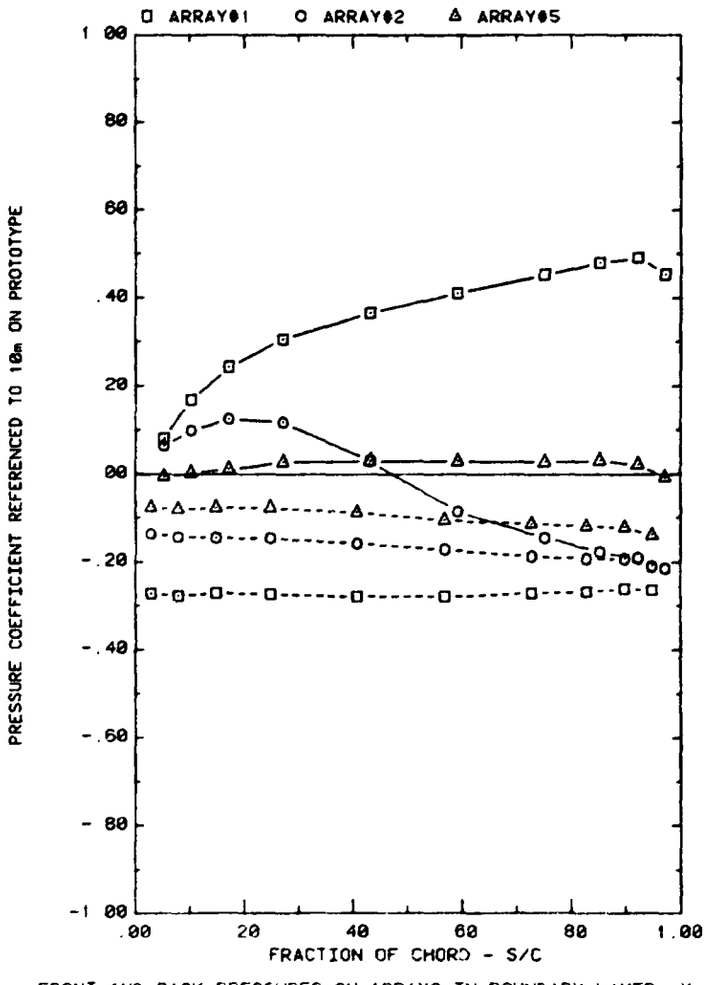


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 1.5C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 145, H/C = 0.25

Plot 2-2-3. (Continued)

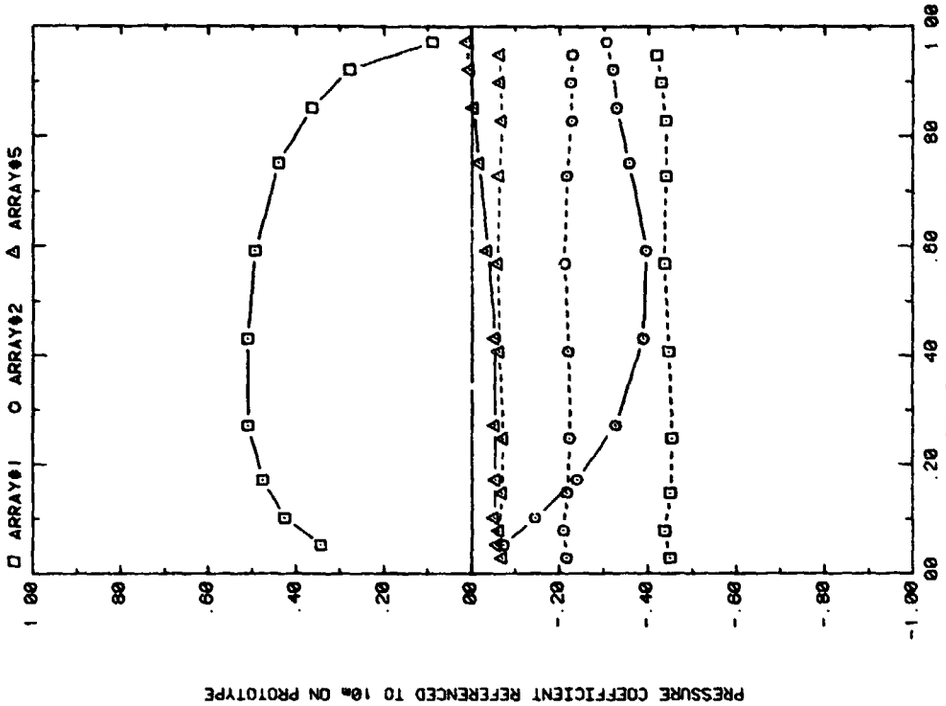


FRONT AND BACK PRESSURES ON ARRAYS IN B NDARY LAYER, X = 2 0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 20, H/C = 0 25

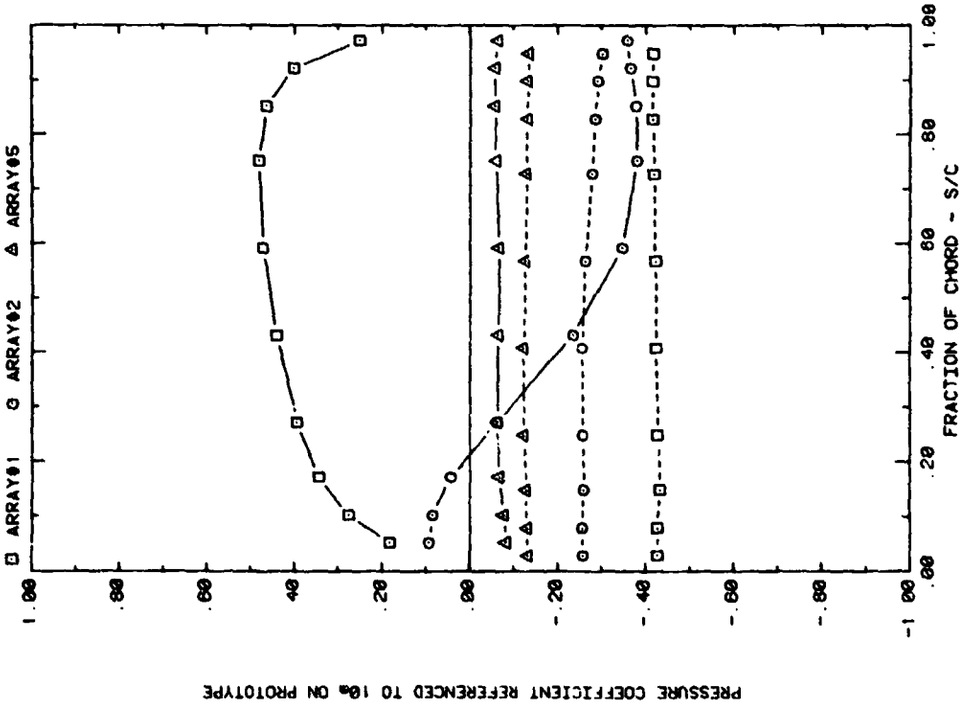


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 2 0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 35, H/C = 0 25

Plot 2-2-3. (Continued)

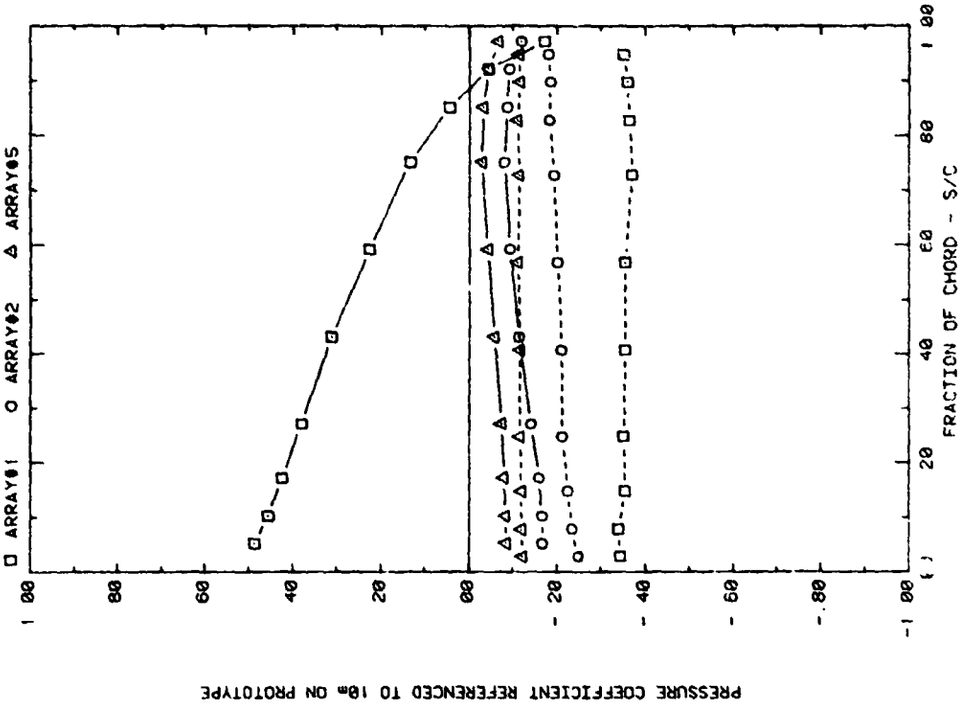


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 2 0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 90, H/C = 0 25

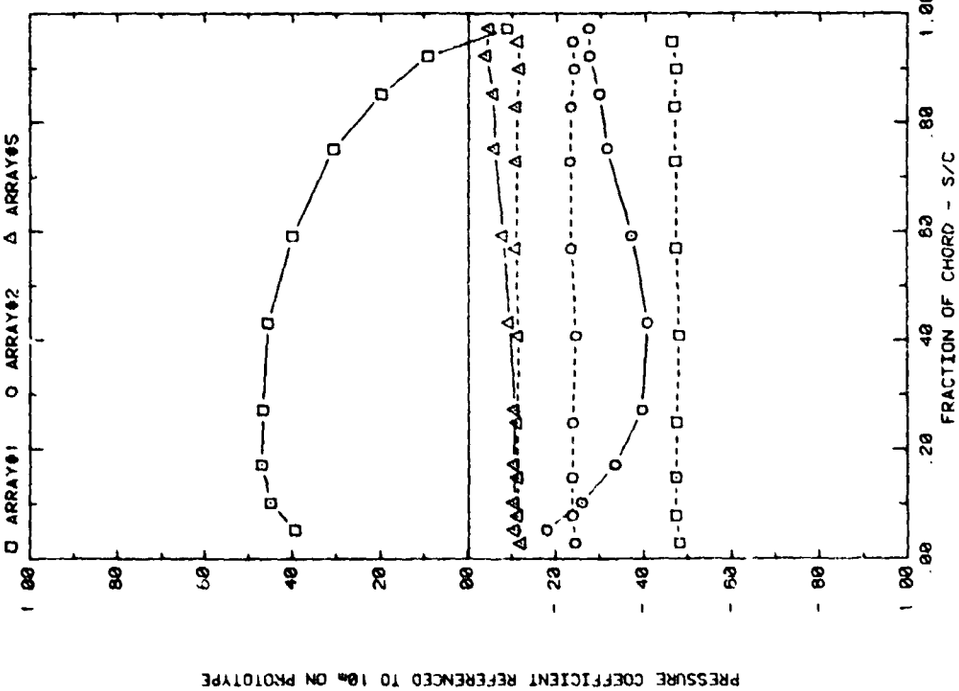


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 2 0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 60, H/C = 0 25

Plot 2-2-3. (Continued)

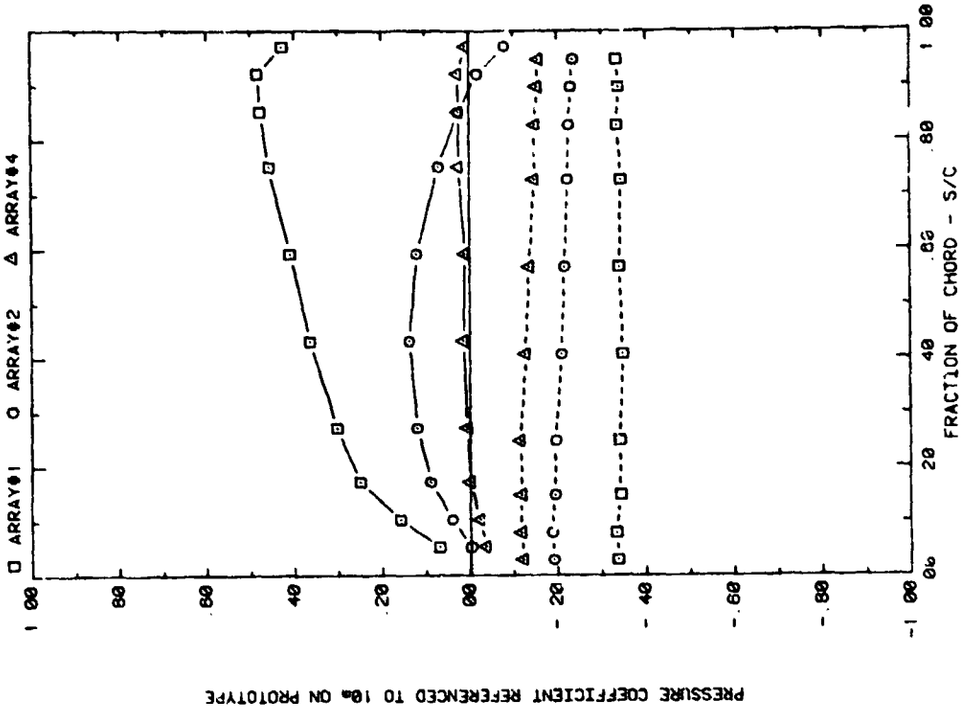


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 2.0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 145, H/C = 0.25

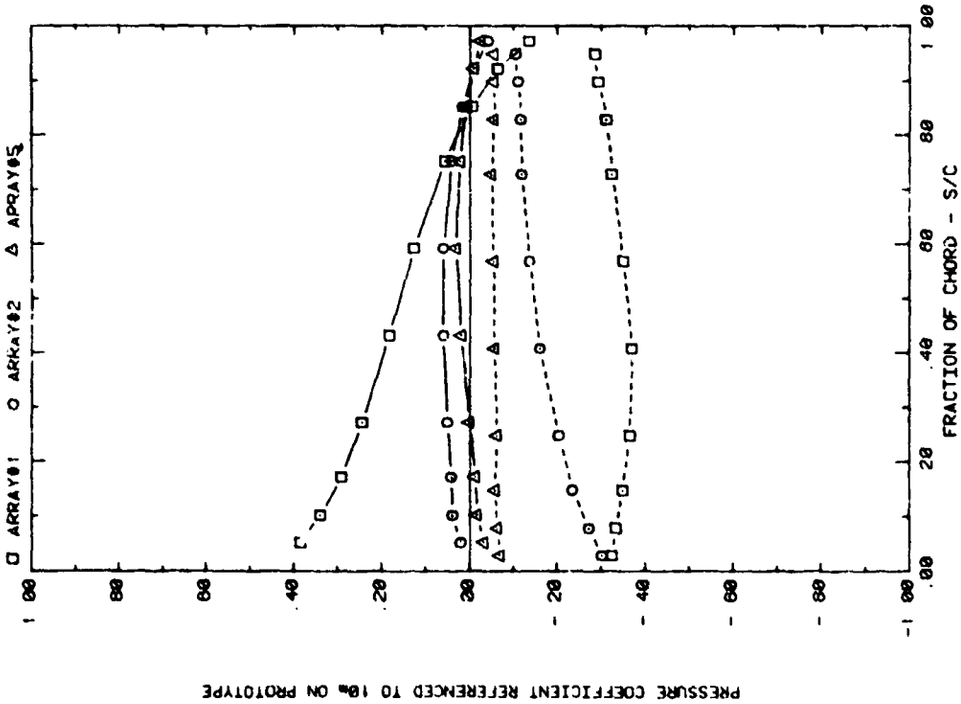


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 2.0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 120, H/C = 0.25

- Plot 2-2-3. (Continued)

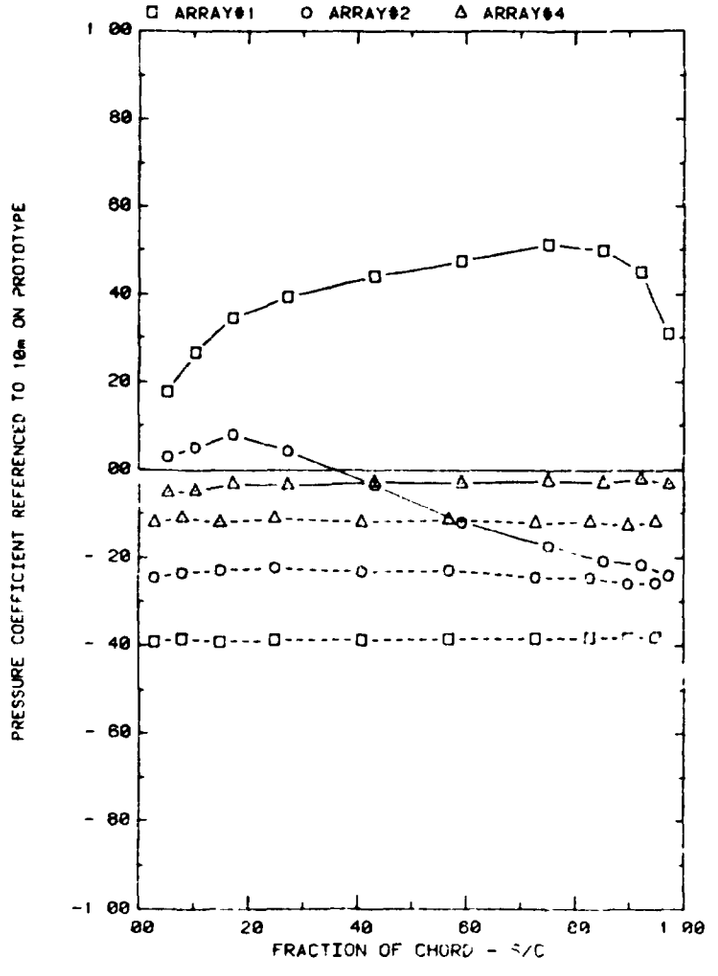


FRONT AND BACK PRESSURES ON APRAYS IN BOUNDARY LAYER, X = 3 ØC
EFFECT OF ARPAY CONFIGURATION ON ATTAC, ANGLE 35, H/C = Ø 25

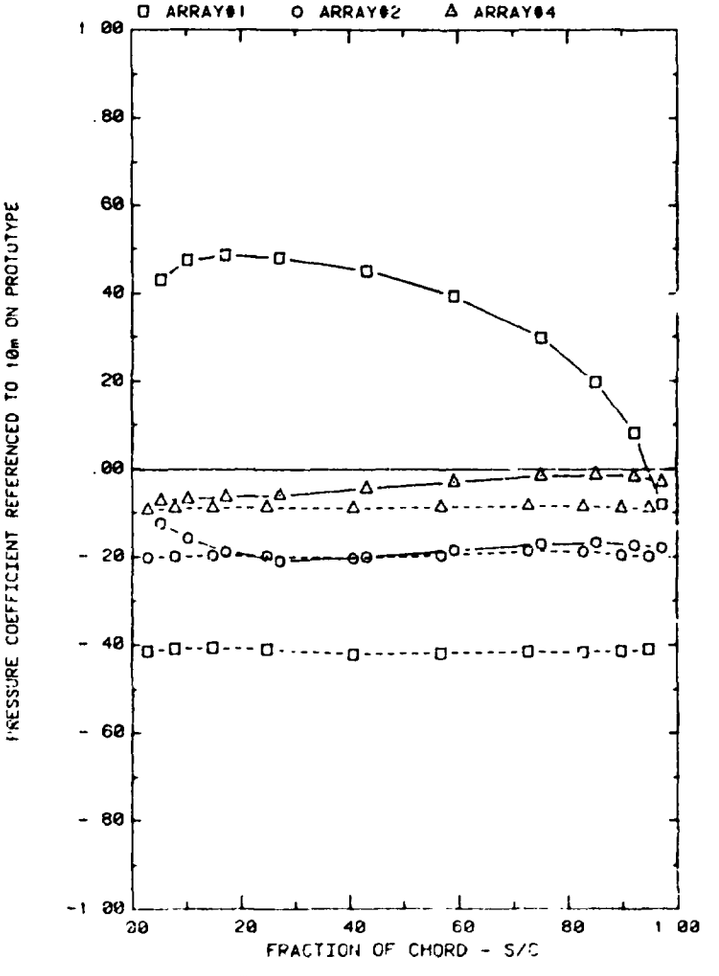


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 2.ØC
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 18Ø, H/C = Ø 25

Plot 2-2-3. (Continued)

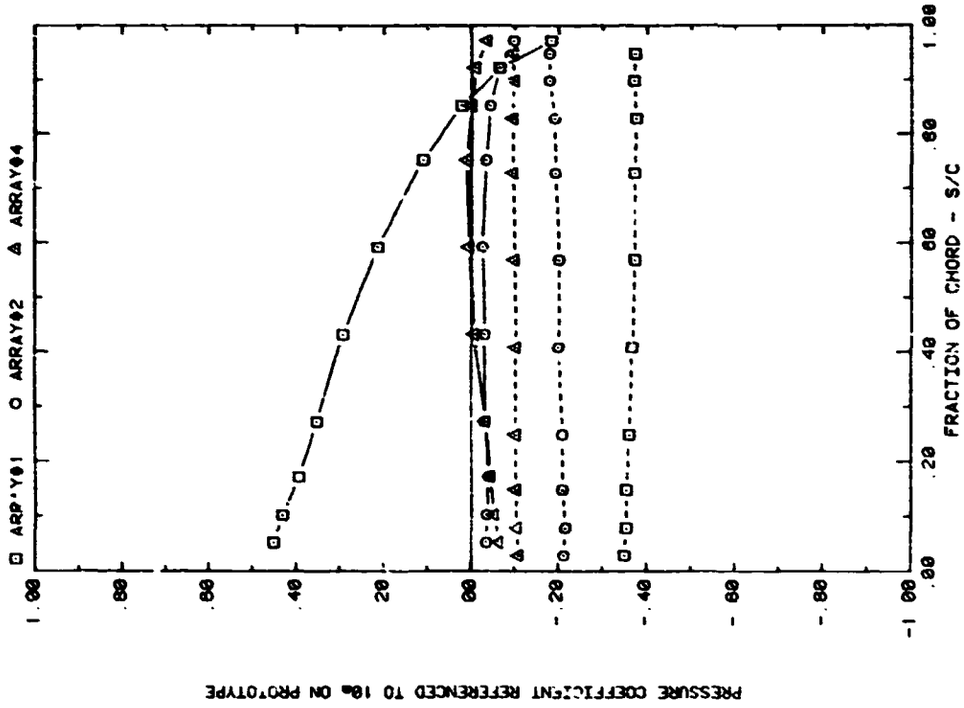


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 3.0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 60, H/C = 0.25



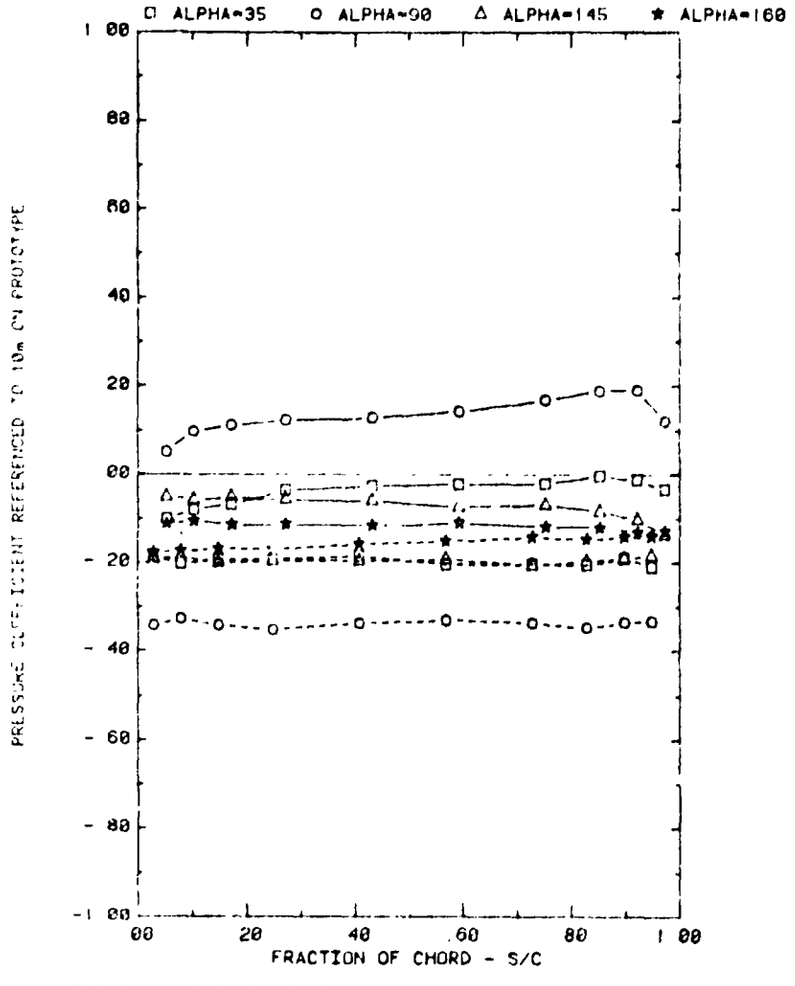
FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 3.0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 120, H/C = 0.25

Plot 2-2-3. (Continued)

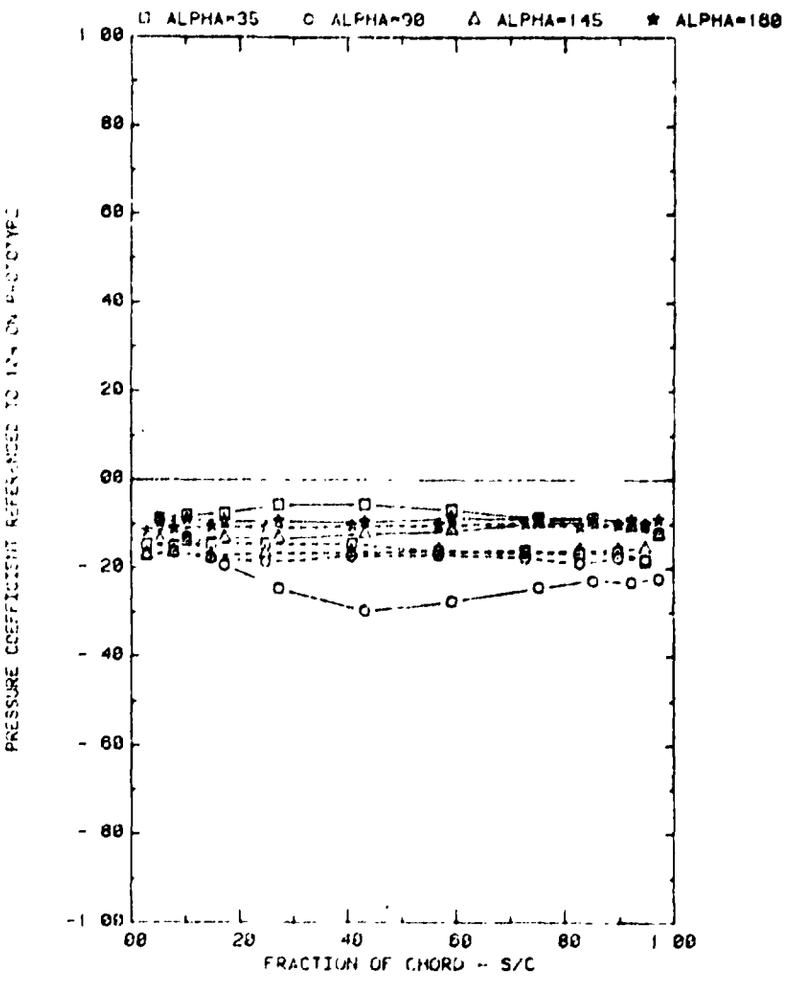


FRONT AND BACK PRESSURES ON ARRAYS IN BOUNDARY LAYER, X = 3 0C
EFFECT OF ARRAY CONFIGURATION ON ATTACK ANGLE 145, H/C = 0 25

Plot 2-2-3. (Concluded)

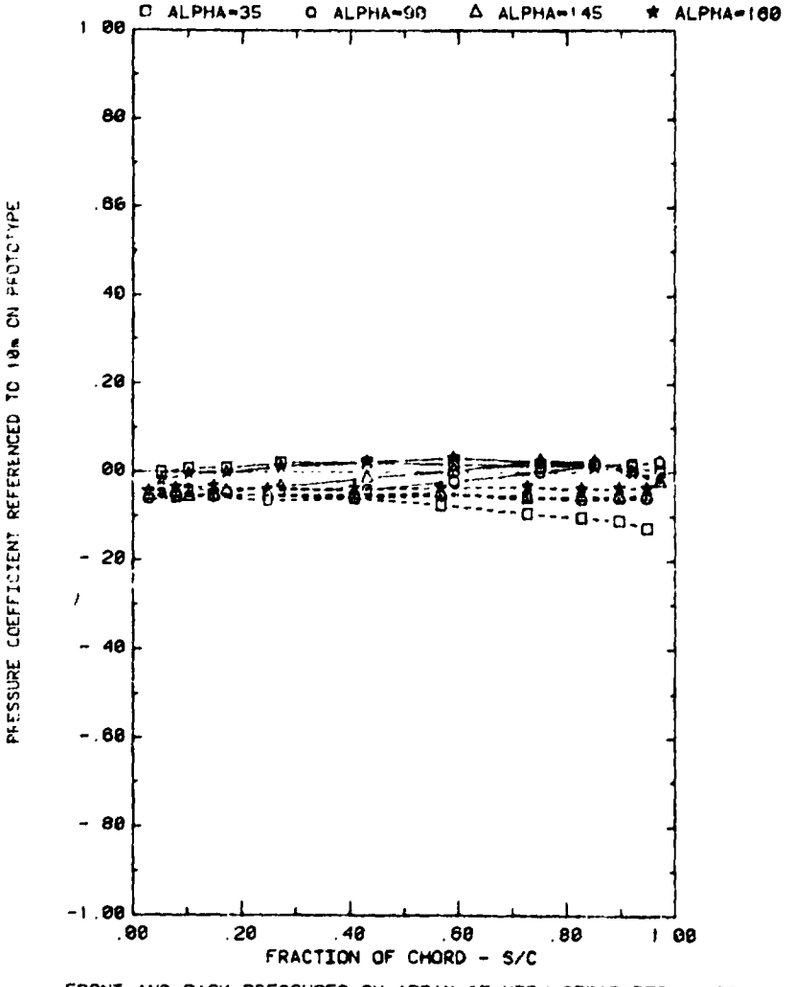


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF ATTACK ANGLE WITH H=3", P=30%, AND D=5"

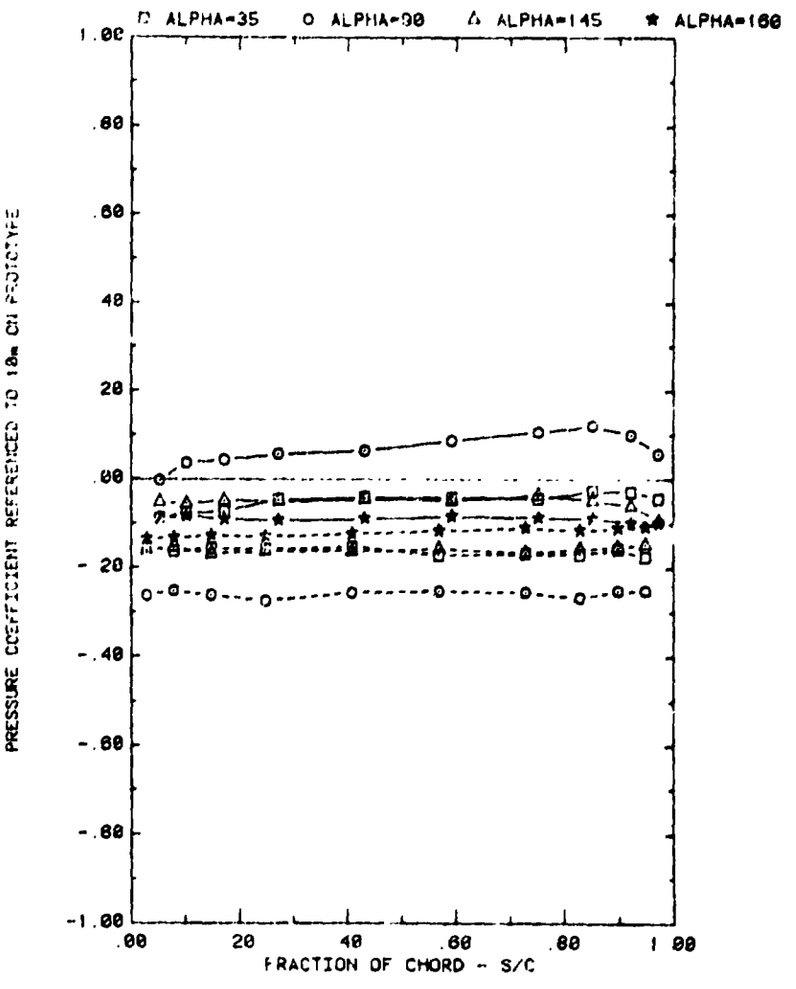


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF ATTACK ANGLE WITH H=3", P=30%, AND D=5"

Plot 3-1. Multiple Arrays with Fence, WD = 0°
Effect of Angle of Attack

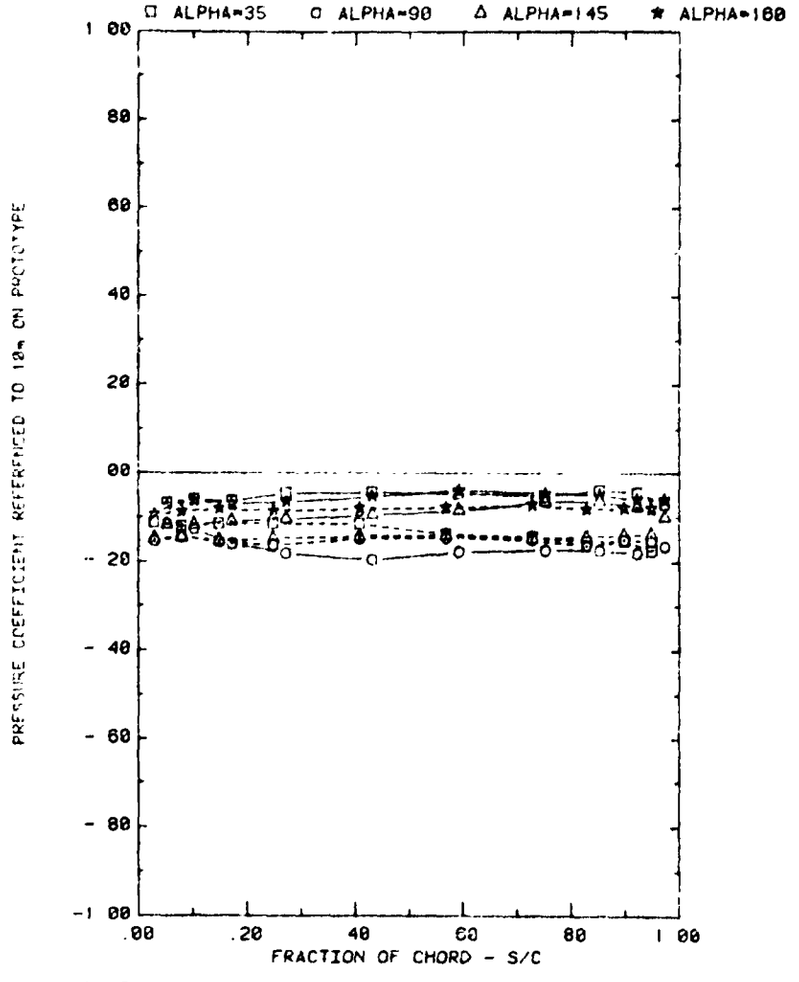


FRONT AND BACK PRESSURES ON ARRAY #5 WITH SEPARATION = 2C
EFFECT OF ATTACK ANGLE WITH H=3", P=30%, AND D=5"

