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The performance and flow characteristics of a gas turbine combustor dump diffuser

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THE PERFORMANCE AND FLOW CHARACTERISTICS OF A GAS TURBINE COMBUSTOR DUMP DIFFUSER

by

KEVIN ANDREW GOOM

A MASTER'S THESIS

Submitted for the award of Master of Science

of the Loughborough University of Technology

December 1974

Supervisor: Dr. S.J. Stevens,

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SUMMARY

Low speed tests have been carried out on a branched diffuser, geometrically similar to that employed in some gas turbine combustion systems. The fully annular test rig consisted of a straight walled, axisymmetric pre-diffuser, exhausting into a sudden expansion, the flow then being divided into two separate streams by a bluff body simulating the combustion chamber situated on the same centre-line as the pre-diffuser. The overall area ratio was maintained at 2.0, and tests were conducted with fully developed entry flow for a range of pre-diffusers of 12° included angle, the design value of the ratio of mass flows in the inner and outer annuli surrounding the flame tube being fixed at 1.2. Further tests were conducted using a single pre-diffuser, a distorted entry velocity profile, and a design flow division around the flame tube of 2.15.

The influence of variation of the division of flow around the bluff body, and the axial location of the bluff body, were investigated at each of the conditions cited above. The performance in terms of total pressure loss and static pressure recovery was evaluated for the system as a whole, and for the regions between measurement stations.

It was found that optimum performance both overall, and for the pre-diffuser alone, occurred at a flow division close to the design value of 1.20, and corresponded to a symmetric pre-diffuser outlet velocity and static pressure distribution.

By bringing the bluff body closer to the pre-diffuser, at a flow division close to the design value, it was found that considerable improvement of pre-diffuser pressure

recovery and outlet flow uniformity was achieved. However, when the distance between bluff body and pre-diffuser was small, considerable loss and pre-diffuser outlet flow distortion resulted at off design conditions.

Increase of pre-diffuser area ratio had the effect of increasing loss within the pre-diffuser, but reducing loss downstream. For each flow split and bluff body location, an optimum pre-diffuser area ratio existed.

In view of the increase of turbulence associated with distortion of the entry profile, it was not possible to isolate the influence of velocity profile distortion alone. However, the overall effect was to increase loss at all operating conditions.

The results of this investigation, and earlier work, emphasize the need to match the system geometry and design flow division.

ACKNOWLEDGEMENTS

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Miss V. M. Johnson is also acknowledged for her excellent typing of this thesis.

LIST OF CONTENTS

APPENDICES

LIST OF FIGURES AND TABLES

NOMENCLATURE

A	Cross-sectional area
A_B	Blocked area
AR	Area ratio
ARe	Effective area ratio of a branched system
B	Blocked area fraction
Cp	Static pressure recovery
Cp'	Ideal static pressure recovery
Cp^*	Locus of maximum pressure recovery for a given diffuser length
Cp^{**}	Locus of maximum pressure recovery for a given diffuser area ratio
D	Dump gap
E	Effective area fraction
H	Boundary layer shape parameter
h	Annulus height
Lov	'Overall' system length ($\bar{L}$ + D)
$\bar{L}$	Length of a simple diffuser
m	Mass flow
P	Total pressure
p	Static pressure
q	Dynamic head
R	Radius
Re	Reynold number
R_H	Radius of combustion chamber head
$\bar{R}$	Mean annulus radius
RD	Velocity profile radial distortion factor
S	Flow split ratio
S^*	Design flow split

U	Maximum velocity
u	Local velocity
u'	Fluctuating component of velocity in 'x' direction (axial)
v'	Fluctuating component of velocity in 'y' direction (radial)
y	Distance from wall
α	Kinetic energy flux coefficient
β	Momentum flux coefficient
γ	Stability parameter
δ^*	Boundary layer displacement thickness
ξ	Diffuser effectiveness
ϵ	Inclination of diffuser to axial direction
θ	Boundary layer momentum thickness
λ	Total pressure loss coefficient
ν	Kinematic Viscosity
ρ	Density
ϕ	Diffuser wall angle

<u>Superscripts</u>

$\bar{}$	Area weighted mean
$\tilde{}$	Mass weighted mean

<u>Subscripts</u>

H	Referred to combustion chamber head
i	Inner wall or annulus
min	Minimum value
max	Maximum value

m	Value at point of maximum velocity
o	Outer wall or annulus
w	Value at wall
1	Diffuser or diffuser system inlet station
2	Diffuser or pre-diffuser outlet station
3	Combustion chamber head station
4	Settling length station
II	Quantity based on a two-dimensional definition

SECTION 1 INTRODUCTION

1.1 THE CHARACTERISTICS OF A DIFFUSER

A diffuser is basically a duct, the cross-sectional area of which increases in the direction of flow. In the absence of transfer of fluid across the duct walls, the mean velocity of the flow must decrease, this generally being accompanied by a rise of static pressure. Hence, a diffuser may be classed as a device which converts kinetic into potential energy.

In the adverse pressure gradient through a diffuser, boundary layers will tend to grow. In some cases, this can lead to separation, which is normally undesirable for the following reasons, although devices such as vortex generators or boundary layer bleed may be used to minimise this effect.

(i) The increased total pressure loss associated with separation.

(ii) The point at which separation occurs is often unpredictable, and furthermore unstable. The resultant velocity and pressure fluctuations can have serious adverse effects on adjacent components.

(iii) The static pressure rise is reduced, since the main flow does not occupy the whole of the duct, so decreasing the effective area ratio of the diffuser.

Even in the absence of separation, the boundary layer growth is normally undesirable, since it produces a velocity profile which has an increase of axial non-uniformity, and since this has a greater kinetic energy than that of a uniform profile, the effect is to reduce the amount of diffusion possible.

1.2 THE CLASSIFICATION OF DIFFUSERS

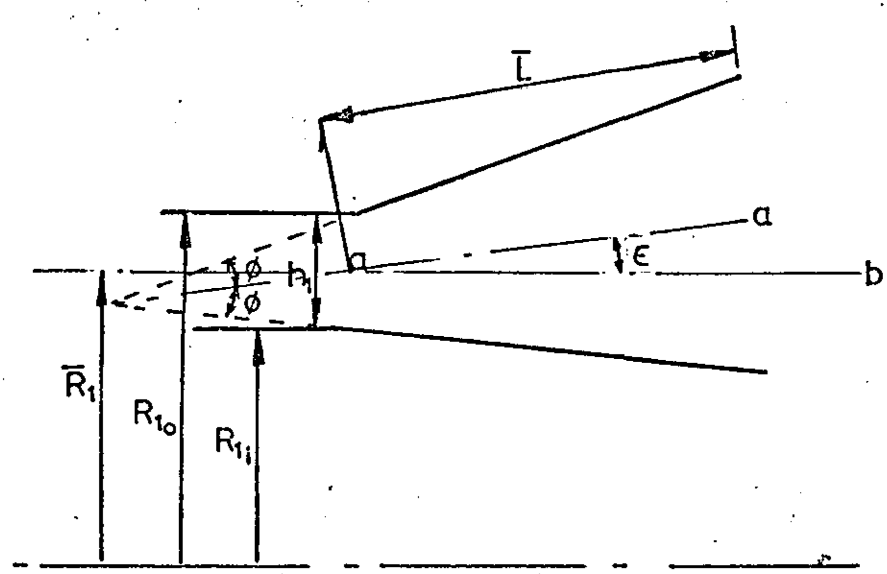
In order to fully describe a diffusing system, it is necessary to define:

(i) The basic type (two-dimensional, conical, annular)

(ii) The wall shape (straight or contoured)

(iii) The dimensions

Within the scope of this work only straight walled annular diffusers are considered. The following parameters have been found useful in classifying this type:



(i) The ratio of inlet annulus height to mean radius

$$h_1/\bar{R}_1 = 2(R_{1o} - R_{1i})/(R_{1o} + R_{1i})$$

(ii) The ratio of inlet annulus height to mean length $\bar{L}/h_1$

(iii) The inclination, ϵ, of the entry axis (a-b) to the diffuser axis (a-a)

(iv) The diffuser included angle 2ϕ

Hence four geometric variables are necessary to fully define a straight walled annular diffuser.

It is often useful to know both the rate and amount of diffusion being attempted. The former can be expressed as the geometric area ratio of the system

$$AR = 1+2\left(\frac{\bar{L}}{h_1}\right)\tan\phi \quad x \quad \left[1+\left(\frac{\bar{L}}{h_1}\right)\left(\frac{h_1}{R_1}\right)\sin\epsilon\right]$$

reducing to $AR = \left[1+2\,\frac{\bar{L}}{h_1}\tan\phi\right]$ for non-inclined diffusers ($\epsilon = 0$)

The overall rate of diffusion is generally expressed in terms of the amount of diffusion being attempted per unit length, which can be written non-dimensionally as:

$$(AR-1)/(\bar{L}/h_1) = 2\tan\phi + \left(\frac{h_1}{R_1}\right)\sin\epsilon + 2\left(\frac{\bar{L}}{h_1}\right)\left(\frac{h_1}{R_1}\right)\tan\phi\,\sin\epsilon$$

or for non-inclined systems, $= 2\tan\phi$

1.3 THE USE OF DIFFUSERS IN GAS TURBINE COMBUSTION SYSTEMS

Typically, air from a gas turbine compressor emerges at a Mach Number of about 0.3. Since kerosene fuel has a low flame speed, a certain proportion of the flow must be diffused before stable combustion can be attempted. Two typical system used to achieve this are shown in Figure 1.3.1.

Typically, having passed through the pre-diffuser, 18% of the air enters the primary zone prior to which, suitable amounts of mixing and swirl are introduced, which sets up the desired turbulent, low velocity flow conditions necessary to promote stable combustion. A further 10% enters through the flame tube walls to complete the combustion process in the secondary zone, the remaining air being used for diluting the combustion products, and cooling the chamber walls. However, the current trend, with the requirement for low pollution engines, is to increase the percentage of flow entering directly into the primary zone, in an attempt to ensure complete combustion. This has only been made possible by the introduction of more sophisticated wall cooling techniques, which ensure that the flame tube temperature is kept within permitted limits, despite the reduction of air available for this purpose.

The combustion and cooling processes must be effective over the whole operating range of the engine, or phenomena such as 'hot spots', and incomplete combustion may occur, giving rise to inefficiency, pollution, a poor turbine entry temperature distribution, and even mechanical damage. Hence the system must operate in a predictable, stable and uniform manner at all engine running conditions.

One of the major sources of flow non-uniformity is separation, since it will introduce instability, and circumferential flow non-uniformity, the latter in view of the uncertainty of the location of separation inception. This is a particular problem with the faired system, since boundary layers are encouraged to grow on both combustion chamber and splitter walls due to the adverse pressure gradient created by the diffusion process. Furthermore, the pressure gradient developed as a result of turning the flow induces the boundary layer on one wall to grow even more rapidly. Separation can normally be avoided by making a system of sufficient length, but this is often undesirable, particularly in aircraft applications, in view of the need to keep engine weight, and length to a minimum.

The dump system is an attempt to create a short, stable system by fixing the separation at an abrupt expansion, and replacing the splitter plates with a blunt nosed head. Since the flow is now split by this blunt body, this system is less sensitive to a change of flow division around the head than the faired system, the splitter plates of which must operate at incidence when the division of flow is other than the design value.

In modern, high by-pass ratio gas turbines, the airflow through the gas generator is often quite low, and the size of the combustion system also correspondingly low. Small dimensional inaccuracies arising during manufacture, or distortion in operation can therefore have a significant effect on the flow within the combustion system. This is a particular problem with the faired system in which three small area ducts exist downstream of the pre-diffuser, this being replaced by a far greater area in the sudden expansion of the dump system.

Further features relating to the operation of a dump diffuser are discussed in Section 1.6.

1.4 PERFORMANCE EVALUATION

In any diffuser work, it is necessary to have a set of parameters which may be evaluated in order to indicate how well a system is performing. The most important are:

(i) The amount of diffusion which has been obtained (i.e. the static pressure rise)

(ii) The total pressure loss incurred

(iii) The degree of flow non-uniformity, both axially and radially, and possibly in addition, circumferentially.

Hence any system of performance presentation must include parameters which give a useful measure of these quantities, presented in non-dimensional form.

1.4.1 AVERAGING METHODS

In general, the properties of a fluid at any given position in a duct will be distributed non-uniformly. Since it is usually necessary to calculate overall changes between various duct positions, it is necessary to introduce as averaging technique which converts the flow into a one-dimensional equivalent. Several such methods can be used, and are as follows:

(i) Area weighting

(ii) Mass derivation

(iii) Mass weighting

(iv) Momentum mixed weighting

Ideally, the one-dimensional equivalent is required to have identical properties to the flow that it represents i.e. the same mass, momentum and energy fluxes. Since a diffuser is primarily a device for converting energy from one form to another, the energy criterion must be satisfied as a prime objective, hence ruling out (i) and (ii) above. Mass weighting has been chosen for the purposes of this work since it is in more common general usage, and is consistent with the averaging method suggested by Livesey(14) as being the correct one to give meaningful equivalents of non-uniform parameters.

In all following derivations, incompressibility has been assumed, justified in view of the fact that the Mach number never exceeds about 0.1.

The mass weighted mean of a parameter X is defined as:

$$\tilde{X} = \int \frac{X\ dm}{m} \qquad 1.4.1$$

Within this system, it is convenient to revert to an area weighted mean in the single case of velocity. In this case, the area weighted mean of velocity, u, is defined as:

$$\bar{u} = {}^{A}\!\!\int \frac{u\ dA}{A} \qquad 1.4.2$$

Total mass flow, m, is given by:

$$m = {}^{A}\!\!\int \rho\, u dA = \rho \int u dA$$

substituting from 1.4.2. yields:

$$m = \rho \bar{u} A \qquad 1.4.3$$

noting that $dm = \rho udA$, the definition of mass weighted mean can be re-written as:

$$\tilde{X} = {}^{A}\!\int \frac{XudA}{\bar{u}A} \qquad 1.4.4$$

1.4.2 MASS WEIGHTED PARAMETERS

At this stage, it is convenient to define a parameter which gives a measure of the extra energy associated with a distorted velocity profile, compared with that of a uniform profile of the same mass flow. The kinetic energy flux coefficient is useful in this respect, and is defined as:

$$\alpha = \frac{\text{(kinetic energy of flow)}}{\text{(kinetic energy of flow with the same mass flux, but uniform velocity profile)}}$$

$$\alpha = \frac{\int \frac{1}{2} m\, u^2\, dm}{\frac{1}{2} m\, \bar{u}^2} = {}^{A}\!\int \frac{u^3\, dA}{A\, \bar{u}^3} \qquad 1.4.5$$

A momentum coefficient may be defined in a similar way:

$$\beta = {}^{A}\!\int \frac{u^2\, dA}{A\, \bar{u}^2}$$

1.4.2.1 DYANMIC HEAD

The mass weighted mean of dynamic head, q, is given by:

$$\tilde{q} = \frac{\int \frac{1}{2} \rho\, u^2\, d\, m}{m} = \frac{1}{2}\rho\, {}^{A}\!\int \frac{u^3\, d\, A}{\bar{u}\, A} \qquad 1.4.7$$

substituting from 1.4.5

$$\hat{q} = \frac{\frac{1}{2}\rho \alpha A \bar{u}^3}{A \bar{u}} = \alpha \frac{1}{2}\rho \bar{u}^2 \qquad 1.4.8$$

Hence, mass weighted mean dynamic head may be found directly by integration (1.4.7), or indirectly from the kinetic energy flux coefficient, and an area weighted mean velocity (1.4.8).

1.4.2.2 PERFORMANCE PARAMETERS

SIMPLE DIFFUSERS

The basic definition of loss and pressure recovery coefficients are as follows:

$$\hat{\lambda}_{1-2} = \frac{\hat{P}_1 - \hat{P}_2}{\hat{q}_1} \qquad 1.4.9$$

$$\hat{C}_{p1-2} = \frac{\hat{p}_2 - \hat{p}_1}{\hat{q}_1} \qquad 1.4.10$$

Writing an energy balance between stations 1 and 2:

$$m_1(\hat{p}_1 + \hat{q}_1) = m_2(\hat{p}_2 + \hat{q}_2) - (m_1\hat{P}_1 - m_2\hat{P}_2)$$

if no fluid is transfered across the duct walls, then $m_1 = m_2$

$$\therefore \quad \hat{p}_1 + \hat{q}_1 = \hat{p}_2 + \hat{q}_2 - (\hat{P}_1 - \hat{P}_2)$$

dividing by q_1 and re-grouping:

$$\frac{\hat{P}_1 - \hat{P}_2}{\hat{q}_1} = 1 - \frac{\hat{q}_2}{\hat{q}_1} - \left(\frac{\hat{p}_2 - \hat{p}_1}{\hat{q}_1}\right)$$

substituting from 1.4.8, 9, 10:

$$\lambda_{1-2} = 1 - \frac{\alpha_2}{\alpha_1} \left(\frac{\bar{u}_2}{\bar{u}_1}\right)^2 - \tilde{C}_{p1-2} \qquad 1.4.11$$

for continuity $A_1 \bar{u}_1 = A_2 \bar{u}_2$

also $\frac{A_2}{A_1} = AR_{1-2}$

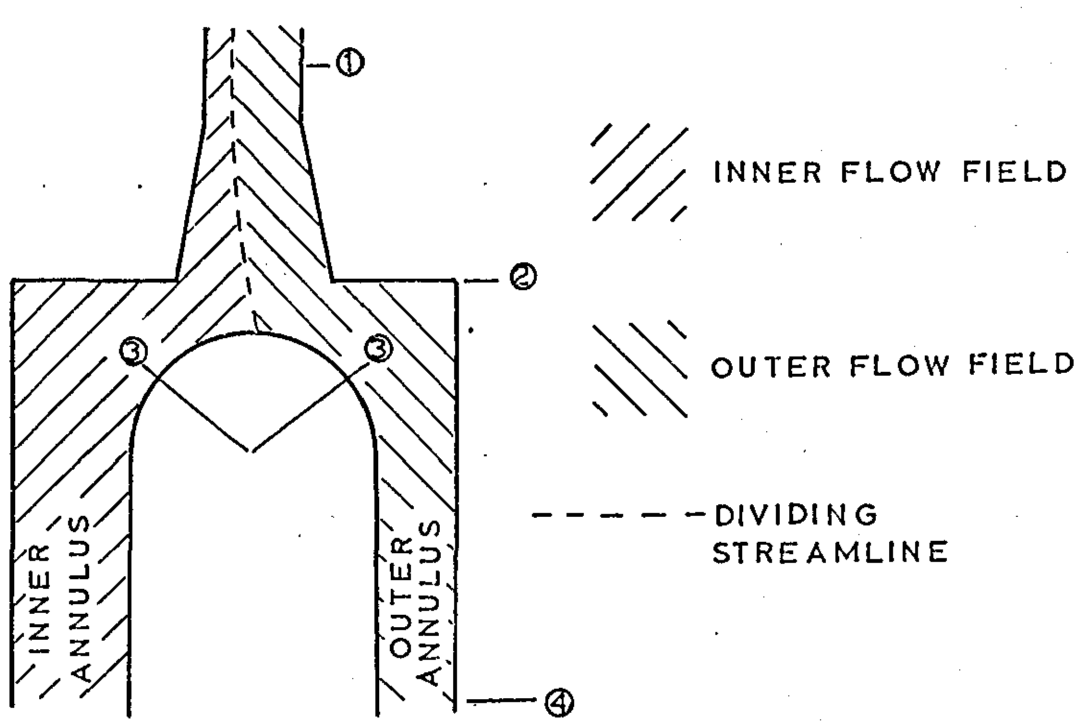
$$\therefore \quad \lambda_{1-2} = 1 - \frac{\alpha_2}{\alpha_1} \left(\frac{1}{AR}\right)^2 - \tilde{C}_{p1-2} \qquad 1.4.12$$

Hence loss coefficient may be found by direct integration of total pressures (1.4.9), or indirectly from 1.4.12. The latter has been found more convenient for the purposes of this investigation.

The ideal pressure recovery may be found from Equation 1.4.12 by assuming no loss ($\lambda_{1-2} = 0$), and a uniform velocity profile at station 2 ($\alpha_2 = 1.0$)

$$\therefore \quad \tilde{C}'_{p1-2} = 1 - \frac{1}{\alpha_1} \left(\frac{1}{AR_{1-2}}\right)^2 \qquad 1.4.13$$

BRANCHED DIFFUSERS



Two definitions are available to express individual flow fluid performance. They differ only in the reference dynamic head used to non-dimensionalise the equation, namely mean entry or individual flow field entry dynamic head, the latter hereafter being called 'split' entry conditions.

Referencing to mean entry conditions:

$$(\breve{\lambda}_{1-4})_i = \frac{\breve{p}_{1i} - \breve{p}_{4i}}{\breve{q}_1} \qquad 1.4.14$$

$$(\breve{C}_{p1-4})_i = \frac{\breve{p}_{4i} - \breve{p}_{1i}}{\breve{q}_1} \qquad 1.4.15$$

Referencing to split entry conditions:

$$(\breve{\lambda}_{1-4})_i = \frac{\breve{p}_{1i} - \breve{p}_{4i}}{\breve{q}_{1i}} \qquad 1.4.16$$

$$(\breve{C}_{p1-4})_i = \frac{\breve{p}_{4i} - \breve{p}_{1i}}{\breve{q}_{1i}} \qquad 1.4.17$$

Writing the energy equation for the inner portion of the divided flow:

$$m_{1i}\ (\breve{p}_{1i} + \breve{q}_{1i}) = m_{1i}\ (\breve{p}_{4i} + \breve{q}_{4i}) + m_{1i}\breve{P}_{1i} - m_{4i}\breve{P}_{4i}$$

dividing by $\breve{q}_{1i}$, putting $m_{4i} = m_{1i}$, and re-grouping

$$\frac{\breve{p}_{1i} - \breve{p}_{4i}}{\breve{q}_{1i}} = 1 - \frac{\breve{p}_{4i} - \breve{p}_{1i}}{\breve{q}_{1i}} - \frac{\alpha_{4i}}{\alpha_{1i}} \left(\frac{\bar{u}_{4i}}{\bar{u}_{1i}}\right)^2$$

substituting from 1.4.16, 17

$$(\breve{\lambda}_{1-4})_i = 1 - \frac{\alpha_{4i}}{\alpha_{1i}} \left(\frac{\bar{u}_{4i}}{\bar{u}_{1i}}\right)^2 - (\breve{C}_{p1-4})_i \qquad 14.18$$

(coefficients referred to split entry mass weighted mean dynamic head)

Similarly, using the definitions of 1.4.16, 15, it can be shown that:

$$(\breve{\lambda}_{1-4})_i = \frac{\alpha_{1i}}{\alpha_1}\left(\frac{\bar{u}_{1i}}{\bar{u}_1}\right)^2 - \frac{\alpha_{4i}}{\alpha_1}\left(\frac{\bar{u}_{4i}}{\bar{u}_1}\right)^2 - (\breve{C}_{p1-4})_i \qquad 1.4.19$$

(coefficients based on mean entry mass weighted mean dynamic head)

It is of interest to note, that by writing the energy equation for both parts of the divided flow:

$$m_1(\breve{p}_1+\breve{q}_1) = m_{4i}(\breve{p}_{4i}+\breve{q}_{4i})+m_{4o}(\breve{p}_{4o}+\breve{q}_{4o})+m_1\breve{P}_1-m_{4i}\breve{P}_{4i}-m_{4o}\breve{P}_{4o}$$

and substituting for the definition given in 1.4.16, 17 (i.e. mean inlet reference),

we obtain:-

$$\frac{m_{4i}}{m_1}(\breve{\lambda}_{1-4})_i + \frac{m_{4o}}{m_1}(\breve{\lambda}_{1-4})_o = \breve{\lambda}_{1-4} \qquad 1.4.20$$

Hence when using definitions based on mean entry conditions, the overall loss coefficient, and similarly pressure recovery, can be found by the sum of the mass weighted means of the individual flow field components.

For calculation purposes it may be convenient to use the flow split ratio, $S = {}^{m_{4o}}/_{m_{4i}}$, when determining overall performance parameters. By substitution of 1.4.20 into 1.4.18, and noting that $(AR_{1-4})_i = A_{4i}/A_{11}$ it can be shown that:

$$\tilde{\lambda}_{1-4} = 1 - \frac{1}{\alpha_1} \left(\frac{1}{1+S}\right)^3 \left(\frac{\alpha_{4i}}{(AR_{1-4})_i^2} + \frac{S^3 \alpha_{4o}}{(AR_{1-4})_o^2}\right) - \tilde{C}_{p1-3}$$

1.4.21

Pressure recovery can also be expressed in this form as:

$$\tilde{C}_{p1-4} = \frac{1}{(1+S)} \frac{1}{\tilde{q}_1} \left[(\tilde{p}_{3i} + S\tilde{p}_{3o}) - (1+S)\tilde{p}_1\right] \qquad 1.4.22$$

The ideal pressure recovery follows from 1.4.23 by putting $\tilde{\lambda}_{1-4} = 0$, and $\alpha_{4i} = \alpha_{4o} = 1$

$$\therefore \quad \tilde{C}'_{p\,1-4} = 1 - \frac{1}{\alpha_1} \left(\frac{1}{1+S}\right)^3 \left(\frac{1}{(AR_{1-4})_i^2} + \frac{S^3}{(AR_{1-4})_o^2}\right)$$

1.4.23

An effective area ratio may now be introduced, defined as the area ratio of a simple diffuser in which the amount of diffusion being attempted is the same as that of the branched system. (i.e. the ideal pressure recovery is identical)

From 1.4.13 and 1.4.23 it follows that:

$$ARe_{1-4} = \frac{\sqrt{(1+S)^3}}{(AR_{1-4})_i^{-2} + S^3 (AR_{1-4})_o^{-2}} \qquad 1.4.24$$

The effective area ratio equals the geometric area ratio at only one value of flow split. This is when the mean velocities in the two divided streams are equal ($\bar{u}_{4i} = \bar{u}_{4o}$) , and corresponds to a point at which the ideal pressure recovery is a maximum (see Fig. 1.4.1). This value of flow split is termed the design value, S^*, and is given by:

$$S^* = A_{4o}/A_{4i} \qquad 1.4.25$$

LOCAL PERFORMANCE PARAMETERS

It is often desirable to divide a flow into sections, and view the performance of each part individually. This section concerns parameters which may be defined to satisfy this requirement.

Firstly, we may use the overall inlet conditions as a reference, yielding for example:

$$\tilde{C}_{p2-3} = \frac{\tilde{p}_3 - \tilde{p}_2}{\tilde{q}_1} \qquad 1.4.26$$

This system enables overall performance parameters to be obtained as the sum of individual components, e.g.:

$$\tilde{C}_{p1-4} = \tilde{C}_{p1-2} + \tilde{C}_{p2-3} + \tilde{C}_{p3-4}$$

However, it may be preferable to use local entry conditions as a non-dimensionalising factor, e.g.

$$\tilde{C}_{p2-3} = \frac{\tilde{p}_3 - \tilde{p}_2}{\tilde{q}_2} \qquad 1.4.27$$

Additionally, local performance parameters may be defined for individual (i.e. inner or outer) flow fields. In this case, a mean or split entry dynamic head may be used in the definition e.g.

$$(\tilde{C}_{p2-3})_i = \frac{\tilde{p}_{3i} - \tilde{p}_{2i}}{\tilde{q}_1} \qquad 1.4.28$$

using overall entry conditions as a reference

or $$(\tilde{C}_{p2-3})_i = \frac{\tilde{p}_{3i} - \tilde{p}_{2i}}{\tilde{q}_{1i}} \qquad 1.4.29$$

$$(\tilde{C}_{p2-3})_i = \frac{\tilde{p}_{3i} - \tilde{p}_{2i}}{\tilde{q}_2} \qquad 1.4.30$$

using local entry conditions as a reference

$$(\tilde{C}_{p2-3})_i = \frac{\tilde{p}_{3i} - \tilde{p}_{2i}}{\tilde{q}_{2i}} \qquad 1.4.31$$

1.4.3 BOUNDARY LAYER PARAMETERS

In the present work, boundary layer parameters have been found useful as a means of quantitatively describing the development of velocity profiles throughout the system. Generally recognised definitions have been used:

non-dimensional displacement thickness,

$$\frac{\delta^*}{R_{wo}-R_{wi}} = \left[\int_{R_w}^{R_m} (1 - \frac{u}{U}) \frac{R}{R_w} \, dR\right] \Big/ (R_{wo}-R_{wi}) \qquad 1.4.32$$

non-dimensional momentum thickness,

$$\frac{\theta}{R_{wo}-R_{wi}} = \left[\int_{R_w}^{R_m} (1 - \frac{u}{U}) . \frac{u}{U} . \frac{R}{R_w} \, dR\right] \Big/ (R_{wo}-R_{wi})$$

1.4.33

Shape factor, $H = \delta^*/\theta$

where R_{wi} = radius of the wall to which the boundary layer relates

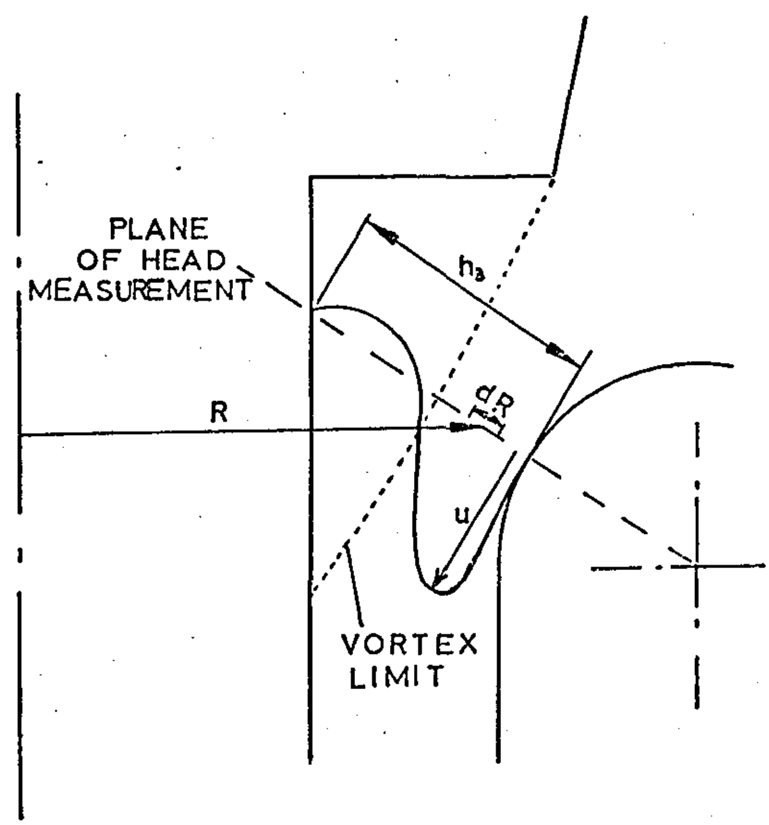
R_m = radius to which the boundary layer under consideration extends

R_{wo} = radius to which the annulus extends

$(R_{wo}-R_{wi})$ = is the annulus height, and is used to obtain non-dimensional parameters

U = maximum velocity i.e. at R_m

Parameters evaluated in the region of the combustion chambers head (station 3), require further clarification.



The annulus height h_3 is used to non-dimensionalise, but integration is proceeded only up to the start of the vortex region.

1.4.4 VELOCITY PROFILE PARAMETERS

In diffusers, it is often useful to be able to quantify the change of shape of velocity profiles as the flow progresses through the duct. Two parameters are in general use which give a measure of the axial non-uniformity. Firstly, the kinetic energy flux coefficient, as defined in Equation 1.4.5 may be used, since the kinetic energy of a flow rises with increasing axial non-uniformity.

Secondly, a blocked area concept may be used, which indicates the surfeit of area required to transmit a certain mass of fluid over that required to transmit the same mass of fluid, in a flow of uniform velocity, equal to the maximum velocity of the non-uniform flow.

The blocked area, A_B, is given by:

$$A_B = \int^{A} (1 - \frac{u}{U})\, dA = A(1 - \frac{\bar{u}}{U}) \qquad 1.4.34$$

The blocked area fraction, B, and effective area, E, are then given by:

$$B = (1 - \frac{\bar{u}}{U}) = (1 - E) = \frac{2(R_{wi}\,\delta_i^* + R_{wo}\delta_o^*)}{(R_{wo}^2 - R_{wi}^2)} \qquad 1.4.35$$

These parameters are simpler to calculate than α, since detailed knowledge of the velocity profile is not required, only mass flow rate, duct area, and the maximum velocity. However, for the purposes of this investigation, it has been found more convenient to use α as a measure of axial distortion. The relationship between α_2 and B_2, taken from pre-diffuser outlet test data, is given in

Figure 1.4.2.

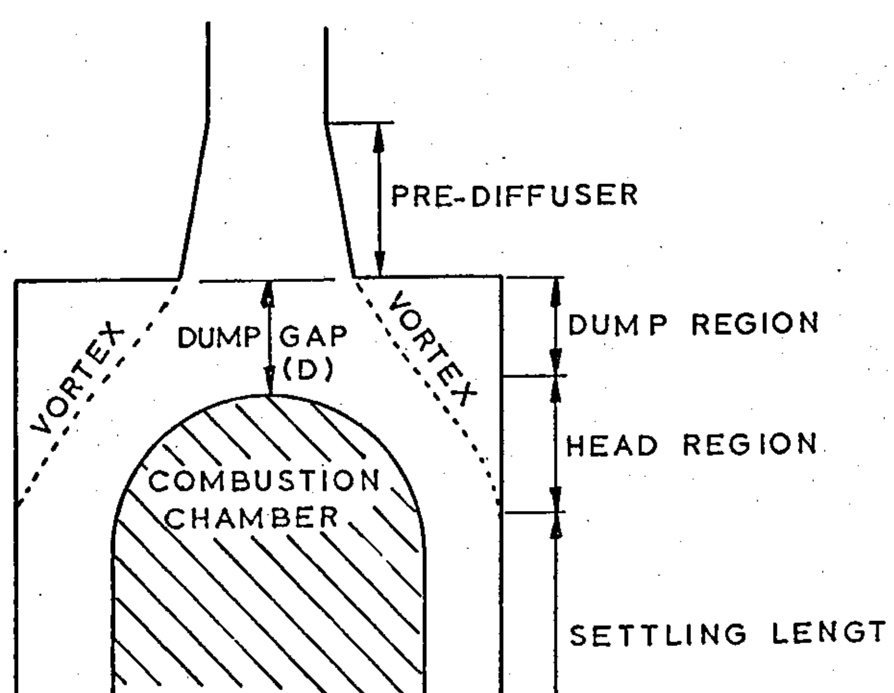
In order to provide an assessment of radial asymmetry, a parameter is required which is independent of axial non-uniformity. The position of maximum velocity could be used, but this point is often ill defined, particularly in fairly uniform profiles. The boundary layer parameter, δ^*, is far less sensitive to accurate determination of the maximum velocity point, in view of the $(1 - \frac{u}{U})$ term which tends to zero near the point.

A parameter, hereafter termed the radial distortion factor, R_D, can then be defined as:

$$R_D = \frac{\delta_i^* - \delta_o^*}{\delta_i^* + \delta_o^*} \qquad 1.4.36$$

Where i and o refer to the two regions of the profile, divided about the point of maximum velocity. For a symmetric velocity profile, $R_D = 0$, but becomes negative for a profile distorted towards the inner duct wall, and positive when distorted towards the outer wall.

1.5. THE OPERATION OF A COMBUSTION CHAMBER DUMP DIFFUSING SYSTEM



The overall area ratio of a dump diffuser is of prime importance, since it governs the amount of diffusion being attempted. It is largely fixed by the Mach number at compressor exit, and the necessity to obtain a sufficiently high static pressure in the settling length annuli to ensure adequate penetration of the flow into the flame tube walls.

Considerable significance is also attached to the pre-diffuser area ratio, since this, in part, dictates the amount of diffusion which must subsequently occur further downstream. The purpose of pre-diffusion is to attempt to minimise loss by reducing diffusion in the potentially high loss region of the turning flow around the combustion chamber head. Consideration must however be given to the length of the pre-diffuser, and the non-uniformity of flow produced by it, with particular regard to separation.

The combustion chamber head, hereafter referred to simply as the head, can however improve the flow conditions at exit from the pre-diffuser. A region of high static pressure, centred around the stagnation point, must exist on the head, creating, particularly at small dump gaps, a non-uniform static pressure distribution across the pre-diffuser outlet annulus. This can then have the effect of reducing the amount of diffusion being attempted in the region of the pre-diffuser walls, and increasing it near the duct centre, thereby reducing the axial non-uniformity of the outlet flow. The possibility then exists to use relatively short, wide angle systems, without the occurance of separation, or gross flow non-uniformity. It should however be noted that reducing dump gap to a very small value effectively reduces the pre-diffuser outlet area, with the result that this 'diffuser' can operate as a nozzle.

The size, and shape of the head is important, since as well as influencing the upstream flow, it largely governs the amount of turning which must be accomplished, and the way in which it takes place.

The significance on overall performance of the division of flow into the two settling length annuli can be clearly seen by referring to Equation 1.4.23, and Figure 1.4.1, in which it can be seen that the ideal pressure recovery maximises at a flow split, the design value, at which the mean velocities in the two settling length annuli are equal. Flow split influences pre-diffuser flow, since pressure gradients generated by the flow curvative around the head modify the pressure field at outlet of the pre-diffuser.

1.6 REVIEW OF PREVIOUS WORK

1.6.1 SUMMARY OF WORK BY FISHENDEN[1]

A brief summary only of this work appears in this section, since much of it can be directly compared with the present work, and therefore appears in the discussion.

Tests were conducted on a fully annular dump diffuser rig, similar to that used in the present investigation, with a design flow split of 2.15, and overall area ratio of 2.0. The geometry of the system is presented in Figure 2.1.3. Experimental performances evaluation was conducted over a wide range of flow splits, dump gaps, and pre-diffuser geometries, with fully developed flow presented at entry to the system.

It is now convenient to view the main results obtained for the pre-diffuser, and overall system separately.

1.6.1.1 THE PRE-DIFFUSER

(a) It was found that the majority of change of pre-diffuser pressure recovery with dump gap or flow split was due to insufficient and not inefficient diffusion i.e. resulting from a change of the non-uniformity of outlet velocity profiles.

(b) For any given dump gap and pre-diffuser geometry, an optimum flow split existed. This optimum point was similar whether maximum pressure recovery or minimum loss was used as an optimising criteria, and although influenced by both dump gap and pre-diffuser geometry, always occurred at a flow split below the design value of 2.15, often close to a value of about 1.3. Optimum performance was found to be related to a symmetric pre-diffuser outlet velocity profile with minimum axial distortion (i.e. minimum α_2). The use of a pre-diffuser, canted outwards at 3.33°, did however bring the values of design and optimum flow splits closer together.

(c) The effect of reducing dump gap was to increase the influence of flow split on the pre-diffuser flow, and also, particularly in the region of the optimum flow split, to improve the unformity of the flow.

1.6.1.2 OVERALL

(a) For a given pre-diffuser and dump gap, the flow split giving maximum overall performance was generally of a higher value than that giving maximum pre-diffuser performance, although lower than the design value of 2.15 in most cases.

(b) Since, at all conditions, there was no gross non-uniformity of the settling length profiles, the reduction of pressure recovery below the ideal value was primarily attributable to loss.

(c) No absolute optimum operating condition could be defined in view of conflicting requirements of minimum length, and maximum performance.

The overall length could be decreased by:

(i) Decreasing pre-diffuser area ratio for a fixed wall angle

(ii) Decreasing dump gap

(iii) Increasing pre-diffuser included angle (2Ø) for a given area ratio.

Each of the above however had adverse effects on performance, and pre-diffuser flow non-uniformity.

(d) As a general guide only, the division of loss within the system was as follows:

Pre-diffuser......25%   Dump region......15%

Annulus surrounding flame tube (3-4 in Fig. 2.3.1)......60%

1.6.2 ISOLATED ANNULAR DIFFUSER PERFORMANCE

Considerable work has been carried out by Sovran and Klomp[(2)] on the testing and performance evaluation of a large number of diffuser geometries. Although, for the system used in the current investigation, the head influences the pre-diffuser flow, this effect is minimised at large dump gaps.

This is clearly seen from Figure 1.6.1, in which it can be seen that good correlation can be obtained between the results of an isolated diffuser, and the pre-diffuser at large dump gaps, each having similar entry conditions.

1.6.3 THE INFLUENCE OF ENTRY CONDITIONS

1.6.3.1 MACH NUMBER AND REYNOLDS NUMBER

The influence of Mach number and Reynolds number relating to diffusers have been established from previous work.

(i) Little and Wilbur(3) have shown from tests on conical diffusers, that pressure recovery is essentially independent of Mach number, provided that sonic conditions do not prevail in the critical region of the inlet corner.

(ii) McDonald and Fox(4) have shown, also in connection with conical diffusers, that performance is essentially insensitive to changes of Reynolds number above a value of about 10^4.

(iii) Gurevich(5) has shown that for low entry swirl, annular diffuser loss coefficient is unchanged by Mach number variation between values of 0.25 to 0.7.

It is assumed that these results apply equally well to the branched system of the current investigation.

1.6.3.2 ENTRY VELOCITY DISTRIBUTION AND TURBULENCE CHARACTERISTICS

In view of the difficulty of changing the shape of a velocity profile without altering its turbulence structure, isolation of the individual effects of each is also difficult. Considerable work has been conducted on the effect on diffuser performance of changing the entry velocity profile, maintaining the turbulence level as near constant as possible, and assuming that all major effects are primarily due to changes of velocity distribution.

In general, the effect of distorting an entry flow, either in the direction of flow, or normal to it, is to reduce the pressure recovery attained. In the absence of separation, this is primarily due to insufficient rather than inefficient diffusion. This is the result of the tendency to accentuate flow non-uniformity in a positive pressure gradient, as can readily be seen from the Navier-Stokes equation for steady two dimensional incompressible flow.

In the x direction:

$$u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = - \frac{1}{\rho} \frac{\partial p}{\partial x} + \nu \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) \qquad 1.6.1$$

It is evident, by consideration of the first terms on left and right hand sides of this equation, that in a diffusing flow, where $\frac{\partial p}{\partial x}$ is positive, the reduction of velocity in the x direction is inversely proportional to the local velocity. Mixing will modify this result, since it has the effect of tending to make the flow more uniform by redistribution of fluid. Increase of velocity profile non-uniformity implies an increase of kinetic energy, thereby decreasing the pressure recovery possible in a diffuser.

Generally, the result of increasing the turbulent mixing of the entry flow is to improve the pressure recovery, and delay separation, by re-energising the low velocity regions near the walls, and thereby producing a more uniform velocity profile at outlet. A small increase of loss is usually incurred.

Extensive work on the correlation of the effects of presenting variously distorted entry velocity profiles have been carried out by Sovran and Klomp[2], using the blockage factor, B_1, (see Equation 1.4.35) as a measure of inlet non-uniformity. An empirical relationship between two-dimensional effectiveness, $\mathcal{E}_{II}$; outlet effective area fraction, E_2, (Equation 1.4.37) geometric area ratio, AR; and entry blocked area fraction, B_2, was obtained, as shown in Figure 1.6.2. In this way, comparison of the data due to Tyler and Williamson [6], Wolf and Johnston, and Sovran and Klomp[2] is possible, as presented in Figure 1.6.3.

Investigations into the effect of changing entry mixing have been undertaken by Bradley and Cockrell[8], and Williams[9]. The results indicate that by doubling the intensity of turbulence near the wall of a fully developed entry velocity profile, a 10-12% improvement of pressure recovery could be obtained.

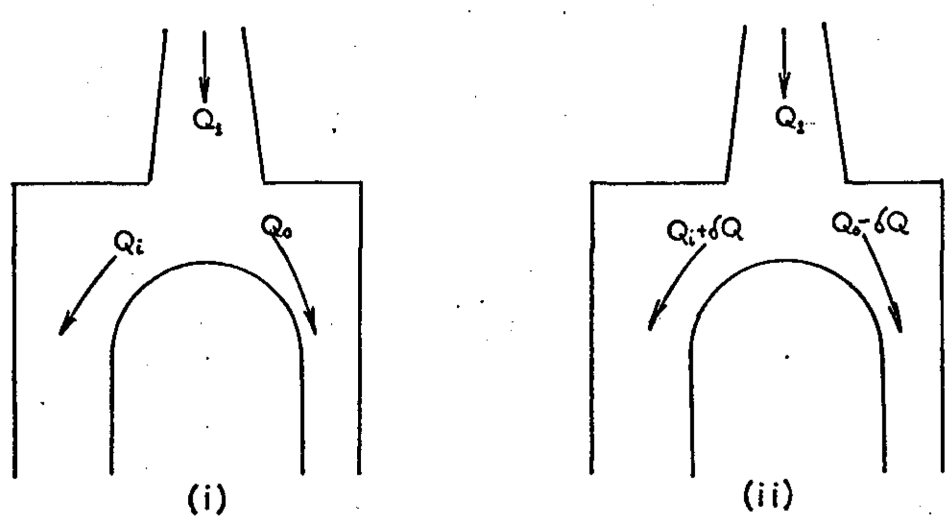
1.6.3.3 ENTRY SWIRL

The effect of entry swirl on various annular diffuser geometries has been investigated by Gurevich[5]. It may be seen in Figure 1.6.4 that swirl is generally detrimental to performance, except for diffusers of large wall angle, where an improvement is possible over a limited range.

The work of Horlock[10] showed the variation of flow pattern as swirl is introduced, as shown in Figure 1.6.5. It can be seen that the separated region moves from outer to inner diffuser wall as considerable swirl is introduced. Hence, at moderate degrees of swirl, the possibility exists to eliminate separation entirely.

1.6.4 THE AERODYNAMIC STABILITY OF A BRANCHED DIFFUSER

A theoretical investigation by Ehrich[11] has been carried out in order to determine a stability criterion for a branched diffuser system, and is briefly presented below.