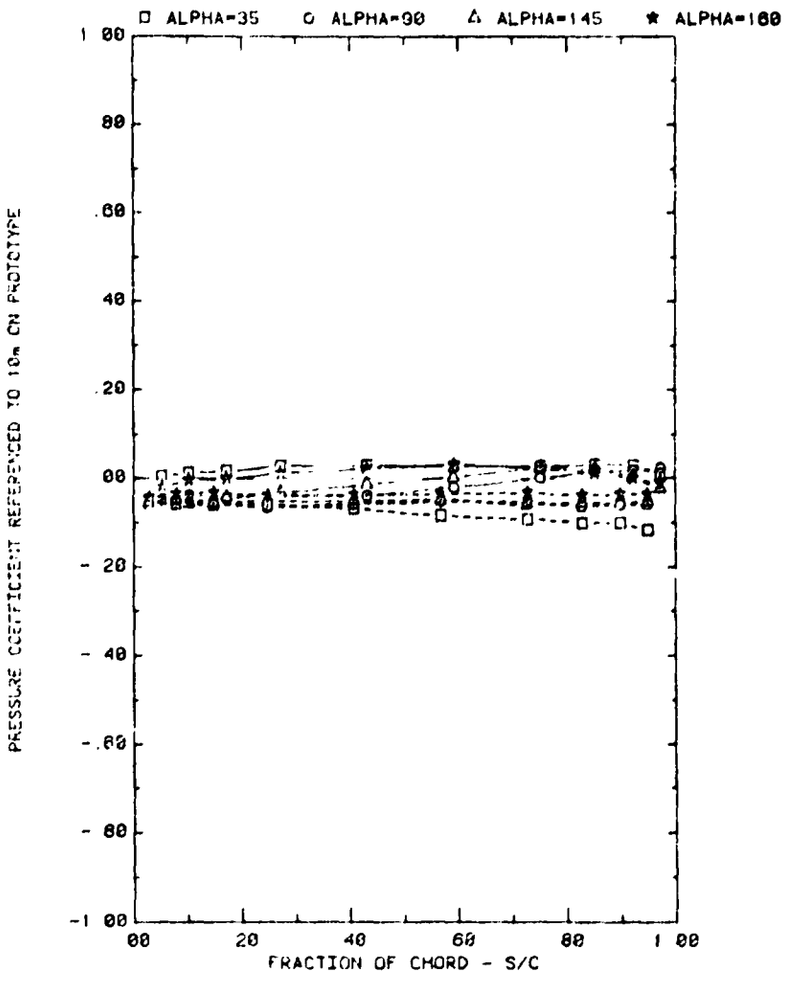


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF ATTACK ANGLE WITH H=3", P=30%, AND D=10"

Plot 3-1. (Continued)

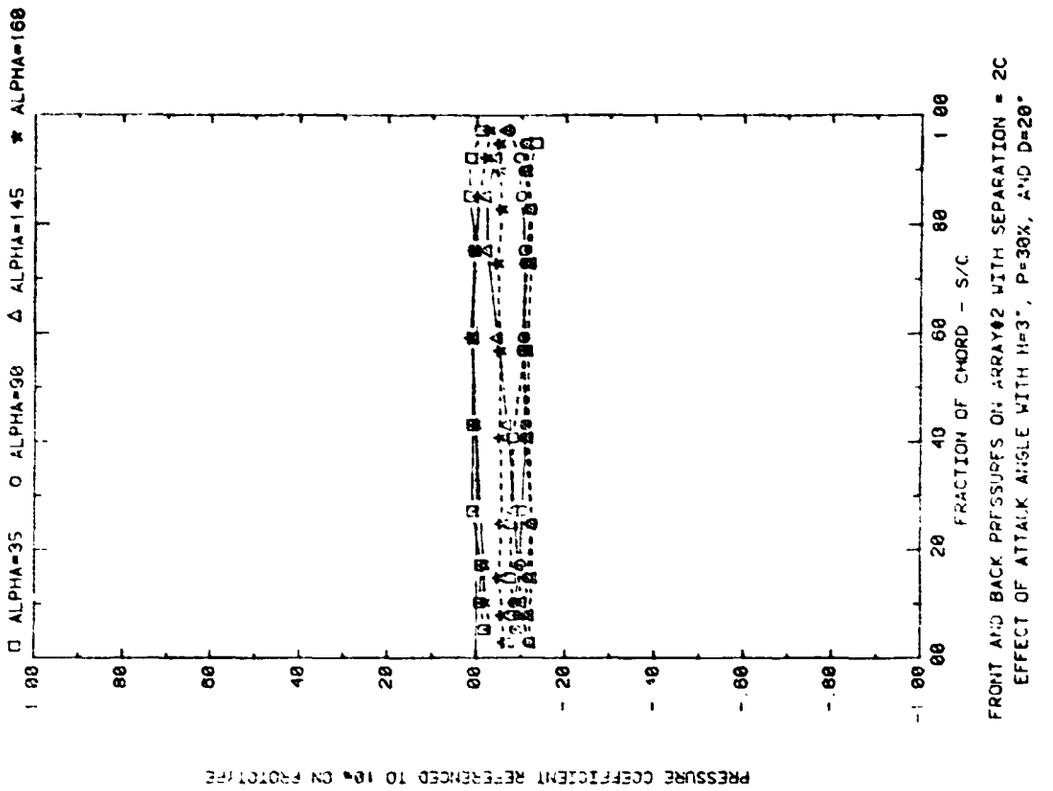


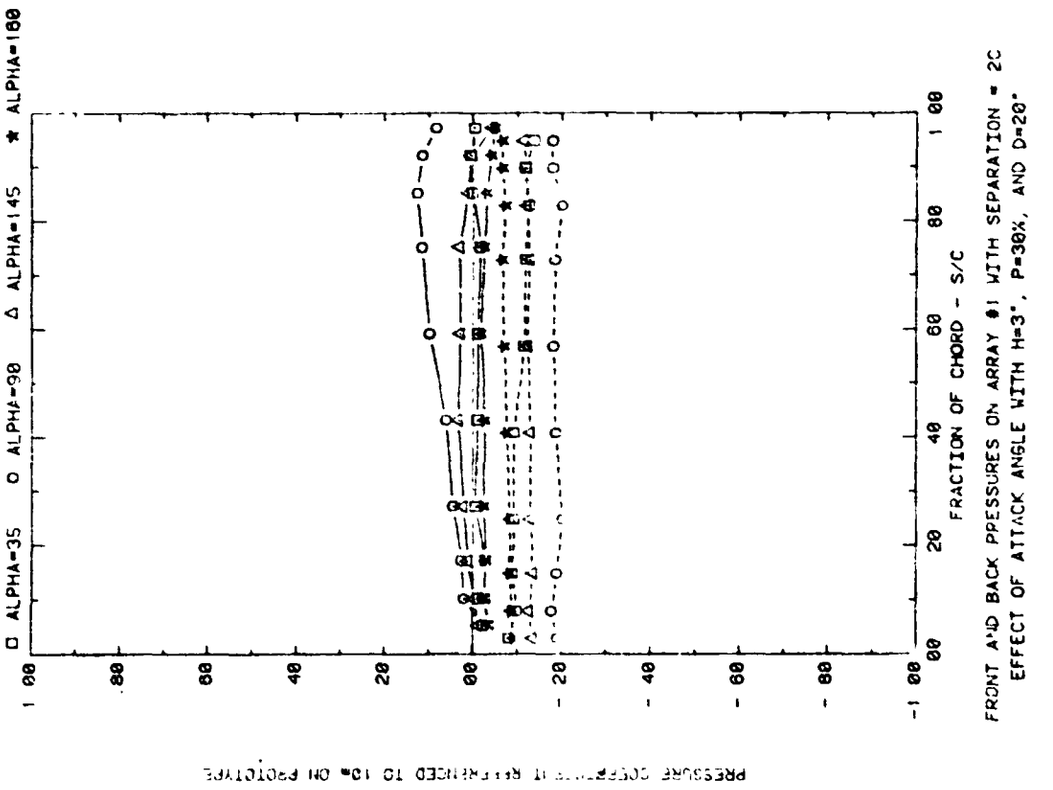
FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF ATTACK ANGLE WITH H=3", P=30%, AND D=10"



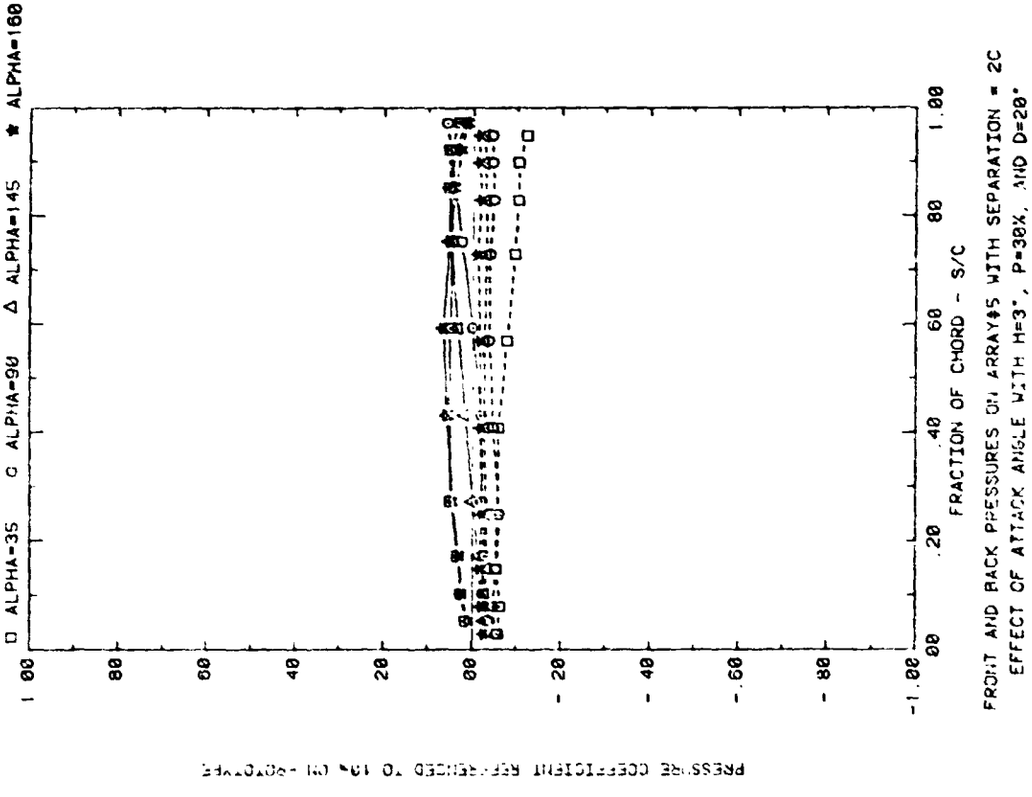
FRONT AND BACK PRESSURES ON ARRAY #5 WITH SEPARATION = 2C
EFFECT OF ATTACK ANGLE WITH H=3", P=30%, AND D=10"

Plot 3-1. (Continued)

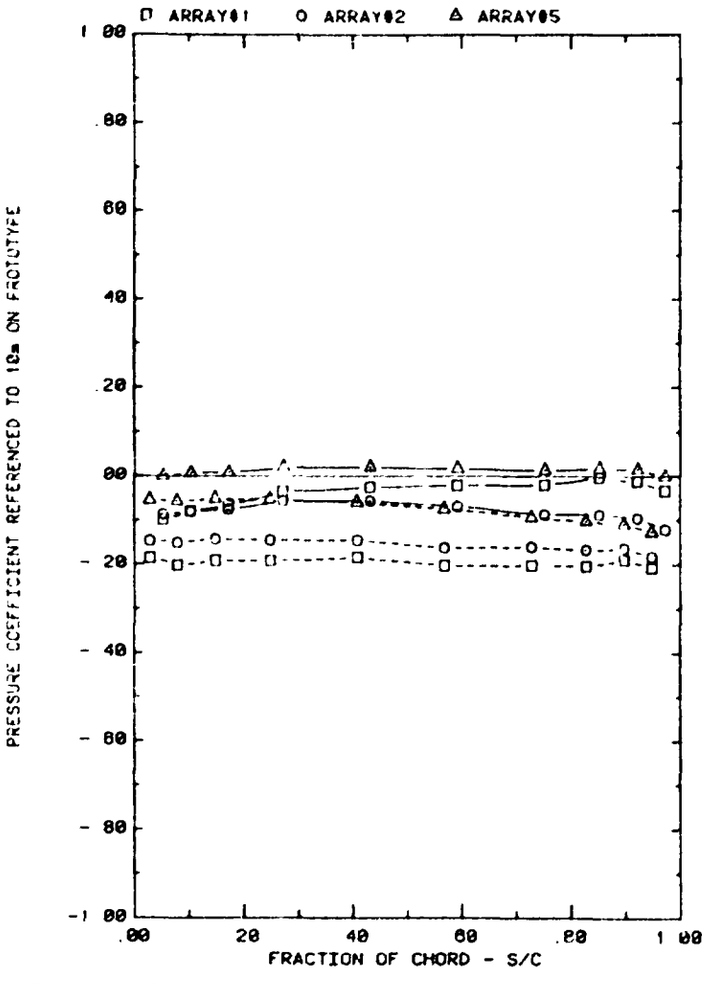




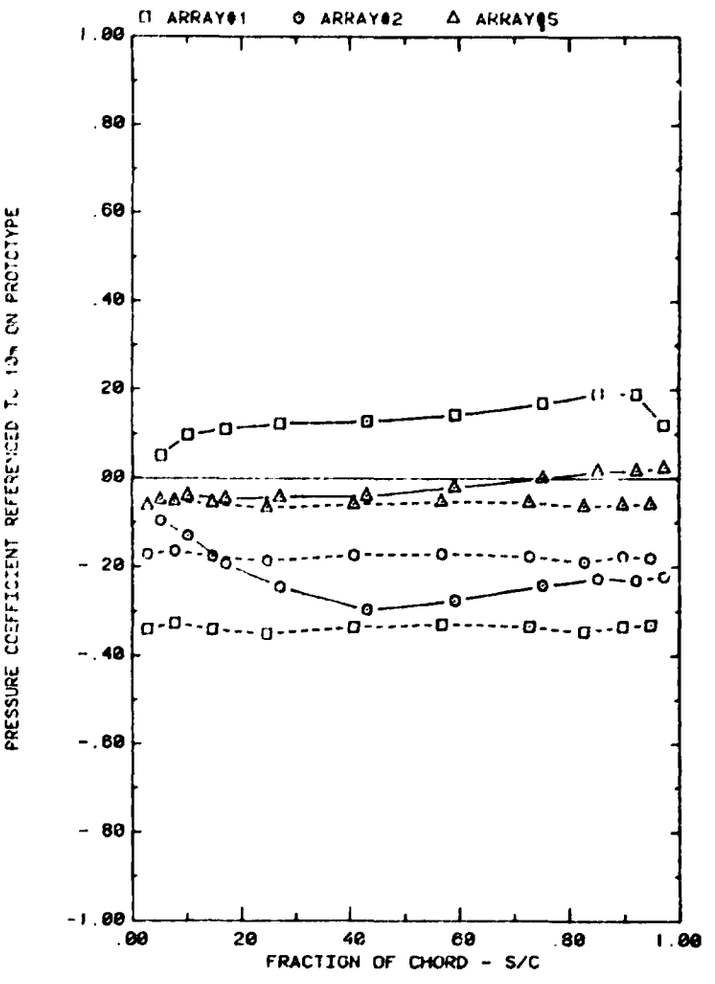
Plot 3-1. (Continued)



Plot 3-1. (Concluded)

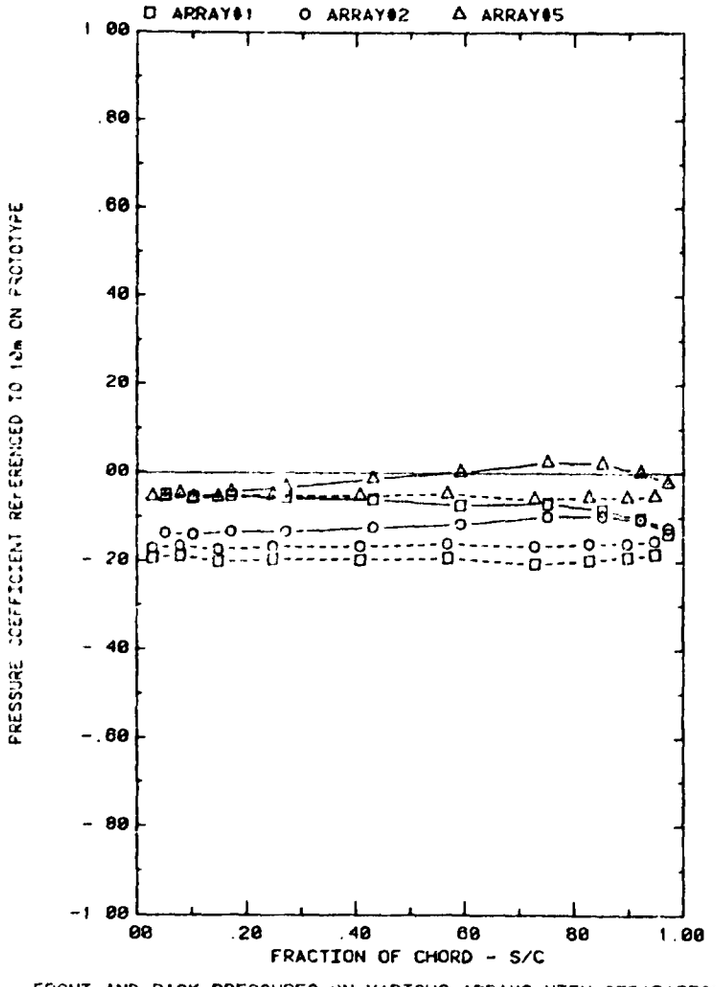


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=35, H=3°, P=30%, AND D=5°

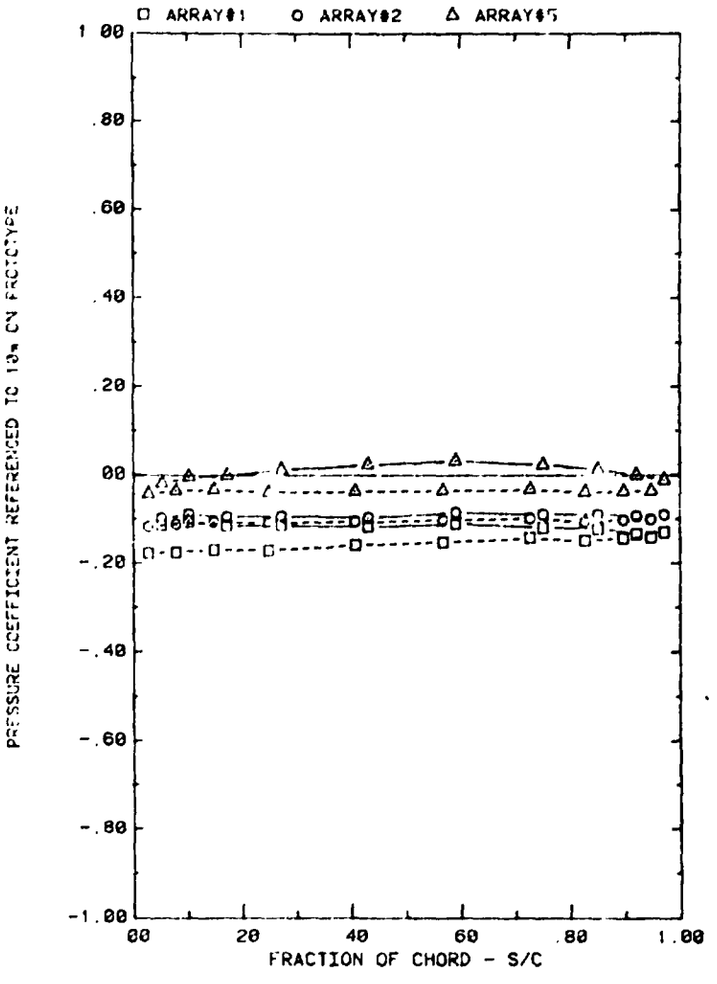


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=00, H=3°, P=30%, AND D=5°

Plot 3-2. Multiple Arrays with Fence, WD = 0°
Effect of Array Position

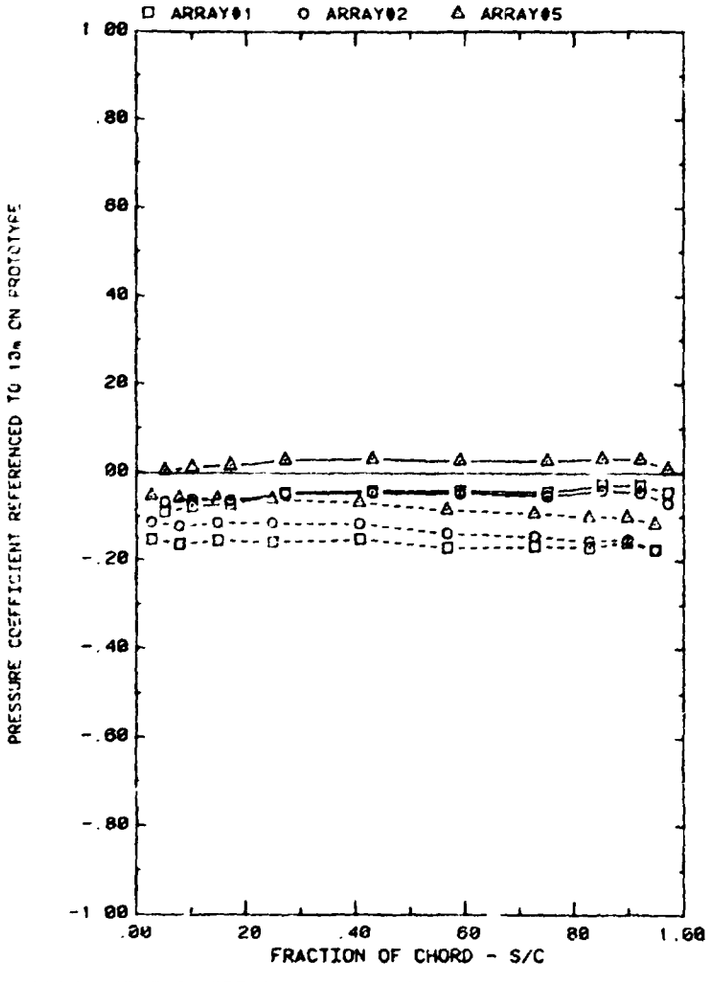


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=145, H=3", P=30%, AND D=5"

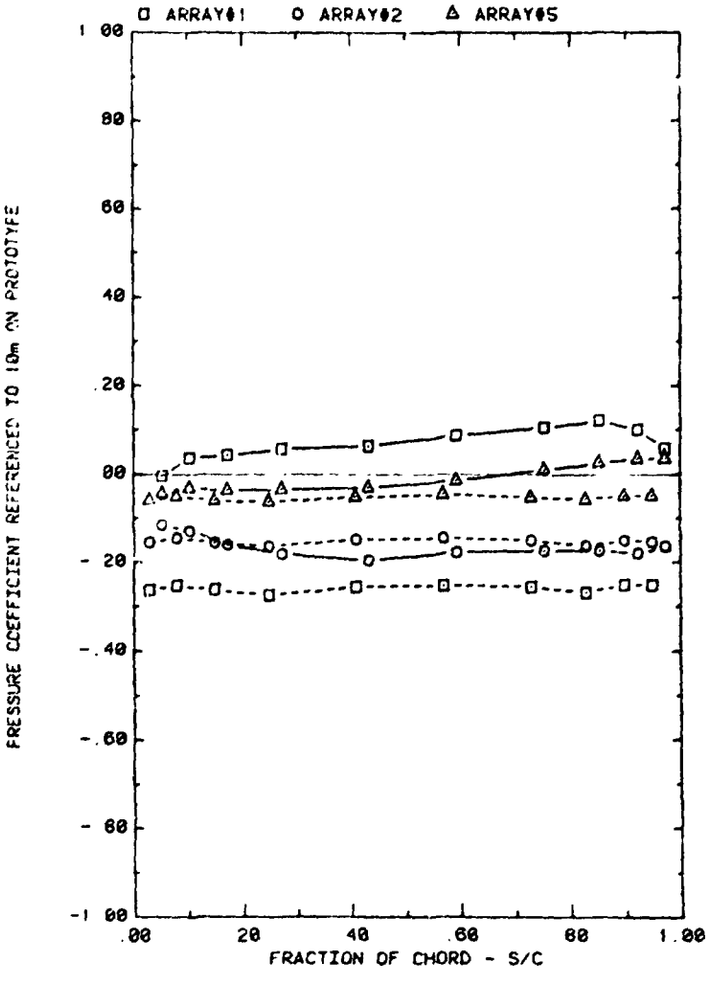


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=160, H=3", P=30%, AND D=5"

Plot 3-2. (Continued)

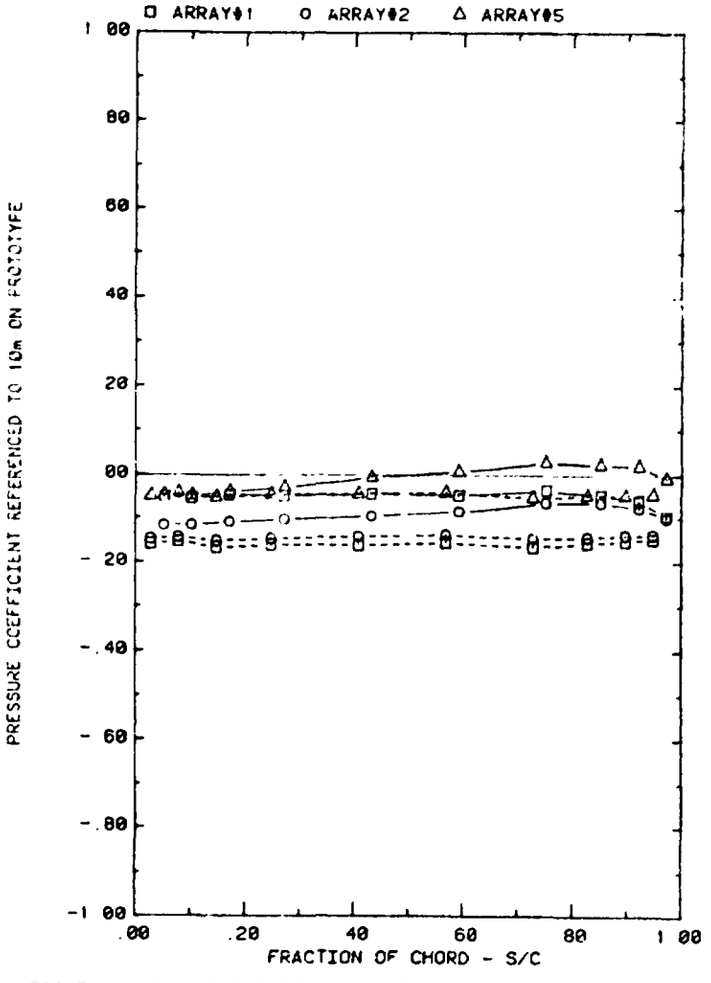


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=35, H=3', P=30%, AND D=10'

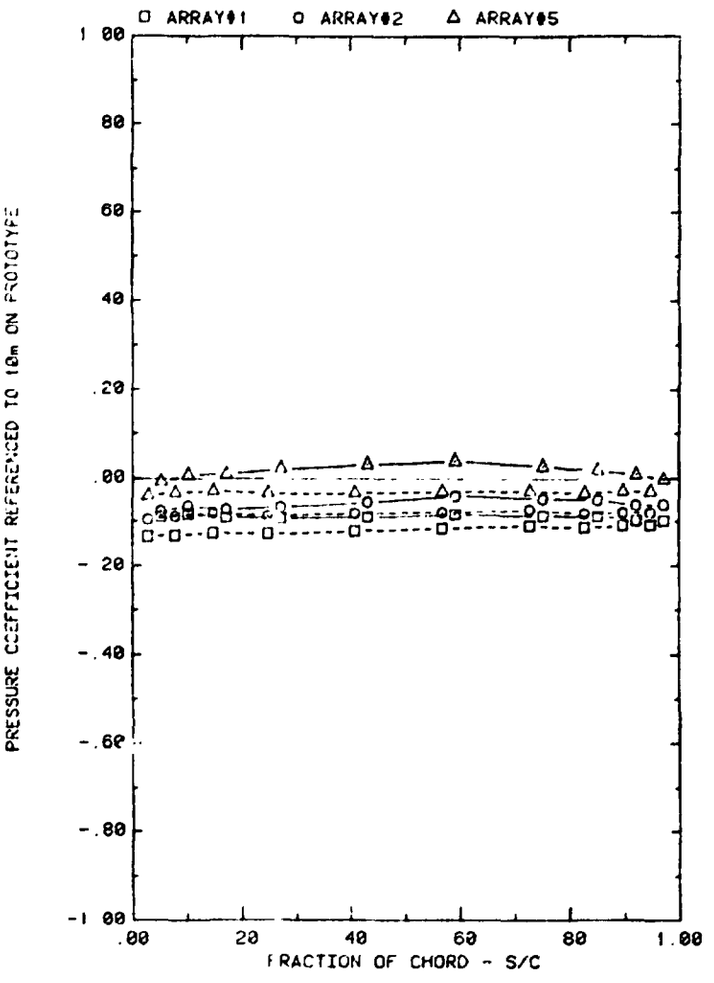


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=90, H=3', P=30%, AND D=10'

Plot 3-2. (Continued)

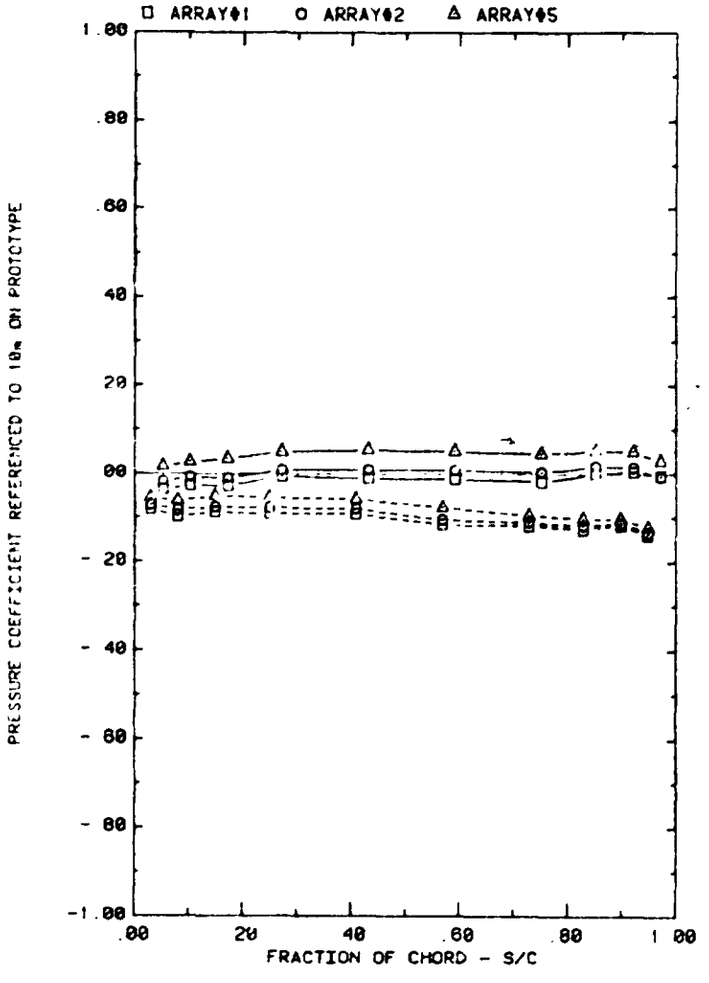


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=145, H=3', P=30%, AND D=10'

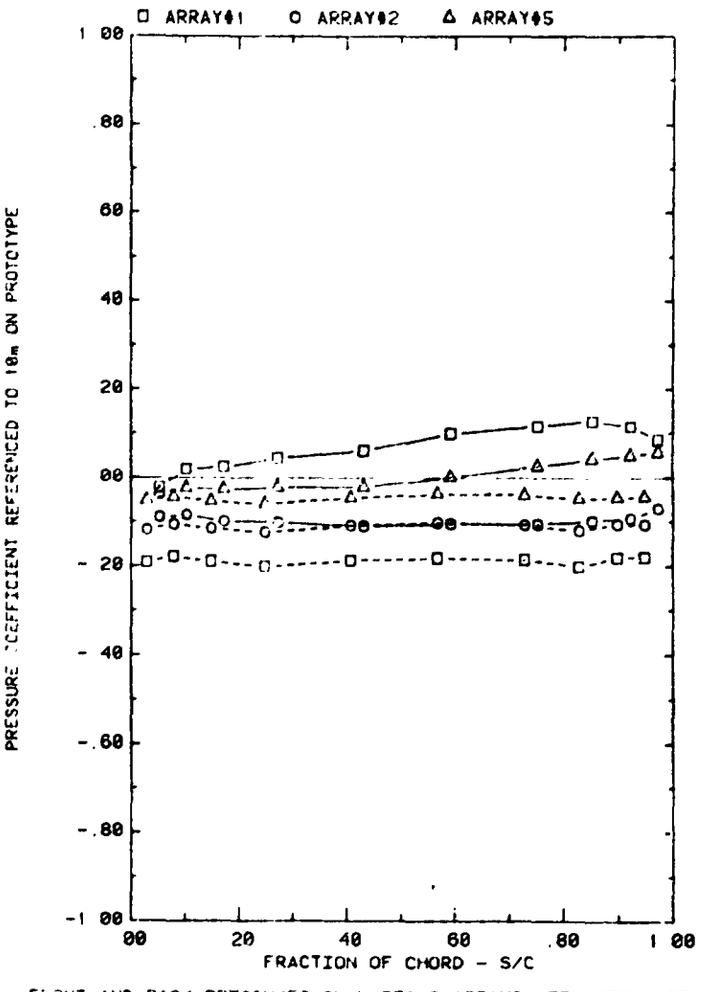


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=160, H=3', P=30%, AND D=10'

Plot 3-2. (Continued)

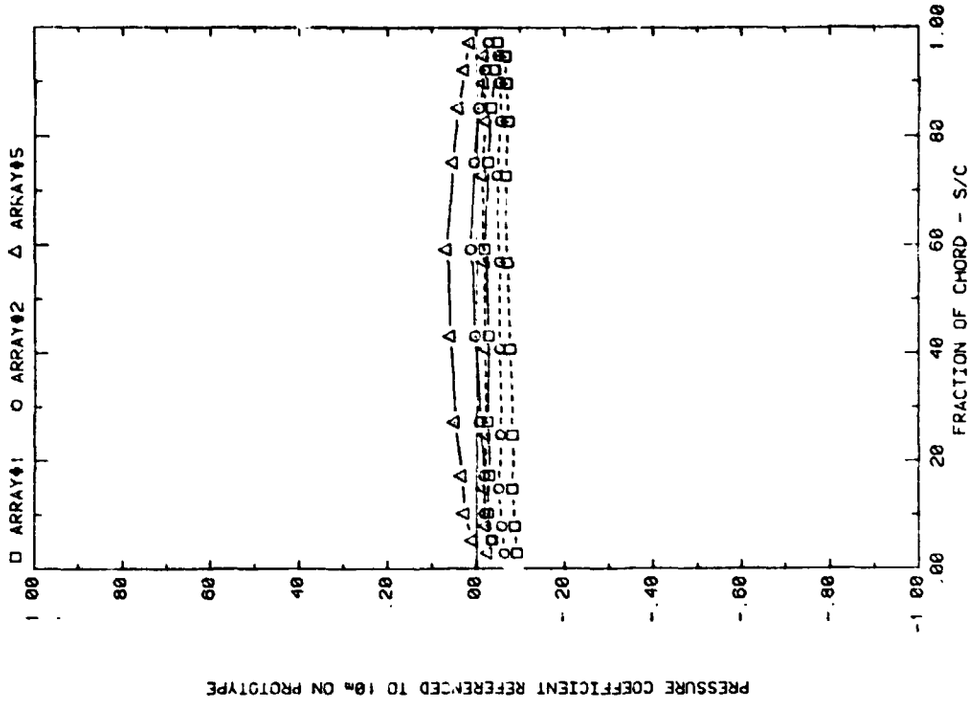


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=35, H=3', P=30%, AND D=20'

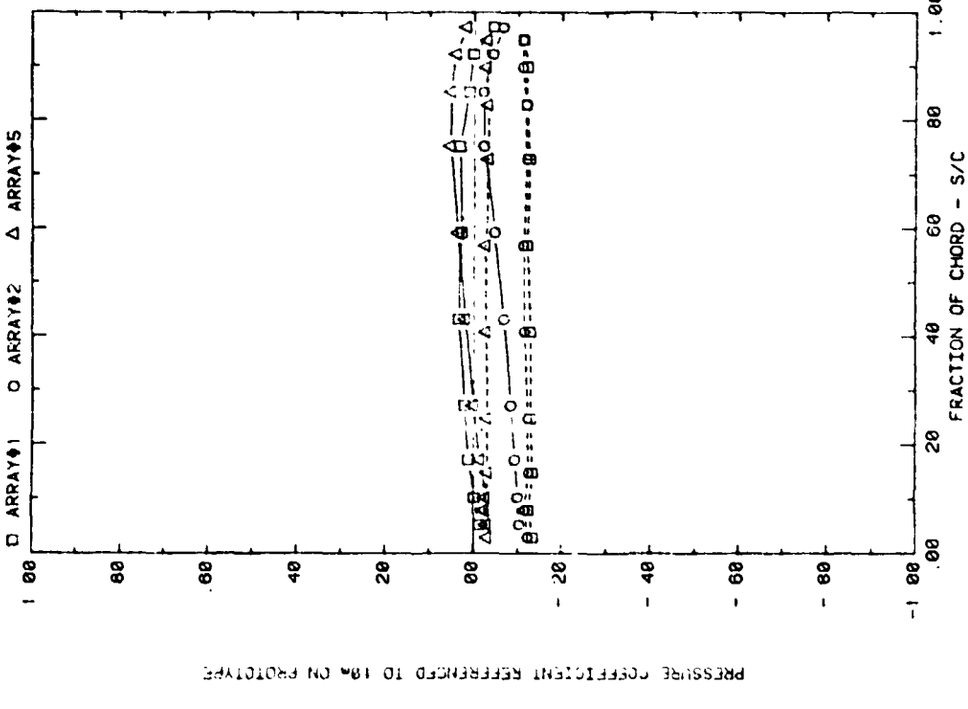


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=90, H=3', P=30%, AND D=20'