Let the flow be disturbed from an equilibrium state, (i), to the condition shown in (ii). For static stability, the initial reaction should be to restore equilibrium, and therefore when disturbing the flow, pressure in the inner annulus must rise to a greater extent than that in the outer falls, in order to provide a pressure force which will tend to restore the original division of flow.

Hence $\delta \hat{p}_{pi} > \delta \hat{p}_{po}$ for static stability

or $\delta \hat{C}_{pi} > \delta \hat{C}_{po}$

but $\delta \hat{C}_{pi} = \frac{\partial \hat{C}_{pi}}{\partial Qi} . \delta Q$

$\delta \hat{C}_{po} = \frac{-\partial \hat{C}_{po}}{\partial Qo} . \delta Q$

$$\therefore \quad \frac{\partial \hat{C}_{pi}}{\partial Qi} . \delta Q < \frac{-\partial \hat{C}_{po}}{\partial Qo} \quad \delta Q$$

$$\gamma = \frac{\partial \hat{C}_{pi}}{\partial (\frac{Qi}{Q_1})} + \frac{\partial \hat{C}_{po}}{\partial (\frac{Qo}{Q_1})} < 0 \qquad 1.6.1$$

1.7 THE CHOICE OF SYSTEM TO BE INVESTIGATED

In the light of recent work by Fishenden(1), the importance of matching the pre-diffuser, and downstream sections has become clear. It has been shown in this work that optimum performance is related to:

(i) A symmetric pre-diffuser outlet velocity profile

(ii) A symmetric static pressure distribution over the head, and pre-diffuser outlet annulus

(iii) A flow split less than a design value of 2.15.

It can be seen from Figure 1.4.1 that the overall ideal pressure recovery maximises at the design flow split, and hence an improvement of performance could be expected if optimum performance also occurred at this point. With this in mind, the design flow split was changed to a value of 1.2. This was based on the fact that this is approximately the ratio of outer to inner mass flows of a symmetric pre-diffuser outlet profile, divided about its centreline.

In order to be able to directly compare the results of Fishenden[1], and those of the present investigation, the main parameters, such as head shape, size and position, overall area ratio, and pre-diffuser geometries, remain unchanged, the alteration of the design flow split being accomplished by moving the inner and outer casing walls. (see Figure 2.1.3)

1.8 THE SCOPE AND AIMS OF THE INVESTIGATION

The objective of this work is to obtain a better understanding of the fluid dynamic behaviour of a combustion system dump diffuser, to provide details of performance over a range of operating conditions, and to suggest possible improvements. With these points in mind, the following tests have been conducted:

(i) Performance evaluation over a range of dump gaps, and flow splits, with each of three axisymmetric pre-diffusers of 12° included angle, and area ratios of 1.4, 1.6, and 1.8 respectively. These tests were conducted with fully developed entry conditions, and a design flow split of 1.2

(ii) Performance evaluation over a range of dump gaps and flow splits, with a single 1.6 area ratio, axisymmetric pre-diffuser of 12° included angle, and a distorted entry velocity profile, with a design flow split of 2.15.

In isolation, the results of these tests show:

(i) The effect of a variation of pre-diffuser area ratio at a fixed included angle

(ii) The result of variation of dump gap

(iii) The result of changes of flow split.

When compared with the results of Fishenden[1], they also show:

(i) The effect of changing entry conditions at various common downstream conditions

(ii) How a change of design flow split affects performance and fluid dynamic behaviour.

SECTION 2 THE EXPERIMENTAL FACILITY

2.1 CONSTRUCTION OF THE TEST RIG

The general arrangement of the test facility can be seen in Figures 2.1.1 and 2.1.2, detailed dimensions being presented in Figure 2.1.3. A fully annular system has been used, in view of the uncertainty of the end wall effects associated with segmented models.

Flow was supplied by drawing air through the rig by means of a Keith and Blackman 2513S centrifugal fan, driven by a D.C. electric motor, fitted with resistive speed control. The use of a suction system, with remote atmospheric exhaust, and the presence of a plenum chamber and honeycomb between fan and test regions, minimised the effect of the fan flow characteristics on the airflow through the rig.

In order to prevent large scale ambient air movements from having a significant effect on the flow through the rig, honeycomb was incorporated into an 8:1 contraction ratio entry flare. Additionally, trip wires were attached to both inner and outer annulus walls just after the start of the parallel entry length, in order to ensure stable, and circumferentially uniform transition to turbulent flow. Fully developed flow was then ensured at the end of the 24 hydraulic diameter entry length.

By using a vertical construction, the use of support struts was minimised, these only being found necessary at the start of the entry length, and in the downstream regions of the settling length. Clean flow was therefore ensured in the sections in which measurements were taken.

Perspex was chosen as the main structural material in view of:

(i) The relative ease of manufacture

(ii) The high accuracy possible (typically 500.00 $\pm$ 0.07 mm)

(iii) The possibility of using flow visualisation techniques

(iv) The need to 'set up' traverse probes.

2.2 TEST RIG VARIABLES

(i) Dump Gap

The combustion chamber assembly was mounted on a screw jack, enabling it to be moved vertically by means of a calibrated wheel mounted at the base of the rig. In this way, the dump gap, D', could be varied between 0 and 200 mm with an accuracy of $\pm$ 0.1 mm.

(ii) Flow Split

The variation of flow split was facilitated by vertical movement of a profiled throttle ring mounted at the end of the settling length outer annulus on three equispaced lead screws, as shown in Figure 2.2.1. In order to extend the range of flow splits available, a fixed throttle of 66% area blockage could be fitted to the end of the inner settling length annulus.

(iii) Pre-Diffuser Geometry

A range of pre-diffusers with various geometries was available, these being interchangeable without modifications to the test rig. The dimensions of those used in this series of tests (designated 1, 2 and 3) are given in Figure 2.1.3.

It can be seen from Figure 2.2.2 that these geometries are close to the optimum lines of Sovran and Klomp[2].

2.3 INSTRUMENTATION

(i) Pre-Diffuser Entry and Exit

Facilities for employing the manual traverse mechanism shown in Figure 2.3.5 were located at three circumferential position, mutually at 120°, at stations 1 and 2, as defined in Figure 2.3.1. Entry traverse positions were located two annulus heights upstream of the start of the pre-diffuser in order to provide invariant entry reference conditions, with a uniform static pressure. The miniature pitot and wedge static probes used to obtain measurements are shown in Figures 2.4.5 and 2.4.6.

(ii) Combustion Chamber Head

In view of the movement of the combustion chamber necessary to vary dump gap, it was not feasible to locate a traverse mechanism on the head. Fixed rakes were therefore employed, located on the inner and outer head regions at 30° to the horizontal, the details of which are given in Figure 2.3.2. Additionally, calibration checks on the outer head rake were possible, at a single value of dump gap, by employing the single traverse facility located on the outer wall of the rig.

(iii) Settling Length Traverse

In view of the radial uniformity of the static pressure in the settling length annuli, and the circumferential symmetry of the flow, it was found necessary to conduct total pressure traverse only, at a single circumferential location. Due to the inaccessible nature of the inner annulus, it was necessary to use the traverse system shown in Figure 2.2.1.

(iv) Wall Static Tappings

Static pressure tappings were provided on all test rig walls as shown in Figure 2.3.3. These were located at three circumferential positions, each having a diameter of 0.79 mm.

(v) Approximate Flow Split Determination

In order to assist in setting the throttles to obtain a given flow split, instruments giving an approximate mean total pressure in the settling length annuli were fitted. These consisted of lengths of tubing, mounted radially across each annulus, blanked off at one end, with several small holes drilled into them, facing the direction of the oncoming flow.

(vi) Recording of Pressures

Pressures from the instruments described above were fed, via plastic pressure tubing, into a Furness Micromanometer, the output signal of which was recorded on a D.I.S.A. type 55 D 30 digital voltmeter.

SECTION 3 EXPERIMENTATION

3.1 SCOPE OF TESTS

For each of three pre-diffusers, tests were conducted over a range of dump gaps and flow splits, with an overall design flow split of 1.20, and fully developed entry conditions. Additionally, the effects of distorting the entry profile were investigated in tests conducted over a range of flow splits and dump gaps with a single pre-diffuser, and design flow split of 2.15. The range of these tests is summarised in Figure 3.1.1, the values of dump gap, and flow split having been chosen on the basis of previous experience so as to include the regions of greatest interest.

Each test included measurement of the following items:

(i) Total and static pressure profiles in the pre-diffuser outlet plane (station 2)

(ii) Total and static pressure data from inner and outer head rakes (stations 3_i and 3_o)

(iii) Total pressure profiles in both settling length annuli (stations 4_i and 4_o)

(iv) Static pressures from the wall tappings

(v) 'Key' static pressures from wall tappings.

(i), (ii), (iii) and (iv) above were conducted at a single circumferential location, (v) being conducted at each of the three circumferential locations available.

Each test has been designated a number for convenience of reference, the system used being explained by the use of the following example:

TEST NO. 2 - 0518

Pre-diffuser reference number	Non-dimensional dump gap ($D/h_2 = 0.5$)	Approximate flow split ($S \simeq 1.8$)

In addition, complete blocks of tests can be referred to:

e.g. 2-05 test series refers to the range of tests conducted with pre-diffuser 2, and dump gap 0.5.

3.2 ENTRY CONDITIONS

(i) Fully Developed Entry Profile

Total and static pressure profiles were obtained by means of traverses at station 1, at each of three circumferential locations. These were conducted at extremes of flow split and dump gap outside the normal testing range. Circumferential uniformity, independence of downstream conditions, and the absence of a radial static pressure gradient were ascertained, and the entry velocity profiles presented in Figure 3.2.1 were assumed to apply for all test conditions.

(ii) Distorted Entry Conditions

A perforated ring, as shown in Figure 3.2.2, was used to produce a velocity profile distorted towards the outer wall at entry. This system was chosen in an attempt to limit the increase of mixing presented to the pre-diffuser, bearing in mind construction and mounting limitations.

Total and static pressure profiles were conducted at station 1 for various positions of the ring, and a location providing a velocity profile typical of that at compressor exit was established. The resultant velocity profiles, and also shear stress distributions obtained by using hot wire anemometry, are presented in Figure 3.2.3. It can be seen that the closest approximation to typical compressor exit conditions is when the ring is 203.2 mm from the entry station, and it was therefore at this condition that testing was conducted.

During all tests, the entry velocity was maintained approximately constant at a mean value of about 26 m/s, corresponding to a Reynolds number $\left(\frac{\bar{u}_1 \cdot 2h_1}{\nu}\right)$ of 1.6×10^5.

3.3 EXPERIMENTAL TECHNIQUE

Total and static pressure profiles were obtained using the equipment described in Section 2.3. Traverse reference positions were obtained by moving the probes until just touching the rig walls, enabling, with a knowledge of probe size, the probe location to be known to an accuracy of about 0.1 mm. Traverses were conducted from both inner and outer walls of each annulus, with a region of overlap near the duct centre, the step size between reading being chosen as that consistent with accurately defining the profile.

Station	Annulus height	No. of points in total pressure traverse	No. of points in static pressure traverse
1	38.1 mm	44	35
2	52.5–67.8 mm	34–40	28–34
4_i	58.5 mm	25	-
4_o	30.7 mm	20	-

All traverse and head rake pressures were recorded with reference to local wall statics (i.e. p_{2wo}, $p_{9Hi/o}$, $p_{4wi/o}$), these reference pressures, and all wall static pressures also being recorded, referenced to the wall static pressure at station 1. Additionally, the maximum dynamic head at inlet was recorded, before and after each group of readings.

3.4 ACCURACY

By selecting suitable damping values on both the micromanometer and digital voltmeter, mean values of fluctuating pressures could be recorded to within $\pm$ 0.2 mm water, for a value of maximum entry dynamic head of about 50.0 mm water. However, the pressure probes operated under conditions ranging from steady fully developed flow to separated flow, and at largely unknown incidences, the effect of which is shown in Figure 3.4.1. A general assessment of experimental accuracy is afforded by the discrepancy between integrated mass flows at each station:

Pre-diffuser outlet..... $m_2 = m_1 {}^{+8\%}_{-0}$

mean for all tests m_1+4.7%

Settling Lengths........ $m_4 = (m_{4i}+m_{4o}) = m_1 {}^{+6\%}_{-2}$

mean for all tests m_1+2.7%

In view the fact that calculated parameters are based on large numbers of experimental data, it is difficult to provide an accurate assessment of likely error. Realistic estimates of the maximum likely errors in the more important performance parameters are given below:

	Pre-Diffuser		Overall	
Parameter	Typical value	Error	Typical value	Error
Pressure Recovery $\hat{C}_p$	0.500	$\pm$ .025 ($\pm$ 5%)	0.500	$\pm$ .015 ($\pm$ 3%)
Loss Coefficient $\hat{\lambda}$	0.080	$\pm$ .030 ($\pm$ 40%)	0.250	$\pm$ .025 ($\pm$ 10%)

It should be noted that the high error associated with $\hat{\lambda}_{1-2}$ is the result of the low value of pre-diffuser loss, calculated from the difference of large quantities.

SECTION 4 PRESENTATION AND DISCUSSION OF RESULTS

In this section, the performance characteristics, and fluid dynamic behaviour of the system will be presented and discussed, with particular regard to variation of flow split, dump gap and pre-diffuser geometry. In Section 4.1, the system is viewed as a whole, and in subsequent sub-sections, the flow in various regions of the system is analysed in more detail.

4.1 OVERALL PERFORMANCE (1-4)

4.1.1 OPTIMUM CONDITIONS

The overall design objectives may be stated as follows:

(i) To obtain a maximum pressure recovery

(ii) To incur minimum total pressure loss

(iii) To minimise the overall length

(iv) Good stability, and radial and circumferential flow uniformity

(v) To satisfy the above four points at both on and off-design flow splits.

The overall performance for various flow splits, dump gaps, and pre-diffusers is presented in Figures 4.1.1/3 and compared with the data due to Fishenden[1]. By taking, for given dump gaps and pre-diffusers, values of maximum pressure recovery, and minimum loss, it is possible to obtain curves such as those shown by the unbroken lines of Figure 4.1.4. A tangent to these curves (the broken line) can then be drawn, giving, for fixed overall length, the maximum possible pressure recovery, and minimum possible loss. It can then be seen that the first three design objectives are not consistent. When the overall length is low, pressure recovery is poor, and loss high. However, as non-dimensional length (L_{ov}/h_1) is increased up to a value of about 5.5, an improvement in the maximum attainable performance is possible, although it falls gradually as this length is exceeded. If therefore minimisation of length were not a prime consideration, to obtain the best possible performance for this type of system, it should be operated with a non-dimensional length of 5.5, corresponding to a dump gap (D/h_2) of 1.1 ($D/h_1 = 2.0$), a pre-diffuser length ($\bar{L}/h_1$) of 3.5, and a flow split close to the design value of 1.2. In this case, an overall pressure recovery of 0.58 may be obtained, with a loss coefficient of 0.16.

Since optimum flow splits occur near the design value, at optimum conditions, the ideal inner and outer pressure recoveries are approximately equal. Loss however modifies this result, and equality of inner and outer pressure recoveries invariably occurs at a flow split above design, as indicated by the example of Figure 4.1.5. The result is, that at optimum conditions, the pressure recovery of the outer flow field is below that of the inner, as shown in Figure 4.1.6.

Further curves such as those of Figure 4.1.4 may be drawn giving the maximum performance at flow splits other than design. It is then possible to derive charts which enable systems of similar geometry to be designed, and the performance at off design flow splits to be predicted. These are presented in Figures 4.1.7/9, in which the maximum overall pressure recovery, and minimum loss attainable for various overall lengths and flow splits are presented. Lines of constant dump gap have been superimposed such that at any point, the pre-diffuser length may also be determined. It should be noted that, for convenience, dump gap has been non-dimensionalised by h_1, and not, as is more usual, by h_2. Since it is usually desirable to avoid gross flow non-uniformity, the regions in which pre-diffuser separation is likely to occur have been indicated. It should be noted that it was not found possible to construct minimum loss design curves for flow splits in excess of 1.2 because of the relatively small variation of loss coefficient in this region.

4.1.2 THE INTERRELATION OF PRE-DIFFUSER AND OVERALL PERFORMANCE

In order to study the extent to which the pre-diffuser and overall performance characteristics are interrelated, it is helpful to isolate the variables, flow split, dump gap, and pre-diffuser length. Typical variations of pressure recovery and loss coefficient with these parameters, both overall, and within the pre-diffuser, are presented in Figure 4.1.10.

For a given pre-diffuser and fixed flow split, the beneficial effect of small dump gaps on pre-diffuser flow can be seen, pre-diffuser pressure recovery rising as dump gap is reduced, at the expense of only a small increase of loss. However, reduction of dump gap increases loss downstream of the pre-diffuser to such an extent that the variation of overall pressure recovery is the complete reverse of that in the pre-diffuser. It is also clear from this graph, and indeed all those of Figure 4.1.10, that the majority of the pressure rise occurs within the pre-diffuser, little or none occurring downstream due to the high loss in this region.

The effect, on performance, of variation of flow split at a fixed pre-diffuser geometry and dump gap is shown in Figure 4.1.10. Pressure recovery falls, and loss rises as flow split departs from the design value. This variation is particularly apparent in the overall flow, especially the change of pressure recovery, since even under ideal flow conditions, a similar variation of pressure recovery would occur. (see Figure 1.4.1)

An example of the effect of changing pre-diffuser length (and hence area ratio since 2Ø is fixed) at constant values of dump gap and flow split, is presented in Figure 4.1.10. It is clear, that as pre-diffuser length is increased, more diffusion is being attempted, and a higher pressure recovery could be expected within the pre-diffuser, albeit at the expense of an increase of loss. In this way, it is therefore possible to modify entry conditions to the region downstream of the pre-diffuser, with the result that as more diffusion occurs within the pre-diffuser, loss downstream of it, falls. However, for the particular example shown, a gain of overall performance in this way is only possible by increasing non-dimensional pre-diffuser length up to a value of 3.4. Beyond this value, pre-diffuser loss increases significantly, outweighing any reduction of loss downstream.

4.1.3 FLOW STABILITY

The stability parameter γ (as defined in Section 1.6.4) is plotted in Figure 4.1.11 against flow split for various values of dump gap. Although the system is stable within the range of the experimental results, the margin of stability changes with both dump gap and flow split. In the region of the design flow split, the system is theoretically least stable, although greater stability may be achieved at the smaller dump gaps.

4.1.4 THE INFLUENCE OF DISTORTED ENTRY CONDITIONS

It has been shown in Figure 3.2.3 that, a considerable increase of turbulent mixing was introduced into the flow when the entry velocity profile was distorted. The consequence of this was an increase in overall loss, and a reduction of pressure recovery at all values of flow split and dump gap, as shown in Figure 4.1.12.

In view of the need to turn a considerable amount of the flow outwards in the dump and head regions at high flow splits, it might be expected that under these circumstances, improvement of performance could be possible for an entry flow already distorted outwards. Since no improvement was in fact measured, it must be assumed that the entry mixing characteristics have a greater influence than the velocity profile shape.

4.2 PRE-DIFFUSER PERFORMANCE (1-2)

4.2.1 THE INFLUENCE OF DOWNSTREAM CONDITIONS ON PRE-DIFFUSER FLOW

In order to provide forces to balance the centrifugal effect as flow turns around the head, pressure gradients will exist downstream of the pre-diffuser. The influence of these gradients on flow in the pre-diffuser will have a greater influence at small dump gaps, by the very nature of their proximity.

Near the design flow split of 1.2, the static pressure distribution around the head is symmetrical about the combustion chamber centreline. The inner and outer boundary layers of the pre-diffuser flow are therefore influenced by similar pressure gradients, and, when a symmetric velocity profile is presented at entry, the pre-diffuser outlet profile is also symmetric. Under these conditions, the pre-diffuser outlet static pressure distribution is as shown in Figure 4.2.1, with a high pressure prevailing at the duct centreline, although, as dump gap is increased, the pressure variation becomes less apparent. The resultant effect on the pre-diffuser flow can be seen from the outlet velocity profiles of Figure 4.2.1, in which flow uniformity across the duct increases as dump gap reduces.

As flow split changes from the design value, the head pressure field will become asymmetric, hence creating an asymmetric pressure gradient at pre-diffuser outlet. Consequently, as a result of the differing axial pressure gradients ($\partial p / \partial x$) influencing inner and outer pre-diffuser wall boundary layers, the outlet velocity profile is distorted, as shown in Figure 4.2.2.

4.2.2 PERFORMANCE NEAR DESIGN FLOW SPLIT

Since total pressure loss is an inevitable consequence of turbulent mixing, in order to minimise loss, it is normally desirable to minimise mixing within the pre-diffuser flow. However it should be noted that an increase of mixing can eliminate separation, and the high loss associated with it. This implies that the exit velocity profile should be similar to that at entry, although to obtain maximum pressure recovery, not only should loss be minimised, but the outlet velocity profile must be uniform, since in this case, the maximum amount of kinetic energy will have been converted to static pressure. However, since it is not usually possible, in diffuser flows, to obtain an outlet profile more uniform than that at entry, the conditions for minimum loss, and maximum pressure recovery are normally indentical, and consistant with those giving maximum outlet flow uniformity.

Optimum pre-diffuser performance could therefore be expected to occur at conditions where the kinetic energy parameter, α_2, is a minimum, and for symmetric, fully developed entry conditions, when the radial distortion parameter, RD_2, is equal to zero. As can be seen in Figures 4.2.6-8, these conditions are satisfied, for all pre-diffusers and dump gaps, at flow splits close to the design value of 1.20, further reduction of α_2 being possible by decreasing dump gap. Reference to Figures 4.2.3-5 confirm that optimum performance does in fact occur at these conditions. The beneficial effect of decreasing dump gap near the design flow split can be more clearly seen in Figure 4.2.9, in which it is also apparent that the effect of changing dump gap has a greater influence at small values of D/h_2.

It is of interest to analyse the relative magnitudes of the two contributions to reduction of pressure recovery below the ideal value, namely loss, and flow distortion. Figure 4.2.10 shows that both factors are of considerable importance.

4.2.3 PERFORMANCE AT OFF DESIGN FLOW SPLITS

At flow split other than the design value, the pre-diffuser will come under the influence of an asymmetric radial pressure gradient, as discussed in Section 4.2.1. Radial distortion of the pre-diffuser flow results, and loss increases as a result of extra mixing. Figures 4.2.3-5 show that the reduction of pressure recovery is greater than that attributable to increased loss alone. This is the result of increased kinetic energy associated with outlet velocity profile distortion, as is shown by the variation of the kinetic energy parameter, α_2, in Figures 4.2.6-8.

At small dump gaps, the radial pressure gradient downstream of the pre-diffuser is not only greater in magnitude, but can also have a greater influence on the pre-diffuser flow by the very nature of its proximity. Hence, although a reduction of dump gap has beneficial effects on the pre-diffuser flow near the design flow split, the performance reduction at off design flow splits is greater. This can be seen in Figure 4.2.9, in which, the reduction of pressure recovery resulting from operating at off design flow splits increases as dump gap is reduced.

4.2.4 THE INFLUENCE OF DESIGN FLOW SPLIT

It has already been stated in Section 4.2.2 that, when operating with a settling length geometry having a design flow split of 1.2, optimum pre-diffuser performance occurs at a flow split consistent with a symmetric head static pressure distribution and pre-diffuser outlet velocity profile. The results of Fishenden(1) also indicate a similar relationship, although these conditions do not prevail at the design flow split of 2.15, but at values close to the design (or optimum) conditions of the present investigation, as shown in Figures 4.2.3-5. Hence, not only are conditions for good pre-diffuser performance confirmed, the independence of the downstream pressure gradient influencing pre-diffuser flow, and design flow split, is also shown.

It appears that, even at optimum flow splits, that reduction of the design flow split from 2.15 to 1.2 can marginally increase pressure recovery by reducing loss. However, this result must be treated with caution in view of the slight differences in entry conditions (Figure 3.2.1).

4.2.5 THE INFLUENCE OF PRE-DIFFUSER GEOMETRY

Since all pre-diffuser used in the current work were of 12° included angle, those of greater length had a larger area ratio, and therefore a greater pressure rise was theoretically attainable. However, the increased loss, and higher flow non-uniformity that results from more diffusion being attempted partially nullifies any increase of pressure recovery.

Furthermore, as diffuser length is increased, separation may occur, creating additional loss and flow non-uniformity which result in further reduction of static pressure recovery. The separation limits for various pre-diffuser lengths, dump gaps, and flow splits are presented in Figure 4.2.11, derived from the assumption that separation was imminent when the non-dimensional velocity ($u/_U$) near the wall fell to a value of 0.05.

4.2.6 THE INFLUENCE OF MODIFIED ENTRY CONDITIONS

As shown in Figure 4.2.12, the effect of distorting the entry velocity profile, at all but very low flow splits, is to decrease pressure recovery, due mainly to an increase of loss.

It can be seen from Figure 4.2.13, that the kinetic energy of the pre-diffuser outlet flow (α_2) is higher when distorted conditions are presented at entry. This does not necessarily imply a reduction of pressure recovery, since the kinetic energy of the entry flow is also higher. This is clearly shown from Equation 1.4.14, in which the significance of the ratio $\frac{\alpha_2}{\alpha_1}$ can be seen

$$\tilde{C}_{p1-2} = 1 - \frac{\alpha_2}{\alpha_1} \left(\frac{1}{AR_{1-2}}\right)^2 - \tilde{\lambda}_{1-2}$$

As flow split varies for the distorted entry case, the outlet velocity profiles largely retain their original form as indicated in Figure 4.2.14, whereas for fully developed entry conditions, considerable variation of the outlet velocity profiles result from changes of flow split. With distorted entry conditions, reduction of flow split results in an increase of momentum in the low velocity region near the inner wall, effectively producing a more uniform profile, and reducing α_2. However, for fully developed entry conditions, at flow splits below about 1.2, α_2 rises with decrease of flow split, and the value of $\frac{\alpha_2}{\alpha_1}$ falls substantially below that obtained with a distorted entry. Hence, at low flow splits, despite any increase of loss associated with the increase of mixing of the distorted entry profile, improvement of pressure recovery is possible, as can be seen below flow splits of about 0.8 in Figure 4.2.12.

4.3 DUMP AND HEAD REGION (2-3)

In this section, an attempt is made to outline the factors which influence the flow in this region, and to relate changes of flow split, dump gap and pre-diffuser geometry to variation of fluid dynamic behaviour.

Since, at station 3, the flow is completely divided into two flow fields, the characteristics of inner and outer flows will be considered separately. In Section 1.4.2.2, a number of methods of defining performance parameters were reviewed. Loss or pressure recovery may be non-dimensionalised by mean conditions existing either at pre-diffuser entry or exit (Equations 1.4.28, 1.4.30).

Using these definitions, variation of performance parameters may result solely from variation of flow fraction to either inner or outer portions of the flow due to changes of flow split. However, pre-diffuser outlet conditions can have a significant effect on the flow between stations 2 and 3, and hence conditions prevailing in the individual flow fields at pre-diffuser outlet have been used to non-dimensionalise performance parameters, as defined in Equation 1.4.31.

$$\text{e.g.} \qquad (\tilde{C}_{p2-3}) = \frac{\tilde{p}_{3i} - \tilde{p}_{2i}}{\tilde{q}_{2i}}$$

It should be noted that, in view of the limited number of probes within the head rakes, the uncertainty of flow direction producing probe incidence effects, and the difficulty of accurately defining the extent of the vortex, some degree of inaccuracy of the performance and boundary layer parameters is possible, although general trends will still be apparent.

4.3.1 PERFORMANCE CHARACTERISTICS

A number of attempts have been made to correlate the loss in both inner and outer regions of the flow, in terms of both the amount and rate of diffusion or acceleration being attempted. However, no completely satisfactory correlation was found possible in view of the additional factors affecting the flow, as described in subsequent discussion within this section.

The variations of both inner and outer flow field pressure recovery and loss coefficients (defined as in Equation 1.4.31) with dump gap and flow split are shown, for pre-diffuser number 1, in Figure 4.3.1. Similar trends were observed for the other pre-diffusers tested. It is clear that pressure recovery of the inner or outer flow field rises as dump gap is increased, or as the percentage of the entry flow associated with that particular flow field falls.

4.3.2 FACTORS INFLUENCING FLOW CHARACTERISTICS

4.3.2.1 FLOW TURNING

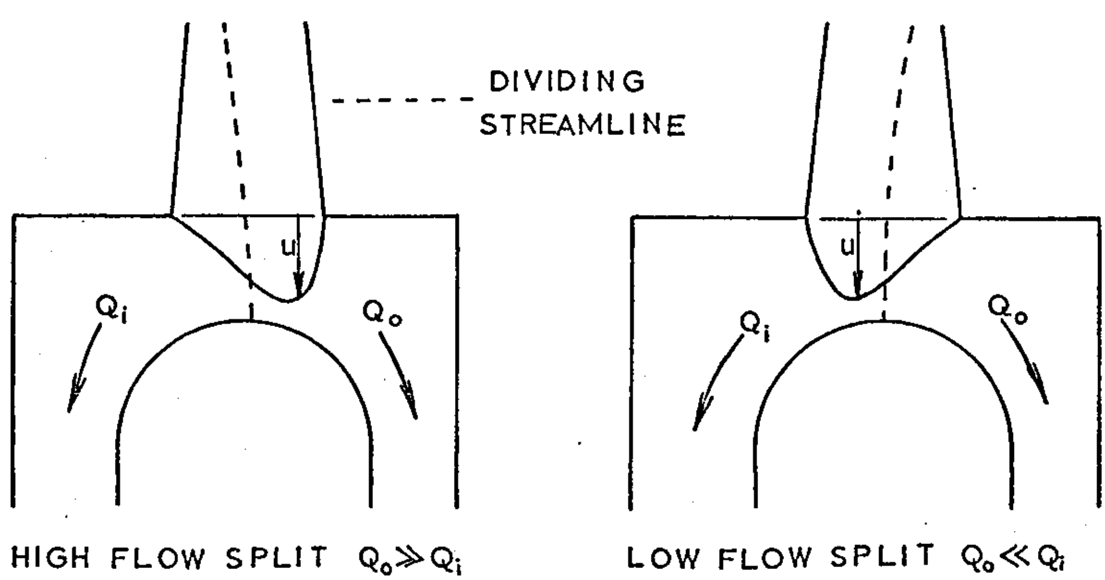
Loss is generally associated with the process of turning flow in view of the mixing required to redistribute the flow as pressure gradients are generated in order to balance centrifugal forces. It could therefore be expected that loss would rise as either the rate or amount of turning increased.

Since the flow must return to the axial direction in the settling length after turning around the head, then at some point along each streamline a point of inflection must occur. Although the position of such a point cannot be defined precisely, it can be seen from the static pressure distributions of Figures 4.3.2 and 4.3.3 (see Appendix 3 for the complete series of results), that the pressure gradient at station 3 is consistent with that of a flow curvature which is convex with respect to the combustion chamber. Hence the flow must have began to return to an axial direction prior to station 3.

The rate at which the flow turns is largely governed by dump gap, since this determines the length available for this process to be completed.

It is considerably more difficult to discuss the amount of turning, since this depends not only on dump gap, but also on flow split. The influence of dump gap on pre-diffuser outlet conditions has already been discussed in Section 4.2.1, in which it was shown that, by reduction of dump gap, a more uniform pre-diffuser outlet velocity profile could be obtained. This would have the effect of reducing the mass flux near the duct centre, and increasing it in the region of the walls, and therefore less turning is needed around the head, since, in effect, some turning has already been accomplished within the pre-diffuser.

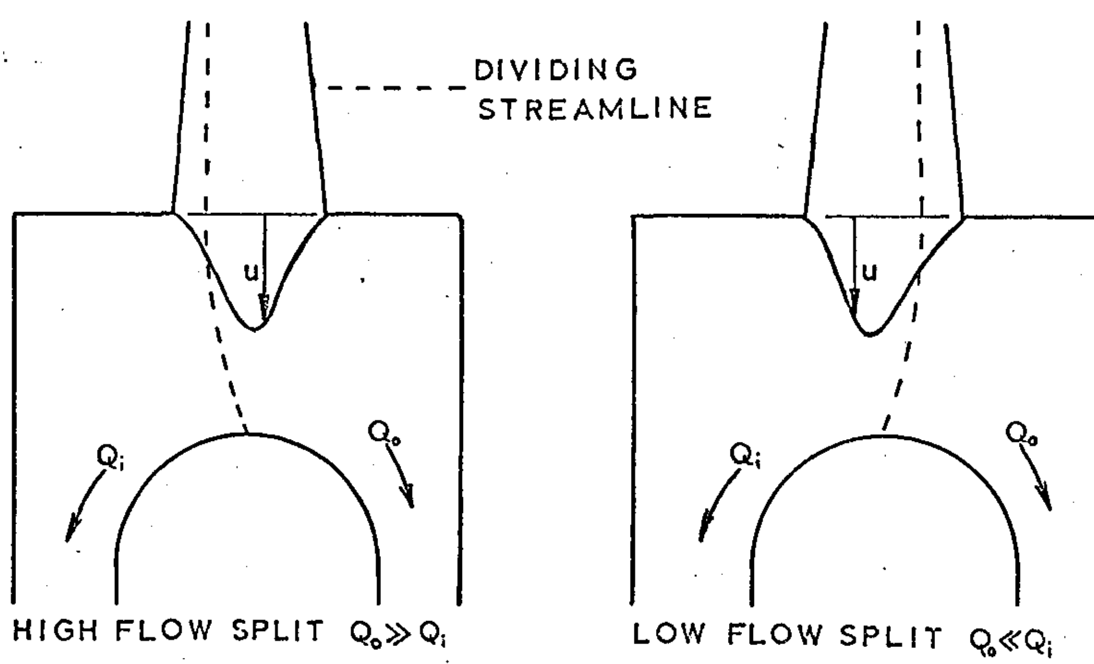
Flow split also varies the amount of turning, in a way that is also influenced by dump gap. It may be seen in Figure 4.3.4 that as flow split varies at small dump gaps, the position of the dividing streamline at pre-diffuser outlet remains almost unchanged, and close to the centre of the annulus.



SMALL DUMP GAP

From the above sketch it can be seen that at a high flow split, in for example, the inner flow field, a greater proportion of the pre-diffuser outlet flow is concentrated in the region of the dividing streamline. Hence more turning of inner flow is required as flow split increases, and vice versa in the outer flow field.

At large dump gaps, there is considerable variation of the dividing streamline location at pre-diffuser outlet with flow split, although the velocity profile at this location does not change appreciably (see Figure 4.3.4).



LARGE DUMP GAP

Taking the inner flow field as an example, it is clear that as flow split is reduced, the effective centre of mass of the pre-diffuser outlet flow moves away from the inner wall, necessitating a greater amount of turning around the head.

4.3.2.2 DIFFUSION AND ACCELERATION OF FLOW

As shown in Figure 4.3.4 the flow between stations 2 and 3 invariably undergo a net acceleration, or, at large dump gaps and a low flow fraction, a slight diffusion. However, at large dump gaps, the flow can undergo considerable diffusion in the rapid expansion of the dump, subsequently accelerating over the head. This can have an adverse effect on performance due to the mixing loss associated with the diffusion process.

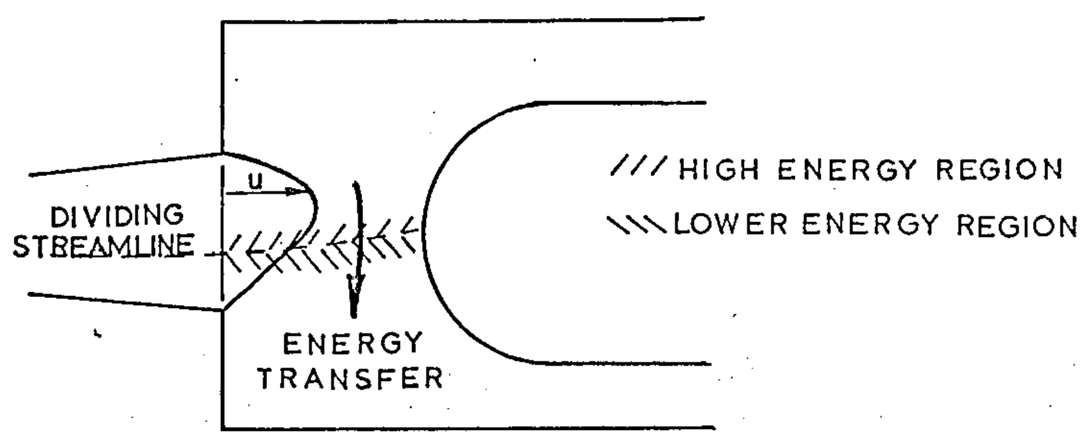
4.3.2.3 THE INFLUENCE OF PRE-DIFFUSER OUTLET TURBULENCE STRUCTURE

In view of the large shear stress associated with high velocity gradients, it could be expected that the turbulent mixing of a velocity profile would rise in the region of high radial velocity gradient as flow non-uniformity increased. The kinetic energy flux parameter, α_2, can be used as a measure of flow non-uniformity, and as can be seen in Figure 4.3.4, for the pre-diffuser outlet inner flow field, this parameter rises with flow split. Hence, considering the mixing characteristics alone, it could be expected that loss around the inner head region would rise due to extra mixing as flow split increased, and vice versa in the outer flow.

4.3.2.4 MIXING BETWEEN INNER AND OUTER FLOW FIELDS

Although it has been found convenient to divide the flow into two parts split about the dividing streamline, in the region up to where the flow becomes completely divided around the head, this division is arbitrary, with no solid boundary between inner and outer flow fields. Mass transfer between the two flow fields, is therefore inevitable in the presence of turbulent mixing, this being particularly apparent at large dump gaps.

In this situation, energy would be transferred to the flow field having the lower velocity in the vicinity of the dividing streamline, decreasing loss in this region at the expense of an increased loss in the other flow field.



4.3.2.5 VORTEX FLOW

Since the majority of the vortex lies within the region 2-3, the energy required to sustain it must constitute part of the loss within this portion of the flow. An approximate estimate of the loss associated with the vortex, found by assuming that all of the kinetic energy contained at station 3 is detroyed has shown that in the order of half of the total loss between 2 and 3 could be attributable to the vortex.

4.3.2.6 THE INFLUENCE OF DIFFERENCES BETWEEN INNER AND OUTER FLOW FIELD DUCT GEOMETRIES

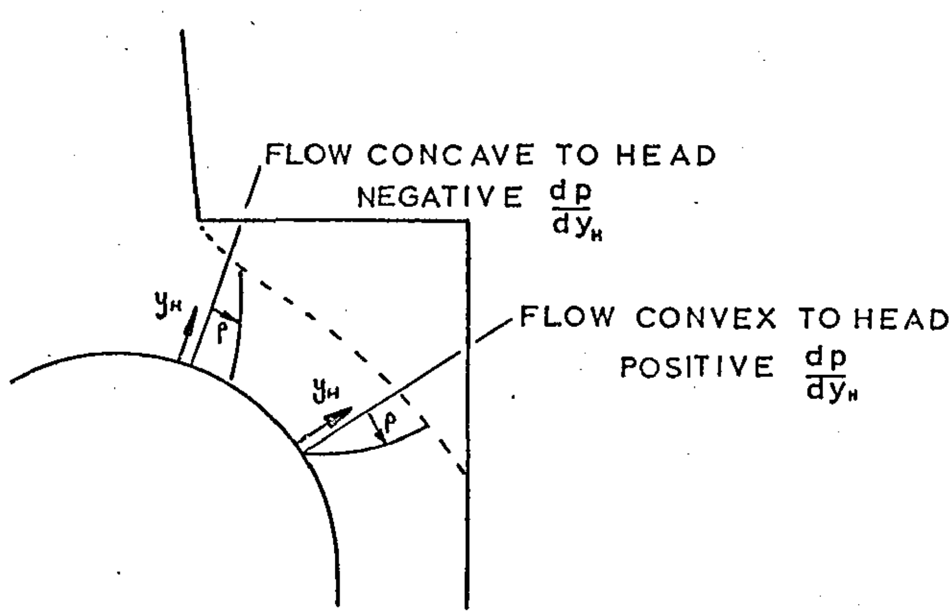
The choice of a design flow split of 1.20 , and annular geometry, dictate inner and outer casing walls which are not equidistant from the combustion chamber centreline. The result is, for similar conditions at pre-diffuser outlet, less turning of the outer flow than that of the inner is required.

There is also a difference in the way in which diffusion or acceleration takes place. At large dump gaps it has already been stated that the flow diffuses into the dump region prior to an acceleration over the head. In the inner flow, the turning procedure around the head implies that the flow is progressing towards a smaller radius, and any diffusion must take place radially, i.e. in the plane of the main velocity profile non-uniformity. However, in turning, since the outer flow is progressing towards a larger radius, a considerable amount of diffusion can occur circumferentially, which is normal to the plane of flow non-uniformity. Viets[12] has shown, in a theoretical investigation, that there can be a substantial difference in the mixing characteristics of flows diffused in different planes, more mixing being associated with diffusion normal to the plane of velocity profile non-uniformity. Solely as a result of this phenomena, it could therefore be expected that total pressure loss would be greater for the outer flow field.

4.3.3 DISCUSSION OF HEAD STATIC PRESSURE DISTRIBUTIONS

The variation of static pressure on the head is presented in Figures 4.3.5-8. It can be seen that, despite changes of dump gap, flow split and pre-diffuser geometry, the magnitude and location of the peak pressure, at the stagnation point, remains unchanged.

The fall of pressure around the head, and subsequent rise downstream of a point corresponding closely with station 3, is the result of two influences. Firstly, as a result of the flow acceleration prior to diffusion into the settling length, the mean static pressure of the flow will fall. This continues up to a region where the mean velocity is a maximum, static pressure subsequently rising as diffusion occurs. Secondly, the flow turning, as discussed in Section 4.3.2.1 also influences the head static pressure distribution. Due to the necessity to turn the flow around the head, and then return it to an axial direction, the pressure gradient across the annulus surrounding the head will change both in magnitude and direction in the manner illustrated below.



Hence, in the absence of any diffusion or acceleration, the turning of the flow would produce similar head static pressure variations to those shown in Figures 4.3.5-8.

4.4 SETTLING LENGTH (3-4)

4.4.1 GENERAL FLOW CHARACTERISTICS

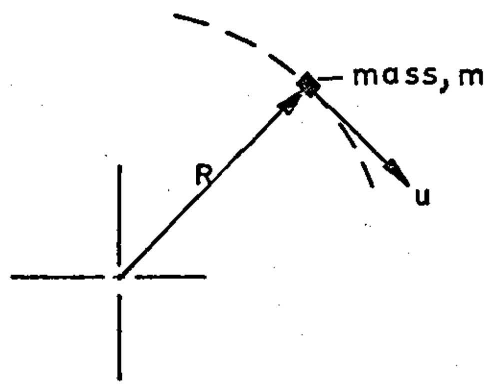
Since the inner and outer flows are completely separate at station 3, and hence almost entirely independent of each other, performance and flow characteristics will be mainly dependent upon local entry conditions (i.e. at station 3).

In general, the flow diffuses rapidly into the initial regions of the settling length, subsequently diffusing more slowly in the constant area regions as the velocity profile becomes more uniform due to mixing. Additionally, the flow is turning towards the combustion chamber, becoming axial in the downstream region of the settling length.

For reasons outlined in Section 4.3, performance parameters in this section have been non-dimensionalised by local entry conditions, as defined by Equation 1.4.31. The variation of performance with dump gap and flow split is typical of that shown in Figure 4.4.1, in which the results for pre-diffuser number 2 are presented. It can be seen that pressure recovery in both inner and outer flow fields falls as the flow fraction to that particular annulus also decreases. The ideal pressure recovery however rises with decreasing flow fraction, and therefore the reduction of pressure recovery is solely the result of a rapid increase of loss.

4.4.2 FLOW STABILITY

Consider a flow particle of mass m, moving in an arc of radius R, with tangential velocity u.



In the absence of significant radial acceleration, the centrifugal force must be balanced by a radial pressure force.

$$\frac{mu^2}{R} = \frac{m}{\rho}\frac{dp}{dR} \qquad \frac{dp}{dR} = \frac{\rho u^2}{R} \qquad 4.4.1$$

Consider the particle displaced to a new radius, R_d. By conservation of angular momentum, if u_d is the new velocity of the particle, then:

$$R_d\, u_d = Ru \qquad 4.4.2$$

The centrifugal force exerted by the displaced particle is then given by:

$$\frac{mu_d^2}{R_d} = \frac{mR^2u^2}{R_d^3} \qquad 4.4.3$$

If the local velocity at the displaced position is u_1, the local pressure gradient is given by:

$$\frac{dp_1}{dR_d} = \frac{\rho u_1^2}{R_d} \qquad 4.4.4$$

For stability of the flow, the displaced particle must tend to return to its initial position, and therefore the net force must act in the direction opposite to that of the displacement.

i.e. $$\frac{m}{\rho}\frac{dp_1}{dR_d} > \frac{mR^2u^2}{{R_d}^3}$$

$$\frac{u_1^2}{R_d} > \frac{R^2u^2}{{R_d}^3}$$

$$u_1R_d > Ru \qquad 4.4.5$$

There, for flow stability, the product uR must increase with R.

It can be seen in Figure 4.2.2, that, for the majority of the flow at station 3, uR decreases with increasing R. It should be noted that it has been assumed that all of the flow at this station is turning with a centre of curvature corresponding to the centre of the semi-circle which forms the head. This assumption is certainly valid close to the head, but may not be entirely correct elsewhere. Nevertheless, it is not considered that this would alter the conclusion that the flow is unstable, giving rise to a considerable degree of turbulent mixing. The results of Stevens and Fry(15) confirm that turbulent shear stress of a concave surface boundary layer increases considerably at the flow negotiates a constant area annular bend.

4.4.3 RE-DISTRIBUTION OF FLOW DOWNSTREAM OF STATION 3

In view of the high degree of mixing associated with the unstable velocity profile at station 3, a rapid re-distribution of flow could be expected downstream of this location. Given a turning arc of sufficient length this would result in a flow distorted away from the combustion chamber, in view of the direction of flow curvature.