Plot 3-2. (Continued)

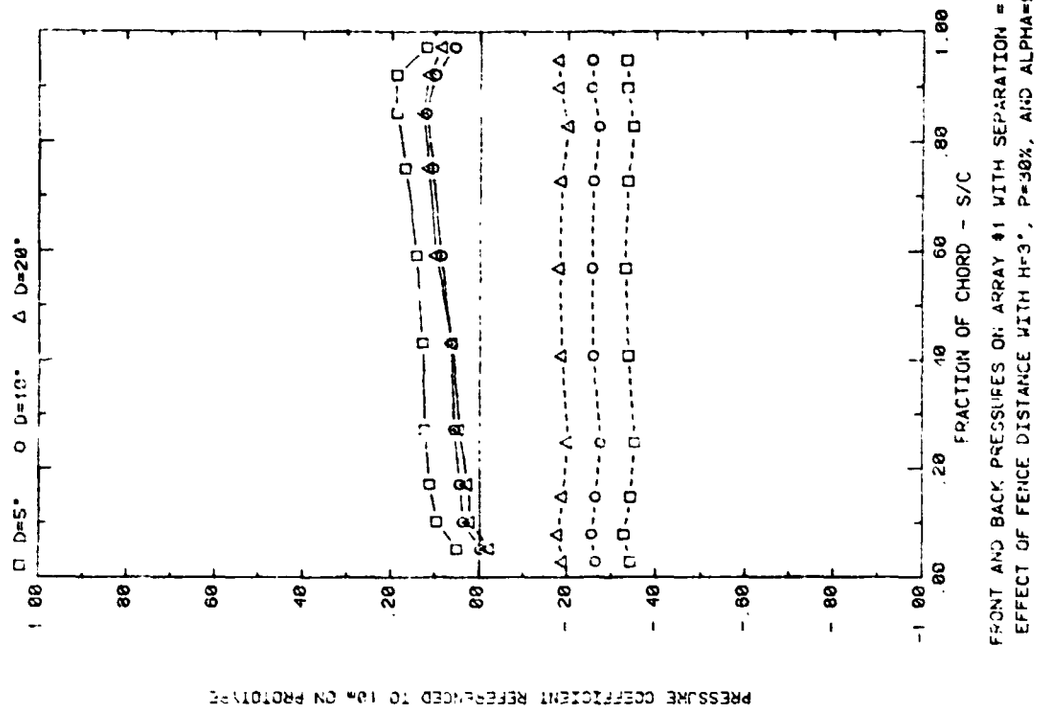


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=160, H=3°, P=30%, AND D=20°

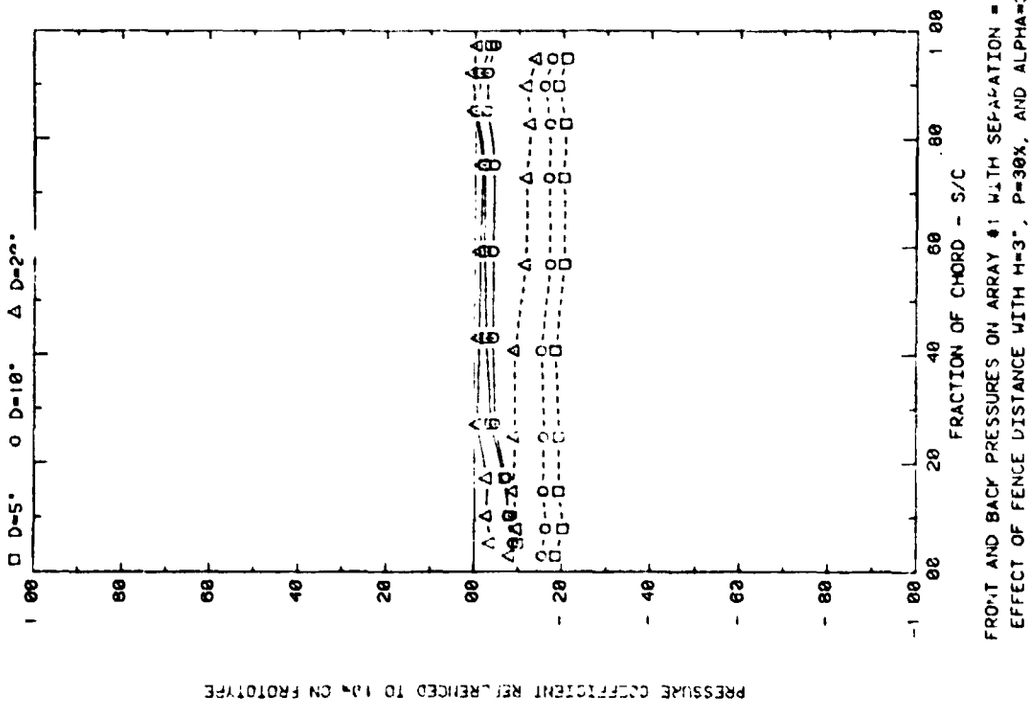


FRONT AND BACK PRESSURES ON VARIOUS ARRAYS WITH SEPARATION = 2C
EFFECT OF ARRAYS WITH ATTACK ANGLE=145, H=3°, P=30%, AND D=20°

Plot 3-2. (Concluded)

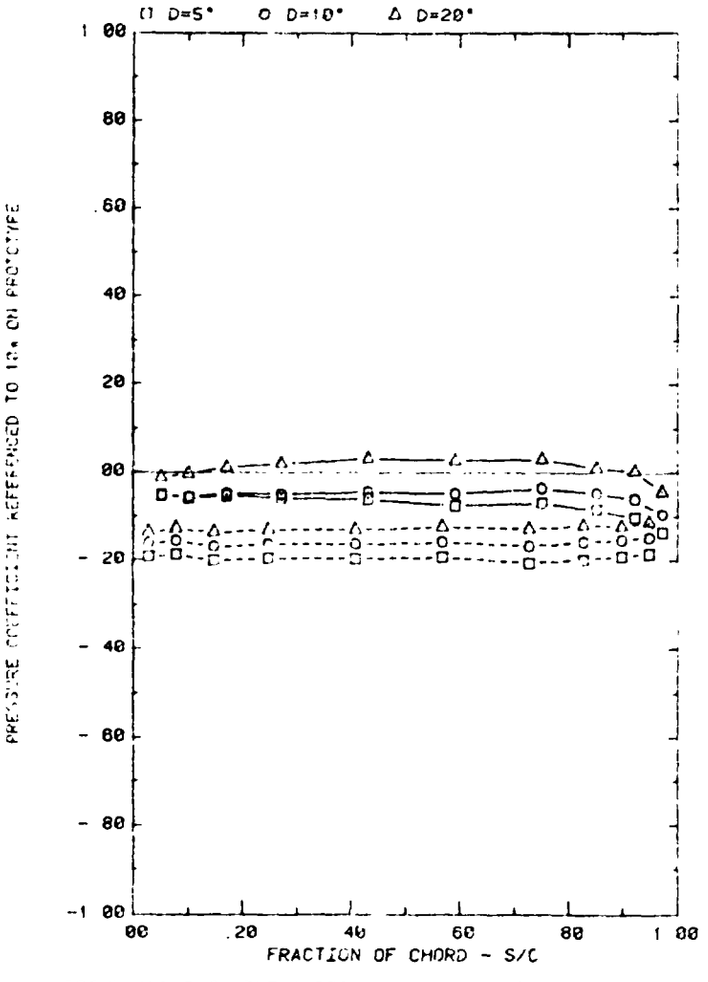


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=90

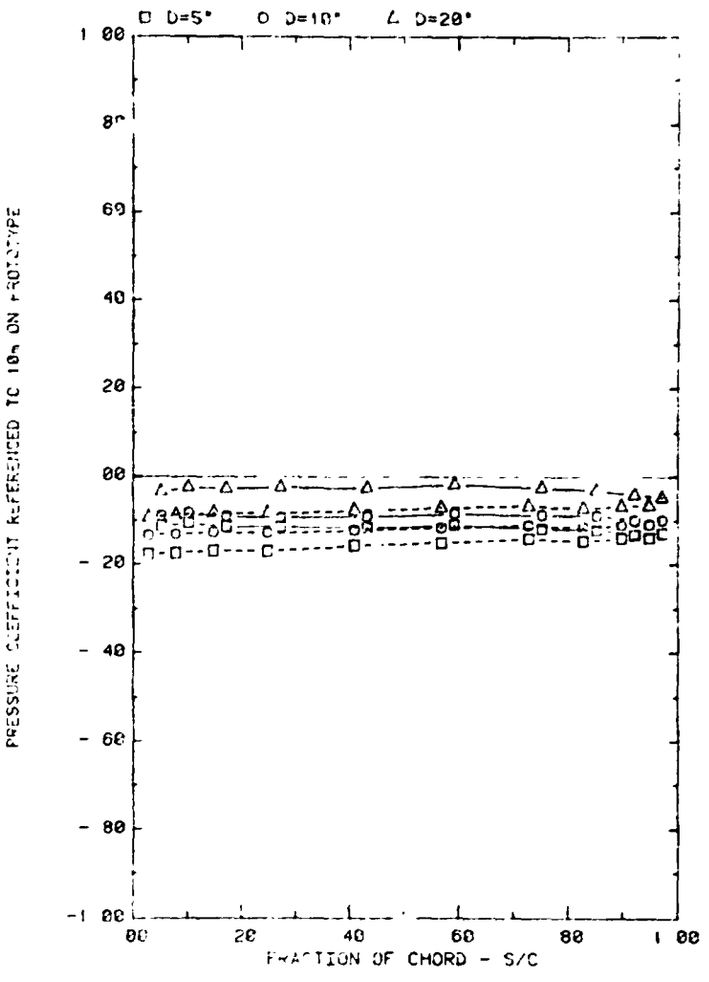


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=35

Plot 3-3. Multiple Arrays with Fence, WD = 0°
Effect of Fence Distance

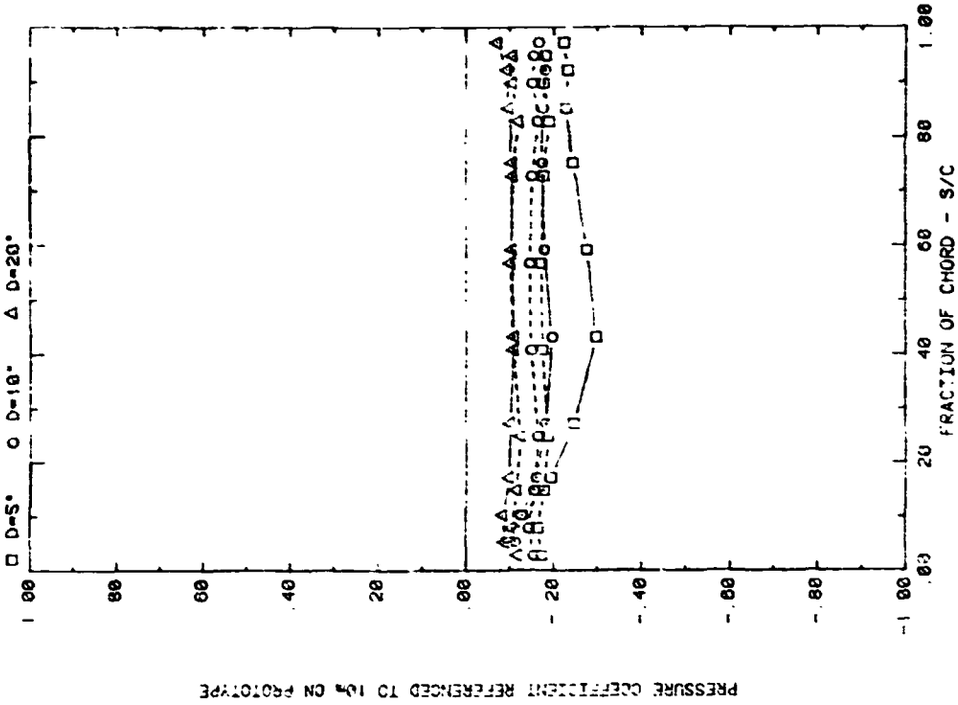


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=145

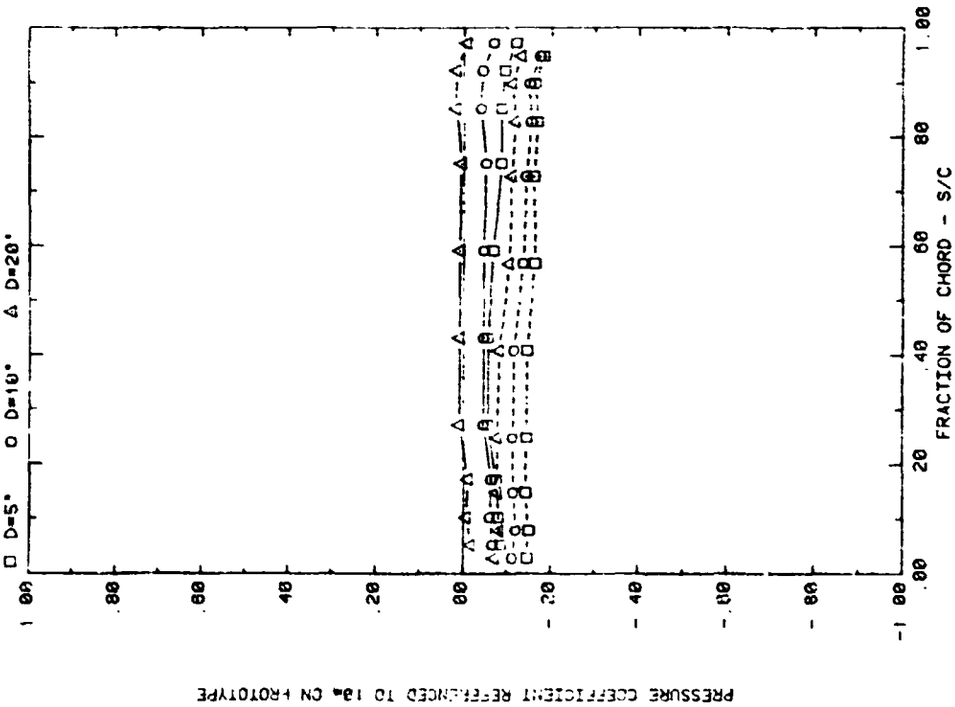


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=160

Plot 3-3. (Continued)

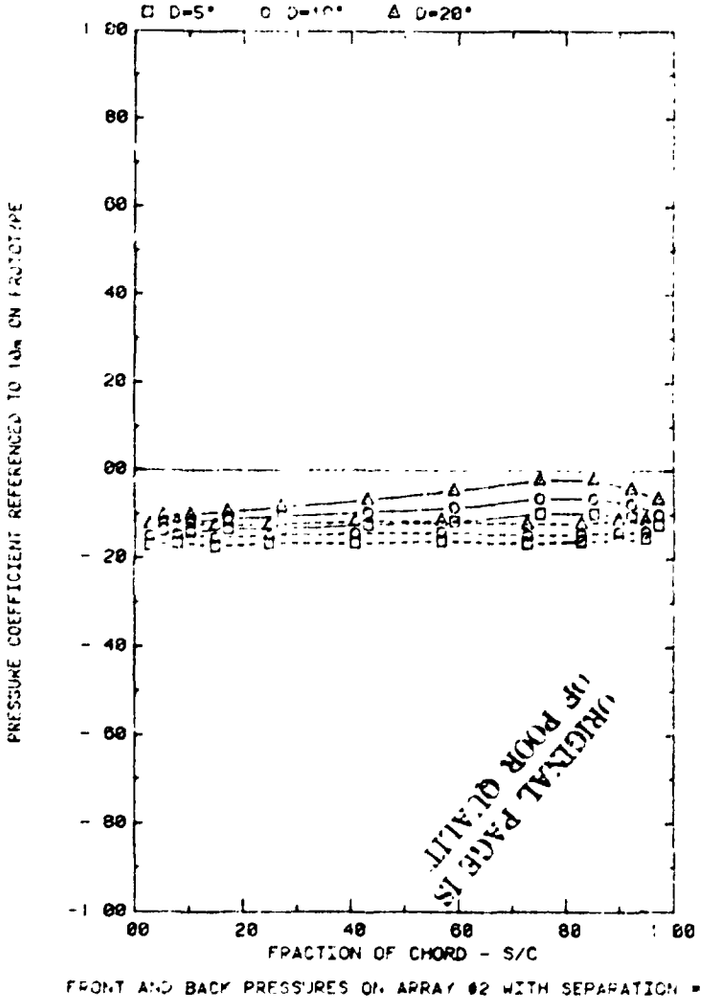


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=00

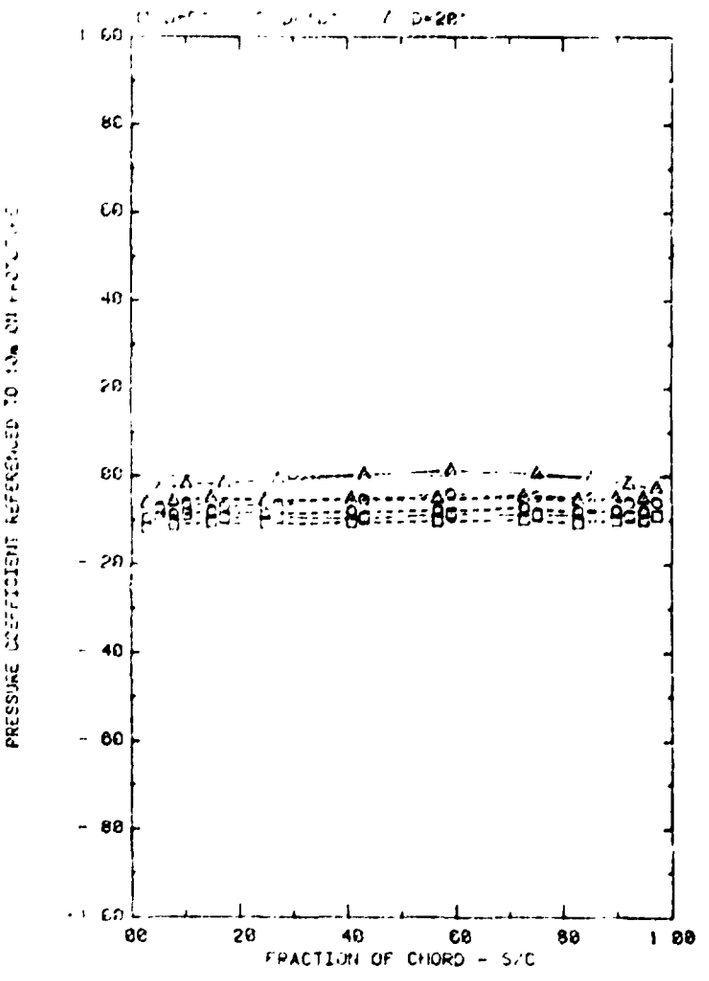


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=35

Plot 3-3. (Continued)

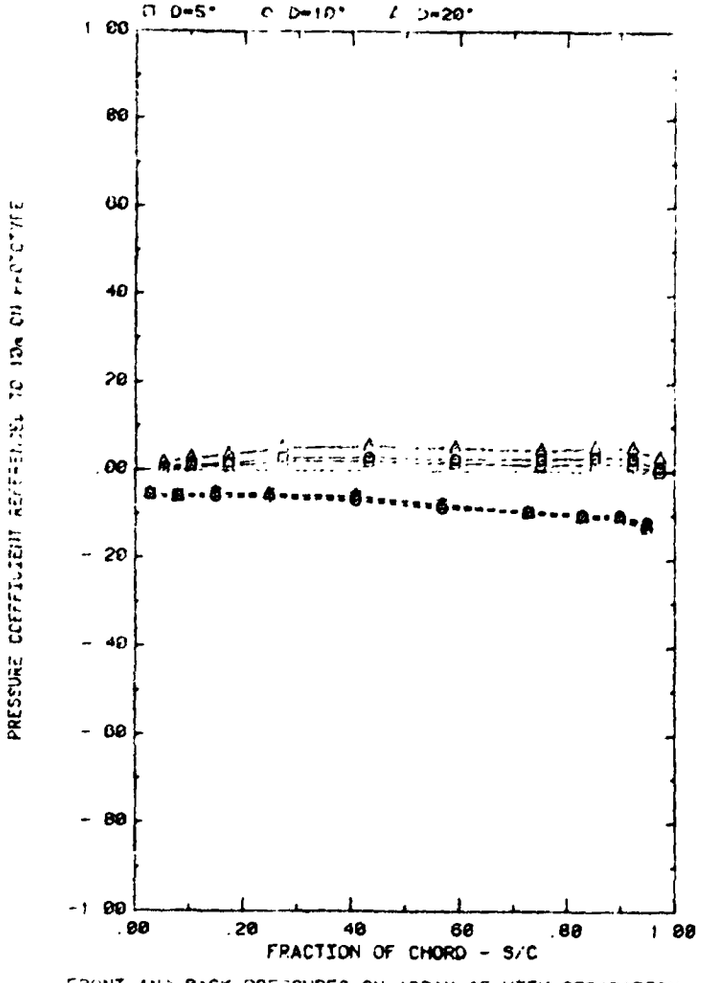


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=145

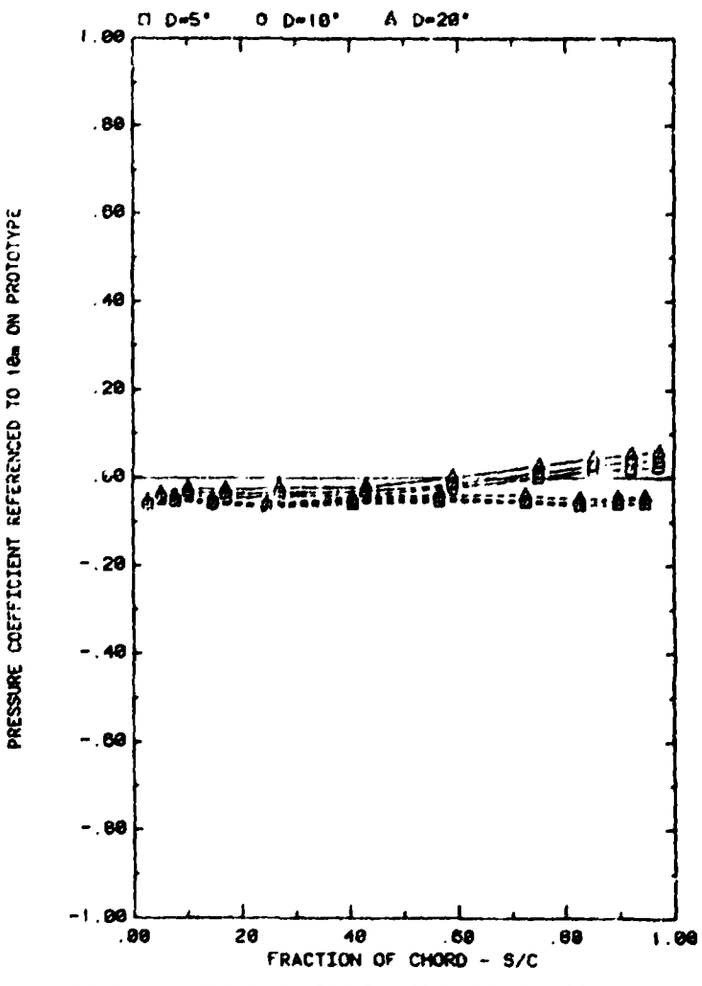


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=160

Plot 3-3. (Continued)

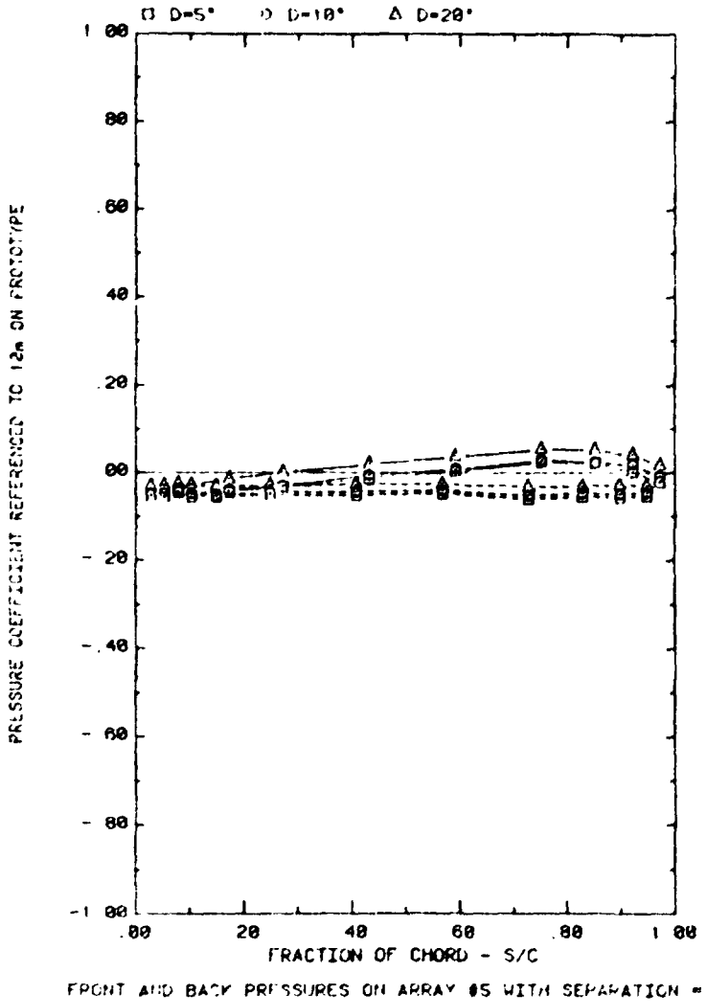


FRONT AND BACK PRESSURES ON ARRAY #5 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=35

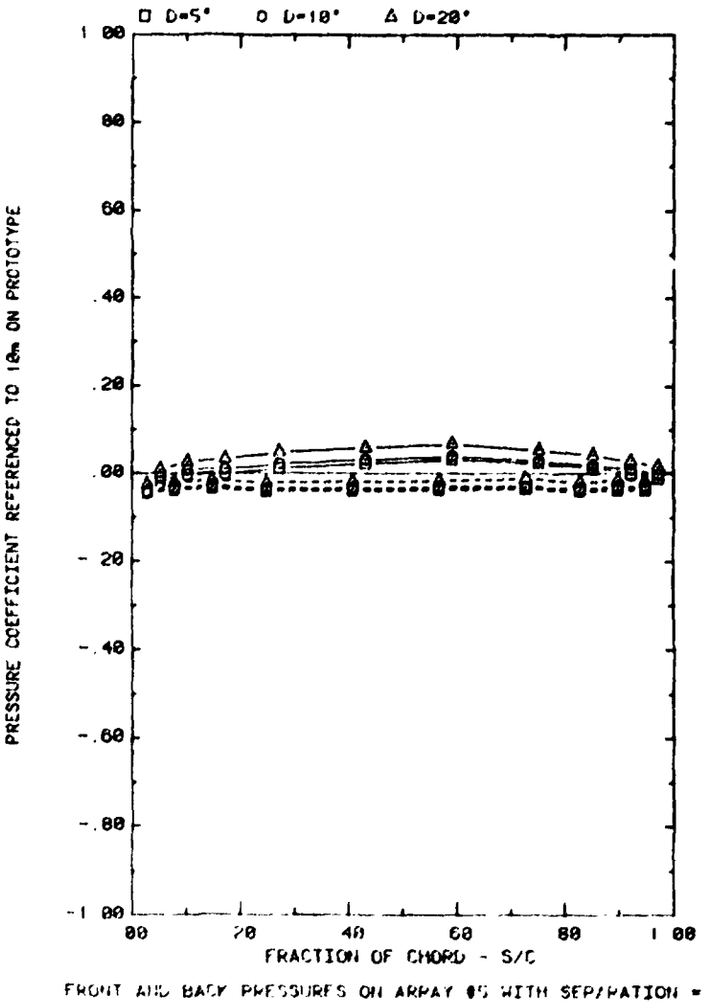


FRONT AND BACK PRESSURES ON ARRAY #5 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3", P=30%, AND ALPHA=90

Plot 3-3. (Continued)

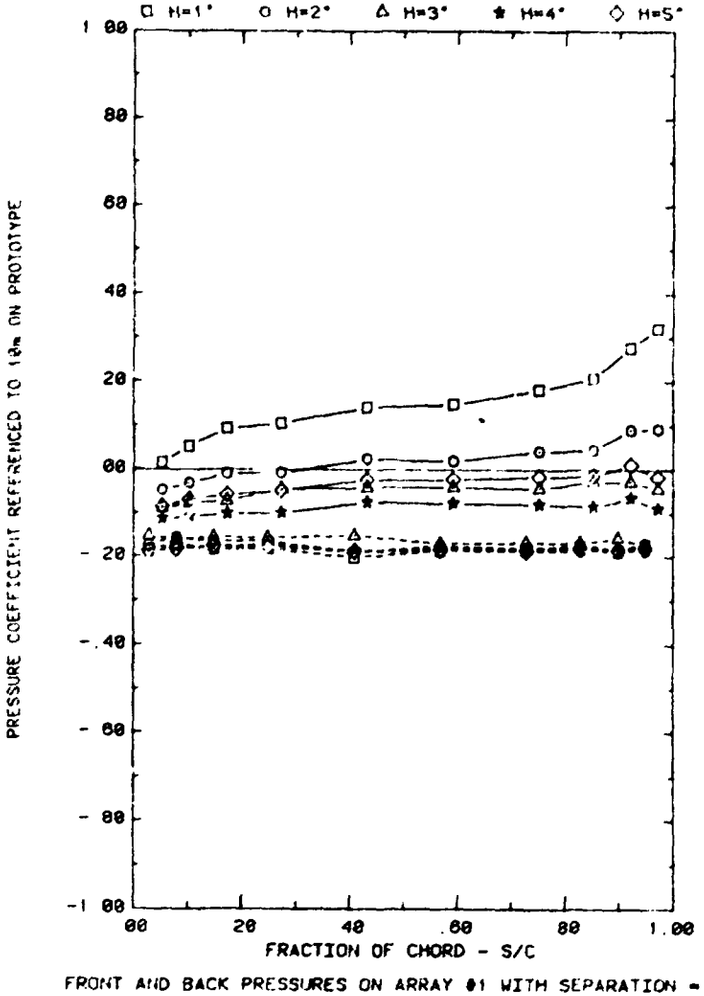


FRONT AND BACK PRESSURES ON ARRAY #5 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3°, P=30%, AND ALPHA=145

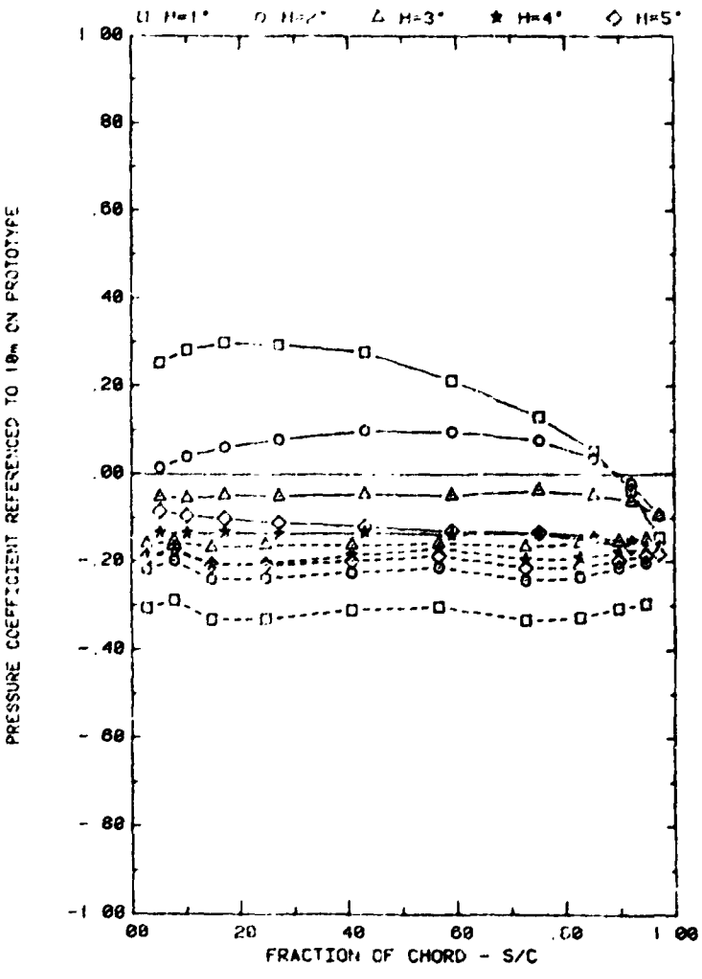


FRONT AND BACK PRESSURES ON ARRAY #5 WITH SEPARATION = 2C
EFFECT OF FENCE DISTANCE WITH H=3°, P=30%, AND ALPHA=160

Plot 3-3. (Concluded)

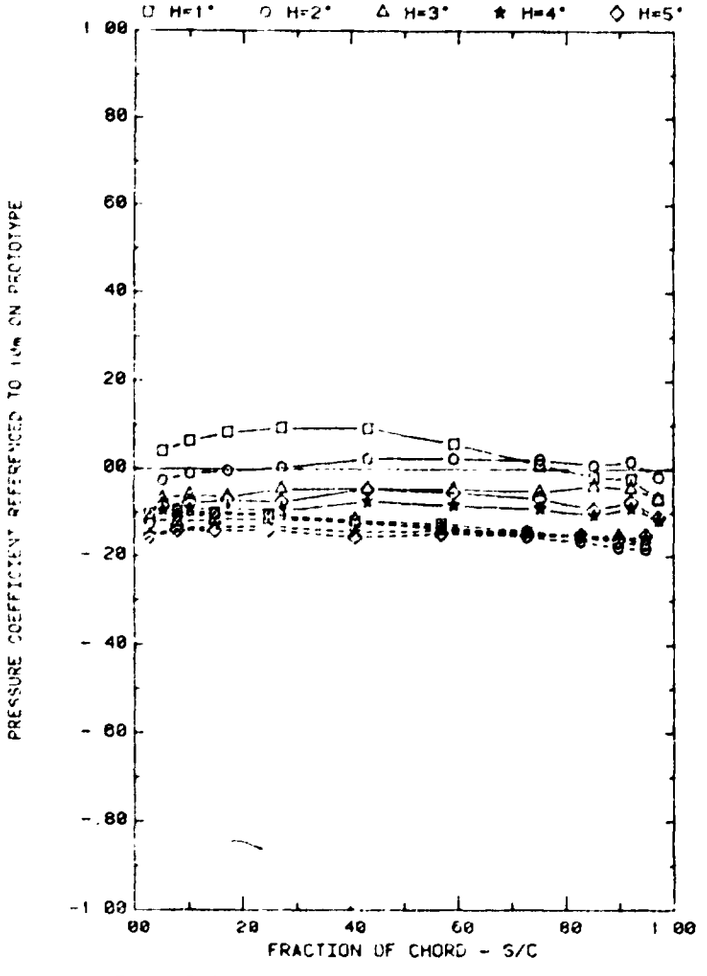


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF FENCE HEIGHT WITH ALPHA=35, D=10°, AND P=30%

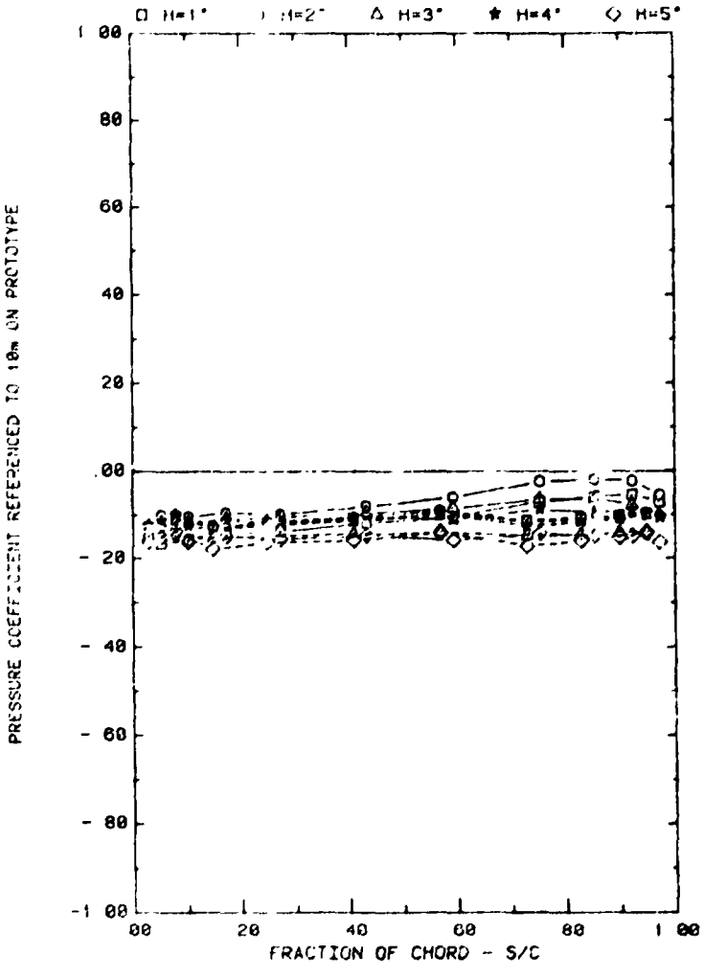


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF FENCE HEIGHT WITH ALPHA=145, D=10°, AND P=30%

Plot 3-4. Multiple Arrays with Fence, WD = 0°
Effect of Fence Height

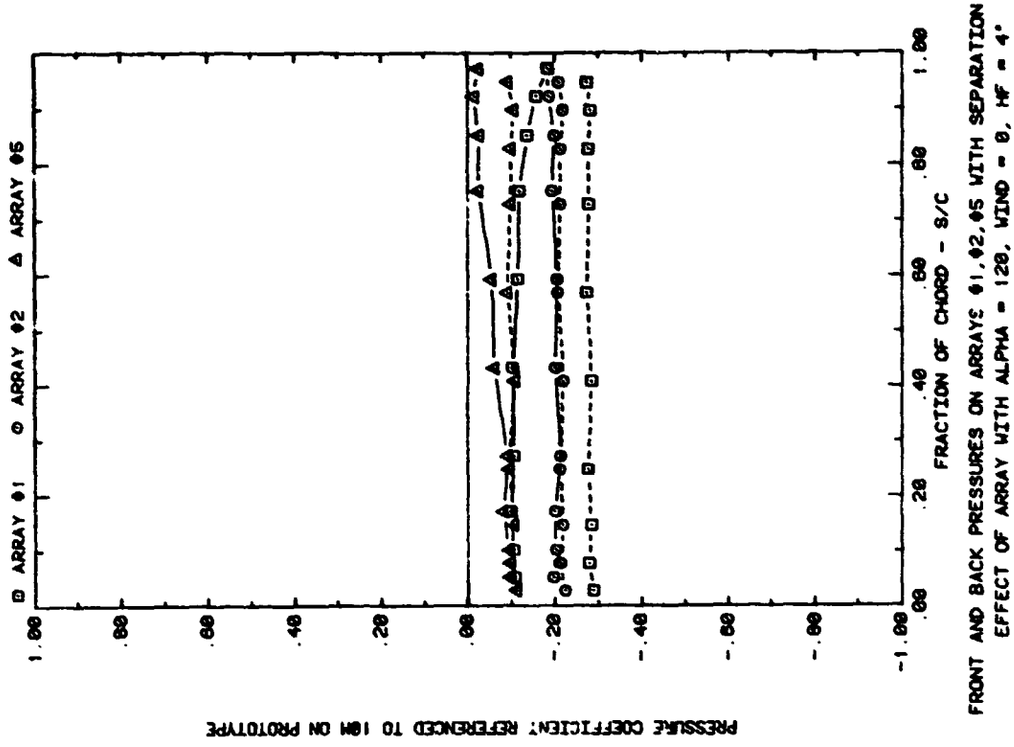


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE HEIGHT WITH ALPHA=35, D=10°, AND P=30%

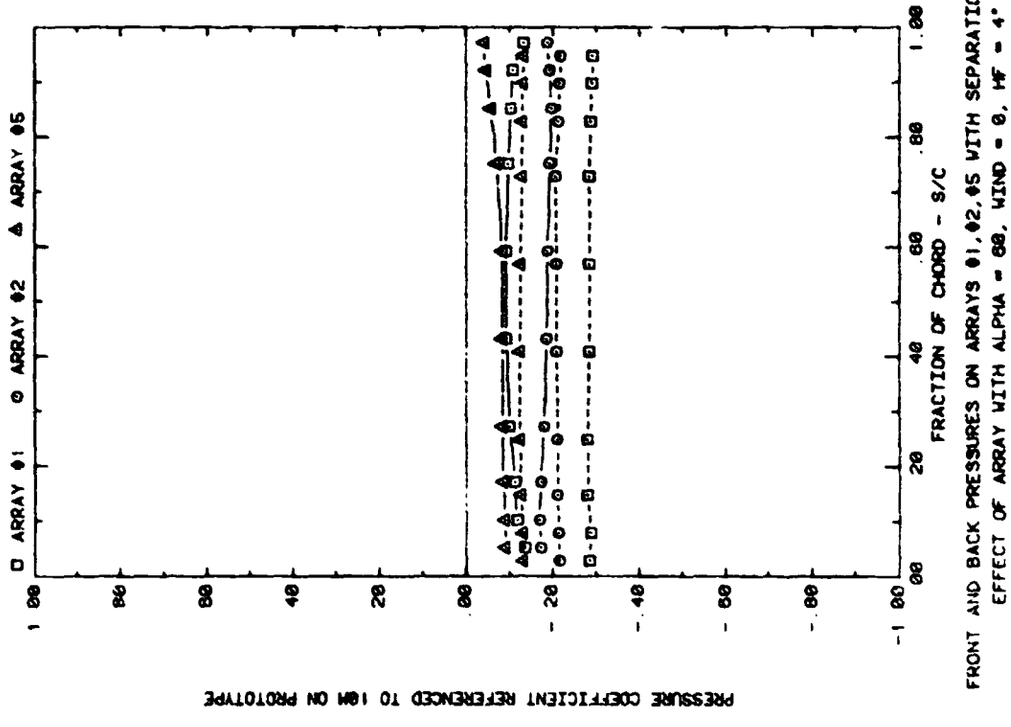


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE HEIGHT WITH ALPHA=145, D=10°, AND P=30%

Plot 3-4. (Continued)

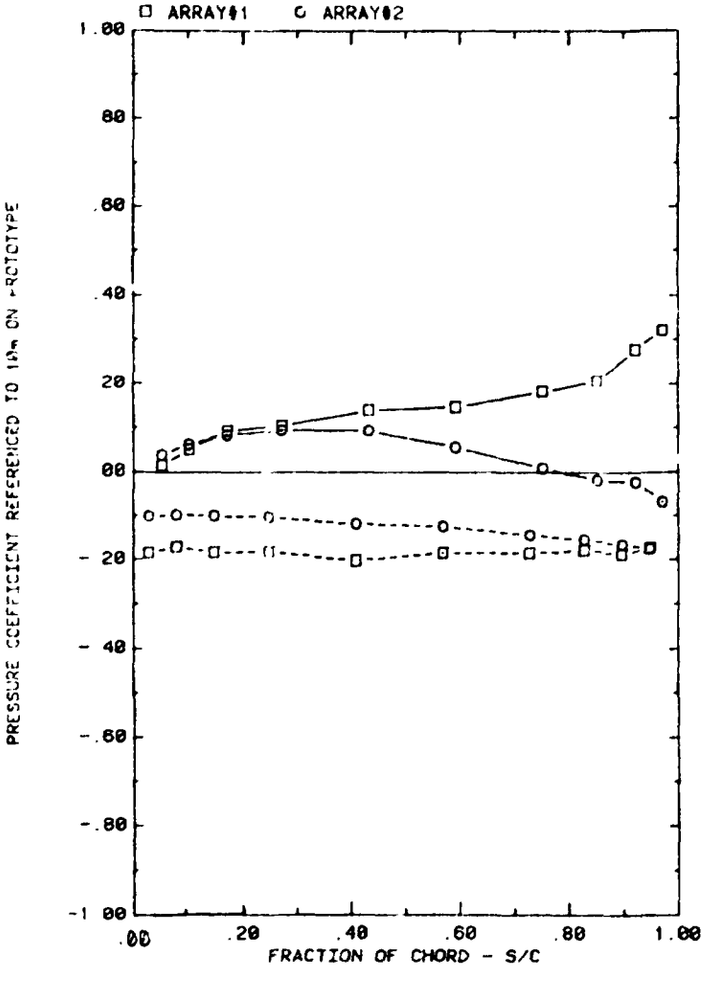


FRONT AND BACK PRESSURES ON ARRAYS #1,#2,#5 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA = 120, WIND = 0, HF = 4'

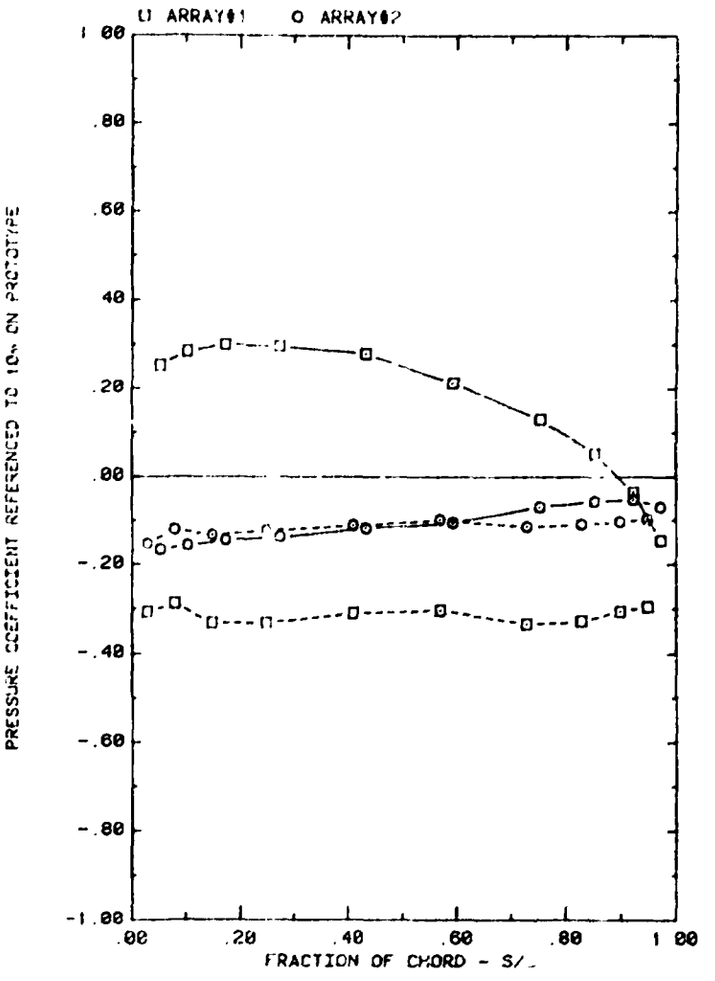


FRONT AND BACK PRESSURES ON ARRAYS #1,#2,#5 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA = 60, WIND = 0, HF = 4'

Plot 3-4. (Continued)

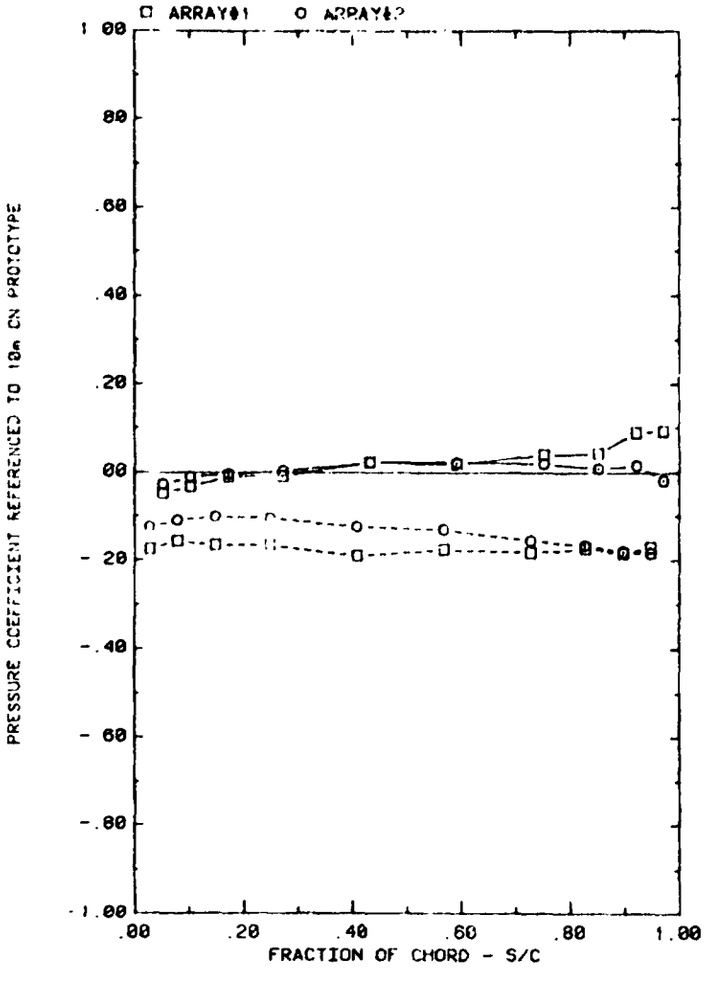


FRONT AND BACK PRESSURES ON ARRAYS #1&#2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=35, H=1", D=10", AND P=30%

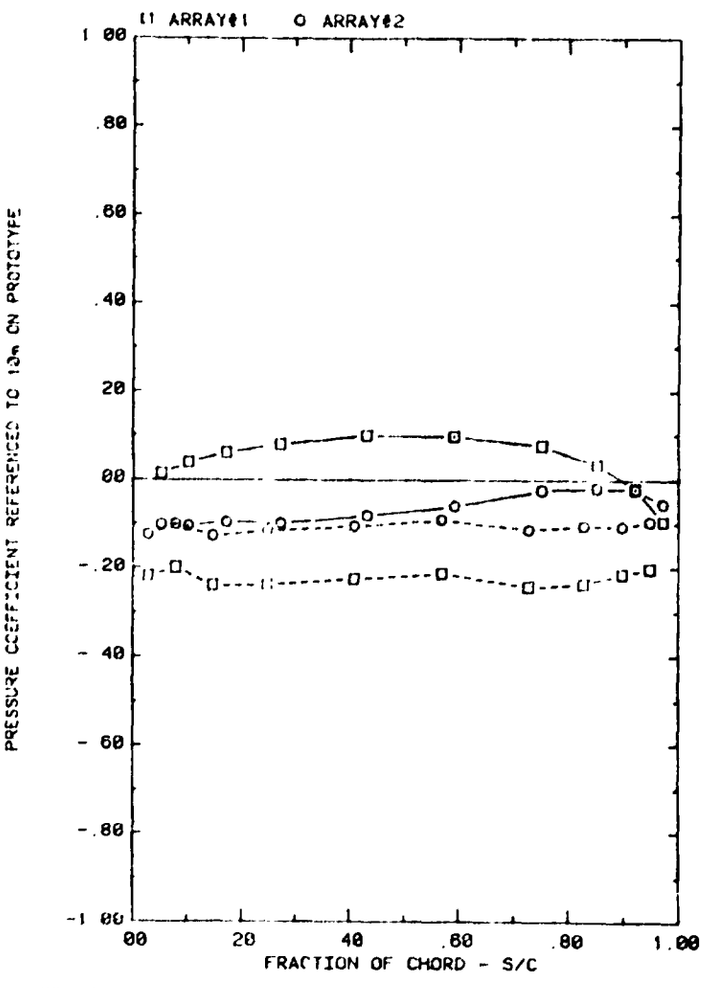


FRONT AND BACK PRESSURES ON ARRAYS #1&#2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=145, H=1", D=10", AND P=30%

Plot 3-4. (Continued)

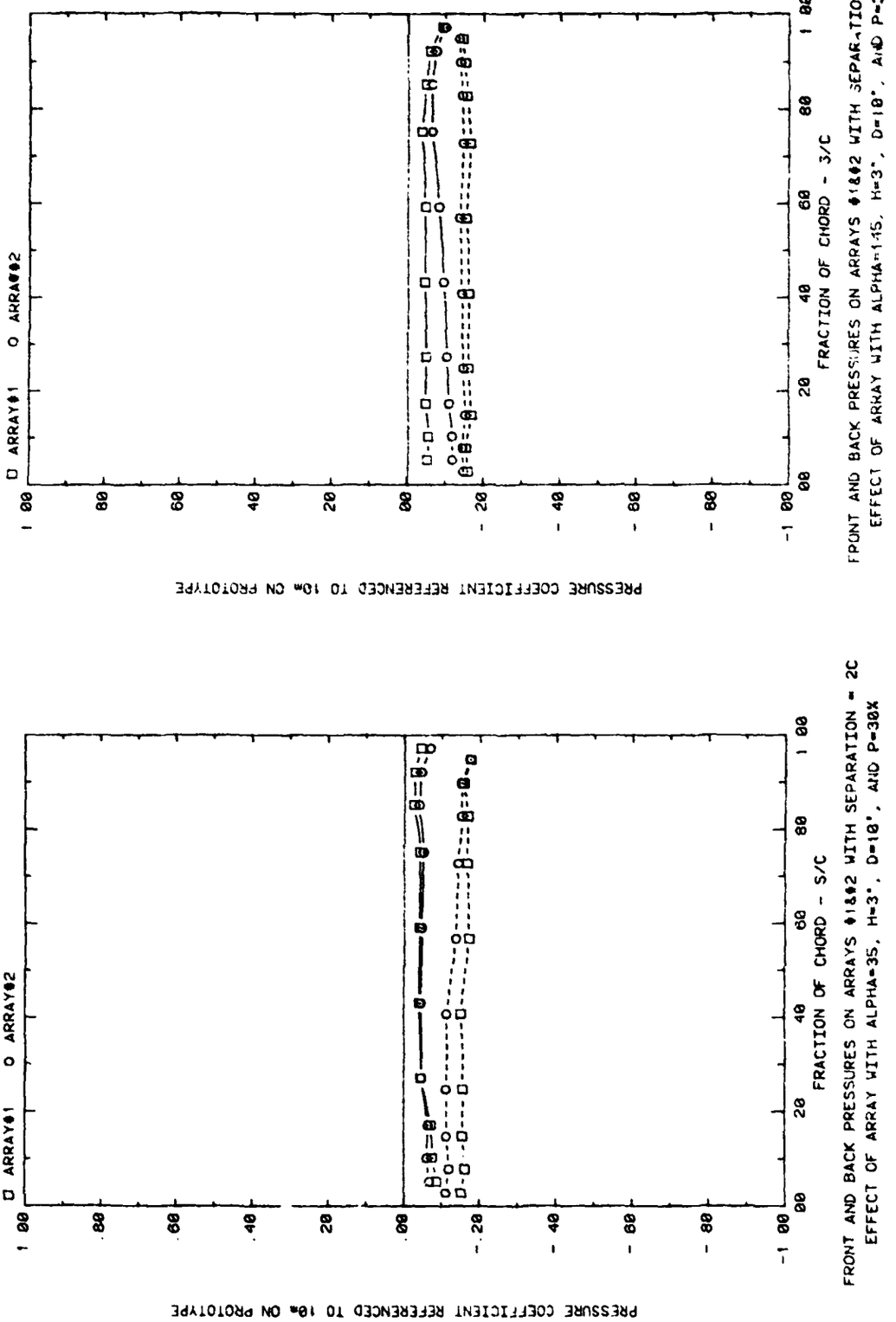


FRONT AND BACK PRESSURES ON ARRAYS #1&#2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=35, H=2°, D=10°, AND P=30%

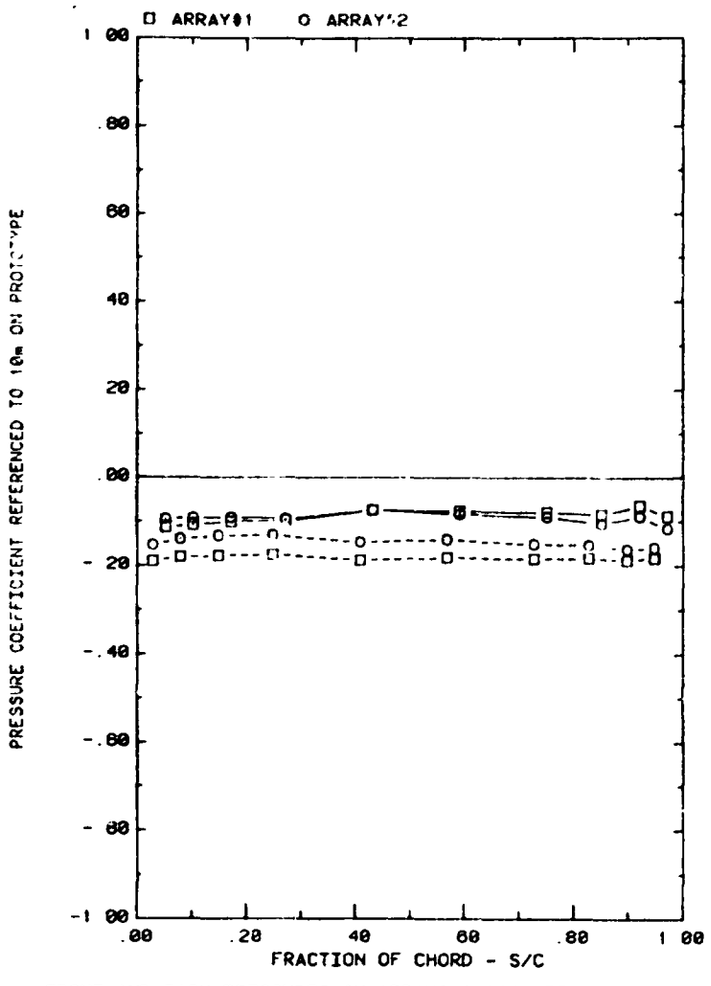


FRONT AND BACK PRESSURES ON ARRAYS #1&#2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=145, H=2°, D=10°, AND P=30%

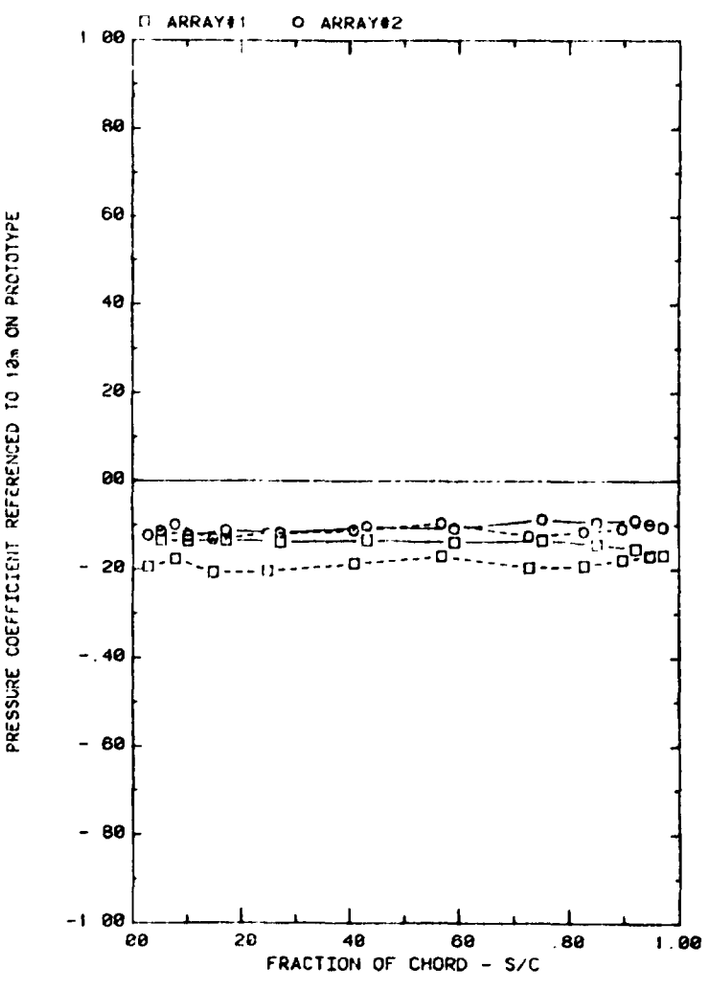
Plot 3-4. (Continued)



Plot 3-4. (Continued)

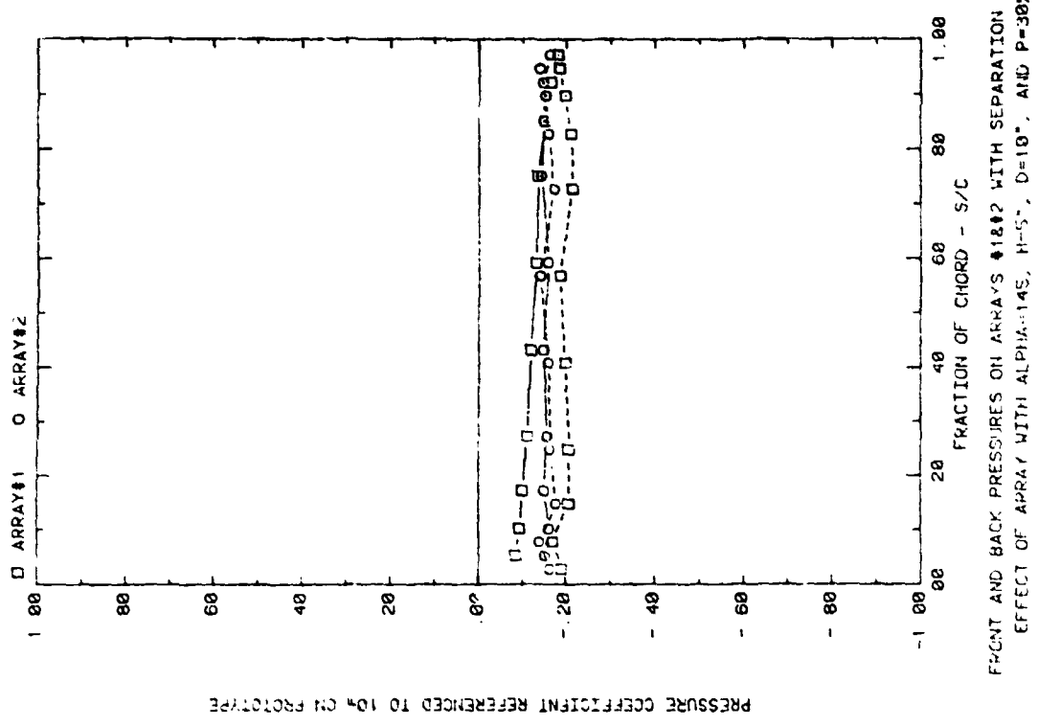


FRONT AND BACK PRESSURES ON ARRAYS #1&#2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=35, H=4", D=10", AND P=30%

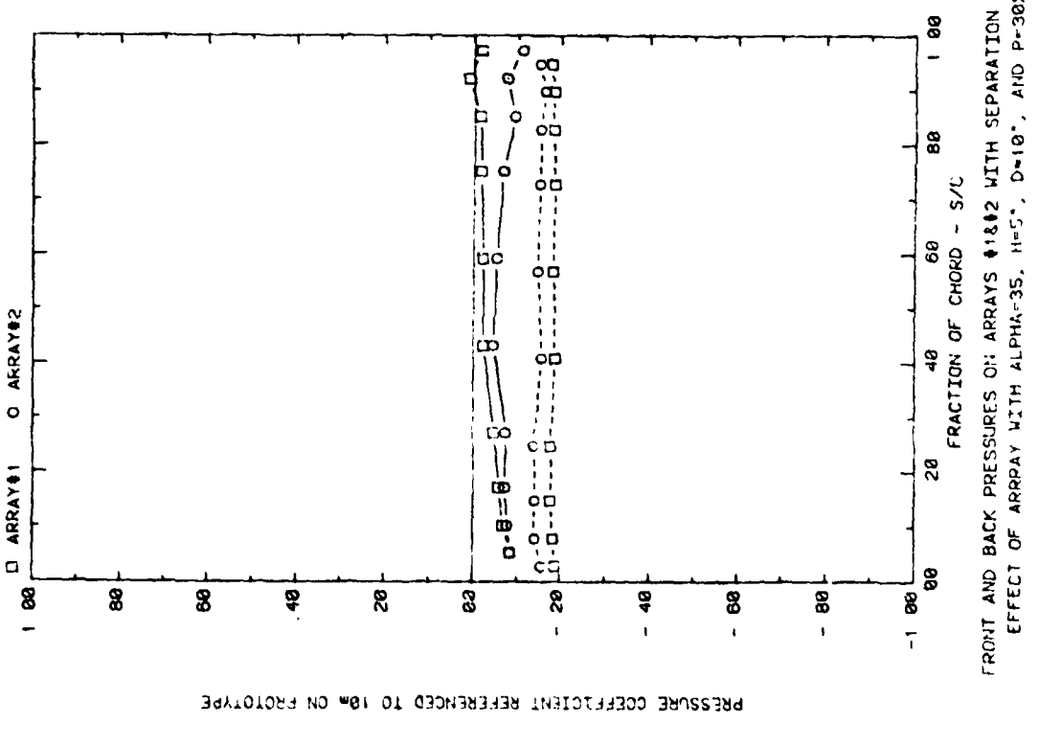


FRONT AND BACK PRESSURES ON ARRAYS #1&#2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=145, H=4", D=10", AND P=30%

Plot 3-4. (Continued)

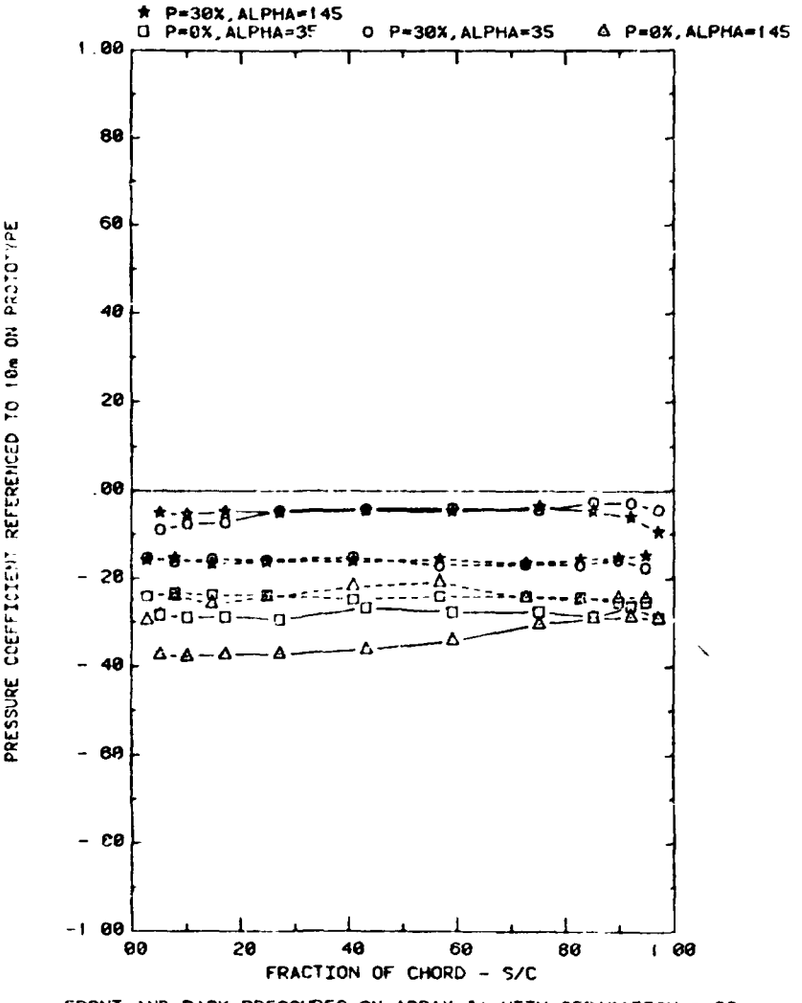


FRONT AND BACK PRESSURES ON ARRAYS #1&2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=45, H=5", D=10", AND P=30%

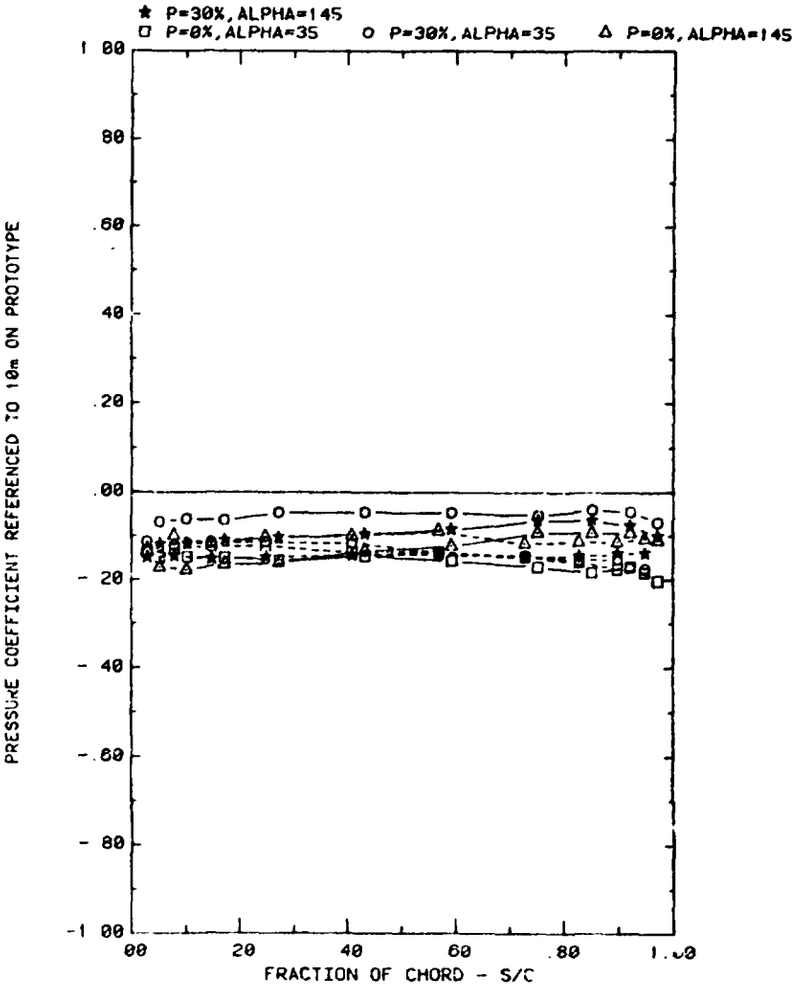


FRONT AND BACK PRESSURES ON ARRAYS #1&2 WITH SEPARATION = 2C
EFFECT OF ARRAY WITH ALPHA=35, H=5", D=10", AND P=30%

Plot 3-4. (Concluded)