In addition to the effect described above, we must also consider the diffusion of the flow, which will tend to accentuate the initial distortion.

The resultant shape of the velocity profile in the settling length will therefore depend upon the relative magnitude of these two effects, viz. diffusion and curvature. Figure 4.4.1 shows that when the flow to either inner or outer annulus is high, the pressure recovery between 3 and 4 is considerable, resulting in velocity profiles in the settling length distorted towards the combustion chamber, as in Figure 4.4.3. However, as the flow to either settling length annulus falls, the instability of the head flow becomes more apparent, as shown in Figure 4.4.2, in which, for the inner annulus, the fall of $(u/_U)R$ with increasing radius is more apparent, for the majority of the flow field, at a high flow split. The result of this is an increase of mixing at low flows, a consequential rise of loss (see Figure 4.4.1), and rapid re-distribution of the curving flow, producing velocity profiles in the settling length distorted towards the casing walls, as shown in Figure 4.4.3.

The plane in which the diffusion takes place has a significant influence on the mixing characteristics of the flow, as discussed in Section 4.3.2.6. A considerable amount of the diffusion in the outer annulus can occur circumferentially, which is normal to the plane of velocity profile non-uniformity, unlike the diffusion in the inner annulus, which must occur entirely in the plane of non-uniformity. In view of the extra mixing which Viets[12] suggest would be associated with the outer flow, it could be expected that loss would be greater than that of the inner flow, although an improvement of flow uniformity in the settling length would result. These effects can be clearly seen from Figures 4.4.1 and 4.4.3.

4.5 DIVISION OF LOSS WITHIN THE SYSTEM

Figures 4.5.1-3 show the percentage of the total loss which is attributable to the various regions of the diffuser system.

It is clear that the majority of the overall loss occurs downstream of the pre-diffuser, particularly in the region between 3 and 4. Furthermore, except at very low flow splits, when the inner flow field mass flow is high, a significantly greater proportion of the loss downstream of station 3 occurs in the outer flow field.

The influence of dump gap, flow split and pre-diffuser geometry on the division of loss between the pre-diffuser, and the downstream regions of the system can also be seen in Figures 4.5.1/3. The adverse influence on pre-diffuser flow of increasing dump gap, changing flow split from the design value of 1.2, or increasing area ratio, is apparent, since in all cases, the percentage of the total loss which occurs within the pre-diffuser rises.

SECTION 5 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Low speed tests have been carried out to investigate the performance of a dump diffuser system of overall geometric area ratio 2.0. The system was tested over a range of flow splits and dump gaps with fully developed entry conditions presented to each of three axisymmetric pre-diffusers of area ratio 1.4, 1.6 and 1.8 respectively, and 12° included angle, the overall design flow split of the system being 1.20. Further tests were conducted using the 1.6 area ratio pre-diffuser, with distorted entry conditions, and design flow split of the system 2.15.

In addition to considering the overall performance, total pressure loss, static pressure recovery, and flow uniformity for various regions of the system were determined.

5.1.1 OVERALL PERFORMANCE

The influence of flow split, dump gap, and pre-diffuser area ratio has been established, and the optimum conditions defined. By comparison of the results of this investigation with those of Fishenden(1), the influence of distorted entry conditions, and a change of design flow split for constant overall area ratio and combustion chamber geometry, have been established.

The main conclusions are:

(i) Optimum performance occurs at flow split close to the design value of 1.20, a dump gap (D/h_2) of 1.1, and pre-diffuser length ($\bar{L}/R_1$) of 3.5. This corresponds to a pre-diffuser area ratio of 1.74, and overall length (Lov/R_1) of 5.5. At these conditions, a pressure recovery of 0.58 is obtained, with a loss coefficient of 0.16.

(ii) For any given dump gap, pre-diffuser, and design flow split, the optimum performance was obtained at a flow split of about 1.2. This corresponded to a symmetric pre-diffuser outlet velocity profile, and a symmetric static pressure distribution on the combustion chamber head.

(iii) In view of the increased level of turbulence associated with the distortion of the entry profile, it is not possible to isolate the influence of a modified entry velocity profile alone. However, the overall influence was to increase loss at all operating conditions.

(iv) Comparison of results obtained for overall design flow splits of 1.20 and 2.15 clearly indicate the need to match system geometry and design flow split. This should be done in such a way that a symmetric pre-diffuser outlet velocity profile and static pressure distribution is obtained at the design flow split.

5.1.2 PRE-DIFFUSER PERFORMANCE

(i) Optimum pre-diffuser performance corresponds closely with a flow split giving optimum overall performance i.e. $S \triangleq 1.20$.

(ii) Reduction of dump gap improved pre-diffuser performance near the design flow split, but the performance penalty associated with off design flow splits increased.

5.1.3 DIVISION OF LOSS

It has been demonstrated that most of total pressure loss occurs downstream of the point of minimum pressure on the combustion chamber head. This is due to the high degree of mixing associated with the rapid diffusion of a flow which is inherently unstable because of the shape of the velocity profile and direction of flow curvature. Generally speaking, the overall loss can be divided between the various regions of the system as follows:

Pre-diffuser (1-2)	....	20%
Dump region (2-3)	....	20%
Settling length (3-4)	....	60%

However, the exact numerical values of the loss division depend upon dump gap, flow split, and pre-diffuser geometry.

5.2 RECOMMENDATIONS FOR FUTURE WORK

(i) Performance has been determined over a wide range of operating conditions for pre-diffusers of 12^{o} included angle only. It would be of considerable interest to examine the influence of pre-diffusers of larger included angles, and also contoured wall shapes.

(ii) Considerable loss is associated with the diffusion and curvature of the flow around the head. There is scope for a considerable reduction of loss if the turning and/or diffusion could be reduced. With this in mind, it might be of interest to conduct tests with various head shapes.

(iii) In view of the current trend towards low pollution gas turbines, there is a tendency to increase the percentage of flow entering directly into the primary zone of the flame tube via the head. Hence in any future work, careful consideration must be given to the inclusion of head porosity.

(iv) It is clear that entry conditions can have a significant effect on diffuser performance. In future work, consideration should be given to the fact that fully developed entry conditions may not give a true representation of conditions occurring in practice. An attempt should therefore be made to test with more representative entry conditions.

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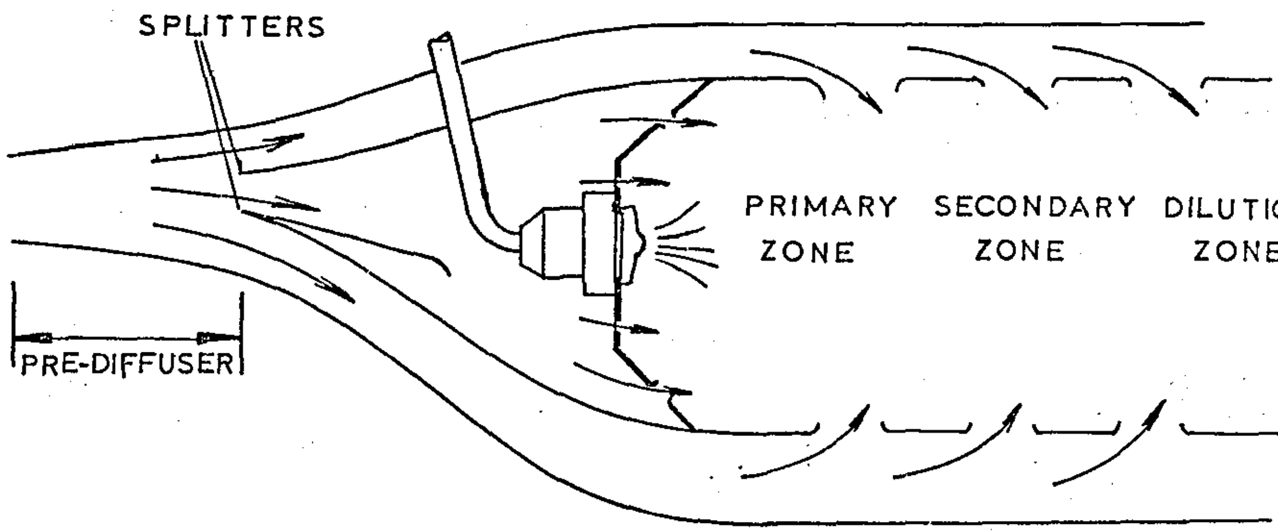
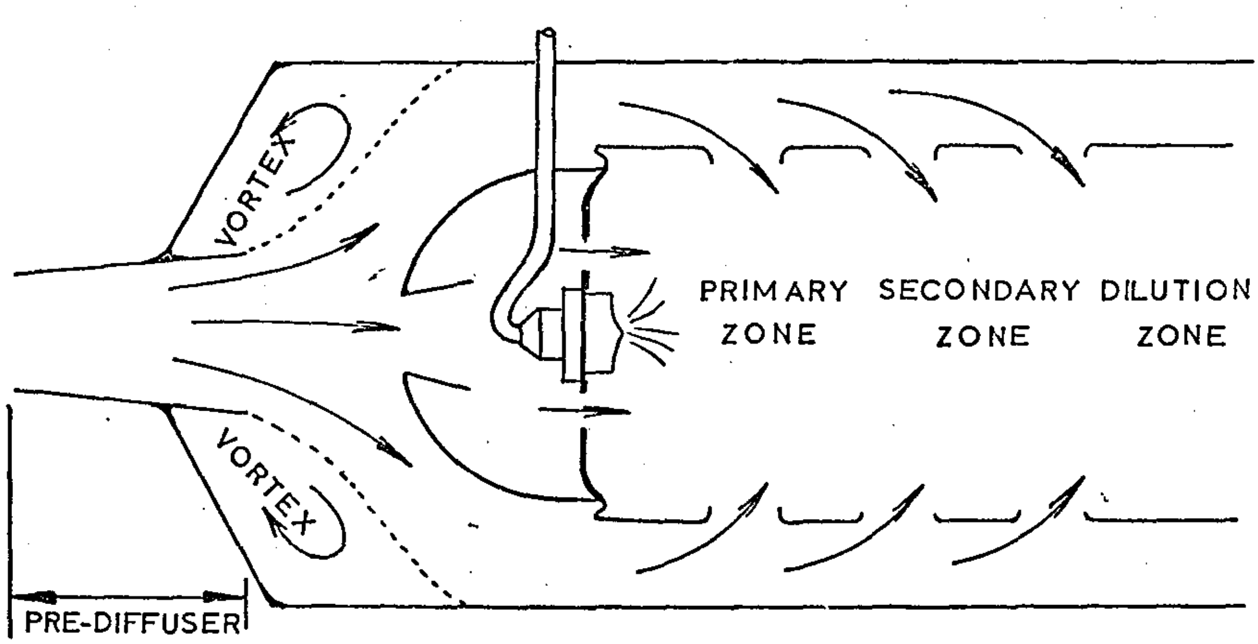
Fig.1.3.1 TWO TYPES OF COMBUSTION CHAMBER DIFFUSER SYSTEMS IN CURRENT USE



FAIRED SYSTEM



DUMP SYSTEM

Fig.1.4.1 VARIATION OF OVERALL IDEAL PRESSURE RECOVERIES AND EFFECTIVE AREA RATIOS WITH FLOW SPLIT

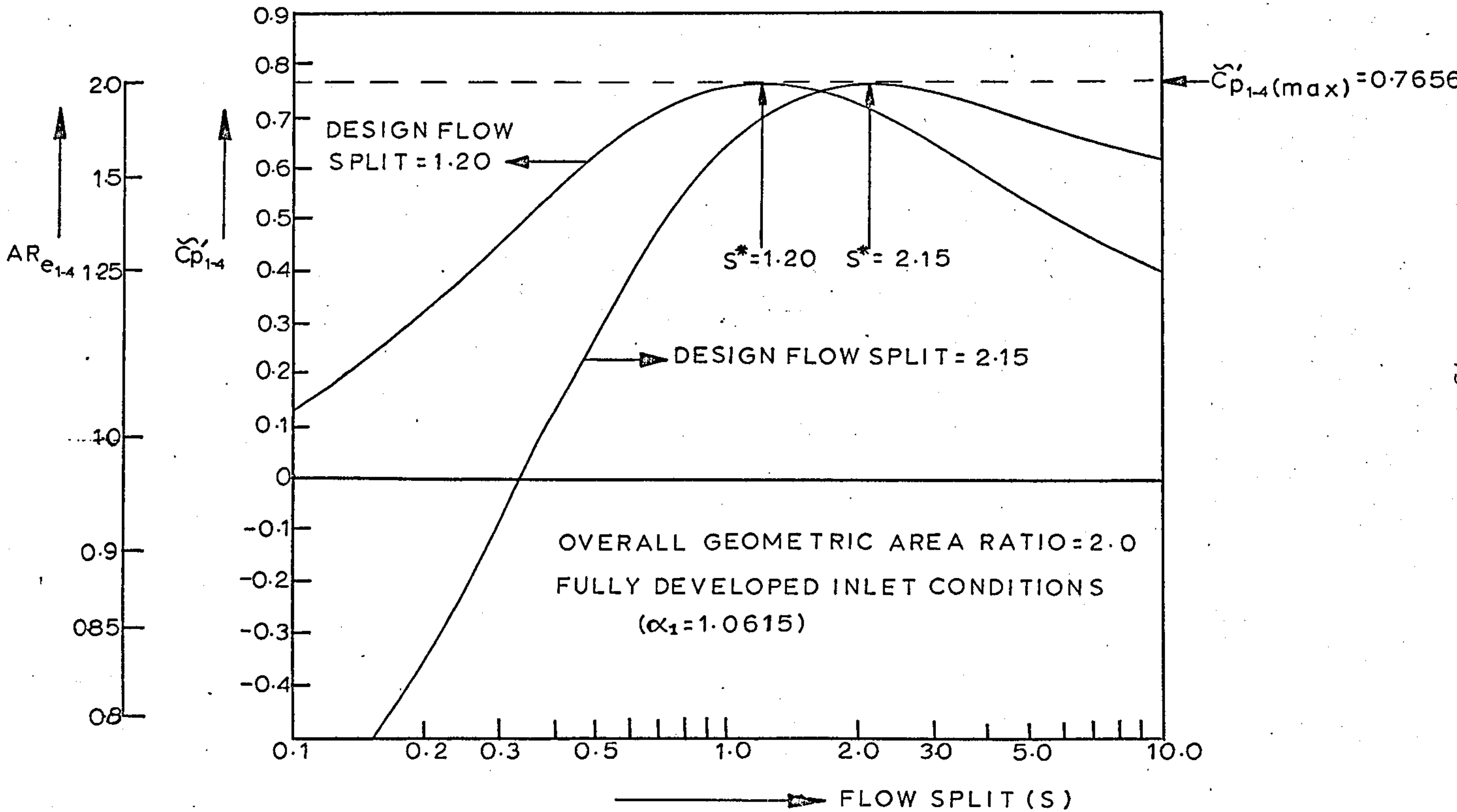


Fig. 1.4.2 RELATIONSHIP BETWEEN KINETIC ENERGY FLUX COEFFICIENT AND BLOCKAGE FRACTION

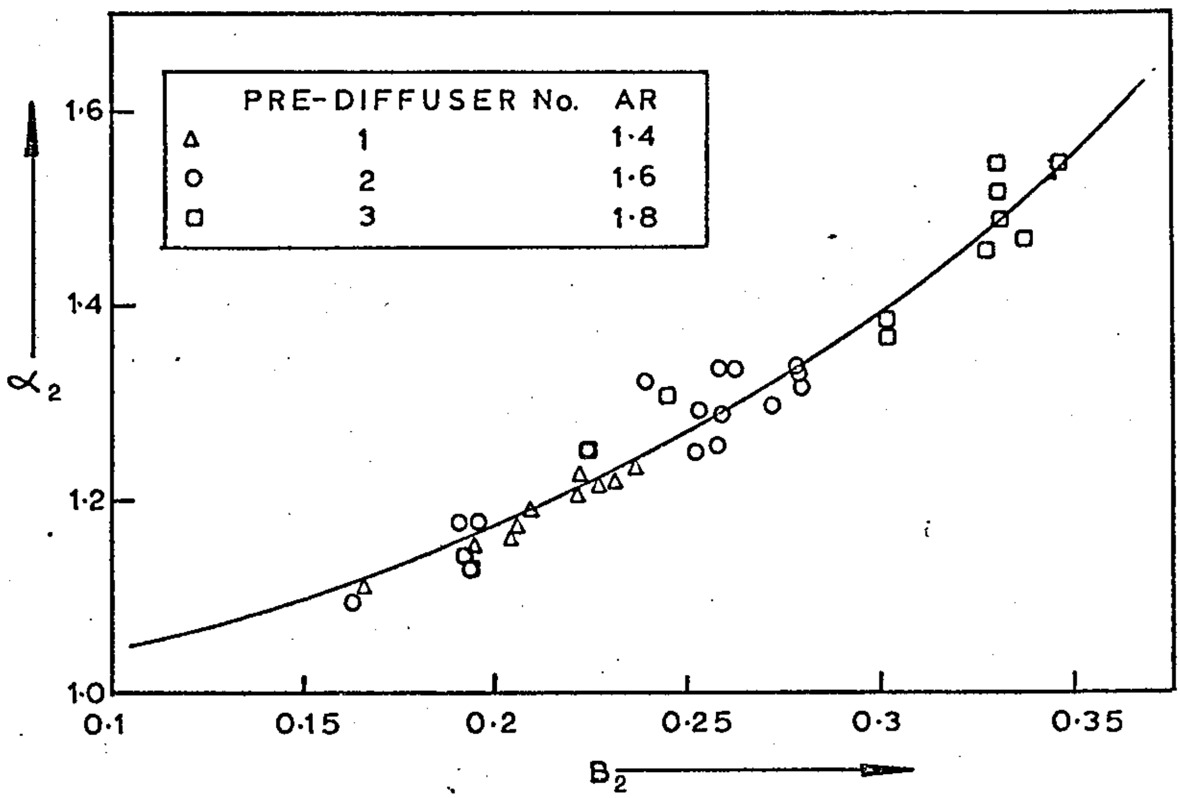


Fig 1.6.1 COMPARISON OF PRE-DIFFUSER AND ISOLATED DIFFUSER PRESSURE RECOVERIES

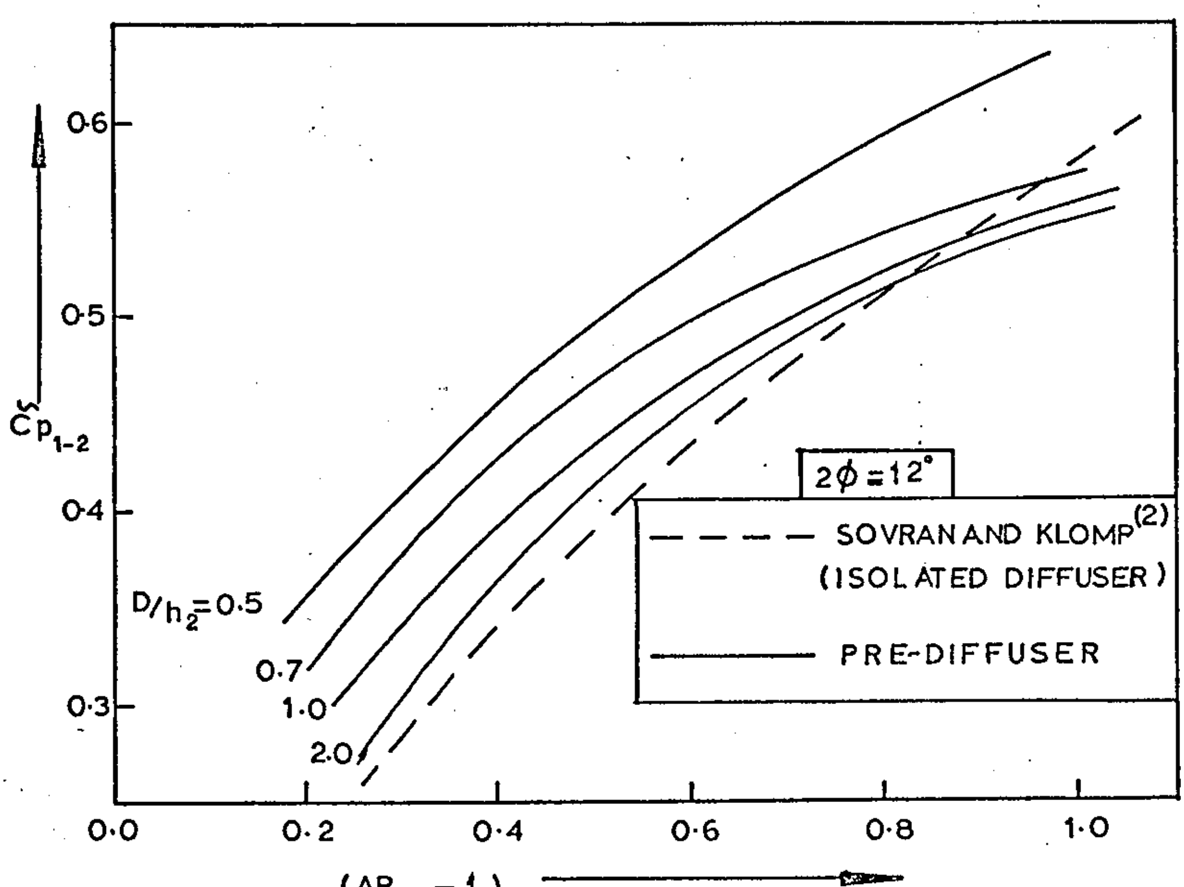


Fig. 1.6.2 INFLUENCE OF INLET BLOCKAGE ON DIFFUSER PERFORMANCE AFTER SOVRAN & KLOMP[2]

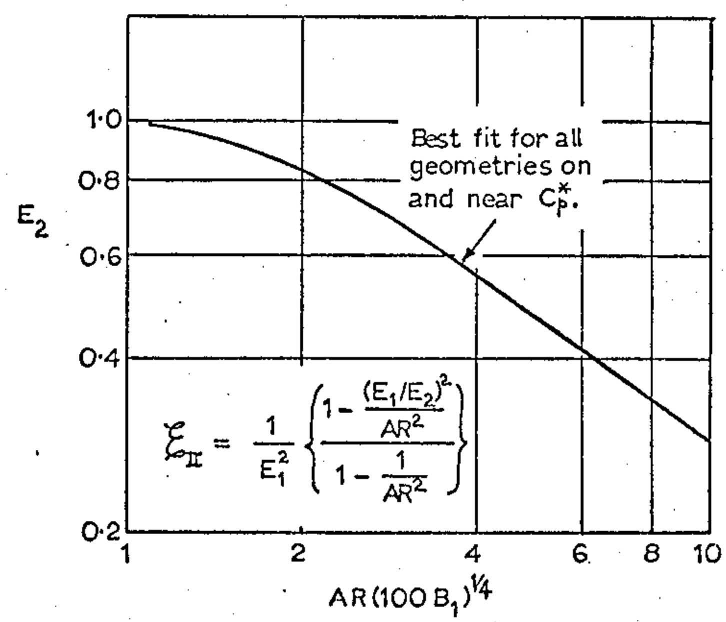


Fig. 1.6.3. VARIATION OF DIFFUSER EFFECTIVENESS WITH INLET BLOCKAGE FRACTION.