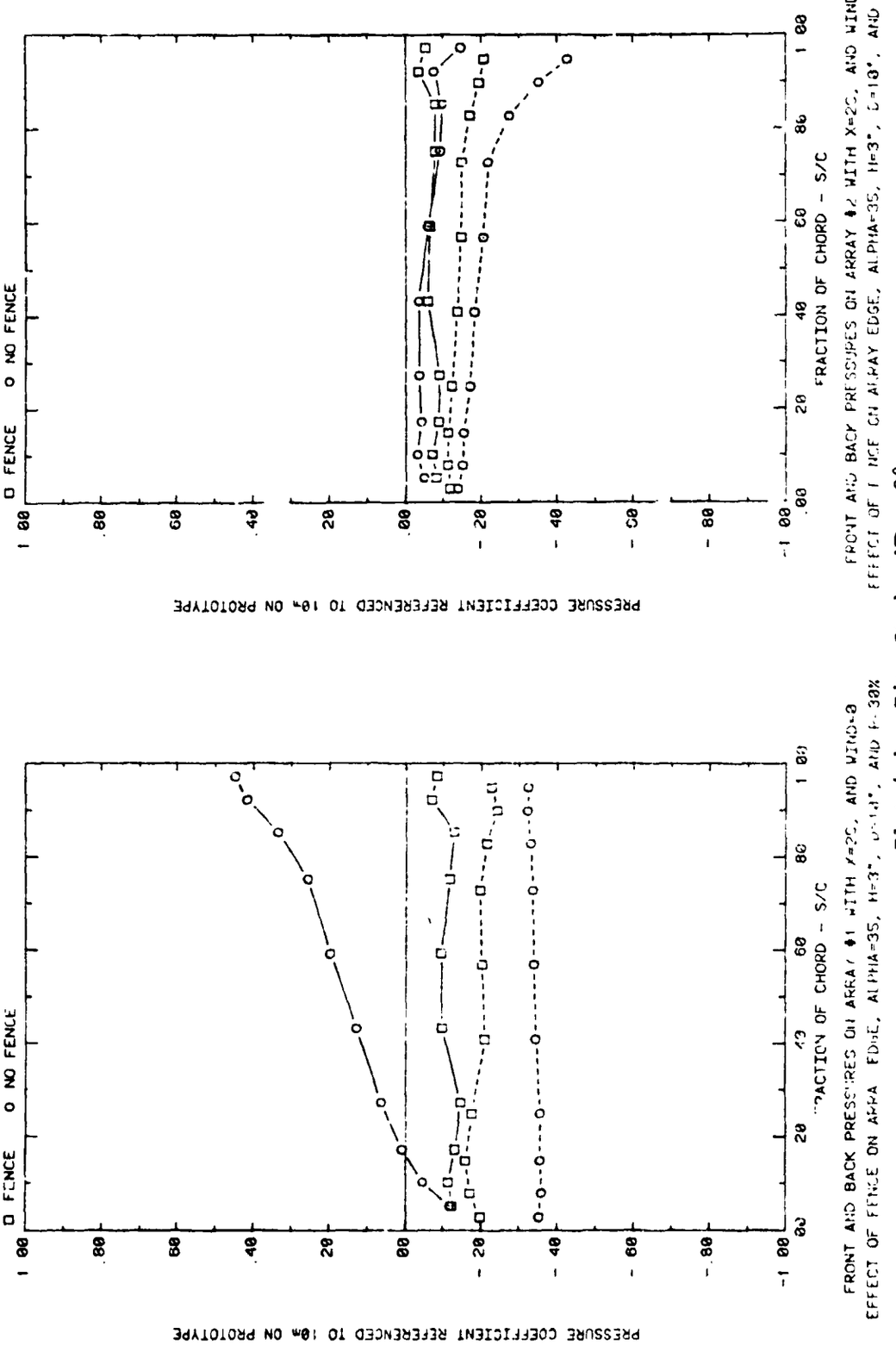


FRONT AND BACK PRESSURES ON ARRAY #1 WITH SEPARATION = 2C
EFFECT OF FENCE POROSITY WITH ALPHA=35 OR 145, D=10°, AND H=3°

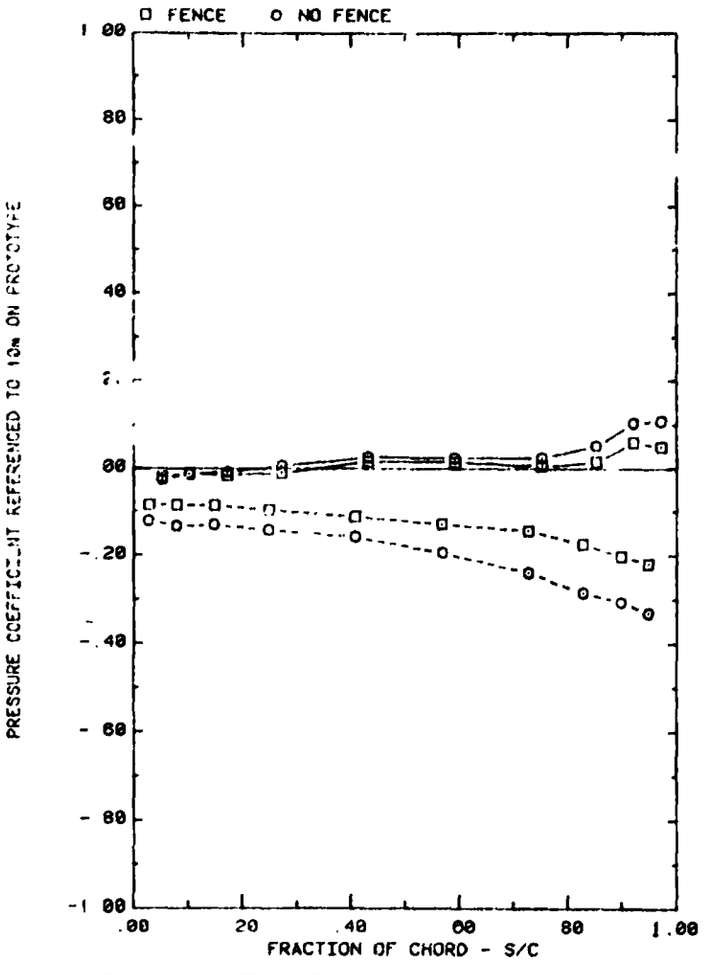


FRONT AND BACK PRESSURES ON ARRAY #2 WITH SEPARATION = 2C
EFFECT OF FENCE POROSITY WITH ALPHA=35 OR 145, D=10°, AND H=3°

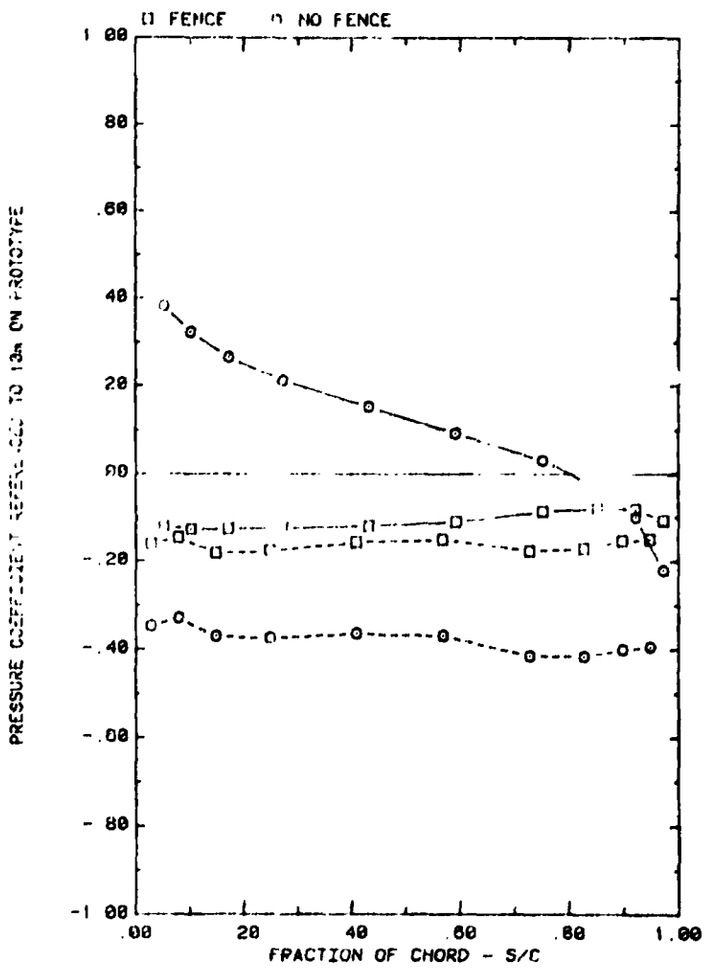
Plot 3-5. Multiple Arrays with Fence, WD = 0°
Effect of Fence Porosity



Plot 4-1. Edge Study, WD = 0°
Effect of Fence

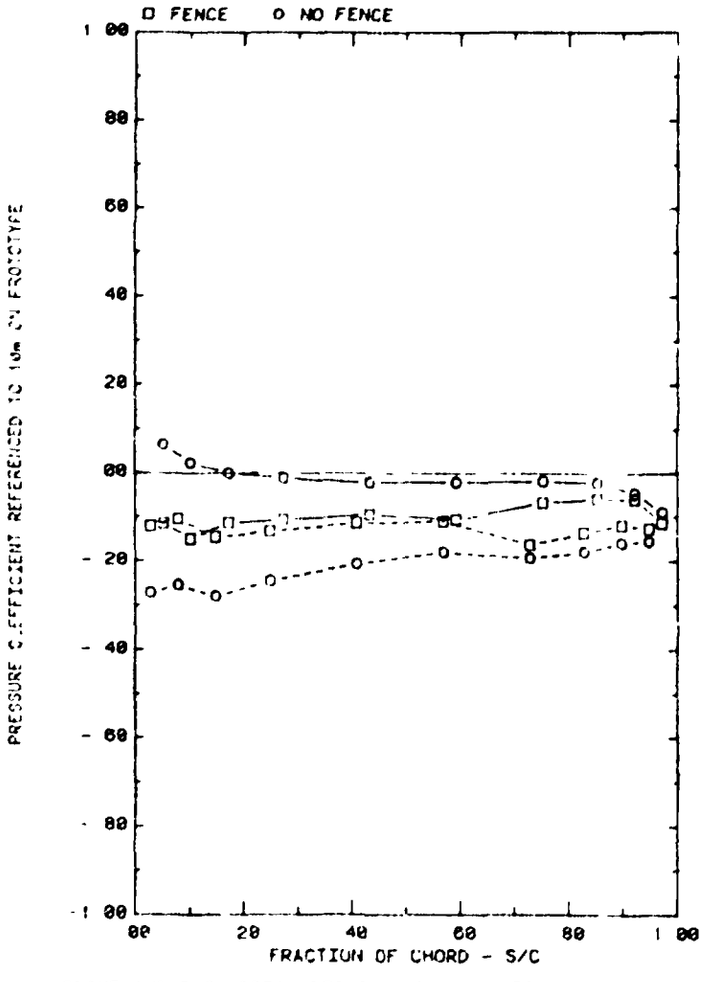


FRONT AND BACK PRESSURES ON ARRAY #5 WITH X=2C, AND WIND=0
EFFECT OF FENCE ON ARRAY EDGE, ALPHA=35, H=3", D=10", AND P=30%

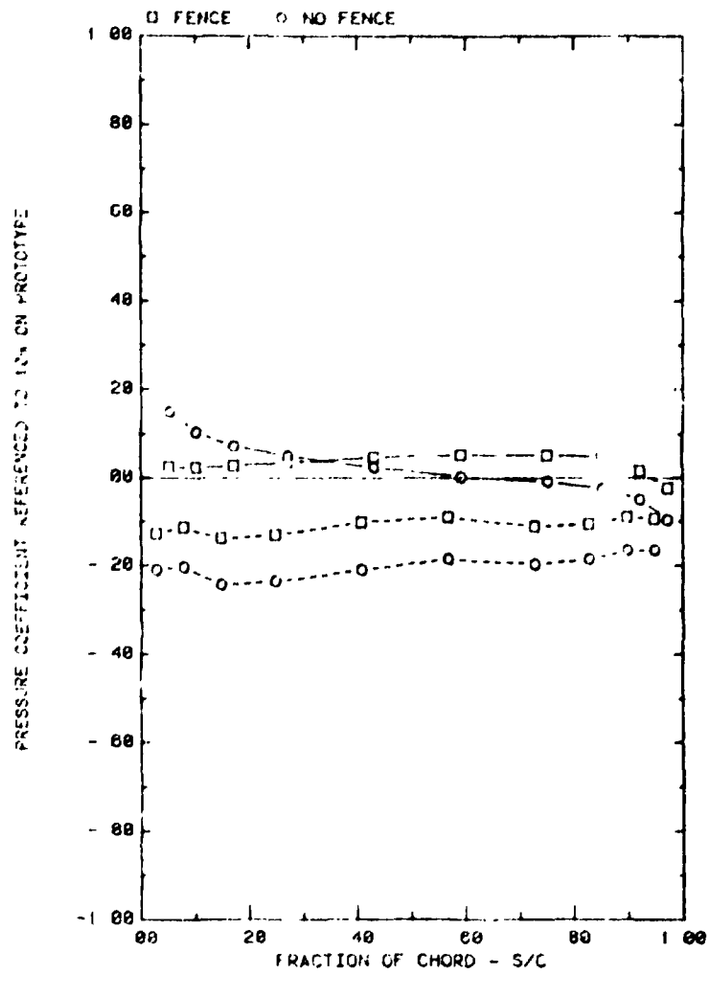


FRONT AND BACK PRESSURES ON ARRAY #1 WITH X=2C, AND WIND=0
EFFECT OF FENCE ON ARRAY EDGE, ALPHA=145, H=3", D=10", AND P=30%

Plot 4-1. (Continued)

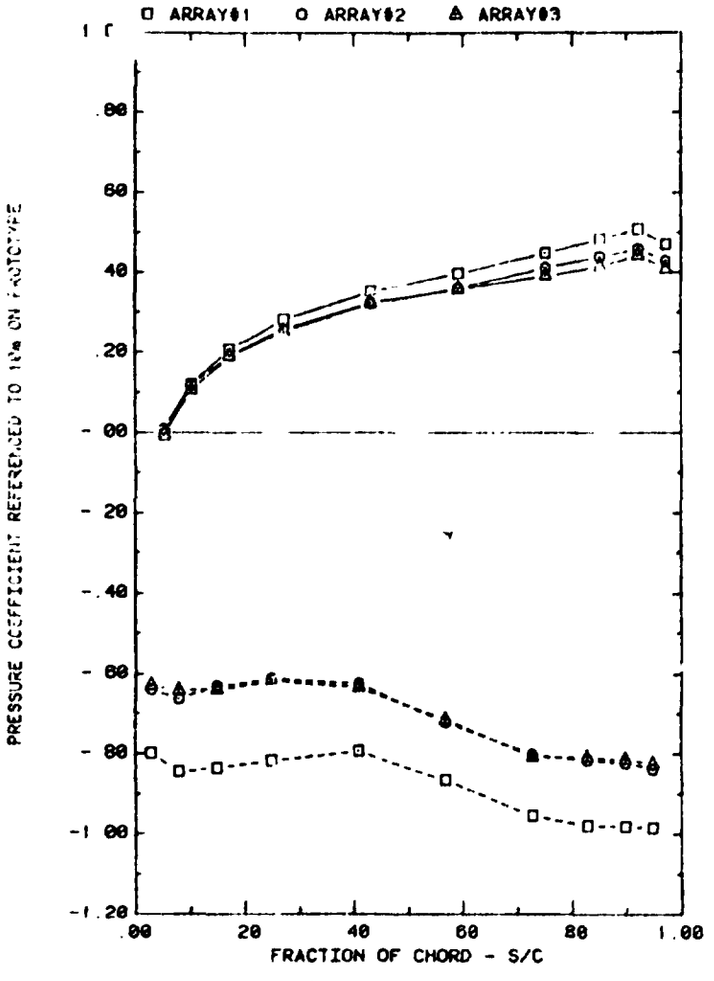


FRONT AND BACK PRESSURES ON ARRAY #2 WITH X=20, AND WIND=0
EFFECT OF FENCE ON ARRAY EDGE, ALPHA=145, H=3", D=10", AND P=30%

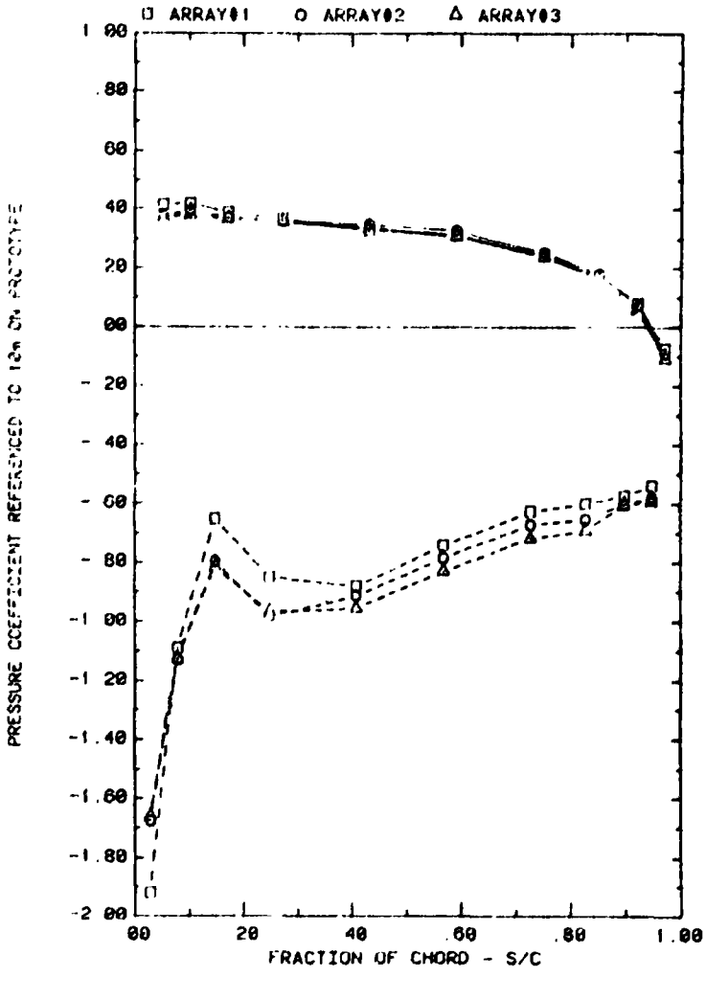


FRONT AND BACK PRESSURES ON ARRAY #, WITH X=20, AND WIND=0
EFFECT OF FENCE ON ARRAY EDGE, ALPHA=145, H=3", D=10", AND P=30%

Plot 4-1. (Concluded)

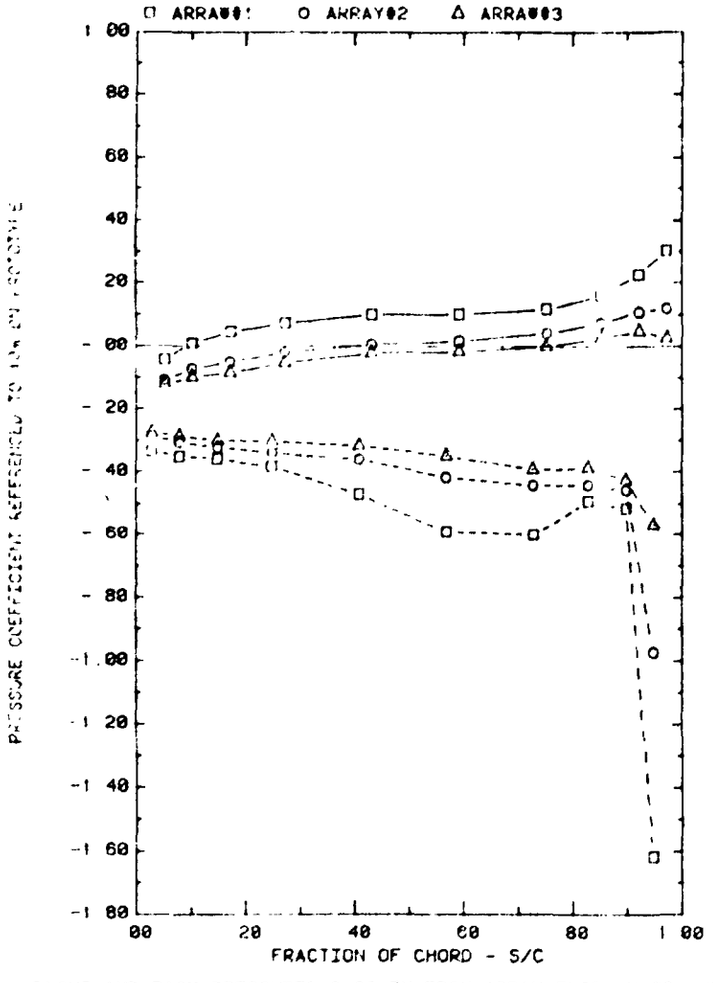


FRONT AND BACK PRESSURES @ 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=35, FC=0, H=3", D=10", AND P=30%

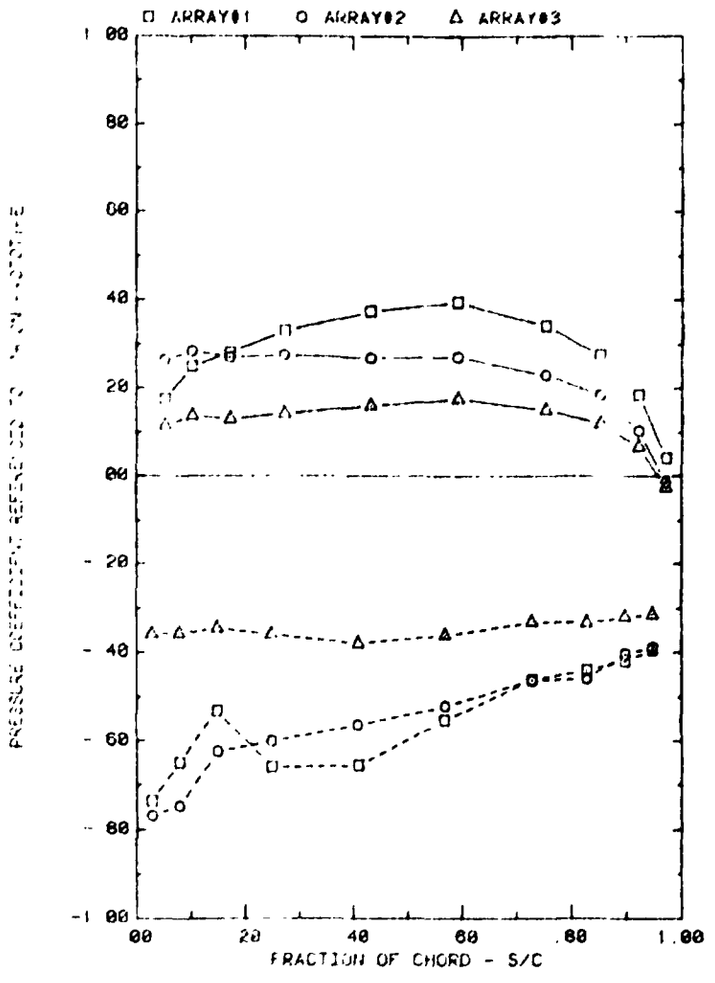


FRONT AND BACK PRESSURES @ 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=0, H=3", D=10", AND P=30%

Plot 5-1-1. Corner Study, WD = 45°, Standard Model
Effect of Array Position

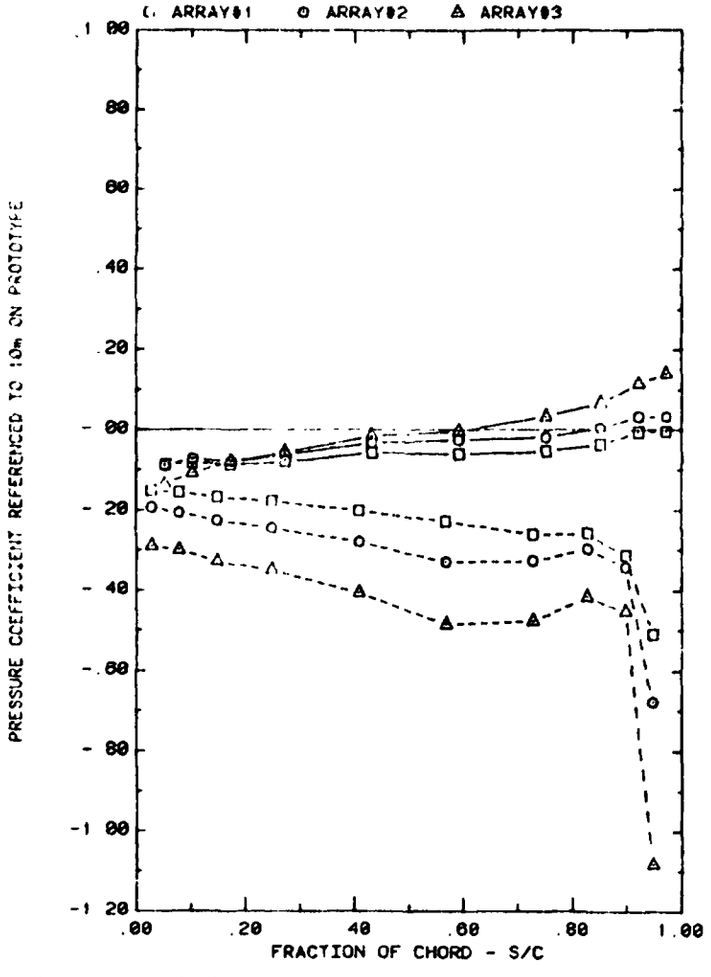


FRONT AND BACK PRESSURES @ 6° IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=35, FC=1, H=3", D=18", AND P=30%

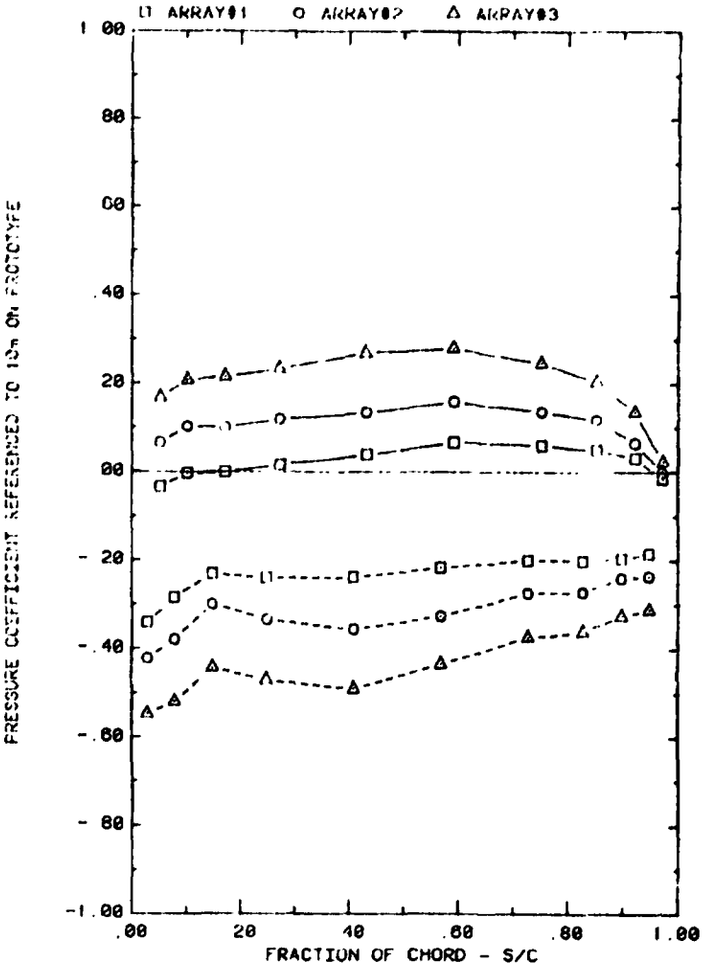


FRONT AND BACK PRESSURES @ 6° IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=1, H=3", D=18", AND P=30%

Plot 5-1-1. (Continued)

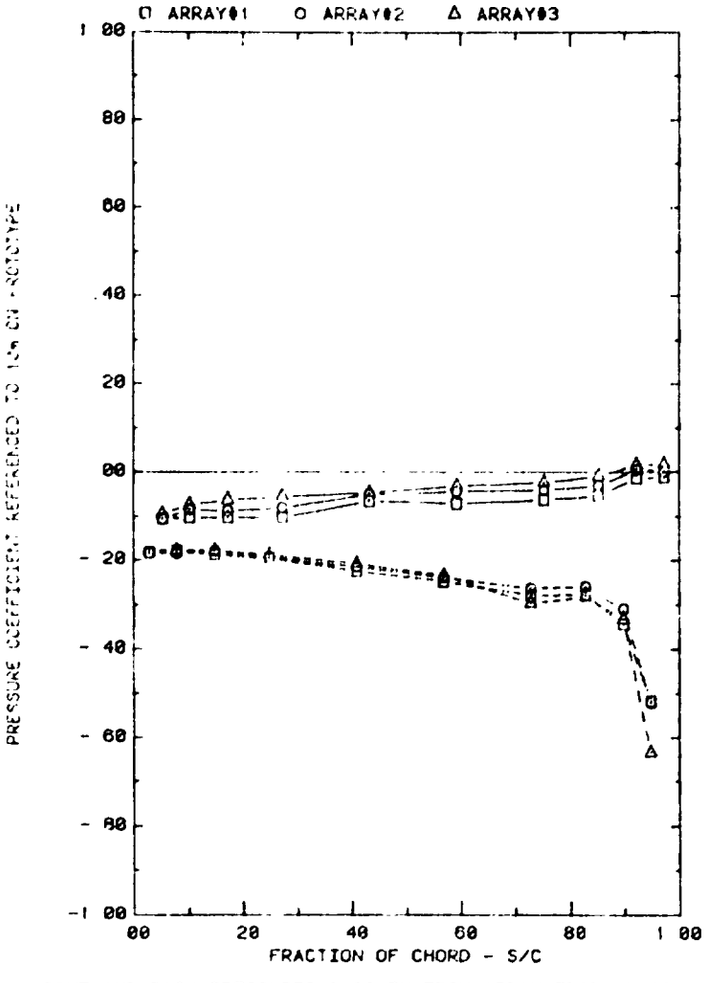


FRONT AND BACK PRESSURES @ 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=35, FC=2, H=3", D=10", AND P=30%

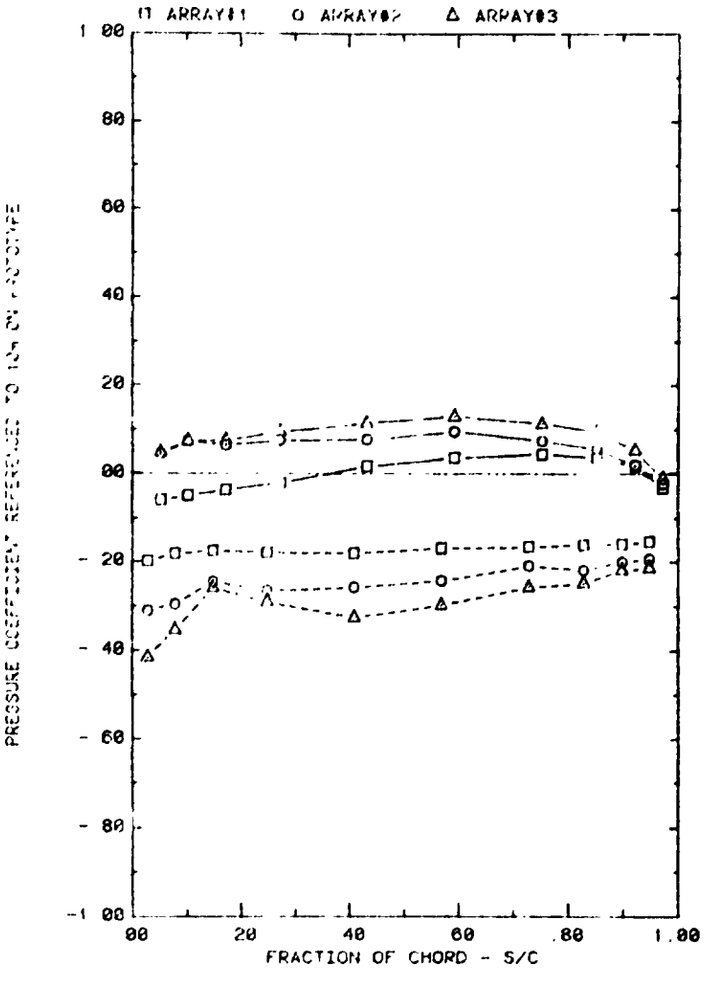


FRONT AND BACK PRESSURES @ 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=2, H=3", D=10", AND P=30%

Plot 5-1-1. (Continued)

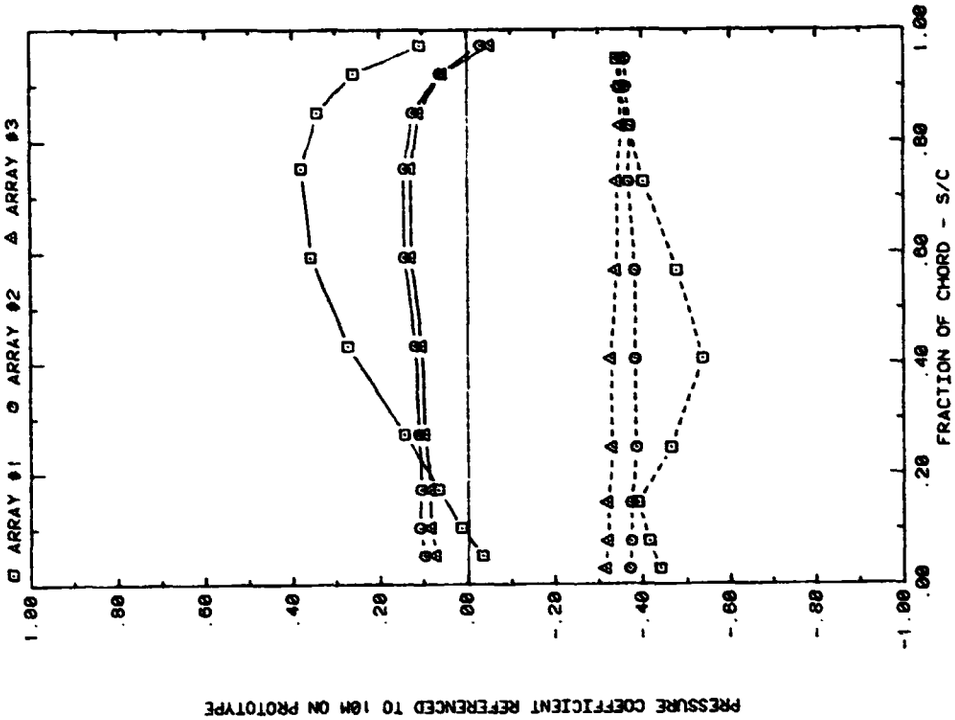


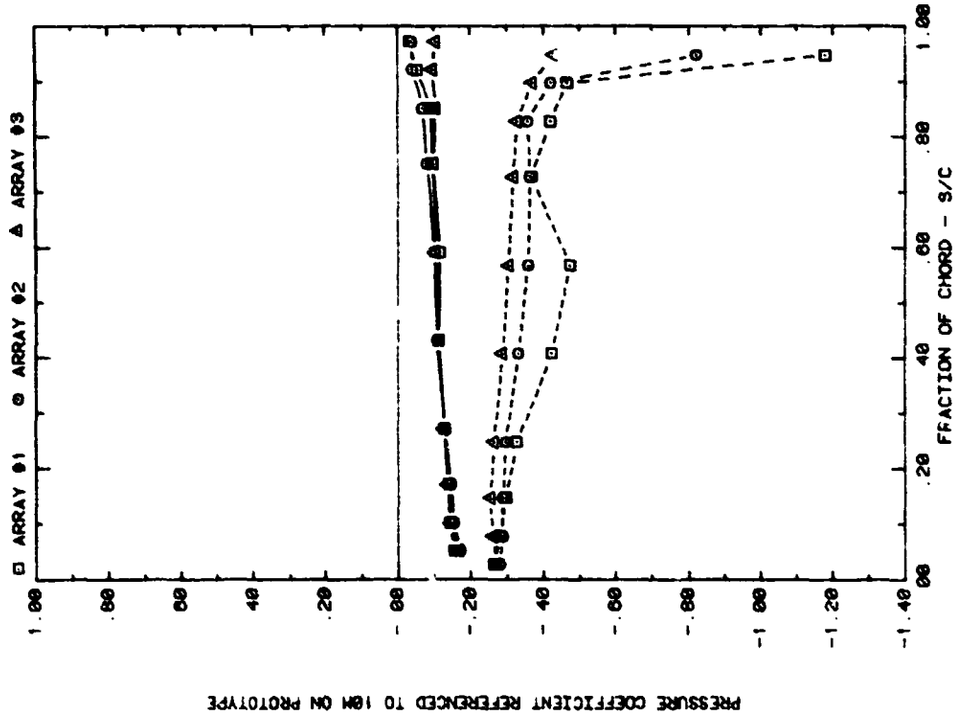
FRONT AND BACK PRESSURES @ 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=35, FC=3, H=3", D=10", AND P=30%



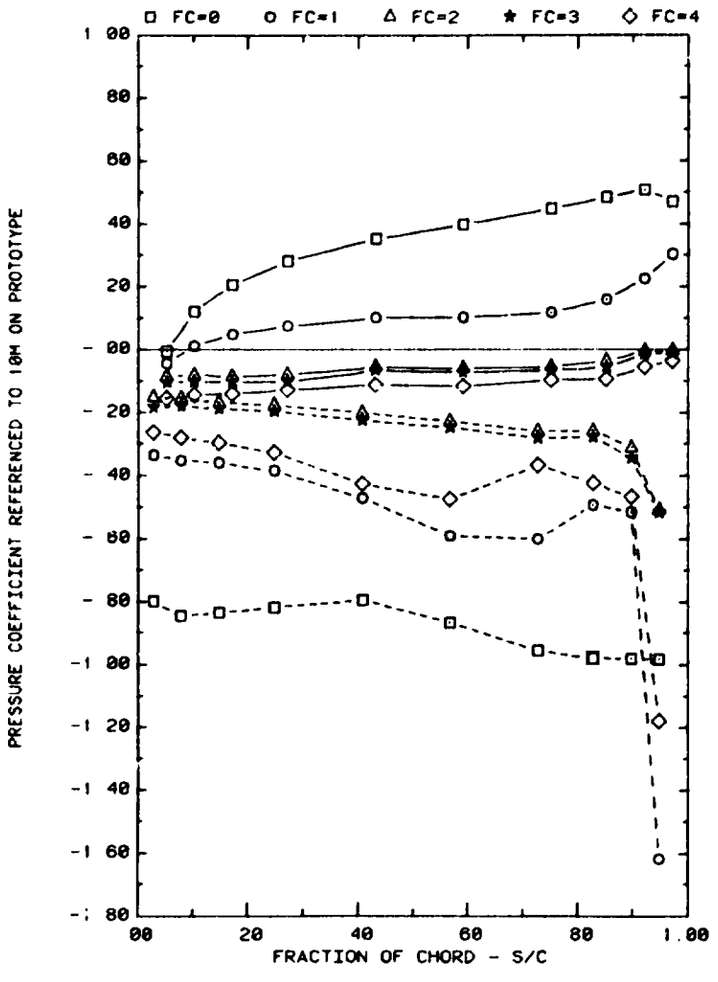
FRONT AND BACK PRESSURES @ 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=3, H=3", D=10", AND P=30%

Plot 5-1-1. (Continued)

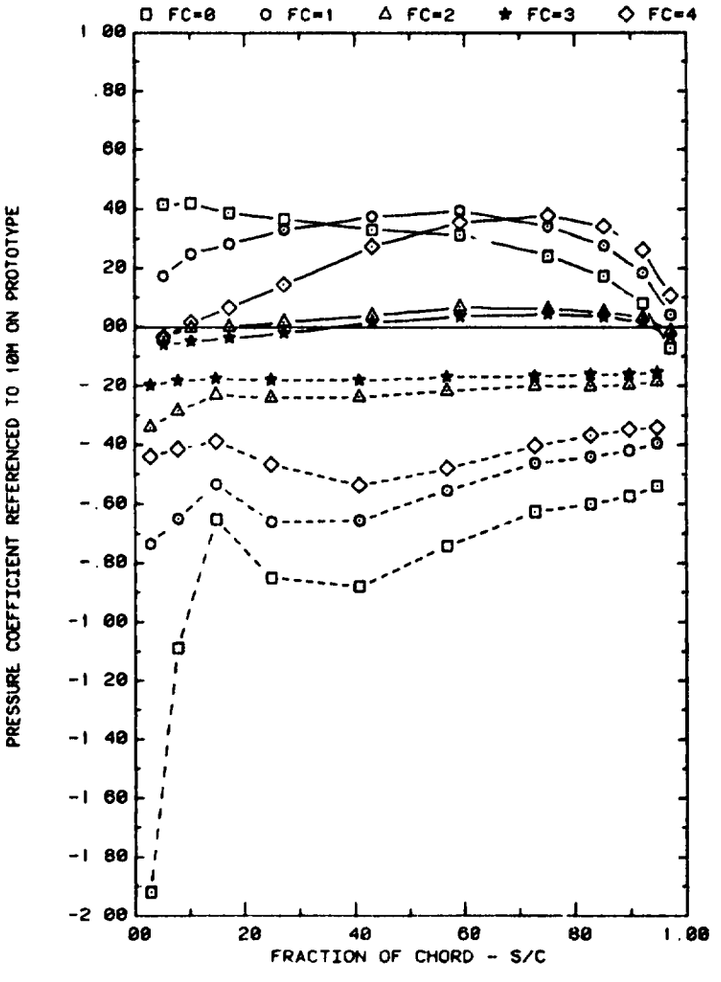




Plot 5-1-1. (Concluded)

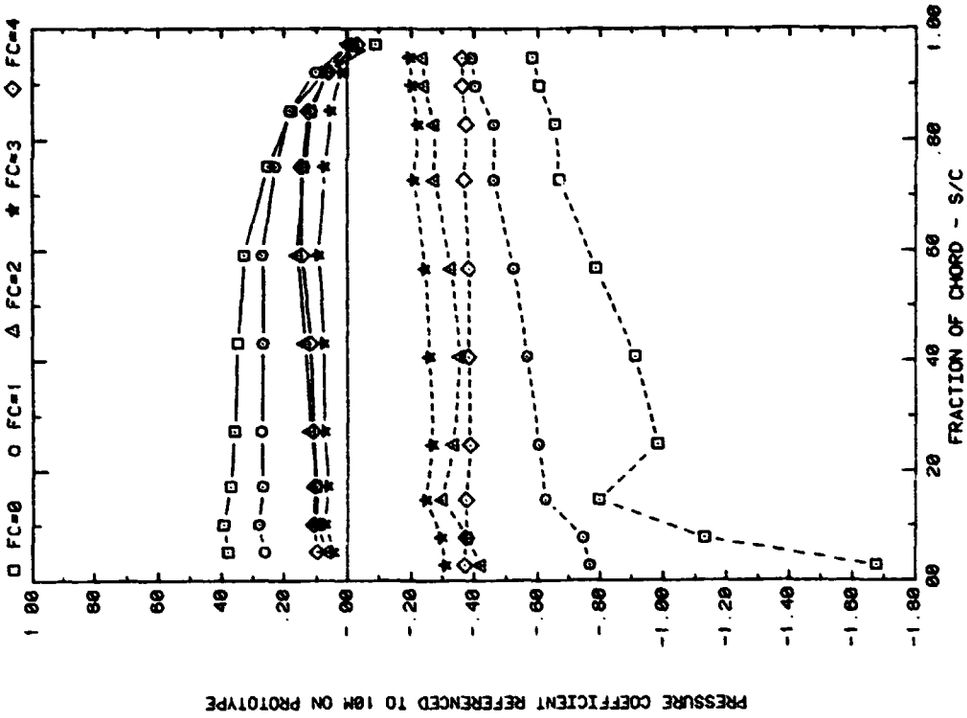


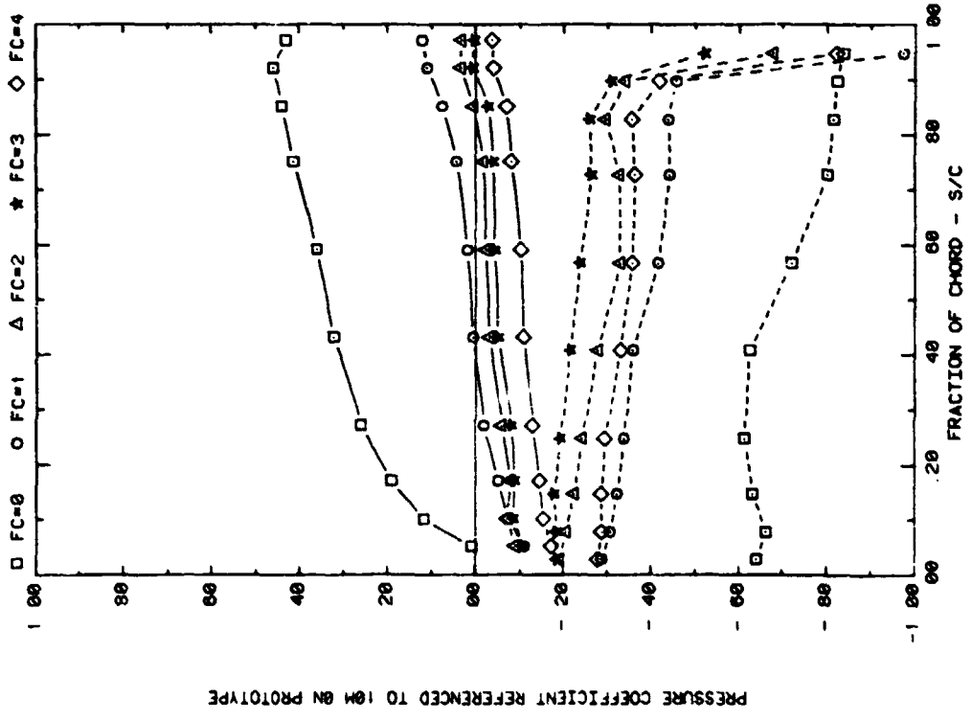
FRONT AND BACK PRESSURES @ 6" IN FROM EDGE OF ARRAY#1, WIND = 45
EFFECT OF FC WITH ALPHA=35, H=3", D=10",P=30%, AND X=2C



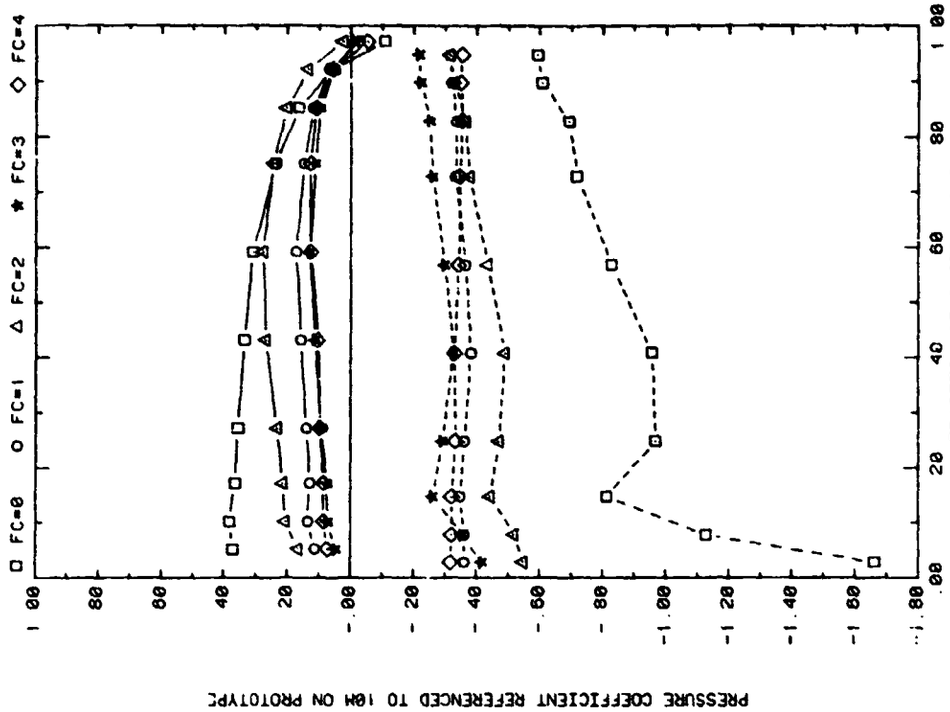
FRONT AND BACK PRESSURES @ 6" IN FROM EDGE OF ARRAY#1; WIND=45
EFFECT OF FC WITH ALPHA=145, H=3", D=10", P=30% AND X=2C

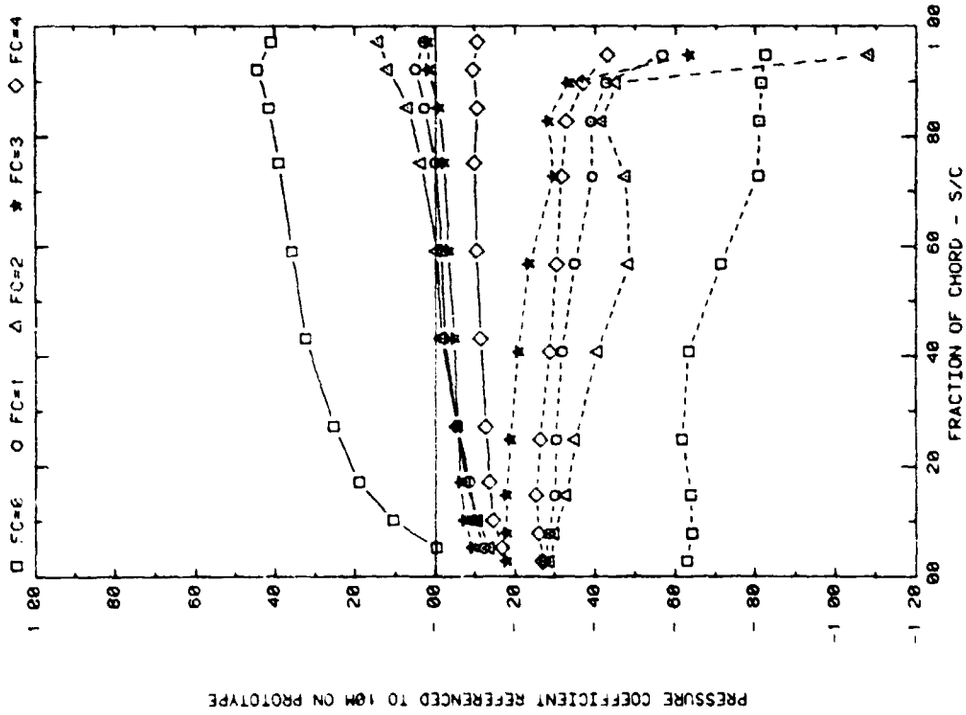
Plot 5-1-2. Corner Study, WD = 45°, Standard Model
Effect of Fence Configuration



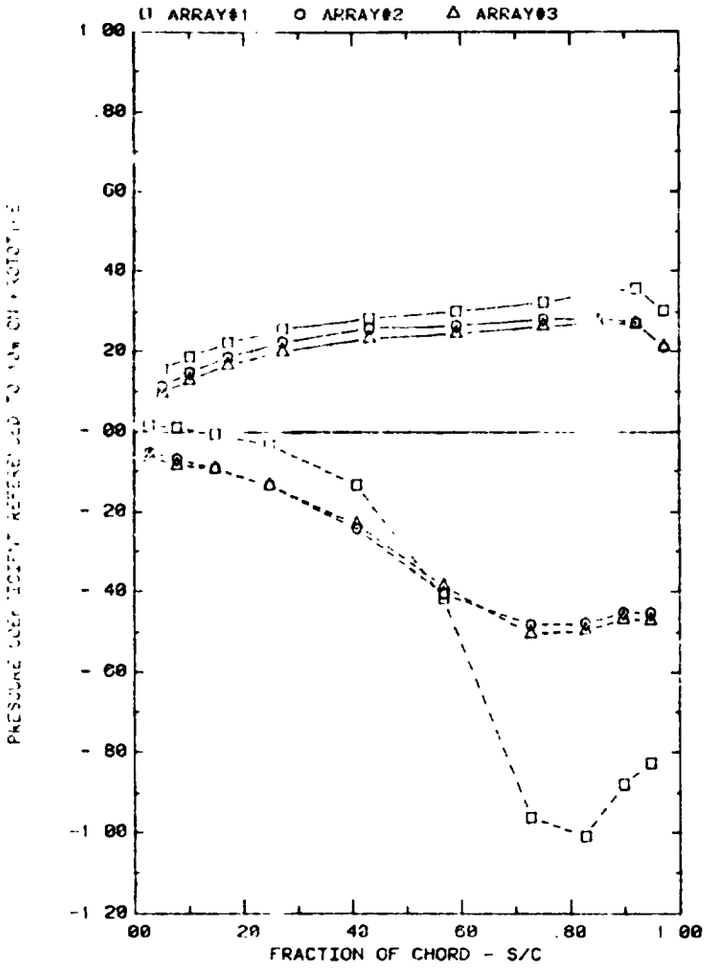


Plot 5-1-2. (Continued)

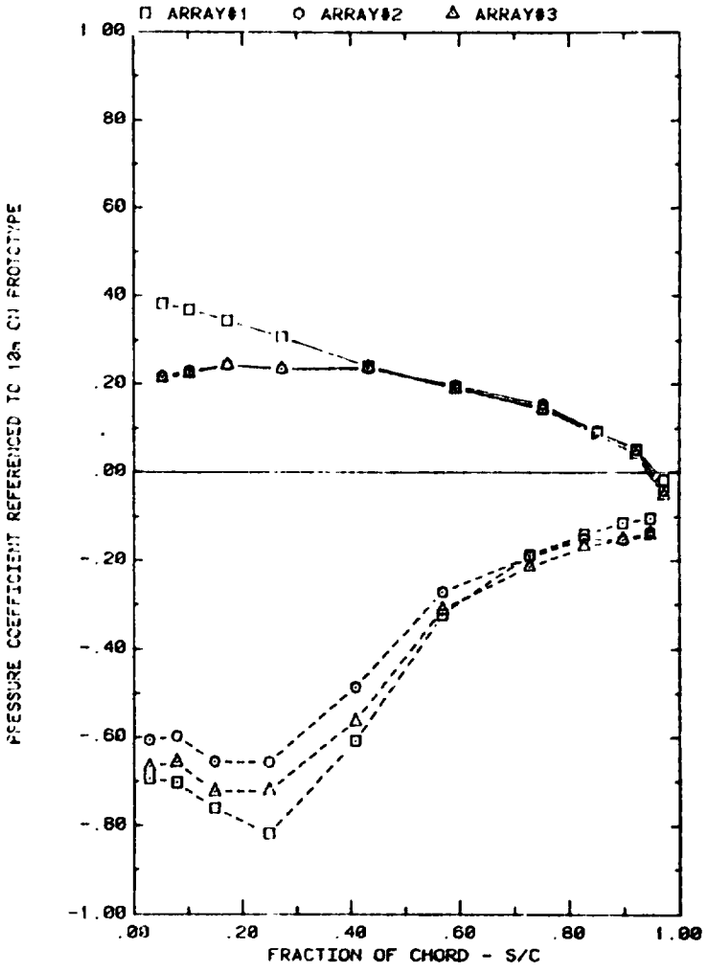




Plot 5-1-2. (Concluded)

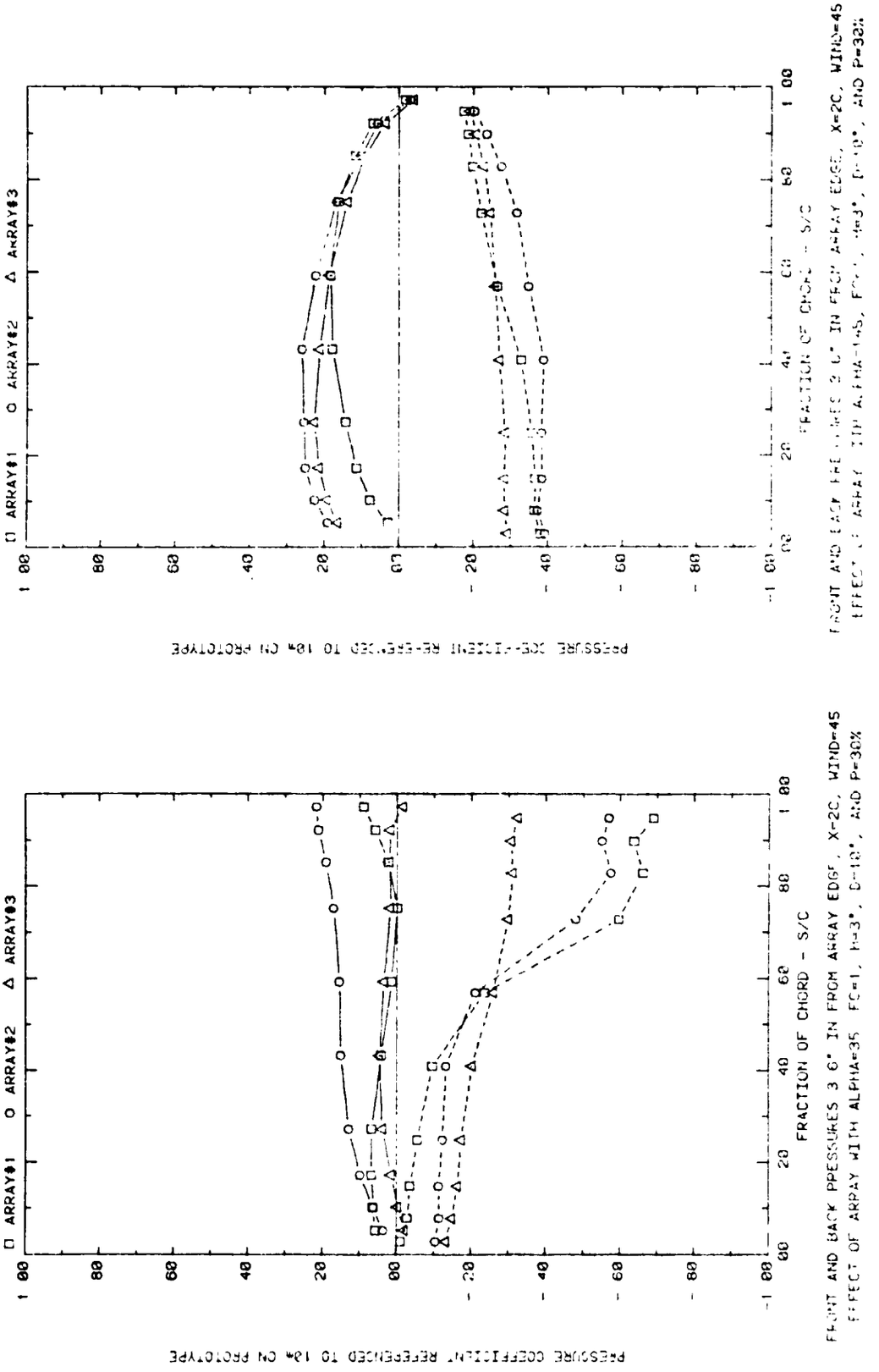


FRONT AND BACK PRESSURES 3.6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=35, FC=0, H=3", D=10", AND P=30%

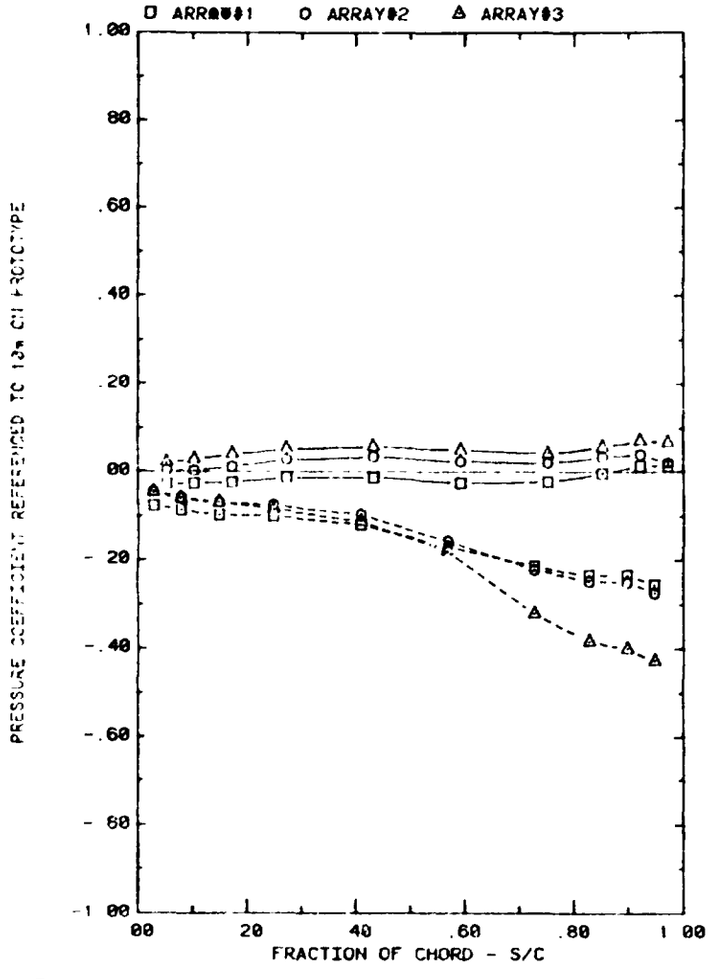


FRONT AND BACK PRESSURES 3.6" IN FROM ARRAY EDGE; X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=0, H=3", D=10", AND P=30%

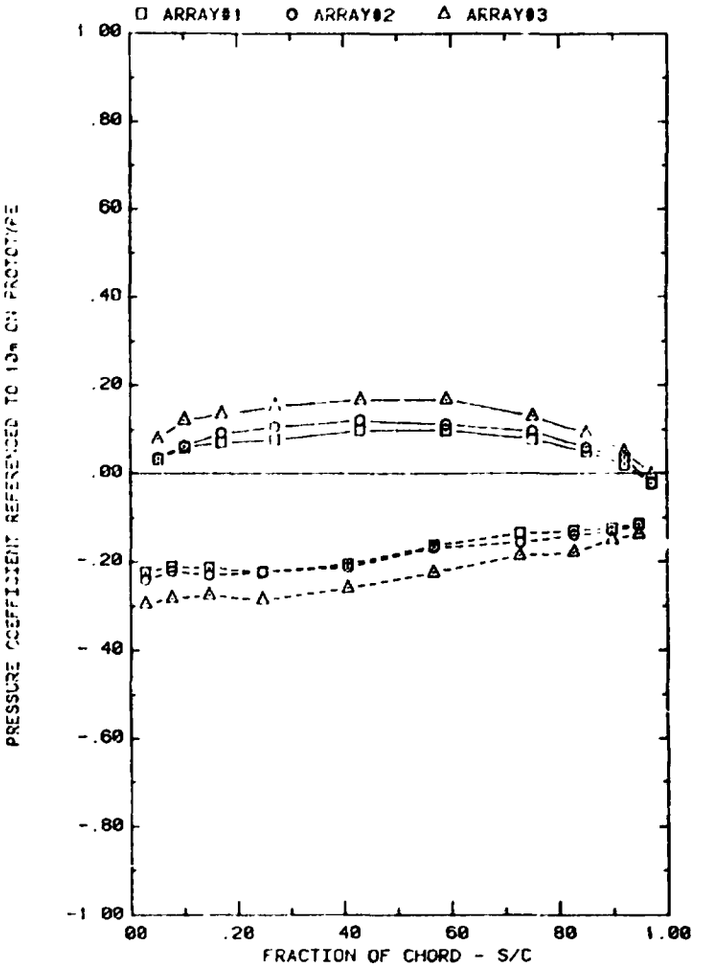
Plot 5-2-1. Corner Study, WD = 45°, Modified Model with Solid Extension
Effect of Array Position



Plot 5-2-1. (Continued)

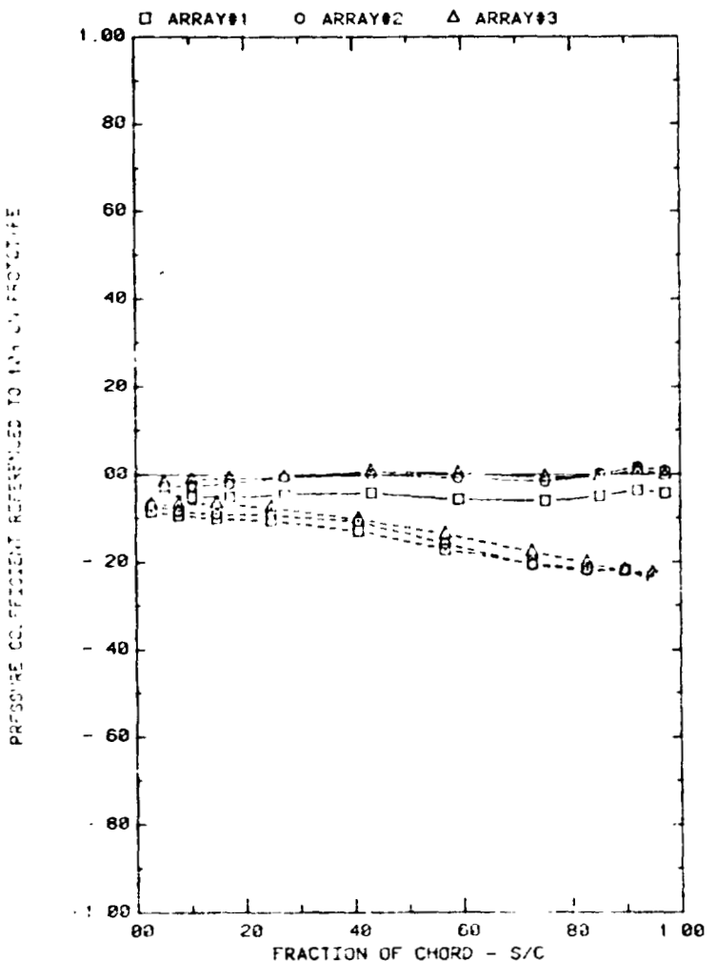


FRONT AND BACK PRESSURES 3.6° IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=35, FC=2, H=3", D=10", AND P=30%

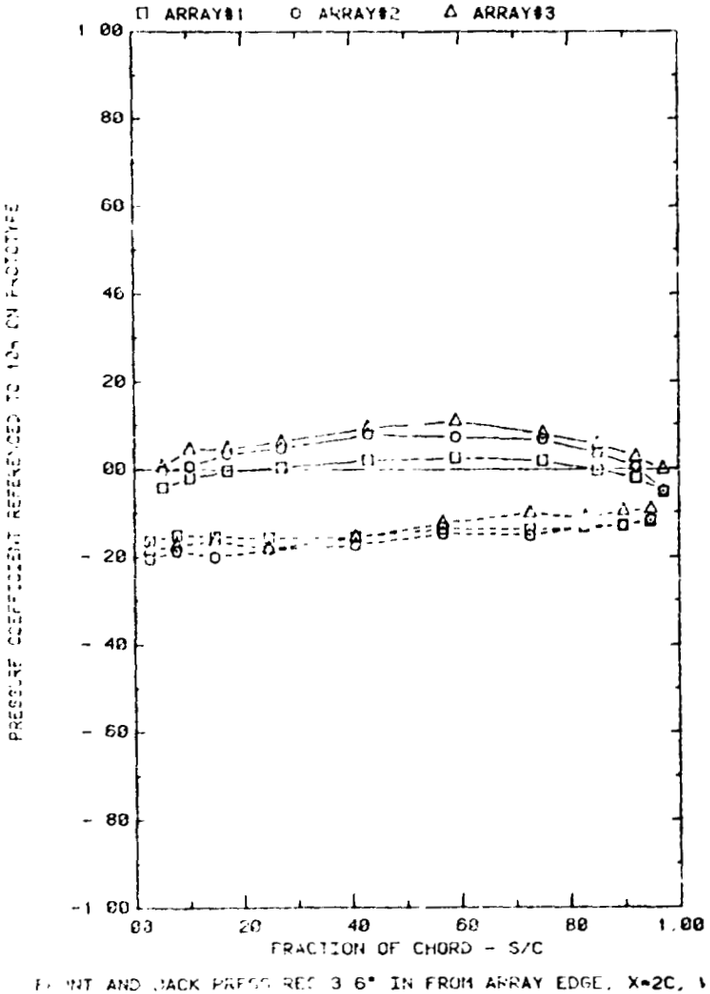


FRONT AND BACK PRESSURES 3.6° IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=2, H=3", D=10", AND P=30%

Plot 5-2-1. (Continued)

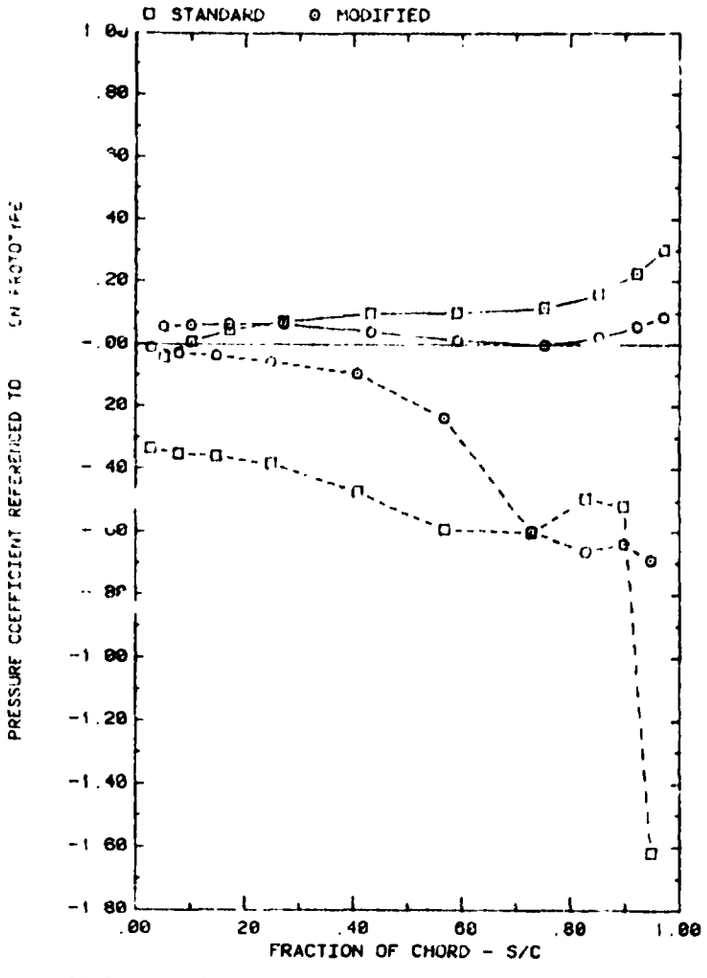


FRONT AND BACK PR[illegible]RES 3 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARR[illegible] ALPHA=45, FC=3, H=3", D=10", AND P=30%

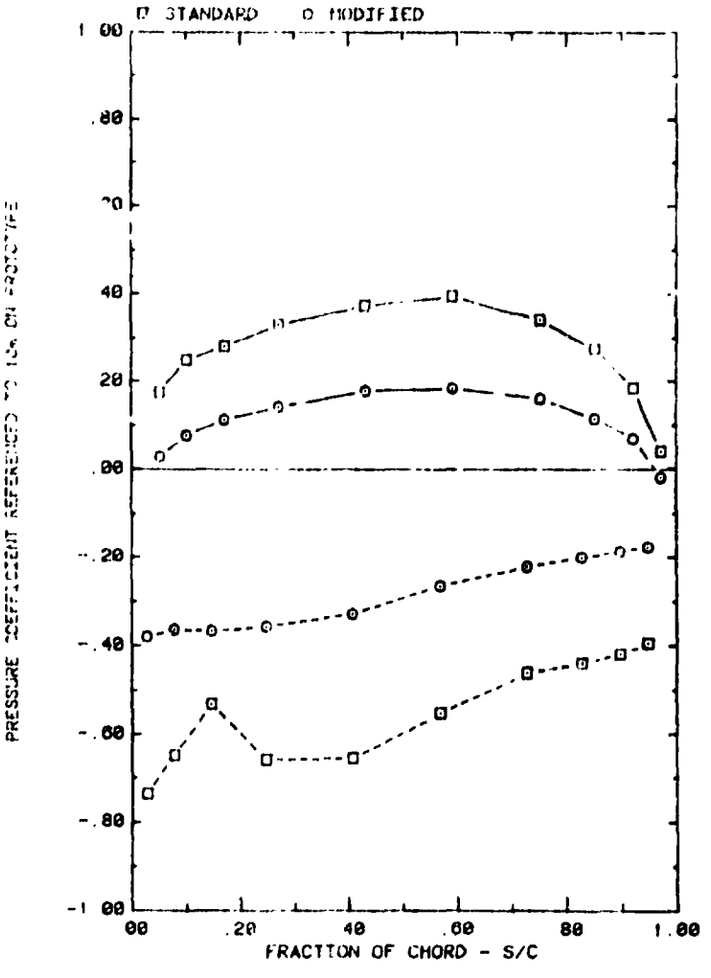


FRONT AND BACK PRESSURES 3 6" IN FROM ARRAY EDGE, X=2C, WIND=45
EFFECT OF ARRAY WITH ALPHA=145, FC=3, H=3", D=10", AND P=30%

Plot 5-2-1. (Concluded)