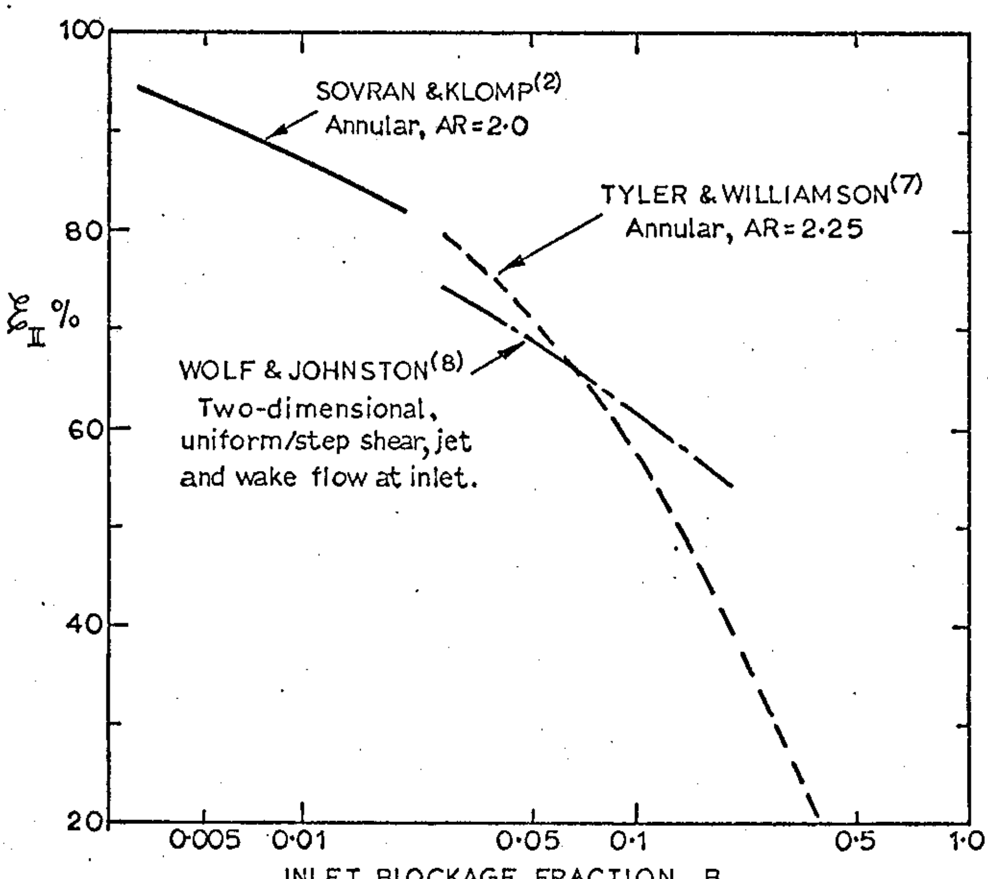
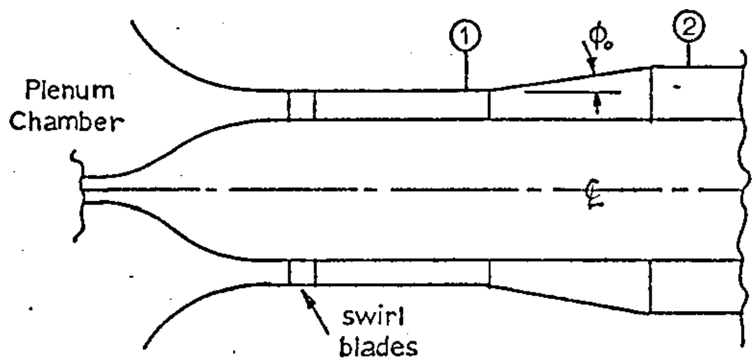


Fig. 1.6.4. INFLUENCE OF ENTRY SWIRL ON LOSS COEFFICIENT FOR CONSTANT INNER CORE ANNULAR DIFFUSERS AFTER GUREVICH[5]



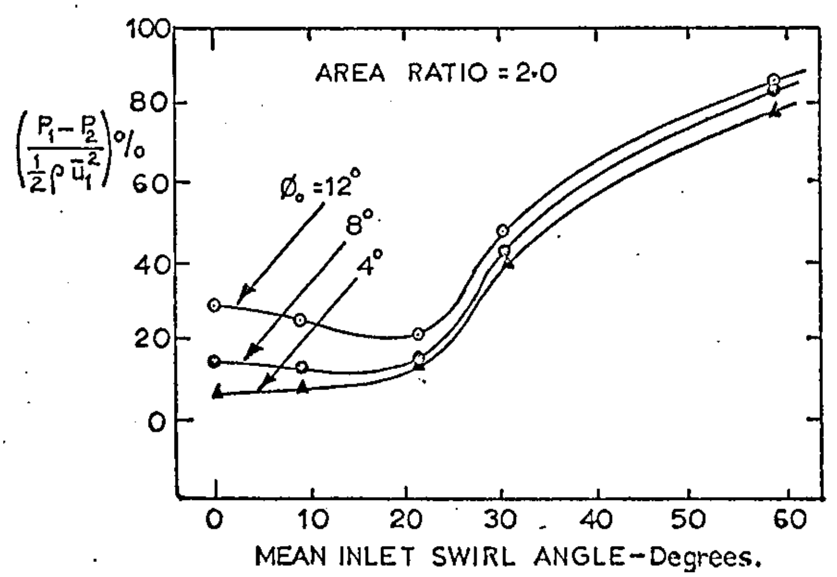
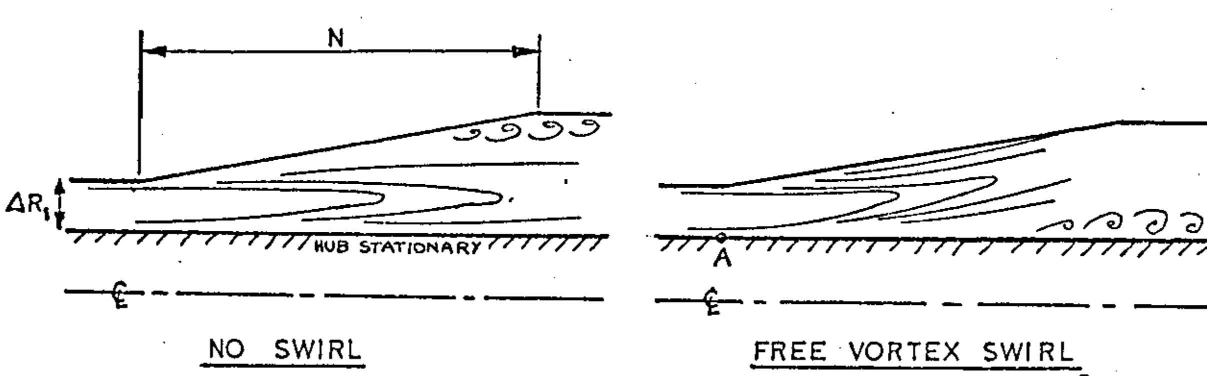


Fig. 1.6.5. TOTAL PRESSURE CONTOURS IN ANNULAR DIFFUSERS.

DATA OF HOADLEY REPORTED BY HORLOCK[13]



DIFFUSER GEOMETRY: $N/\Delta R_1$ = 19·1, AR = 4·57

indicates SEPARATION

Fig. 2.1.1 LAYOUT OF TEST FACILITY.

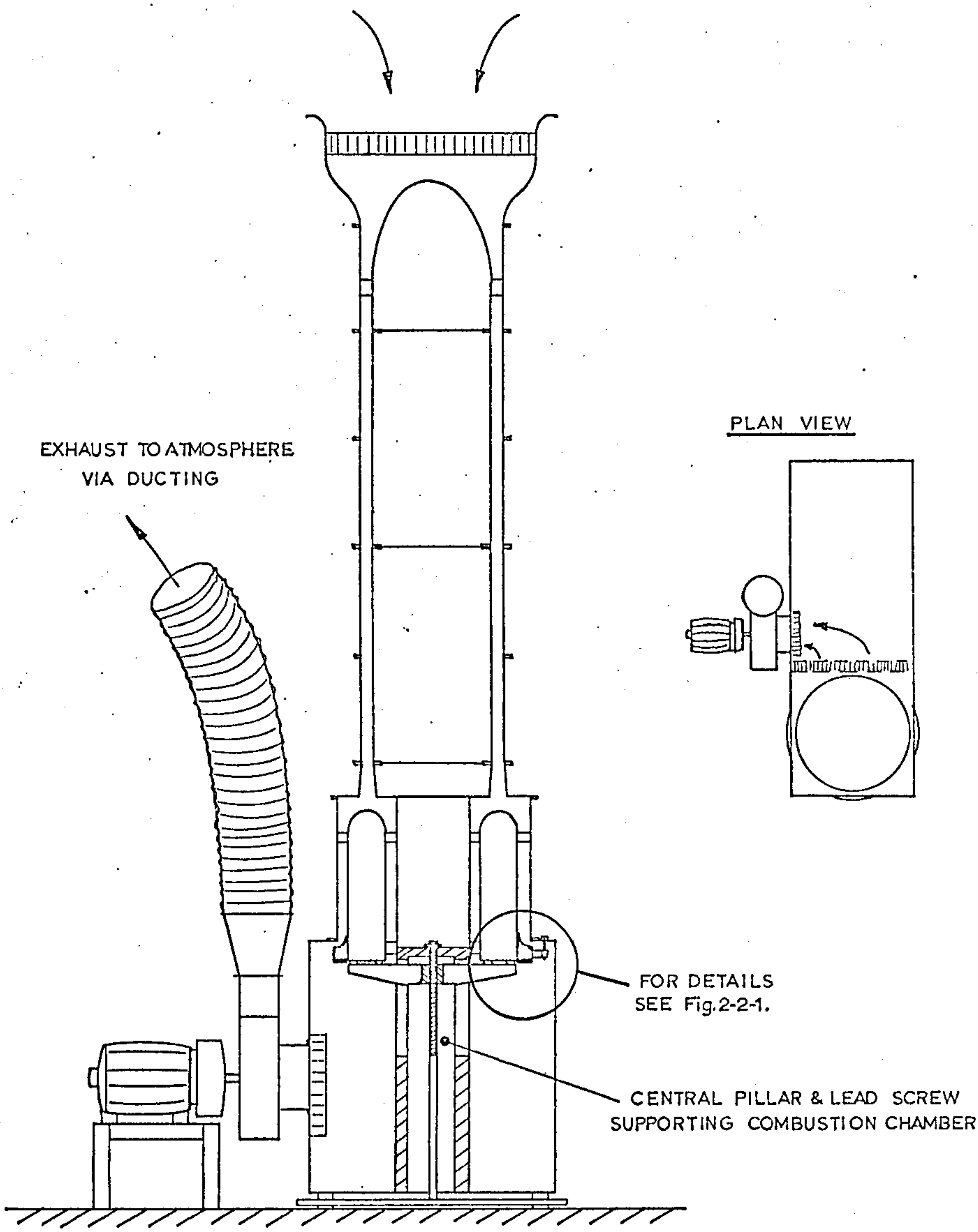
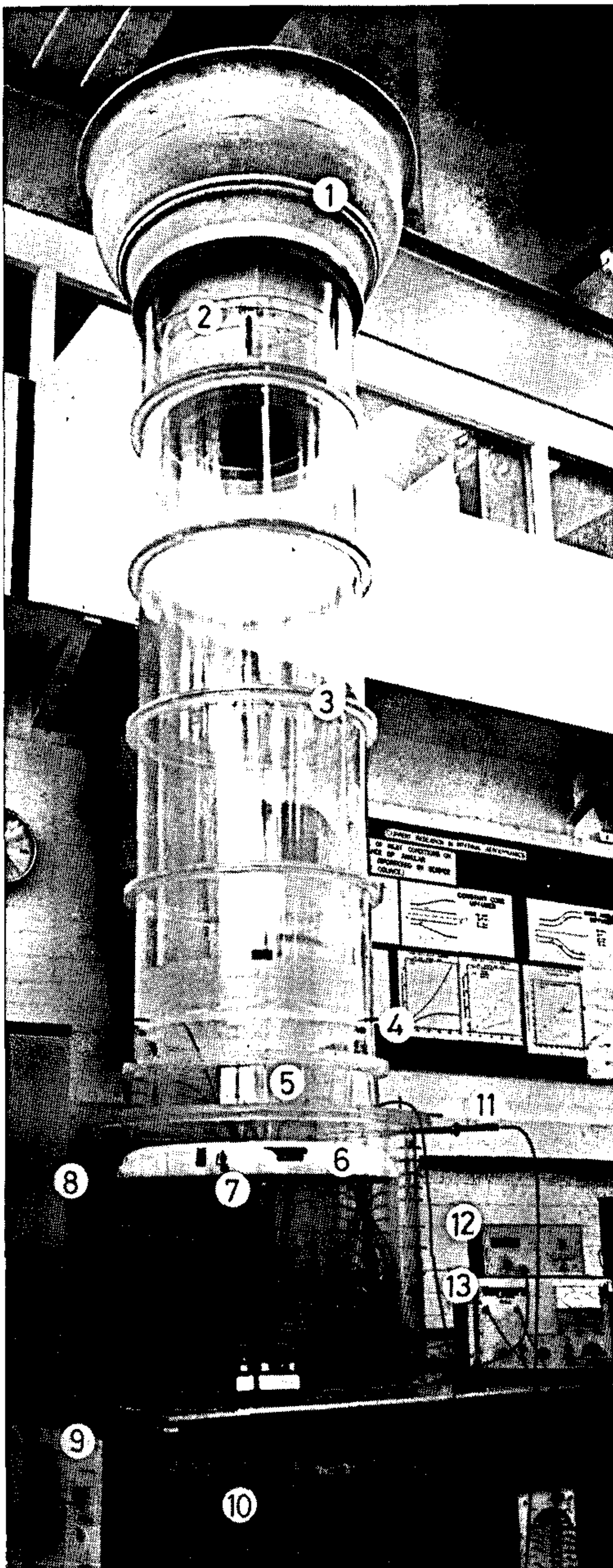


Fig 2-1-2 EXPERIMENTAL FACILITY.



KEY

(1) Intake Flare

(2) Intake Bullet

(3) Inlet Length

(4) Inlet Station (1)

(5) Pre-diffuser

(6) Combustion Chamber Head

(7) Head Rake

(8) External Static Pressure Tappings

(9) Internal Static Pressure Tappings

(10) Plenum Chamber

(11) Traverse Gear

(12) DISA Digital Voltmeter

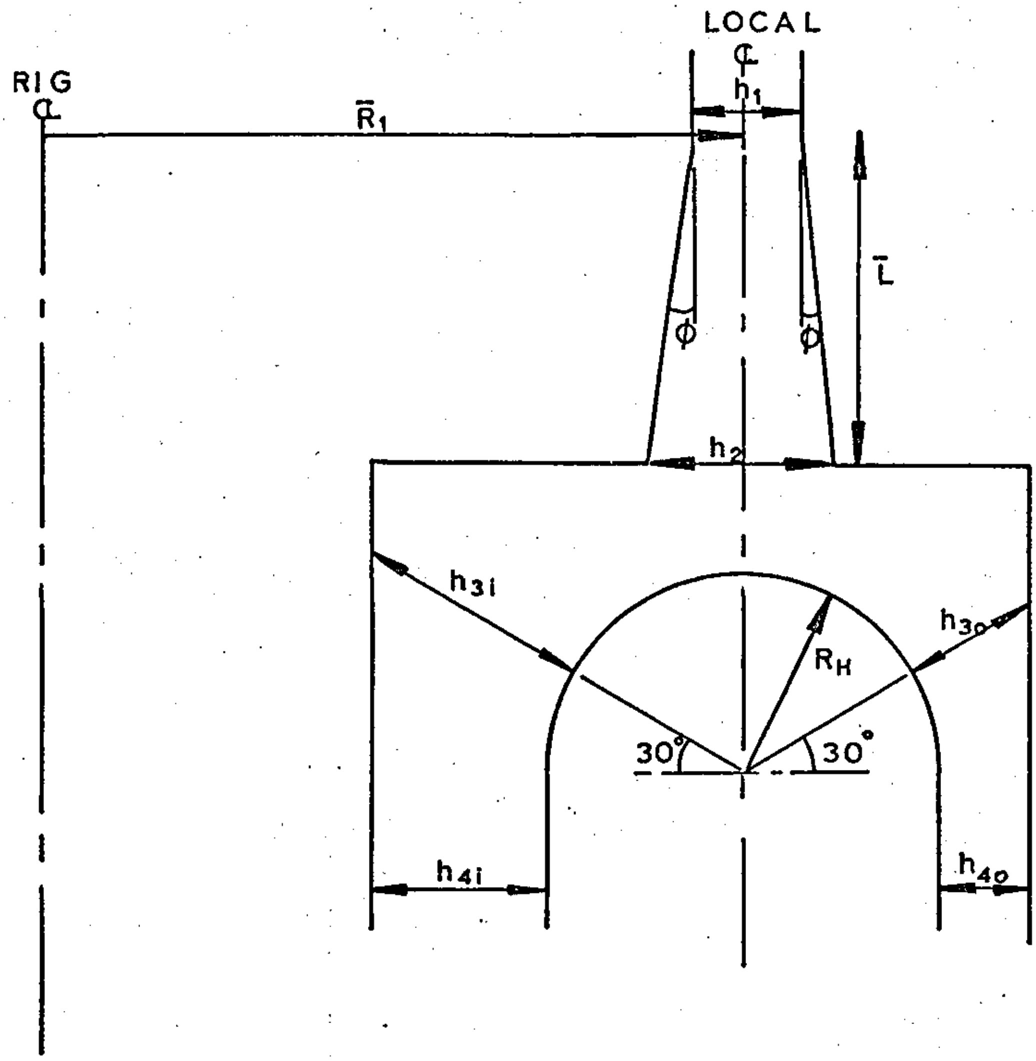
(13) Furness Controls Micromanometer

APPROXIMATE SCALE

0 0·5

Metres

Fig.2.1.3 TEST RIG AND PRE-DIFFUSER GEOMETRIES



TEST RIG DIMENSIONS

$\bar{R}_1$ m.m.	$h_1/\bar{R}_1$	$h_{3i}/\bar{R}_1$	$h_{3o}/\bar{R}_1$	$h_{4i}/\bar{R}_1$	$h_{4o}/\bar{R}_1$	$R_H/\bar{R}_1$	AR_{1-4}
DESIGN FLOW SPLIT S^* = 1·20							
234·9	0·162	0·333	0·117	0·249	0·131	0·284	2·00
DESIGN FLOW SPLIT S^* = 2·15 (1)							
234·9	0·162	0·231	0·231	0·162	0·162	0·284	2·00

PRE-DIFFUSER GEOMETRIES

REF. No.	$\bar{L}/h_1$	h_2/h_1	$2\phi°$	$\xi°$	AR_{1-2}
1	1·897	1·400	12·0	0·0	1·400
2	2·854	1·600	12·0	0·0	1·600
3	3·806	1·800	12·0	0·0	1·800

Fig. 2.2.1 SETTLING LENGTH THROTTLE & TRAVERSE MECHANISM.

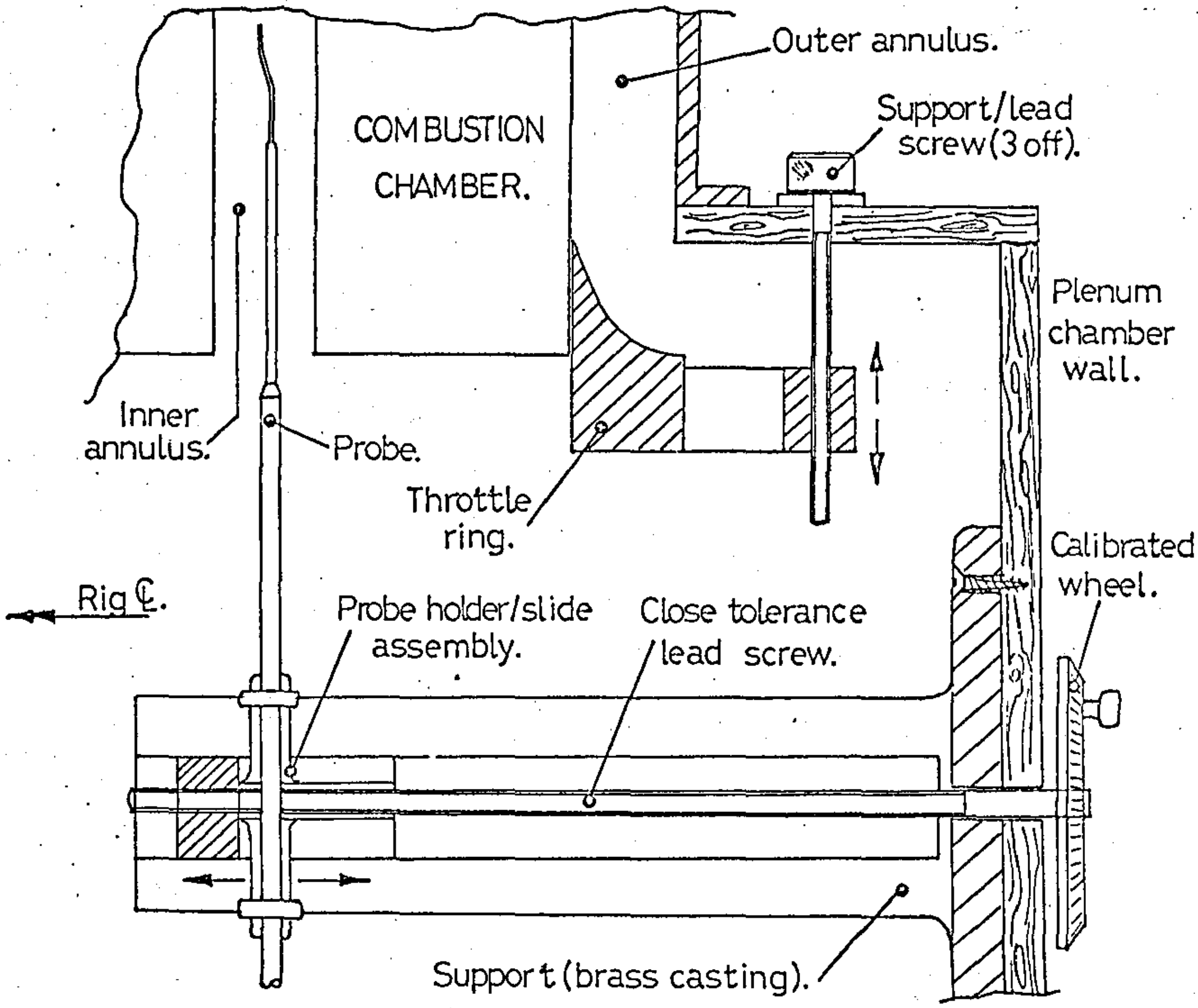


Fig. 2.2.2 PRE-DIFFUSER GEOMETRIES IN RELATION TO PERFORMANCE CHART OF SOVRAN & KLOMP[2]