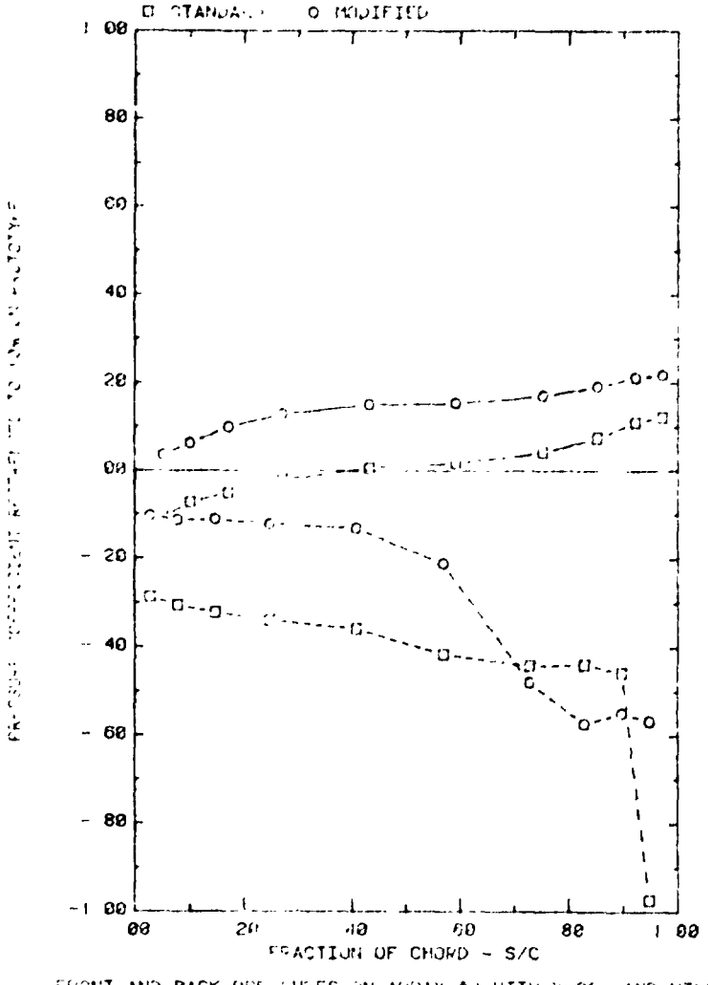


FRONT AND PACK PRESSURES ON ARRAY #1 WITH X=2C, AND WI 15
EFFECT OF TAP LOCATION, ALPHA=35, H=3° D=10°, FC=1, AN. +30%

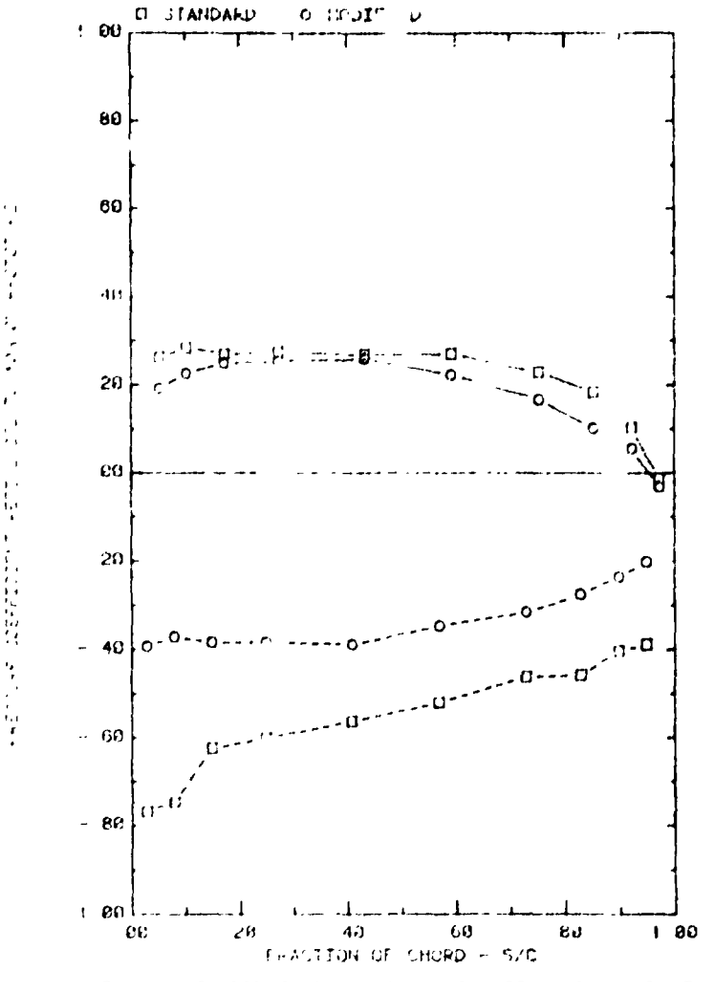


FRONT AND BACK PRESSURES ON ARRAY #1 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=145, H=3°, D=10°, FC=1, AND P=30%

Plot 5-2-2. Corner Study, WD = 45°, Effect of Model Modification

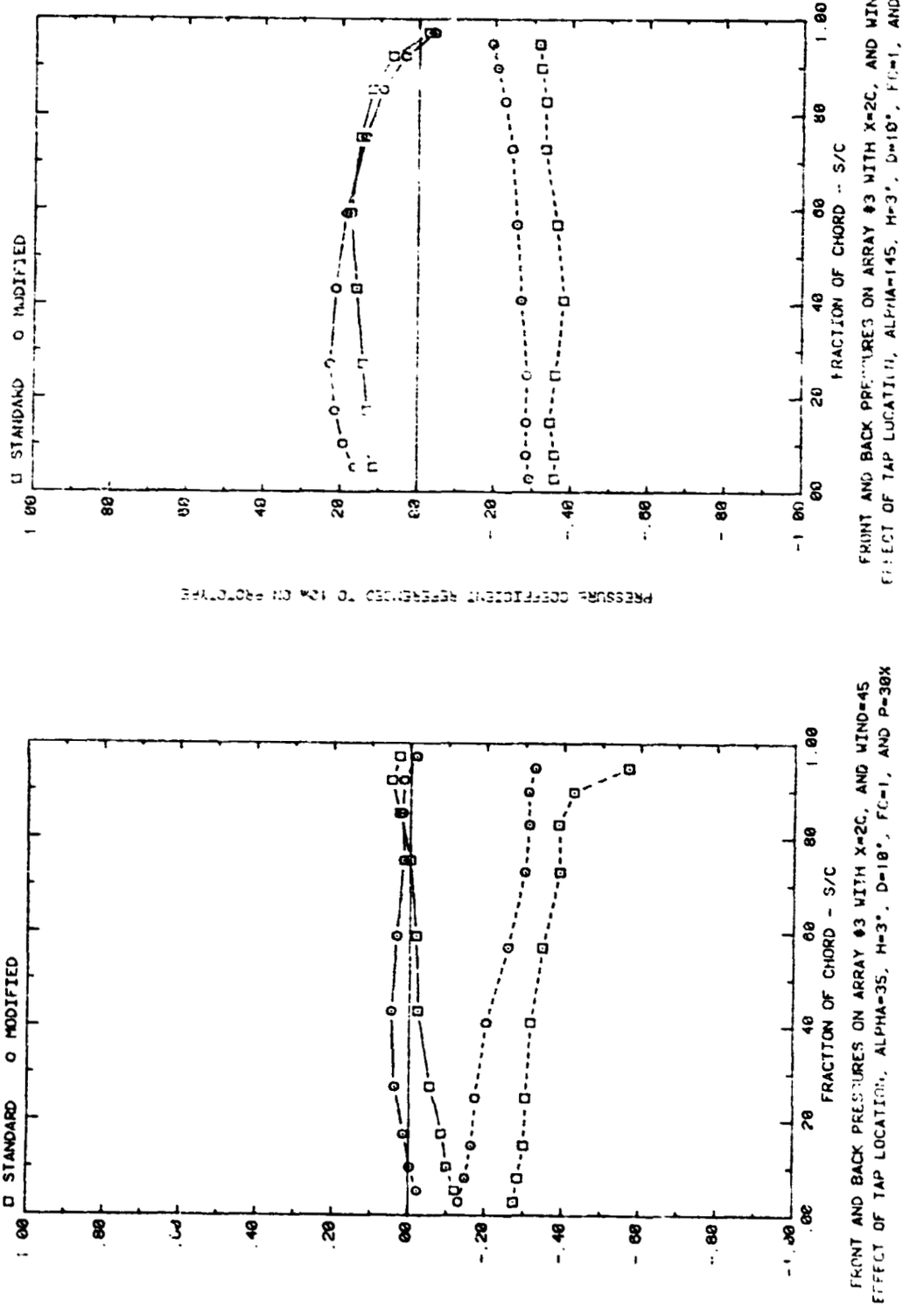


FRONT AND BACK PRESSURES ON ARRAY #2 WITH X=20., AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=35, H=3", D=10", EC=1, AND P=30%

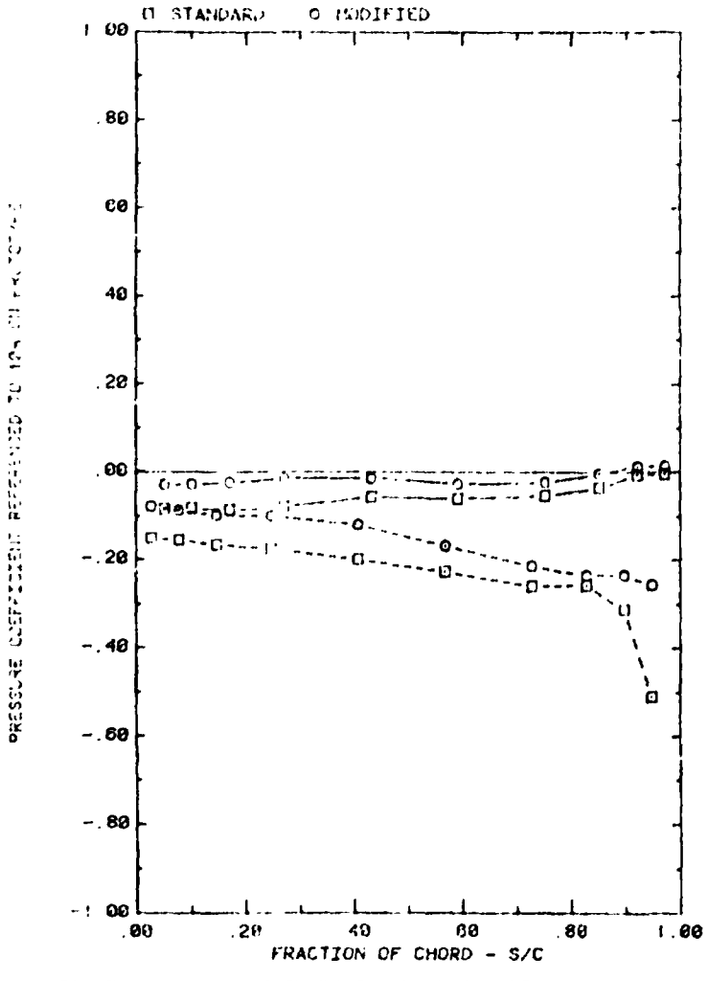


FRONT AND BACK PRESSURE ON ARRAY #2 WITH X=20., AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=35, H=3", D=10", EC=1, AND P=30%

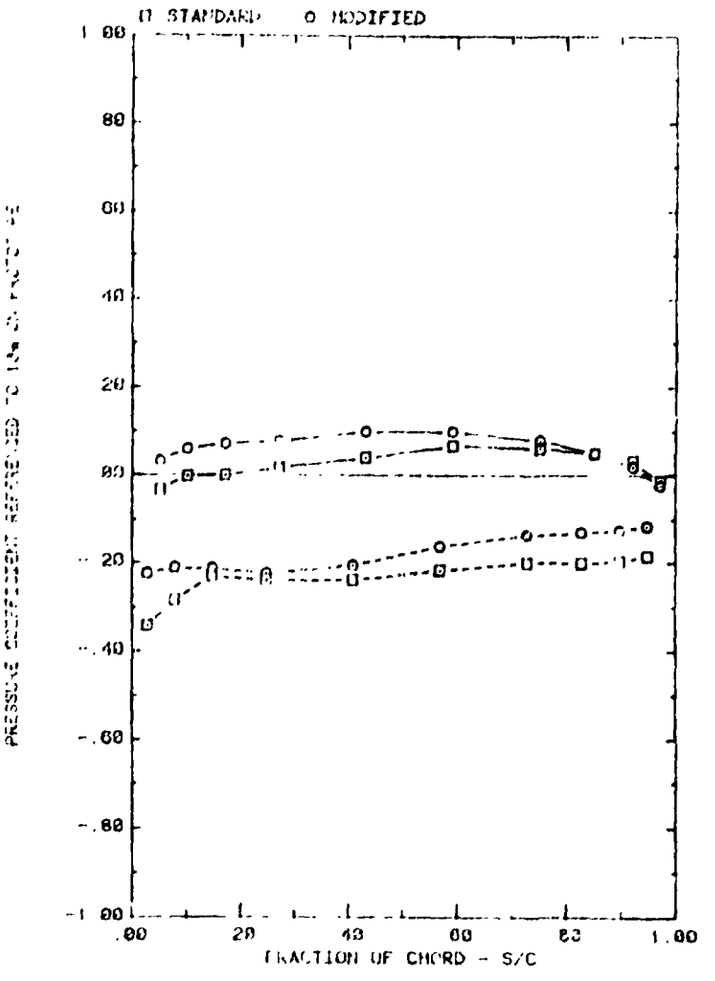
Plot 5-2-2. (Continued)



Plot 5-2-2. (Continued)

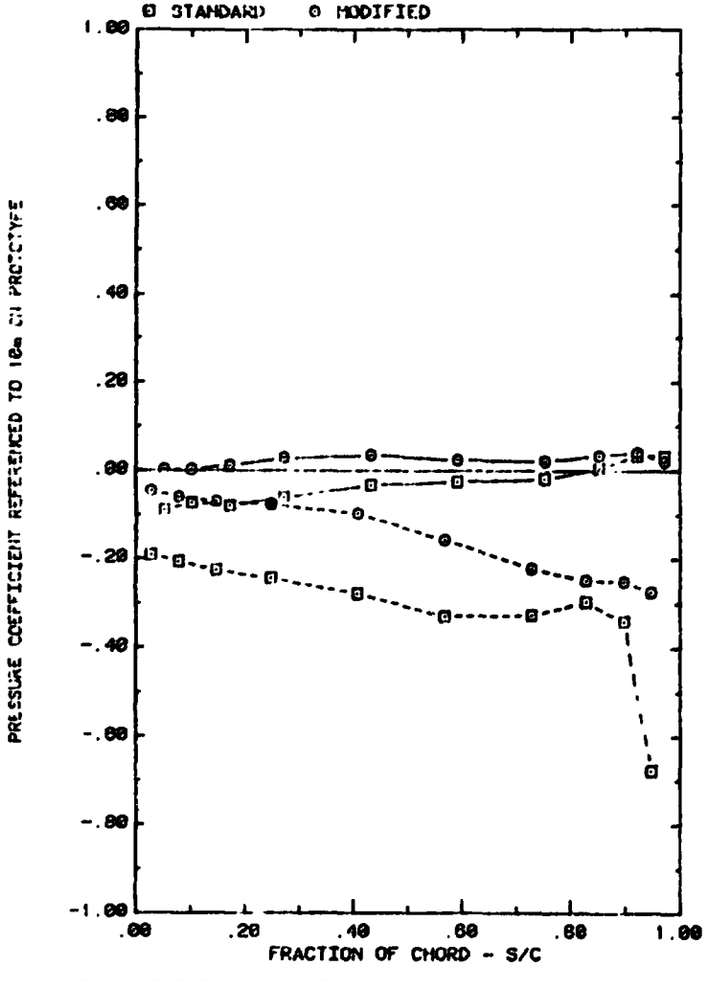


FRONT AND BACK PRESSURES ON ARRAY #1 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=35, H=3", D=10", FC=2, AND P=30%

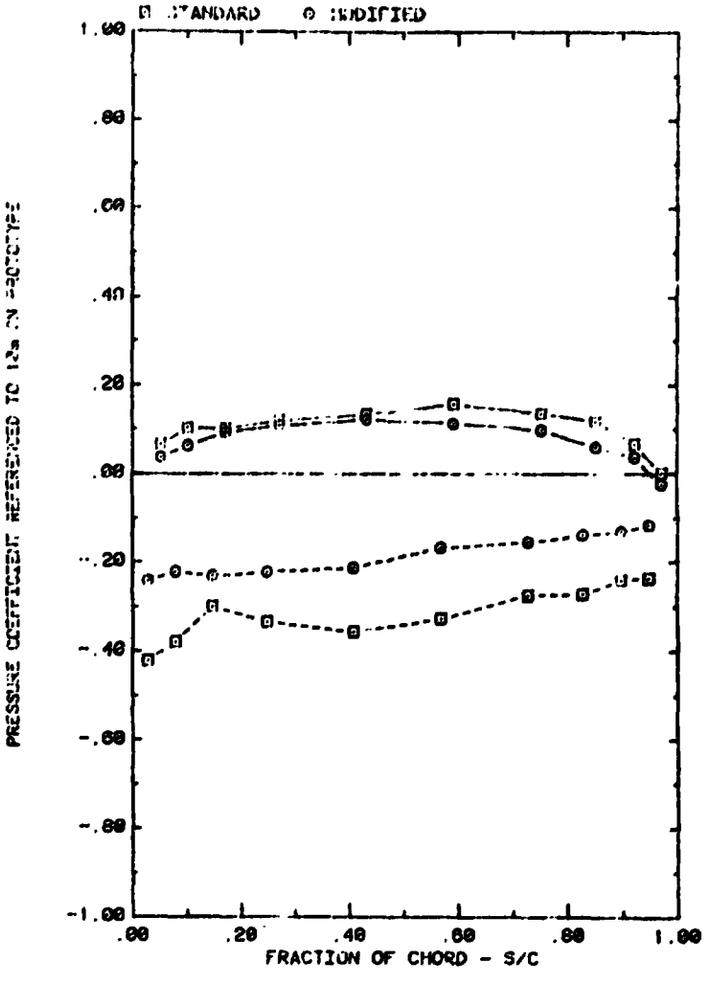


FRONT AND BACK PRESSURES ON ARRAY #1 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=145, H=3", D=10", FC=2", AND P=30%

Plot 5-2-2. (Continued)

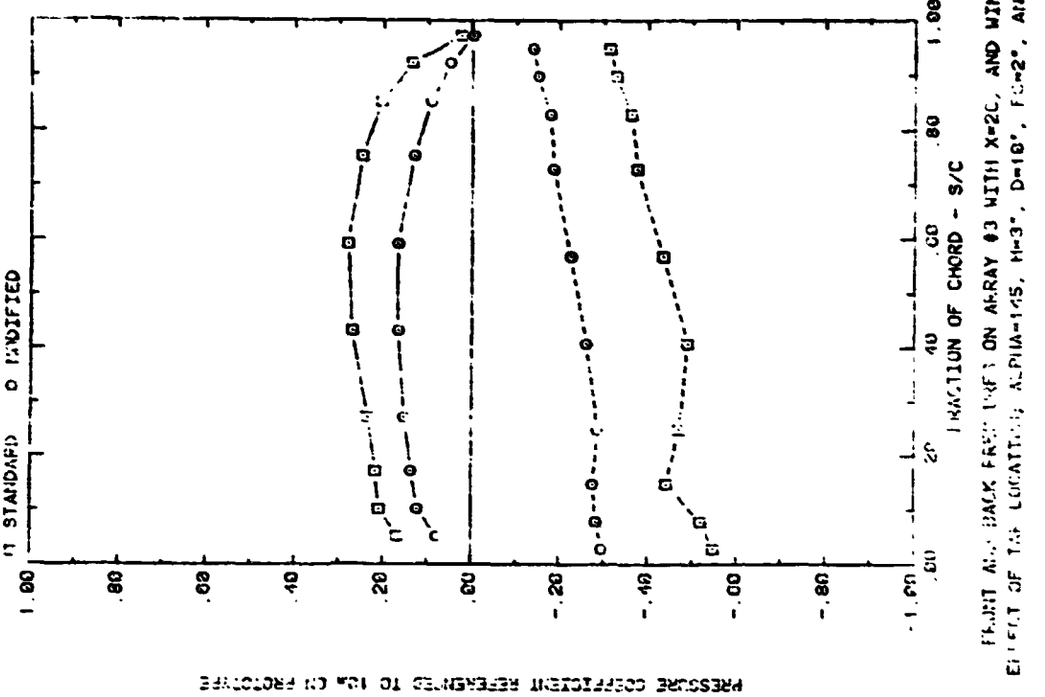


FRONT AND BACK PRESSURES ON ARRAY #2 WITH X=2C, AND WIND=45
FECT OF TAP LOCATION; ALPHA=35, H=3', D=18', FC=2, AND P=30%

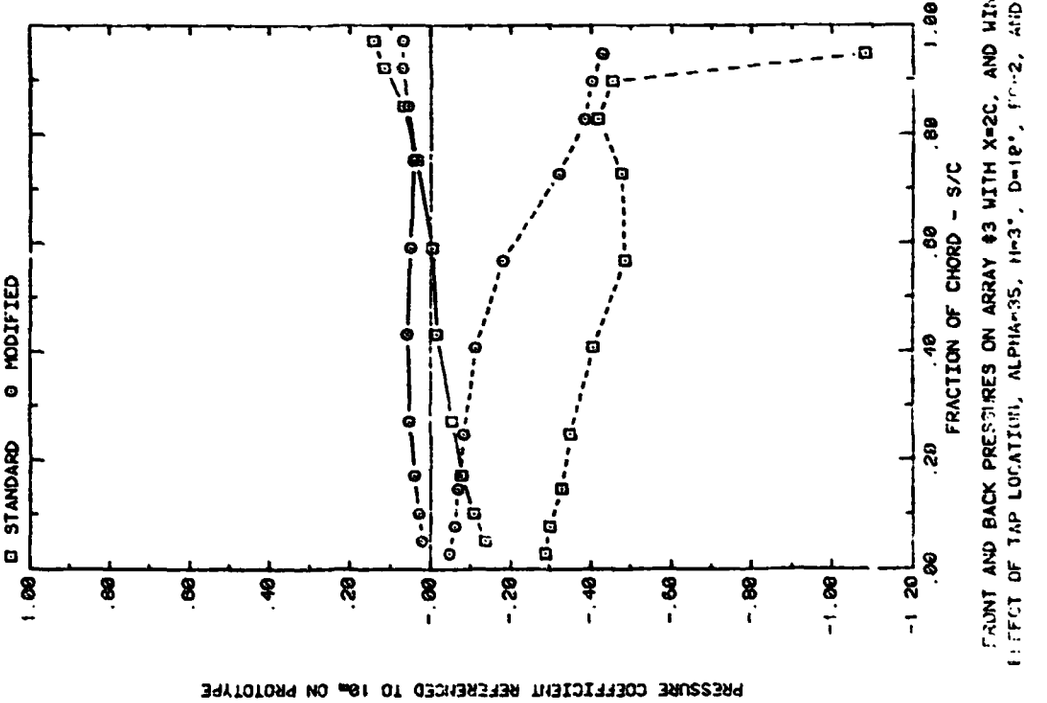


FRONT AND BACK PRESSURES ON ARRAY #2 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION; ALPHA=145, H=3', D=18', FC=2', AND P=30%

Plot 5-2-2. (Continued)

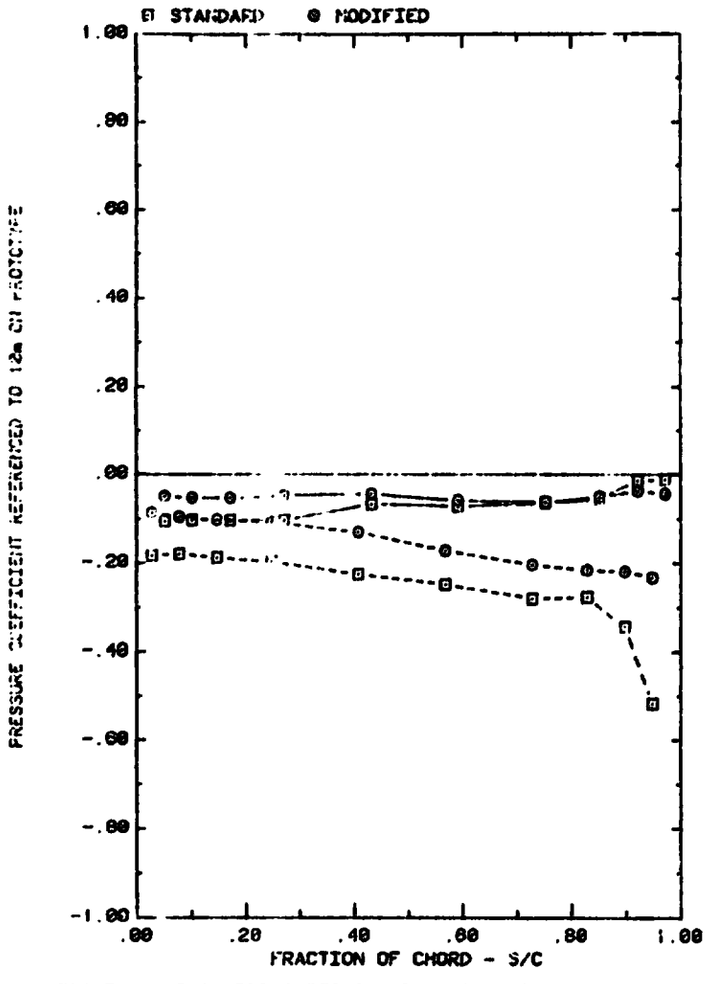


FRONT AND BACK PRESSURES ON ARRAY #3 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=45, H=3", D=18", F=2", AND P=30%

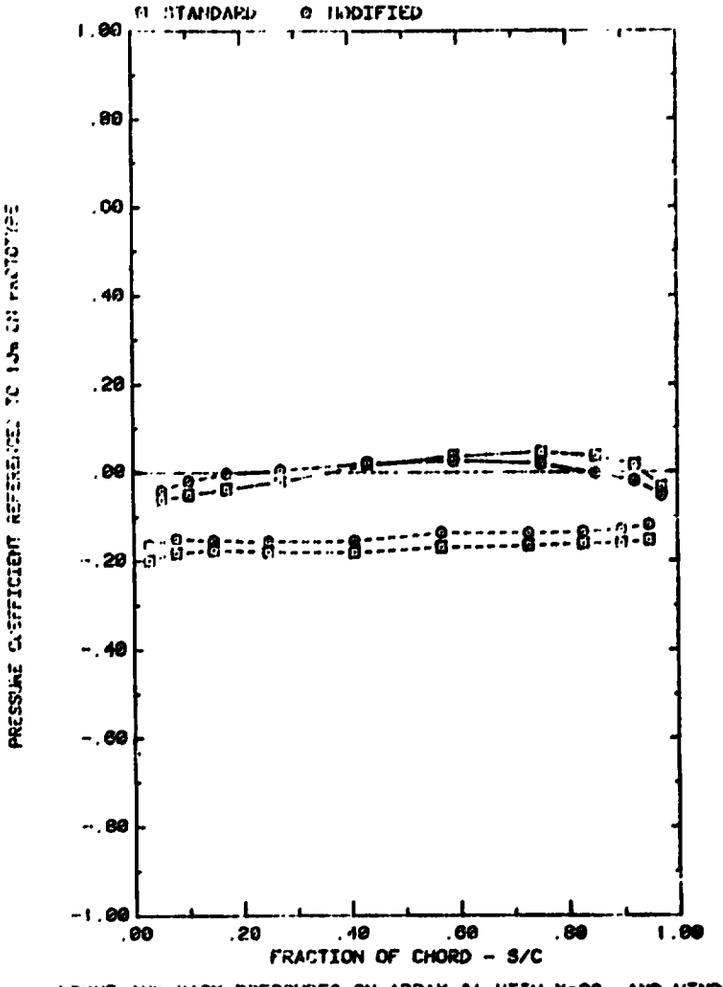


FRONT AND BACK PRESSURES ON ARRAY #3 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=45, H=3", D=18", F=2", AND P=30%

Plot 5-2-2. (Continued)

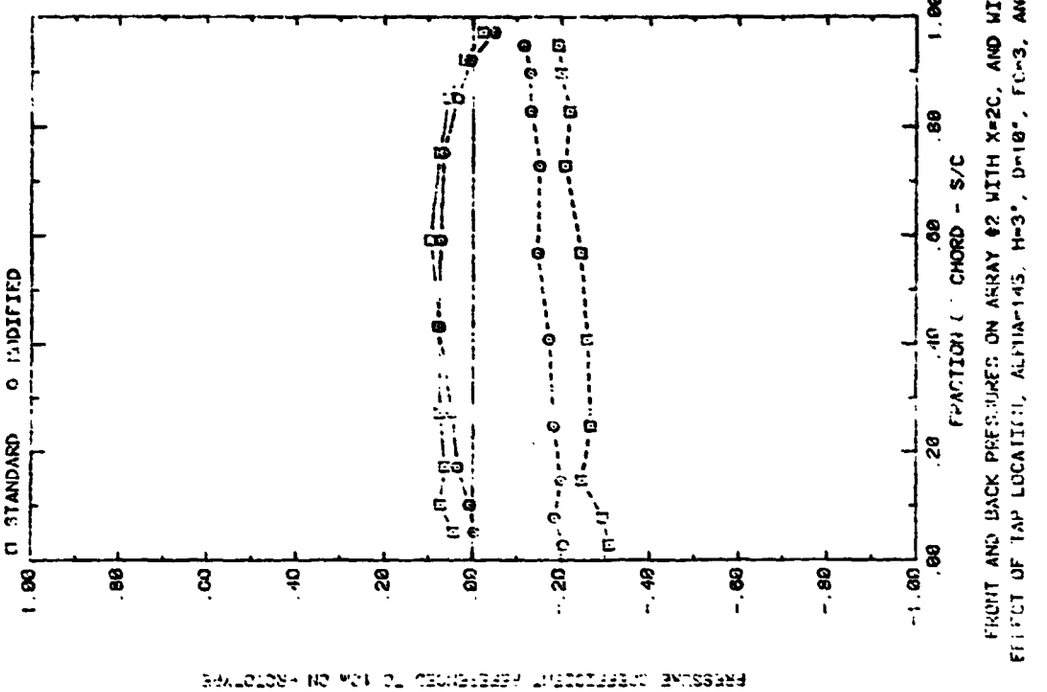


FRONT AND BACK PRESSURES ON ARRAY #1 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION; ALPHA=35, H=3°, D=10°, FC=3, AND P=30%

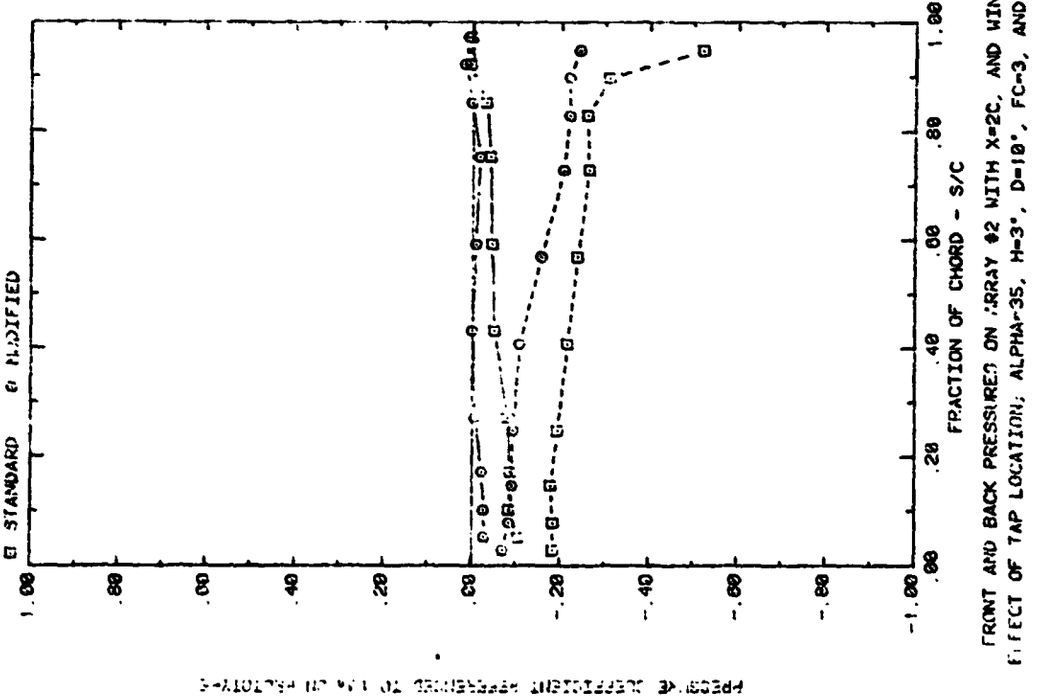


FRONT AND BACK PRESSURES ON ARRAY #1 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION; ALPHA=145, H=3°, D=10°, FC=3, AND P=30%

Plot 5-2-2. (Continued)

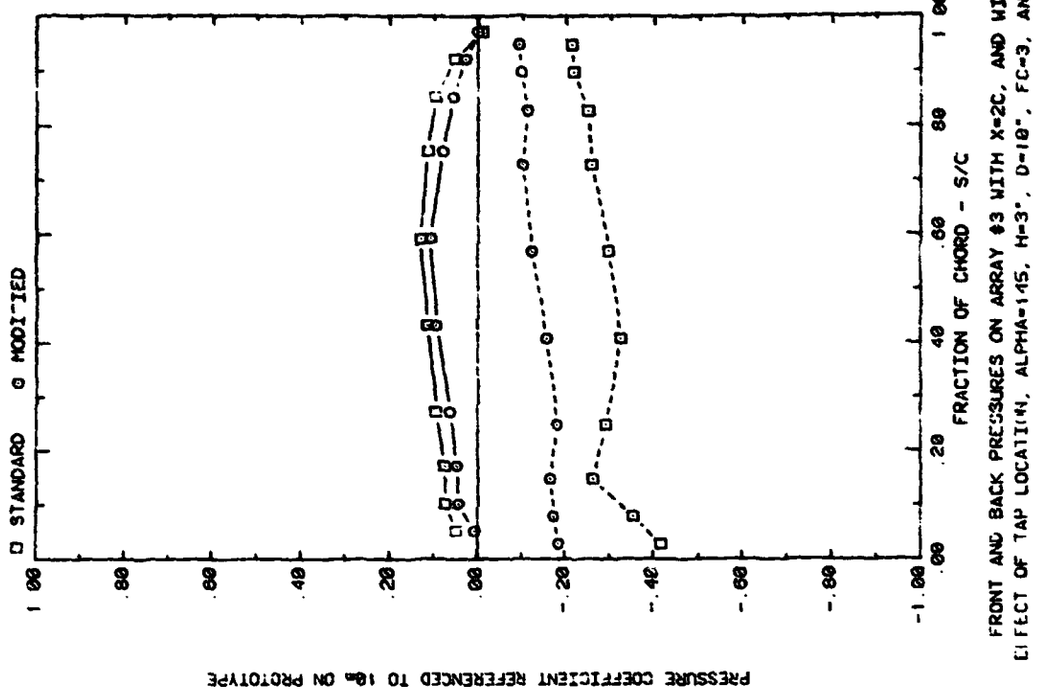


FRONT AND BACK PRESSURES ON ARRAY #2 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION; ALPHA=45, H=3", D=10", FC=3, AND P=38%

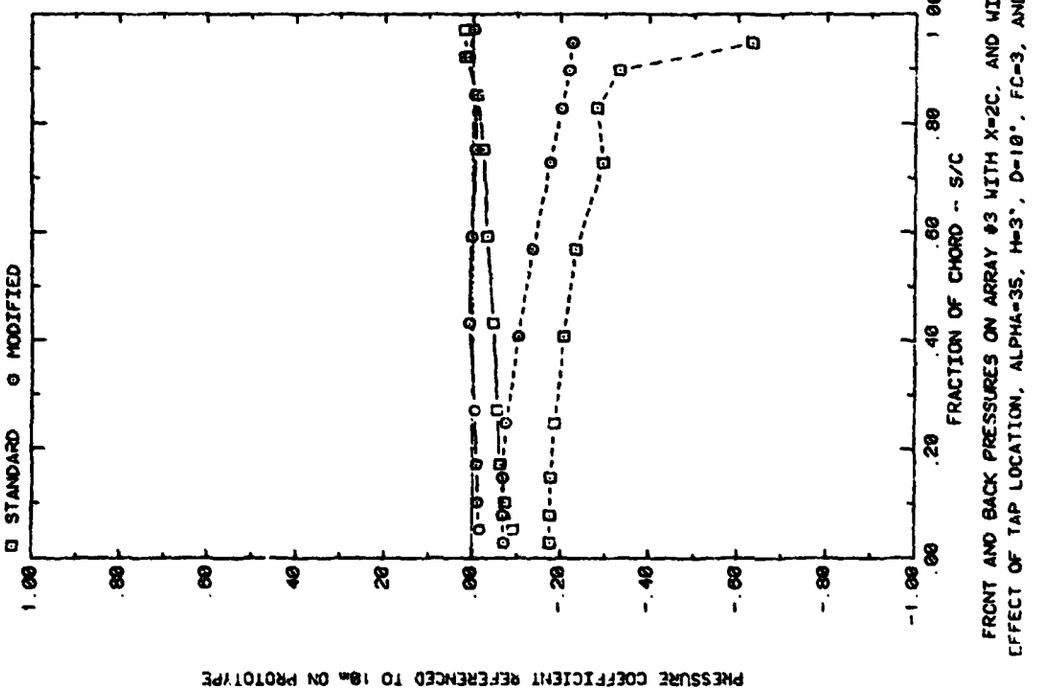


FRONT AND BACK PRESSURES ON ARRAY #2 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION; ALPHA=35, H=3", D=10", FC=3, AND P=38%

Plot 5-2-2. (Continued)