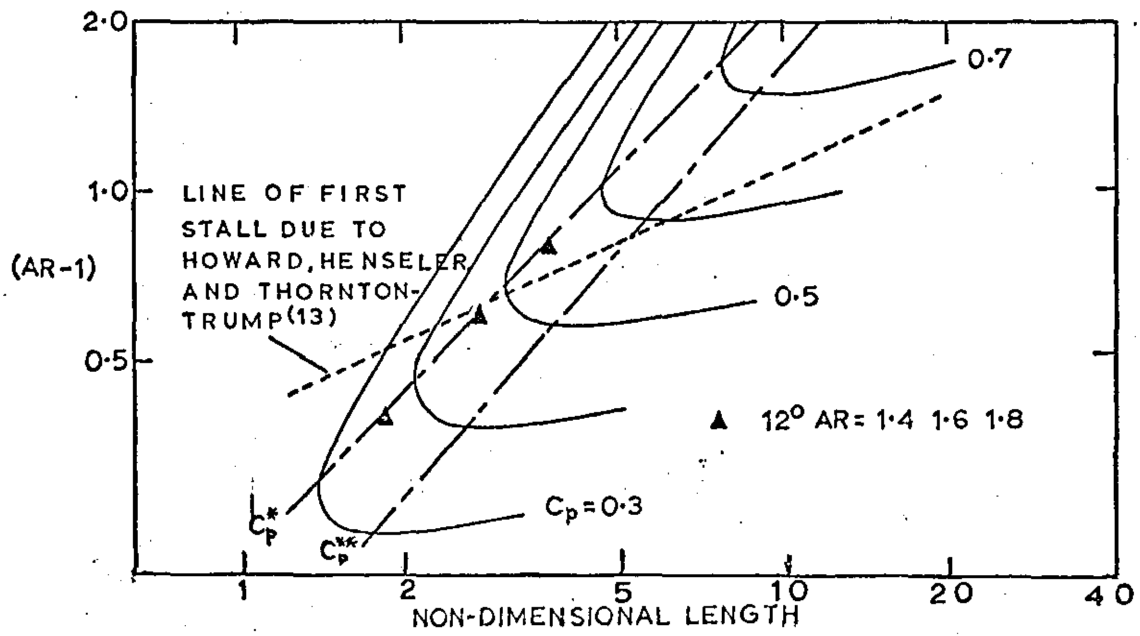


Fig. 2.3.1 LOCATION OF INSTRUMENTATION

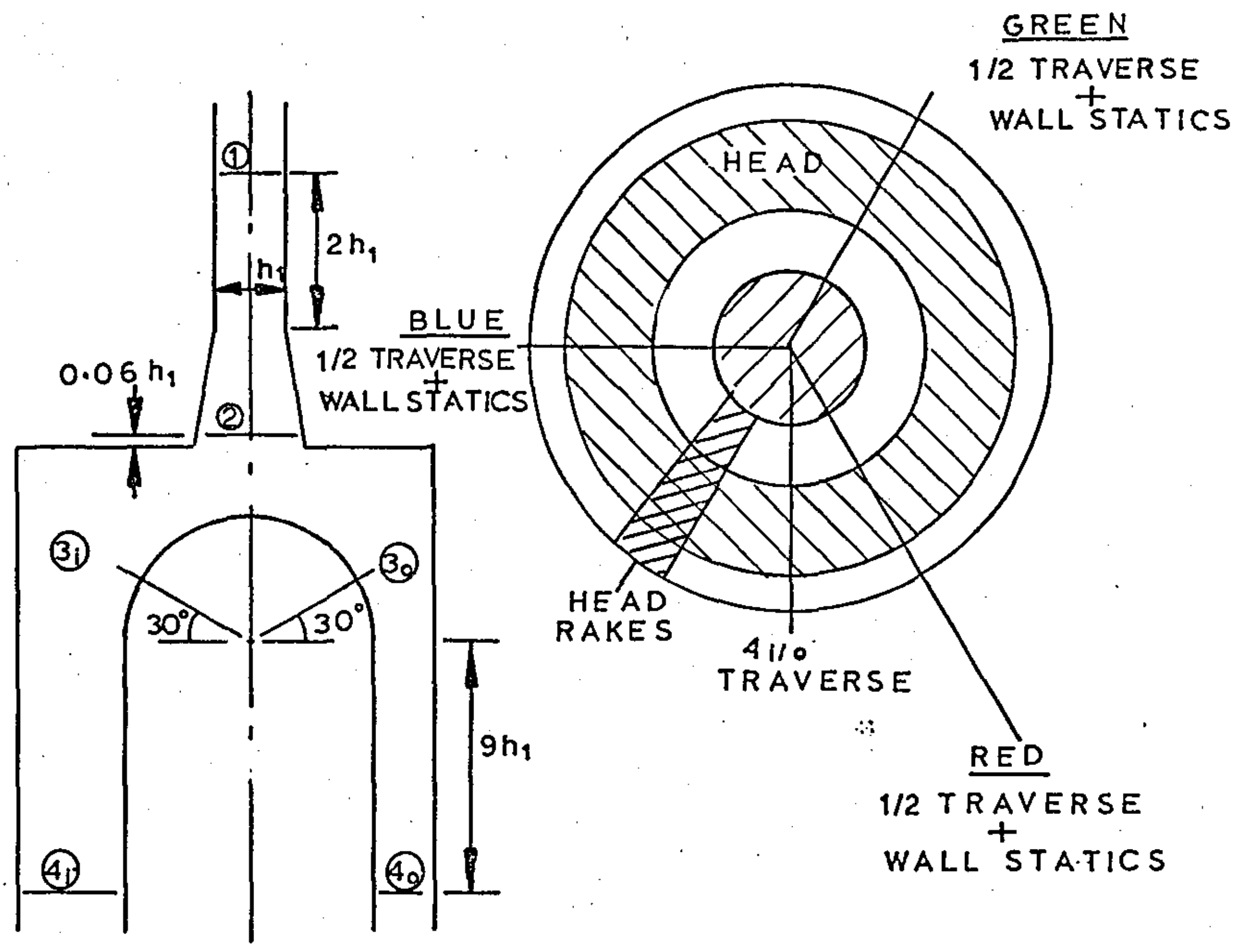
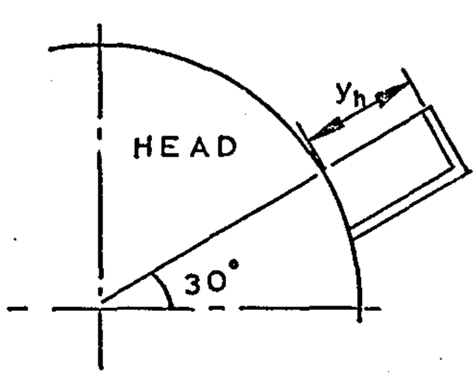


Fig 2.3.2 DETAILS OF HEAD RAKES



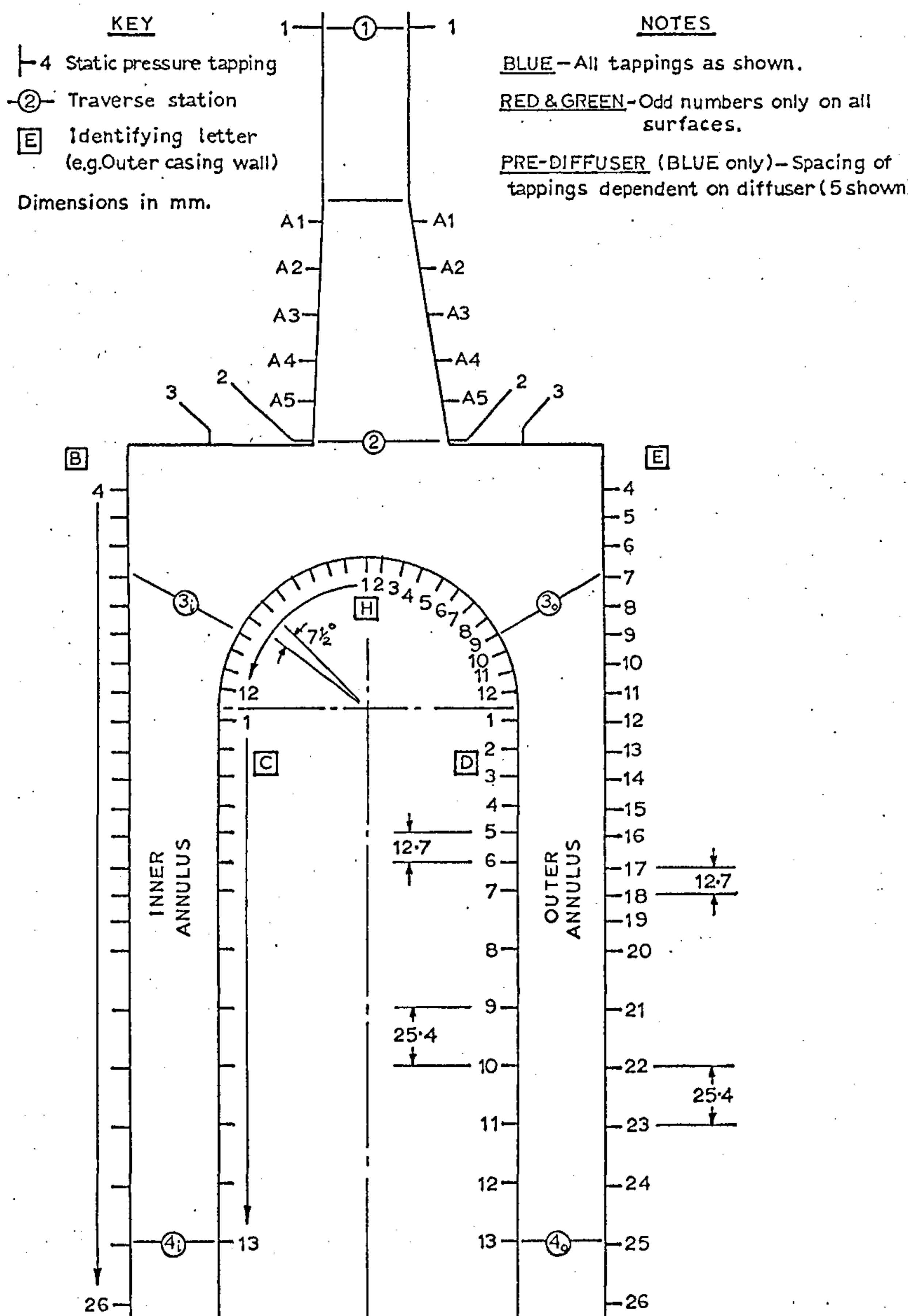
INNER HEAD RAKES

y_h m.m.	3.0	7.6	11.4	15.2	21.6	22.9	27.2
PITOT PROBES	36.6	37.6	50.8	55.2	63.5	68.6	
y_h m.m. STATIC PROBES	7.1	18.4	29.2	41.5	61.6		

OUTER HEAD RAKES

y_h m.m.	2.5	5.1	6.6	10.2	12.7	15.2
PITOT PROBES	19.0	22.3	25.5	31.2	36.8	38.2
y_h m.m. STATIC PROBES	5.1	12.7	20.3	30.5		

Fig. 2.3.3 LOCATION OF STATIC PRESSURE TAPPINGS.



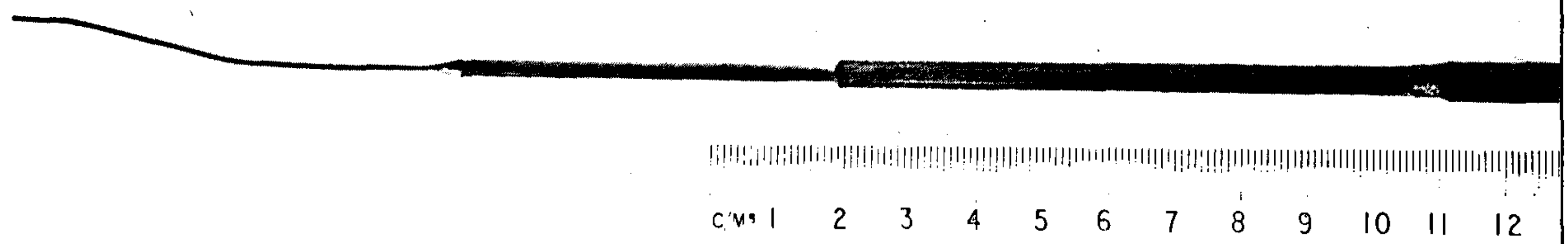


Fig 2-4- Settling Length Traverse Probe.

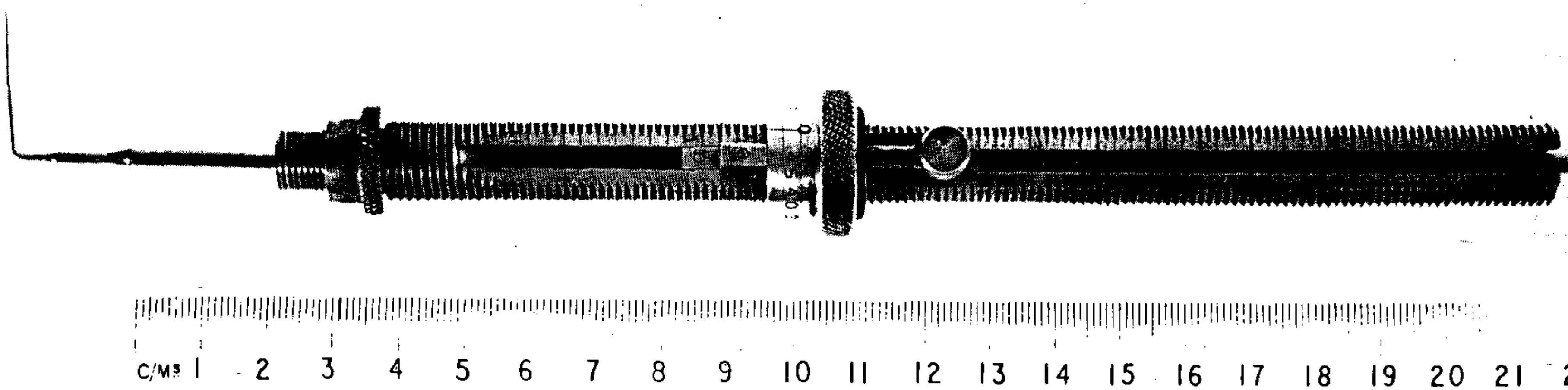


Fig 2-4- Traverse Mechanism and Pitot Probe.

Figs 2-4- & 2-4-

Fig 2.3.6 WEDGE STATIC PROBE

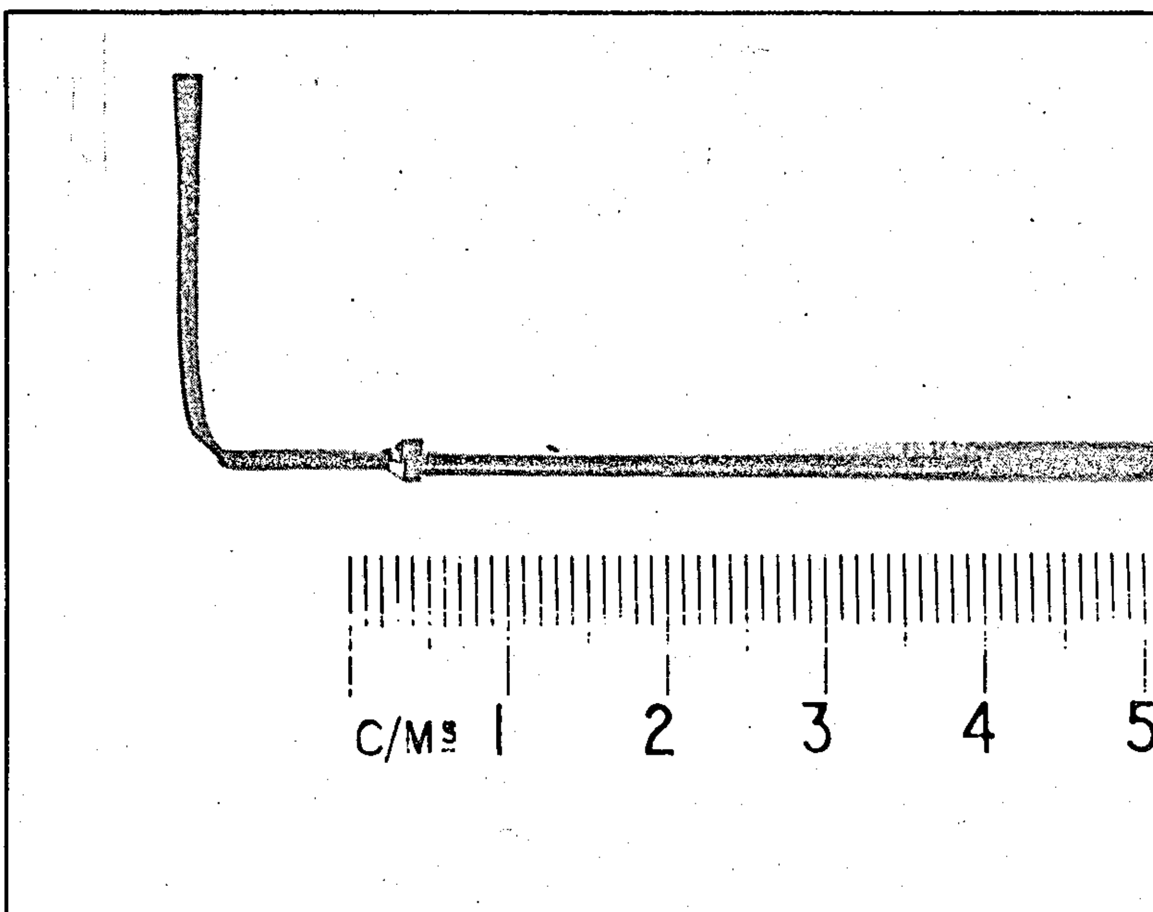


Figure 3.1.1 SUMMARY OF TESTS CONDUCTED

Diffuser No.	AR_{1-2}	Entry Conditions	S^*	SMALL D/h_2	INTERMEDIATE D/h_2	LARGE D/h_2
1	1.4	FULLY DEVELOPED	1.20	$D/h_2 = 0.5$	$D/h_2 = 1.0$	$D/h_2 = 2.0$
				S = 0.71, 0.94, 1.43, 2.06	S = 0.78, 1.03, 1.34, 1.99	S = 0.62, 0.95, 1.60, 1.99
2	1.6	FULLY DEVELOPED	1.20	$D/h_2 = 0.5$	$D/h_2 = 0.8$	D/h_2
				S = 0.58, 0.77 1.22, 1.82, 1.56	S = 0.71, 0.97, 1.00, 1.79, 1.20	S = 0.67, 1.07, 1.75, 1.29
3	1.8	FULLY DEVELOPED	1.20	$D/h_2 = 0.4$	$D/h_2 = 0.7$	D/h_2
				S = 0.69, 0.96, 1.39, 2.05	S = 0.60, 1.02, 1.61, 2.30	S = 0.69, 0.96, 1.70, 2.29
2	1.6	DISTORTED	2.15	$D/h_2 = 0.5$	$D/h_2 = 0.8$	D/h_2
				S = 0.77, 1.06, 1.30, 1.44, 2.38	S = 0.82, 1.05, 1.50, 2.38	S = 0.73, 1.25, 1.47, 1.98