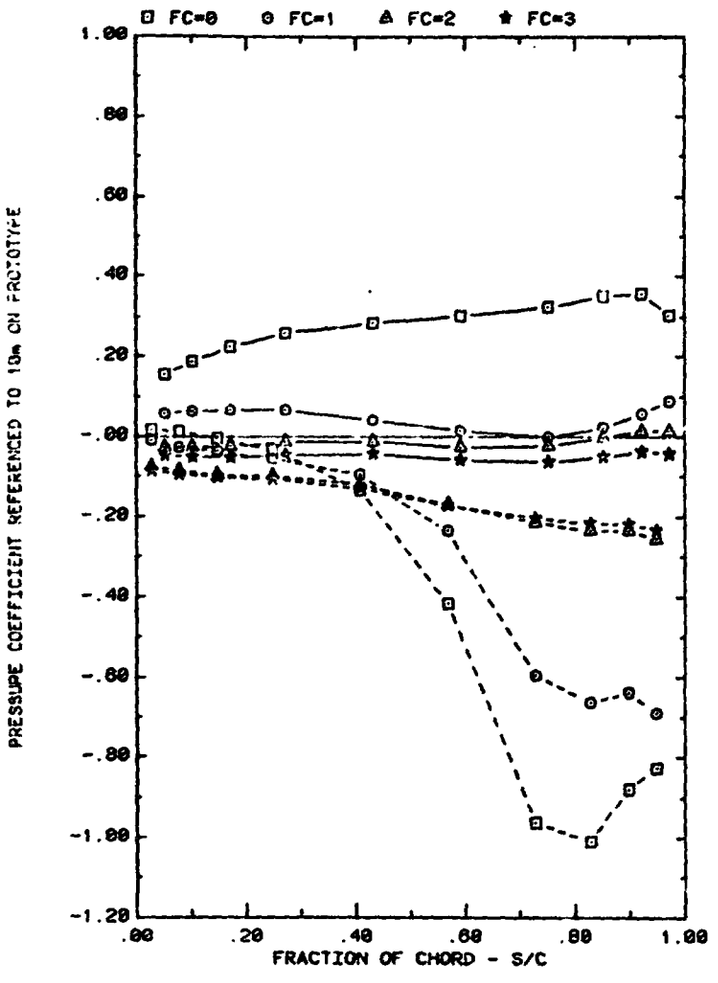


FRONT AND BACK PRESSURES ON ARRAY #3 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=145, H=3", D=18", FC=3, AND P=30%

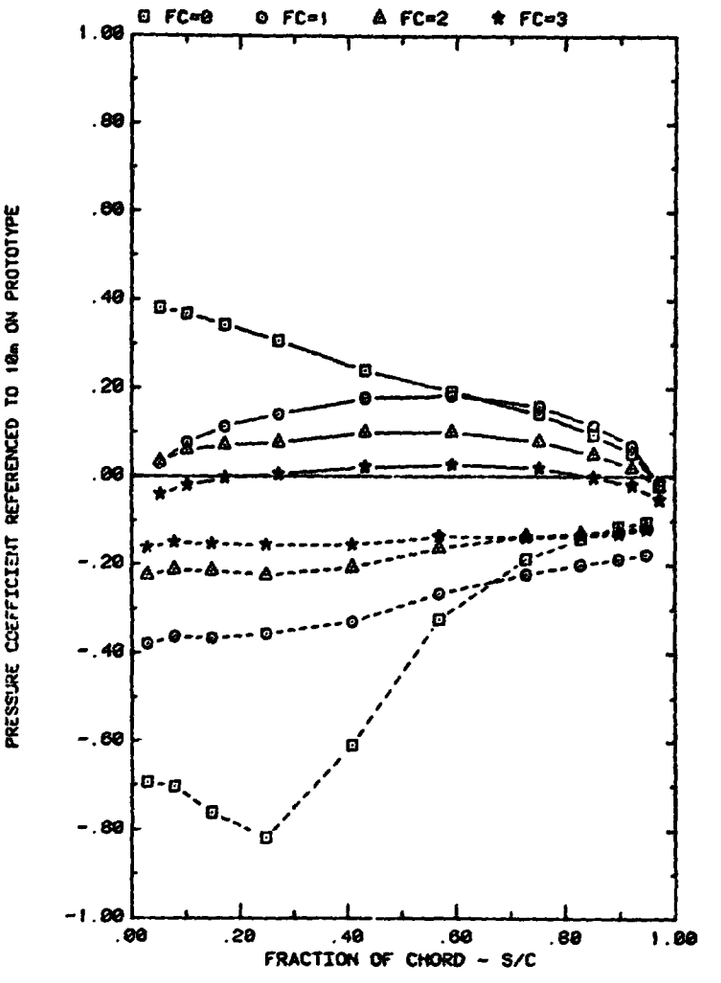


FRONT AND BACK PRESSURES ON ARRAY #3 WITH X=2C, AND WIND=45
EFFECT OF TAP LOCATION, ALPHA=35, H=3", D=18", FC=3, AND P=30%

Plot 5-2-2. (Concluded)

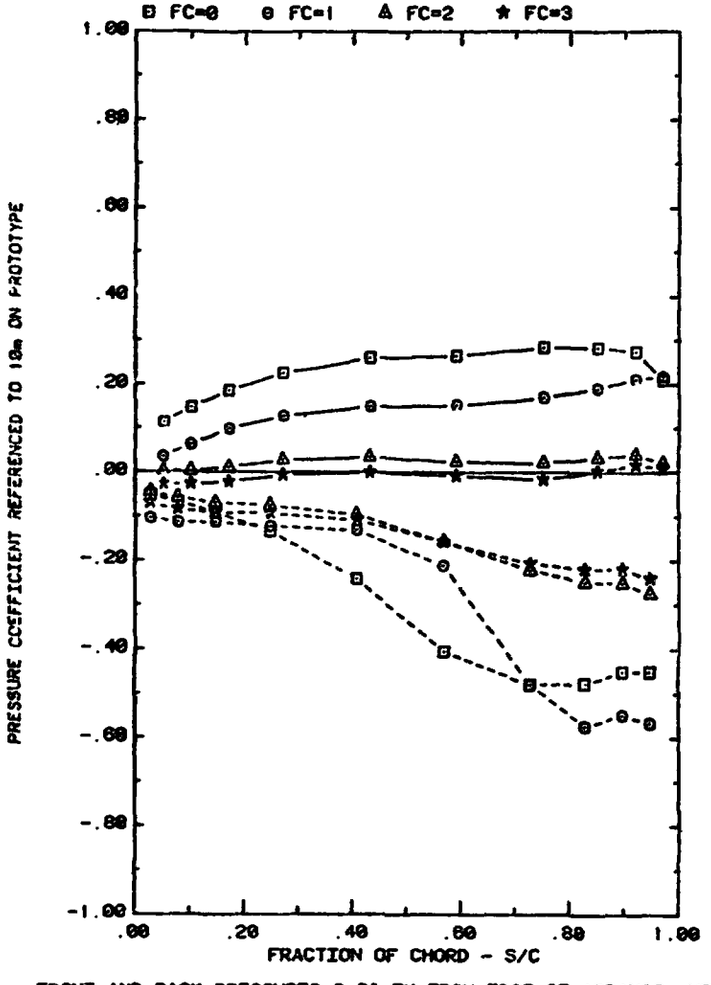


FRONT AND BACK PRESSURES 3.6" IN FROM EDGE OF ARRAY#1; WIND=45
EEFECT OF FC WITH ALPHA=35, H=3", D=10", P=30%, AND X=2C

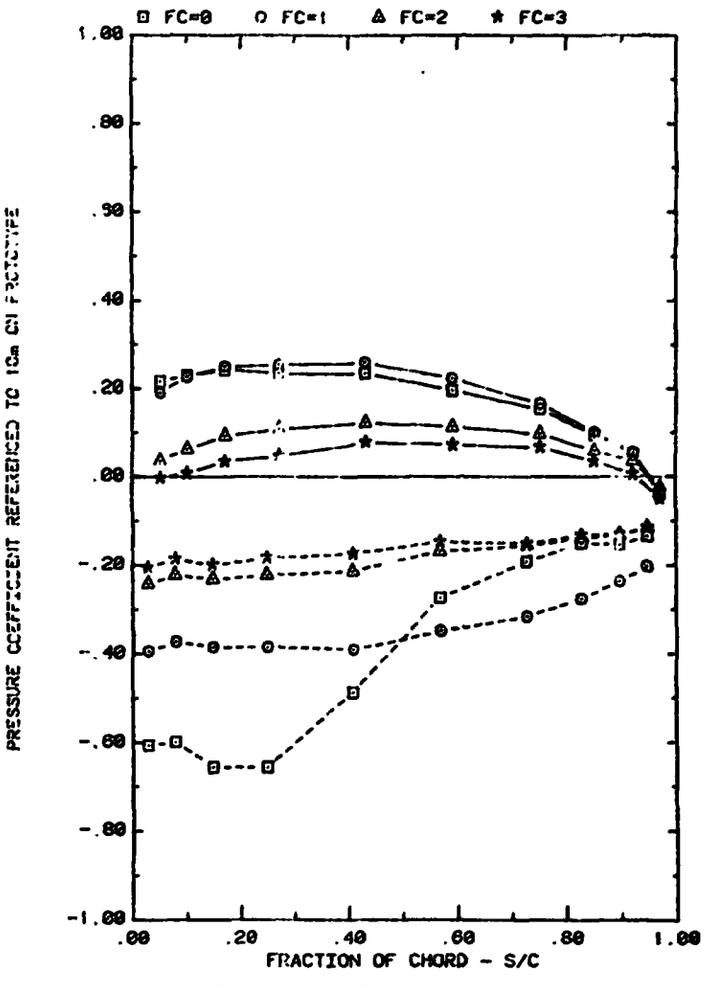


FRONT AND BACK PRESSURES 3.6" IN FROM EDGE OF ARRAY#1; WIND=45
EFFECT OF FC WITH ALPHA=145, H=3", D=10", P=30%, AND X=2C

Plot 5-2-3. Corner Study, WD = 45°, Modified Model with Solid Extension
Effect of Fence Configuration

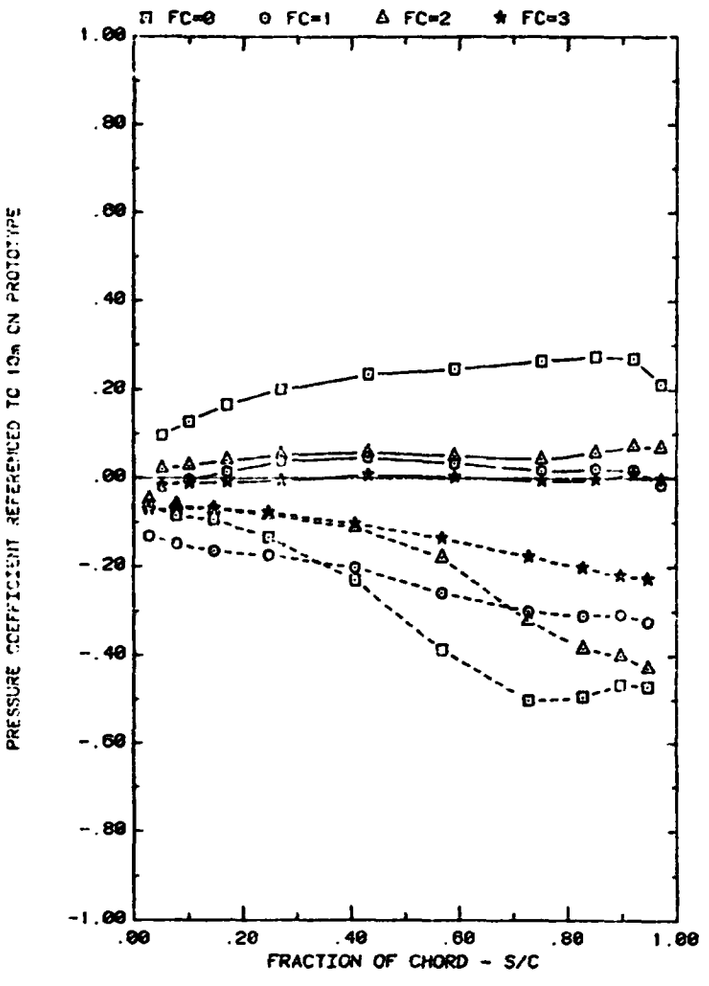


FRONT AND BACK PRESSURES 3.6° IN FROM EDGE OF ARRAY#2, WIND=45
EFFECT OF FC WITH ALPHA=35, H=3°, D=10°, P=30%, AND X=2C

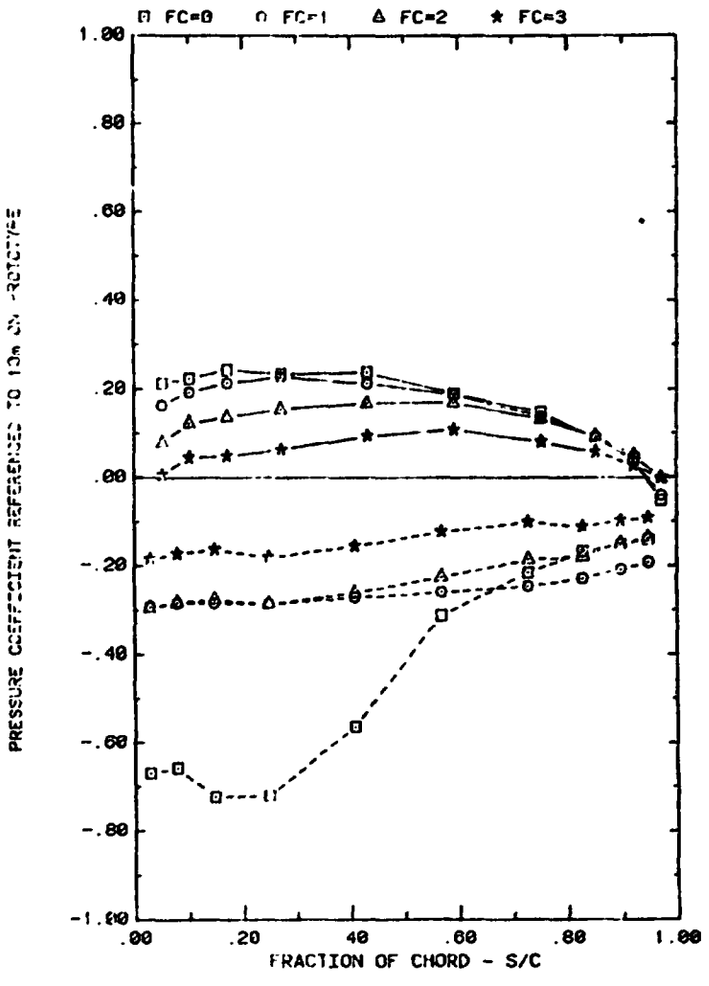


FRONT AND BACK PRESSURES 3.6° IN FROM EDGE OF ARRAY#2, WIND=45
EFFECT OF FC WITH ALPHA=145, H=3°, D=10°, P=30%, AND X=2C

Plot 5-2-3. (Continued)

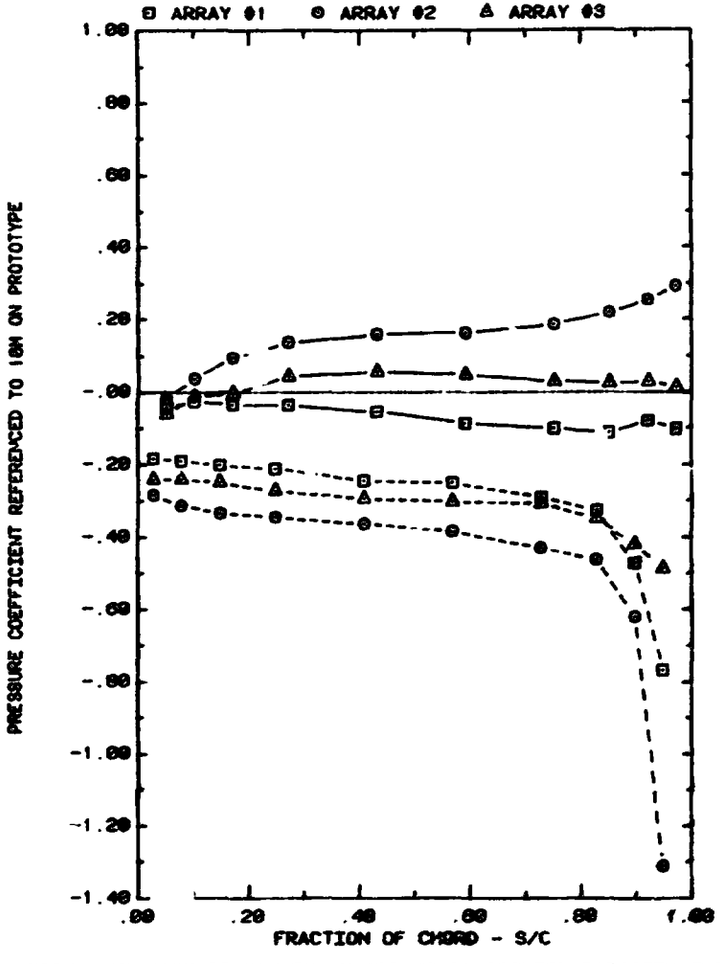


FRONT AND BACK PRESSURES 3.6" IN FROM EDGE OF ARRAY#3; WIND=45
EFFECT OF FC WITH ALPHA=35, H=3", D=10", P=30%, AND X=2C

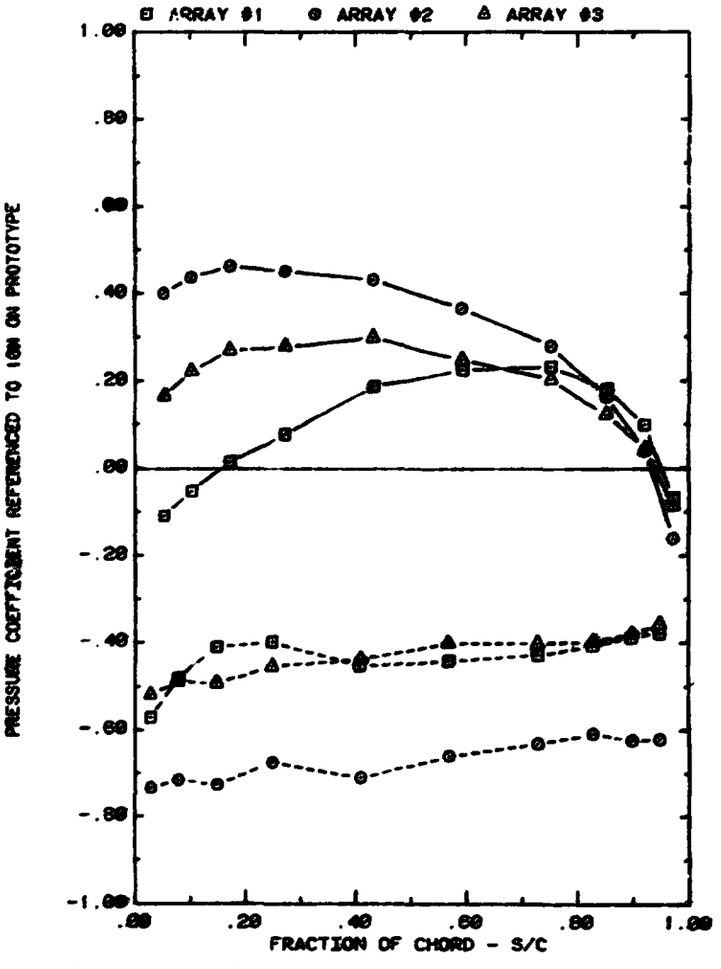


FRONT AND BACK PRESSURES 3.6" IN FROM EDGE OF ARRAY#3; WIND=45
EFFECT OF FC WITH ALPHA=145, H=3", D=10", P=30%, AND X=2C

Plot 5-2-3. (Concluded)

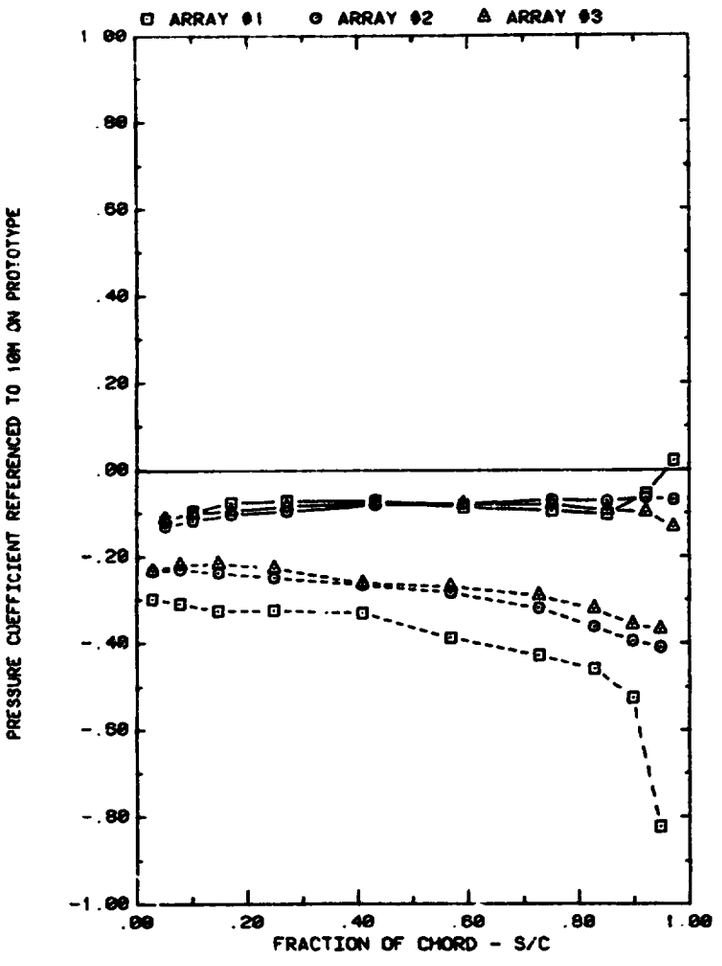


FRONT AND BACK PRESSURES ON ARRAYS #1,2&3\50% POROSITY EXTENSION
EFFECT OF ARRAY WITH ALPHA = 35, WIND = 45, X = 2C, FC = 1

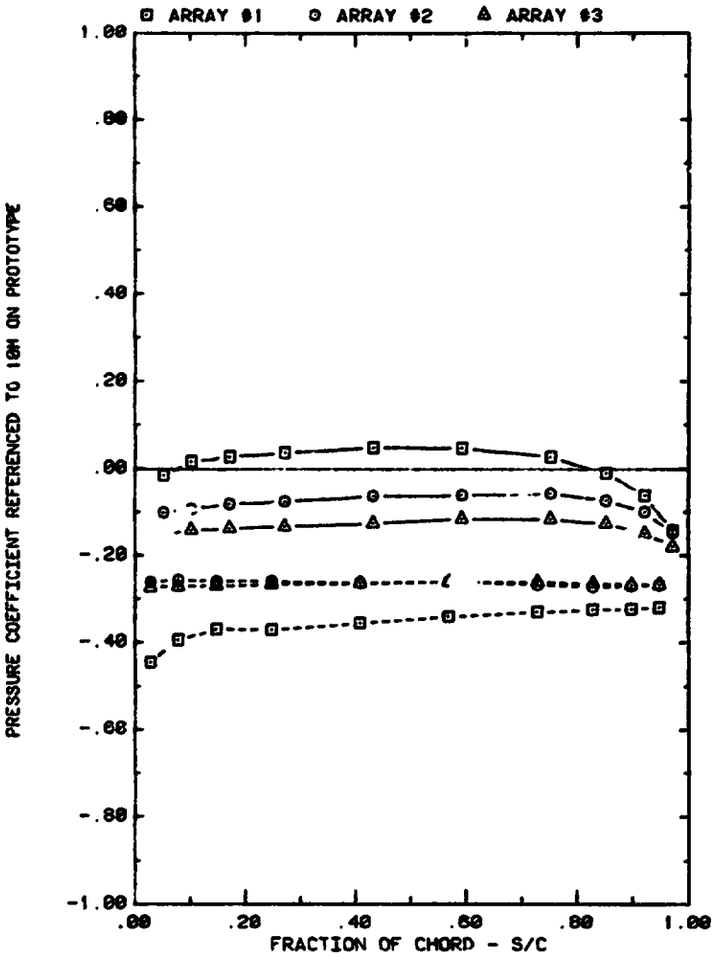


FRONT AND BACK PRESSURES ON ARRAYS #1,2&3\50% POROSITY EXTENSION
EFFECT OF ARRAY WITH ALPHA = 145, WIND = 45, X = 2C, FC = 1

Plot 5-3-1. Corner Study, WD = 45°, Modified Model with Various Extension
Effect of Array Position

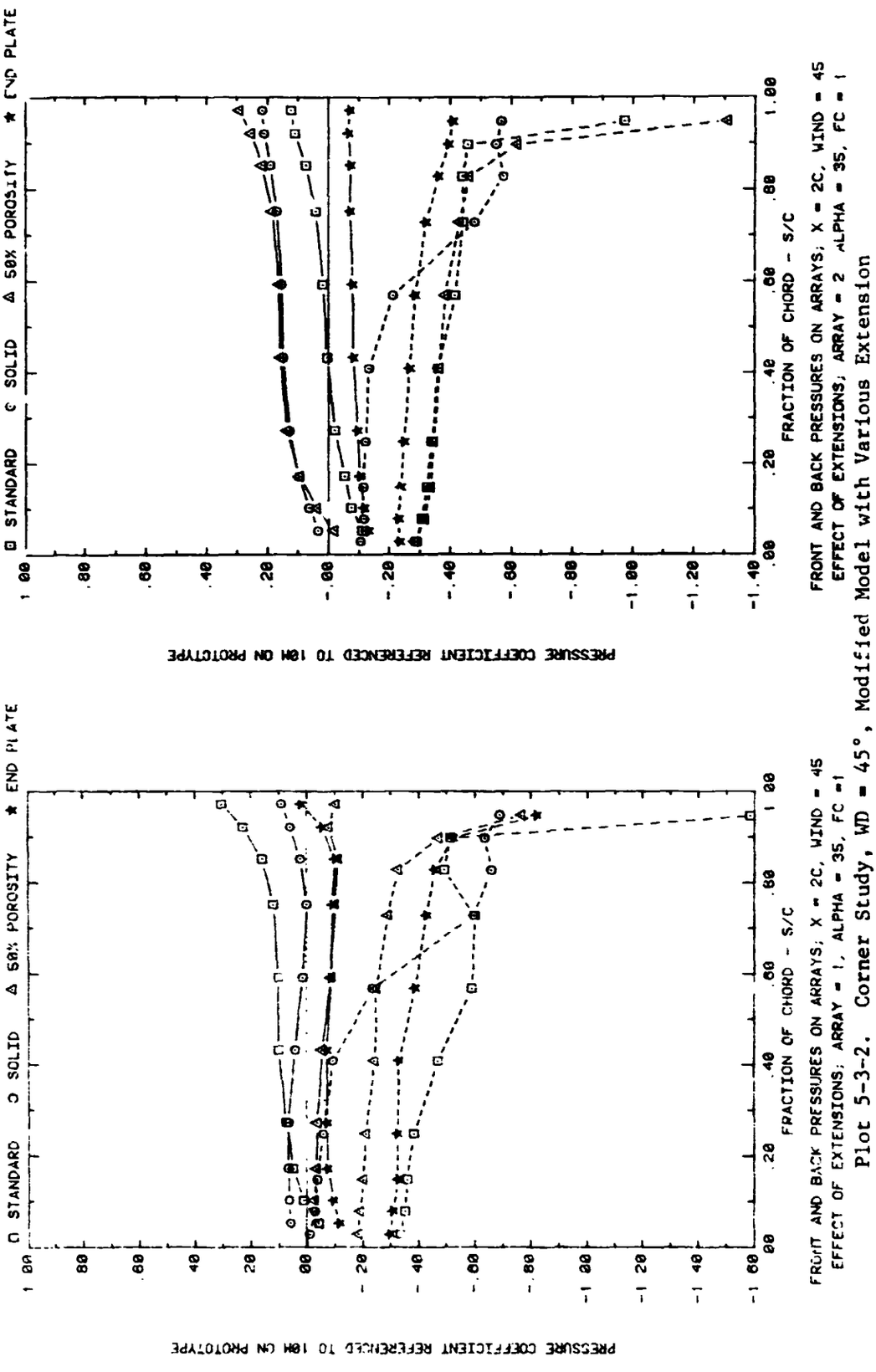


FRONT AND BACK PRESSURES ON ARRAYS #1,2&3\END PLATE
EFFECT OF ARRAY WITH ALPHA = 45, WIND = 45, X =2C, FC = 1



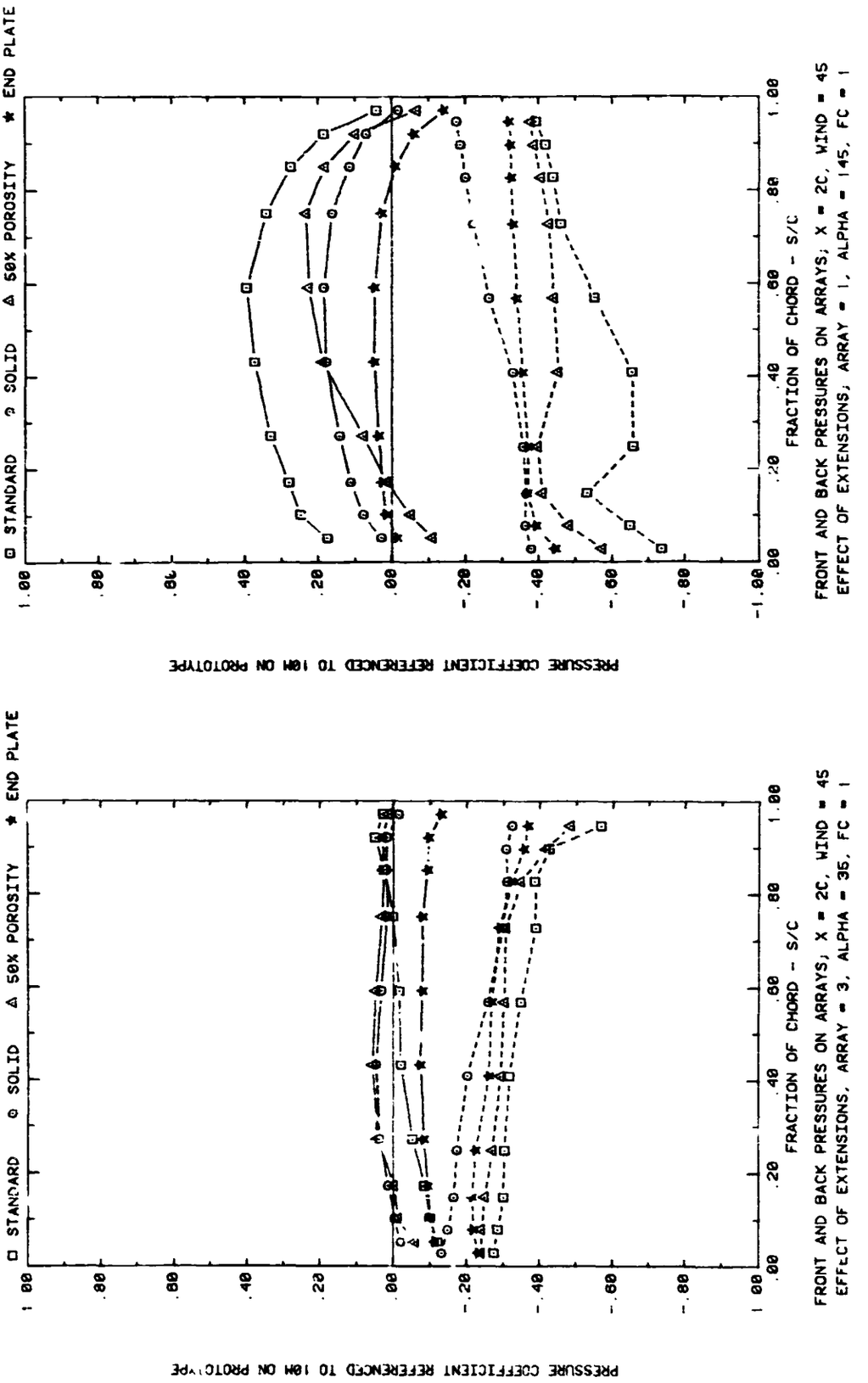
FRONT AND BACK PRESSURES ON ARRAYS #1,2&3\END PLATE
EFFECT OF ARRAY WITH ALPHA = 145, WIND = 45, X = 2C, FC = 1

Plot 5-3-1. (Continued)

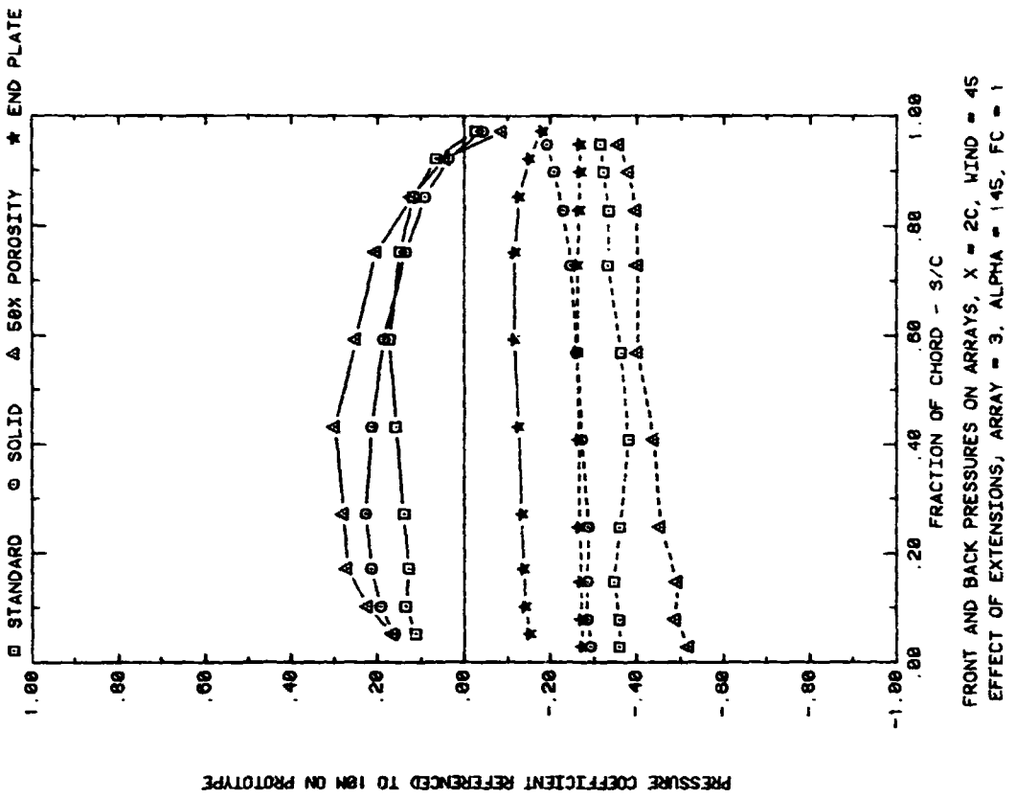


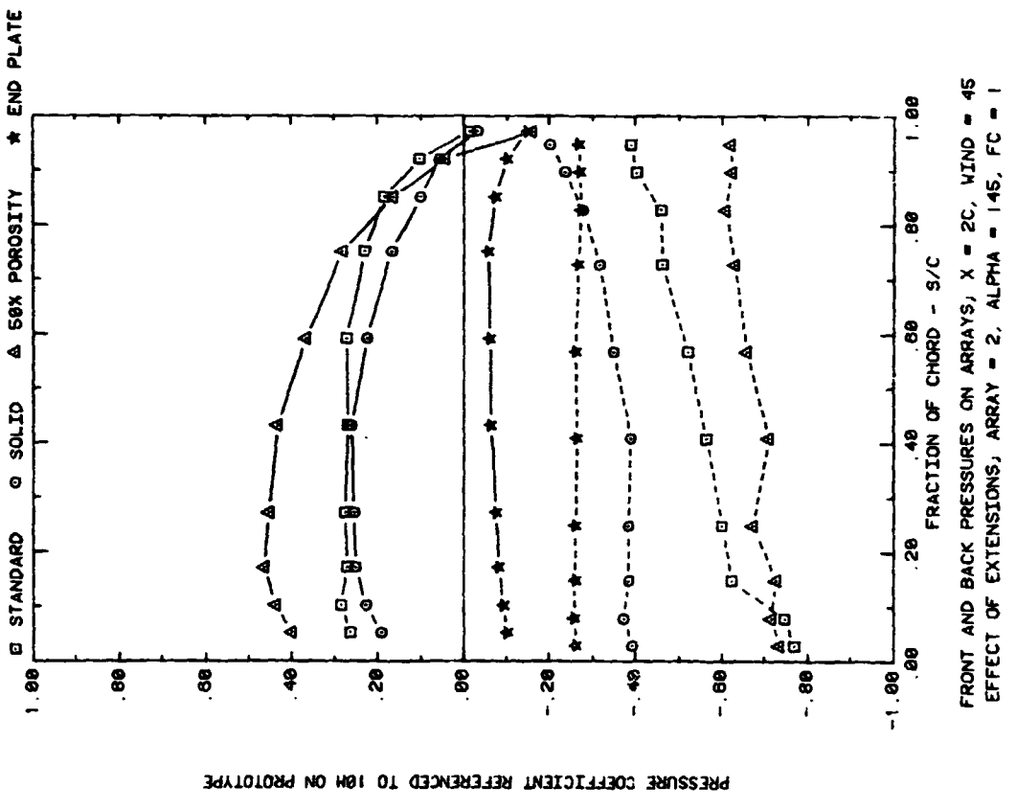
Plot 5-3-2. Corner Study, WD = 45°, Modified Model with Various Extension Effect of Model Configuration

C 5



Plot 3-3-2. (Continued)





Plot 5-3-2. (Concluded)