Fig. 3.2.1 ENTRY VELOCITY PROFILES

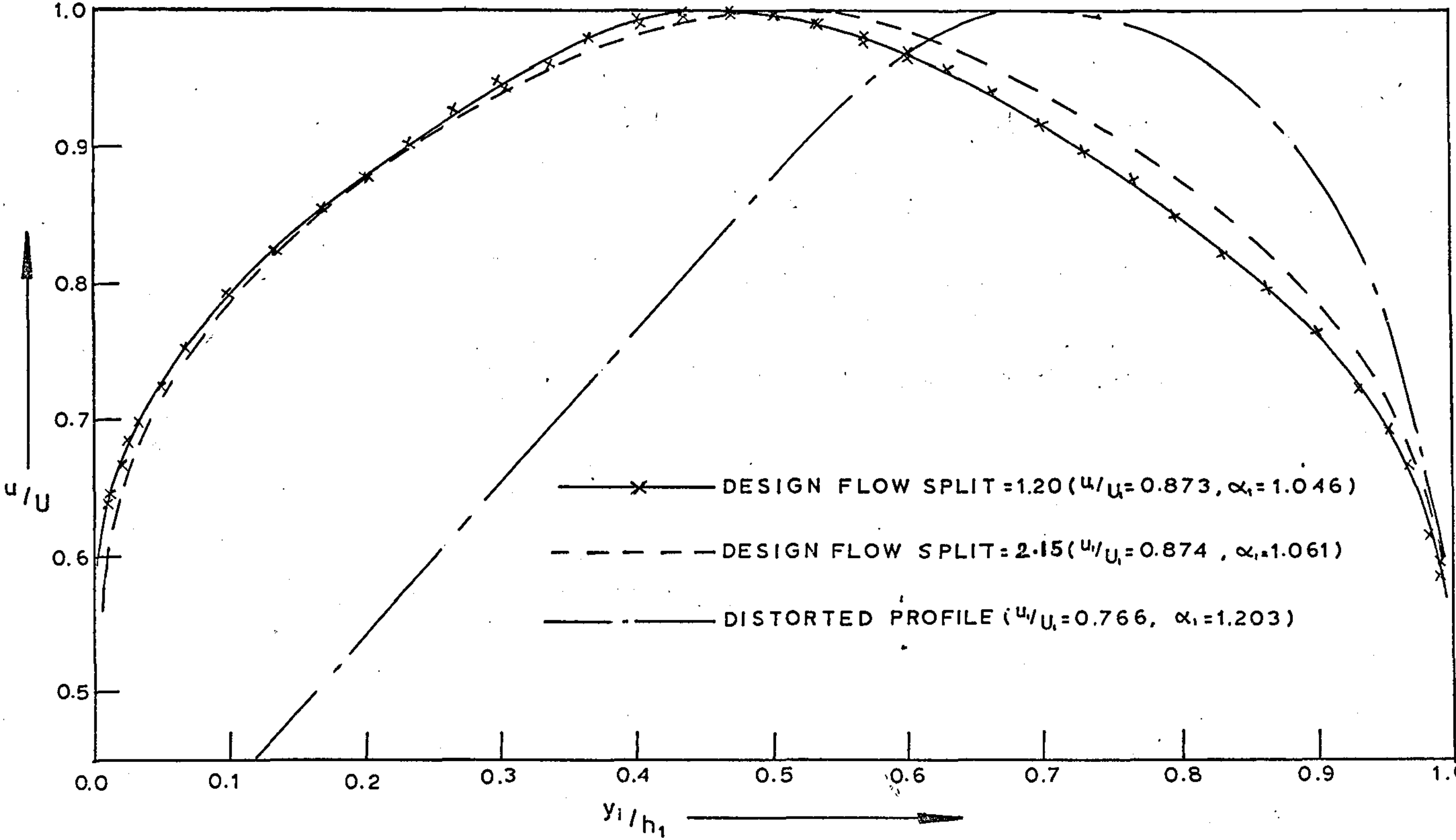
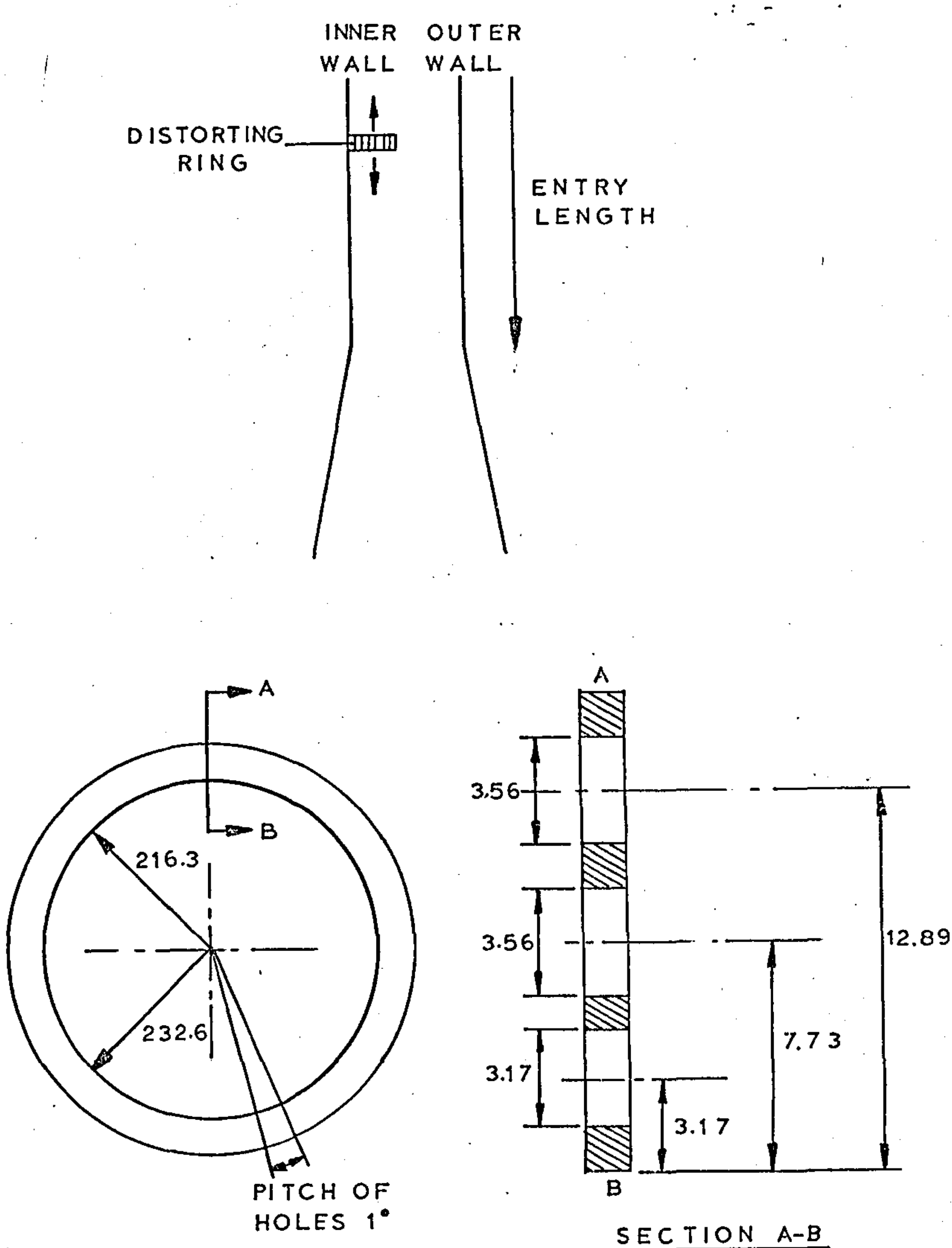
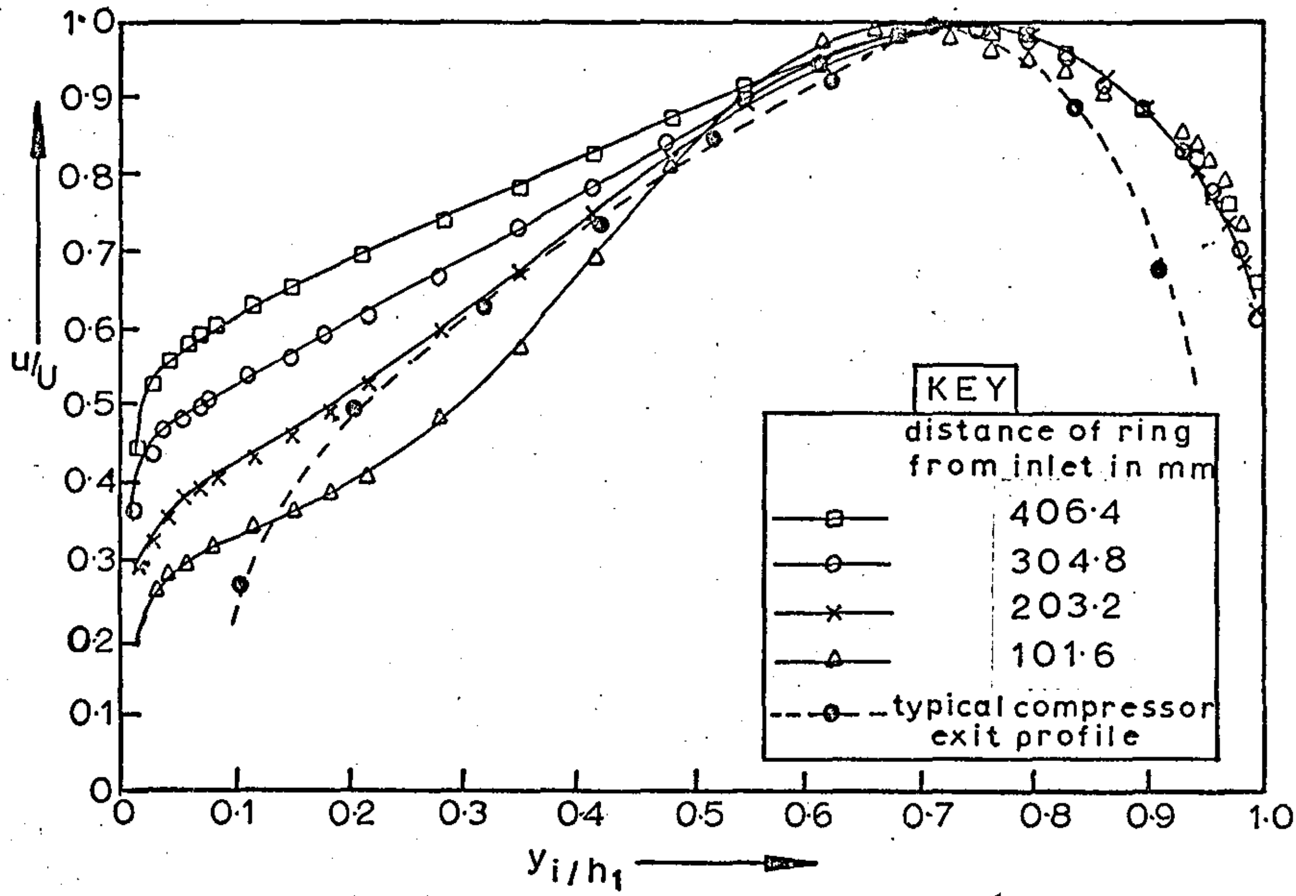


Fig.3.2.2 DETAILS OF THE SYSTEM USED TO GENERATE A DISTORTED ENTRY VELOCITY PROFILE



DIMENSIONS IN m.m.

Fig.3.2.3 SHEAR STRESS AND VELOCITY DISTRIBUTIONS AT INLET FOR VARIOUS RING POSITIONS



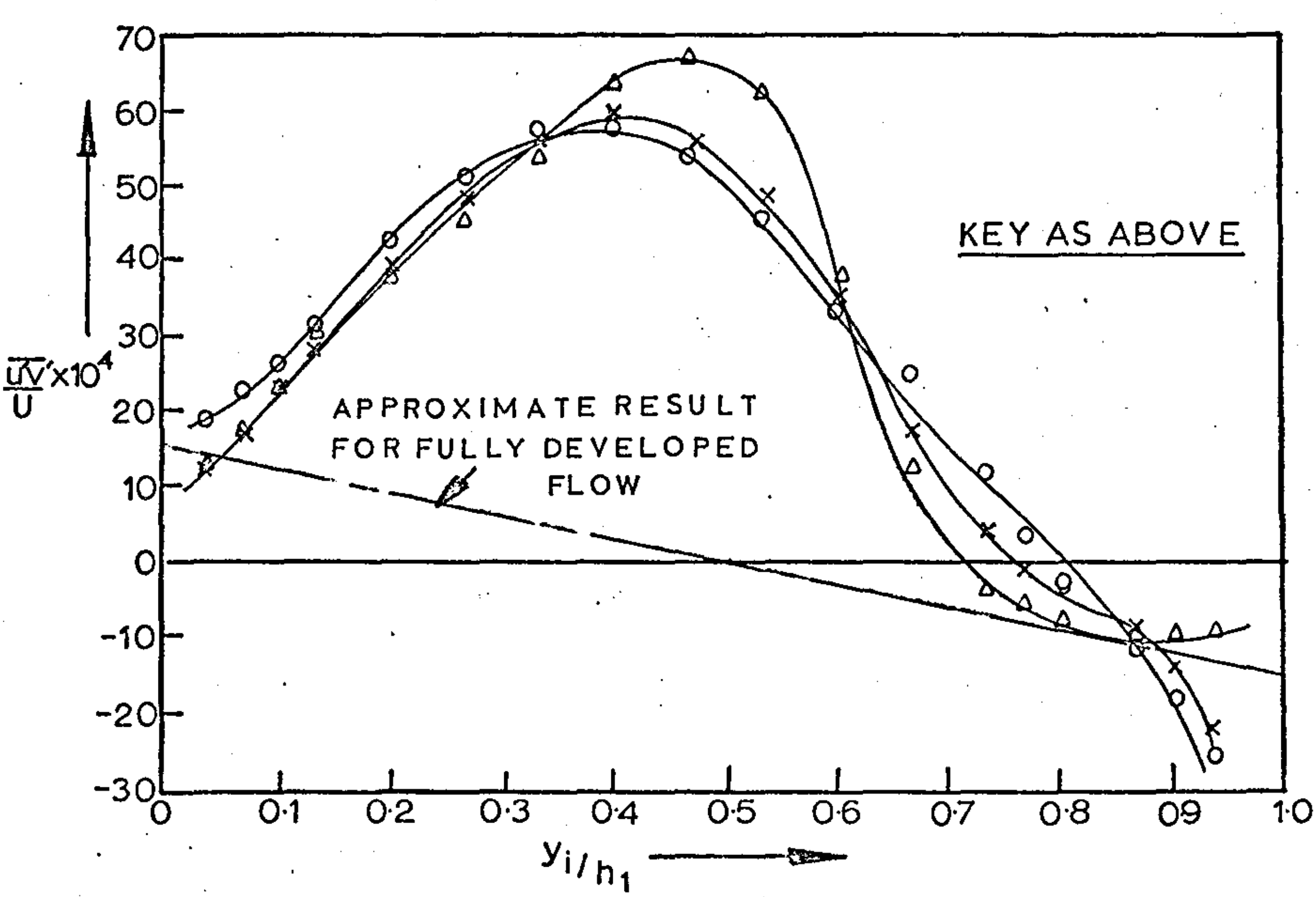
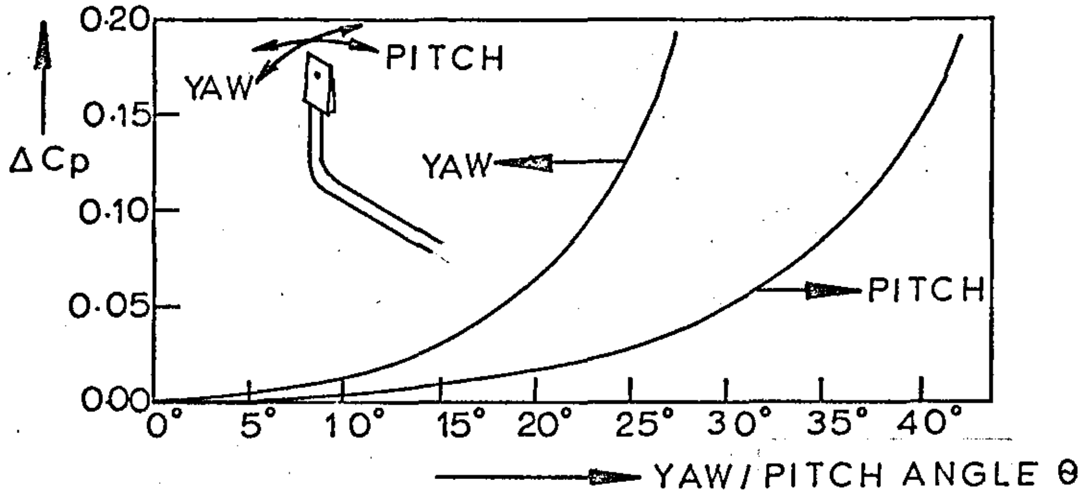


Fig. 3.4.1 CALIBRATION OF PRESSURE PROBES AT INCIDENCE

WEDGE STATIC PROBE ERROR AT INCIDENCE



ΔC_p = (PRESSURE AT $\theta = 0^\circ$ − PRESSURE AT θ) / $\frac{1}{2}\rho U^2$

PITOT PROBE ERROR AT INCIDENCE

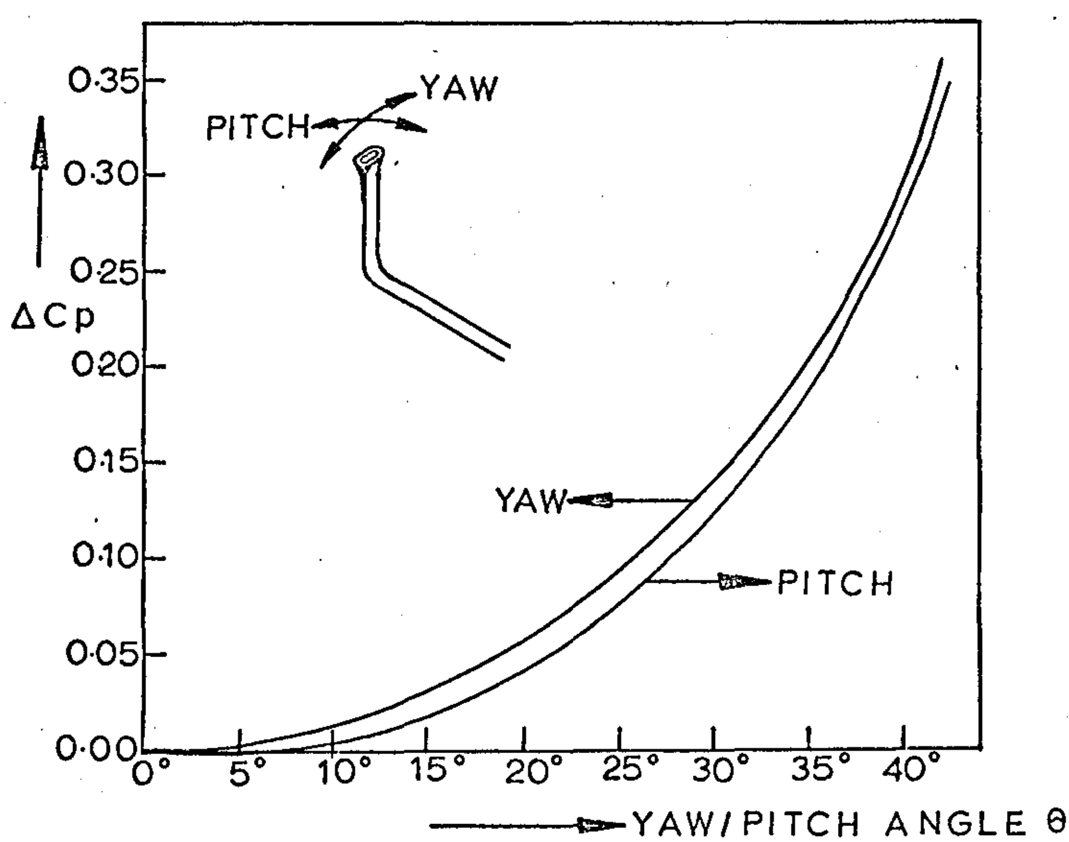
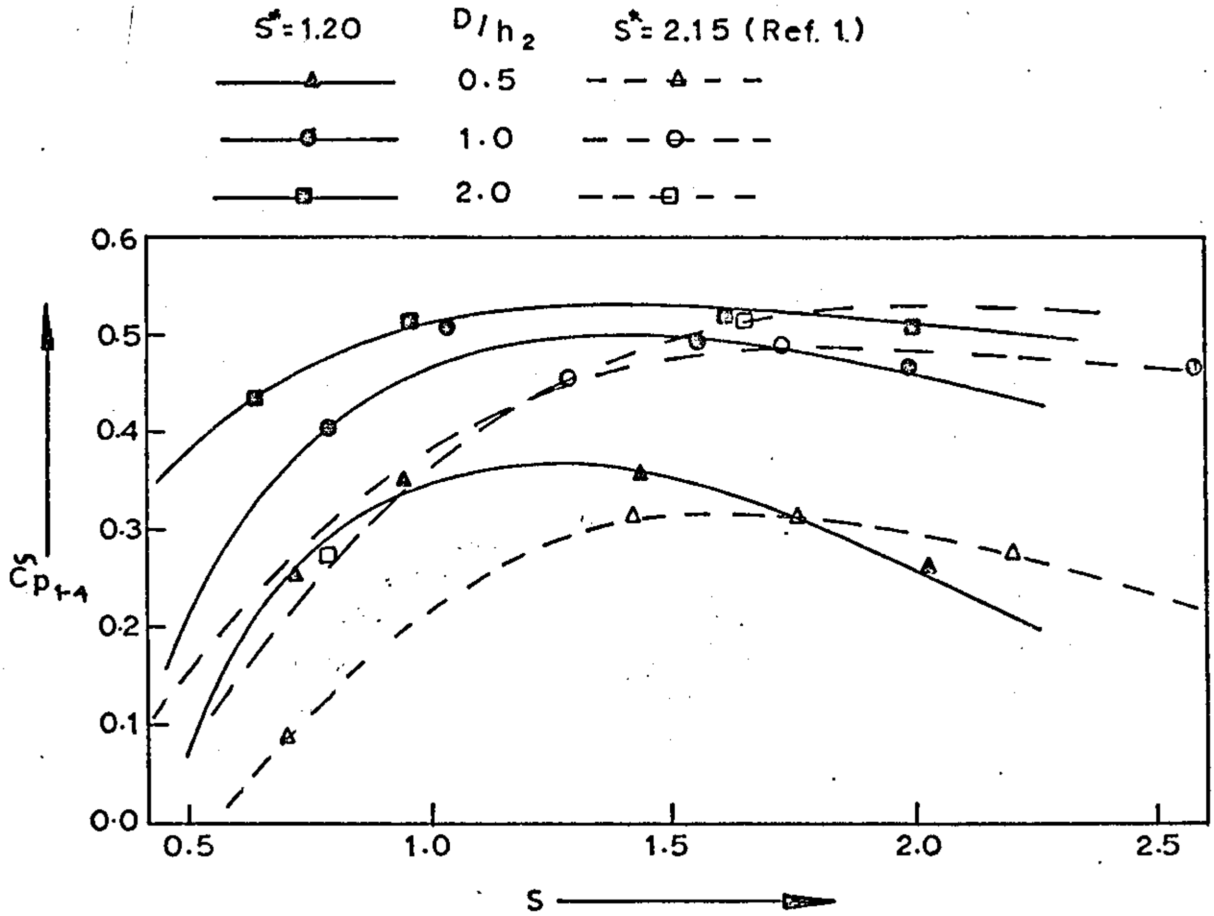


Fig. 4.1.1 OVERALL PERFORMANCE — PRE-DIFFUSER No 1



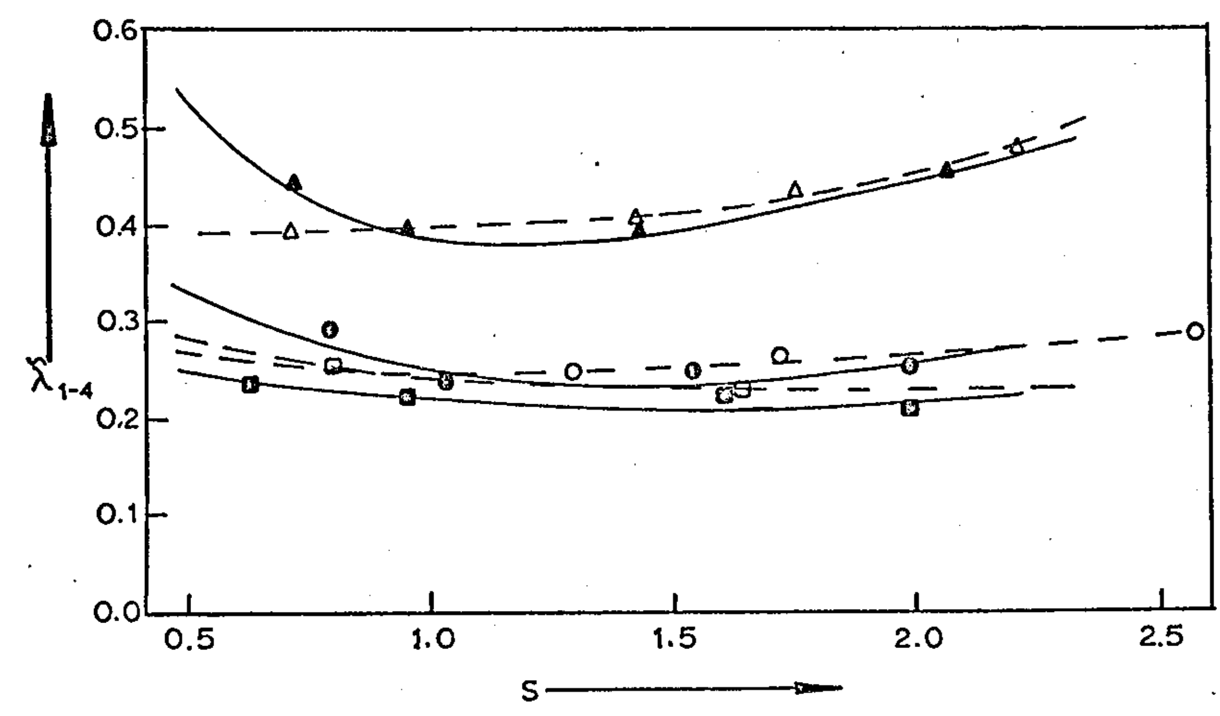


Fig. 4.1.2 OVERALL PERFORMANCE—PRE-DIFFUSER No. 2

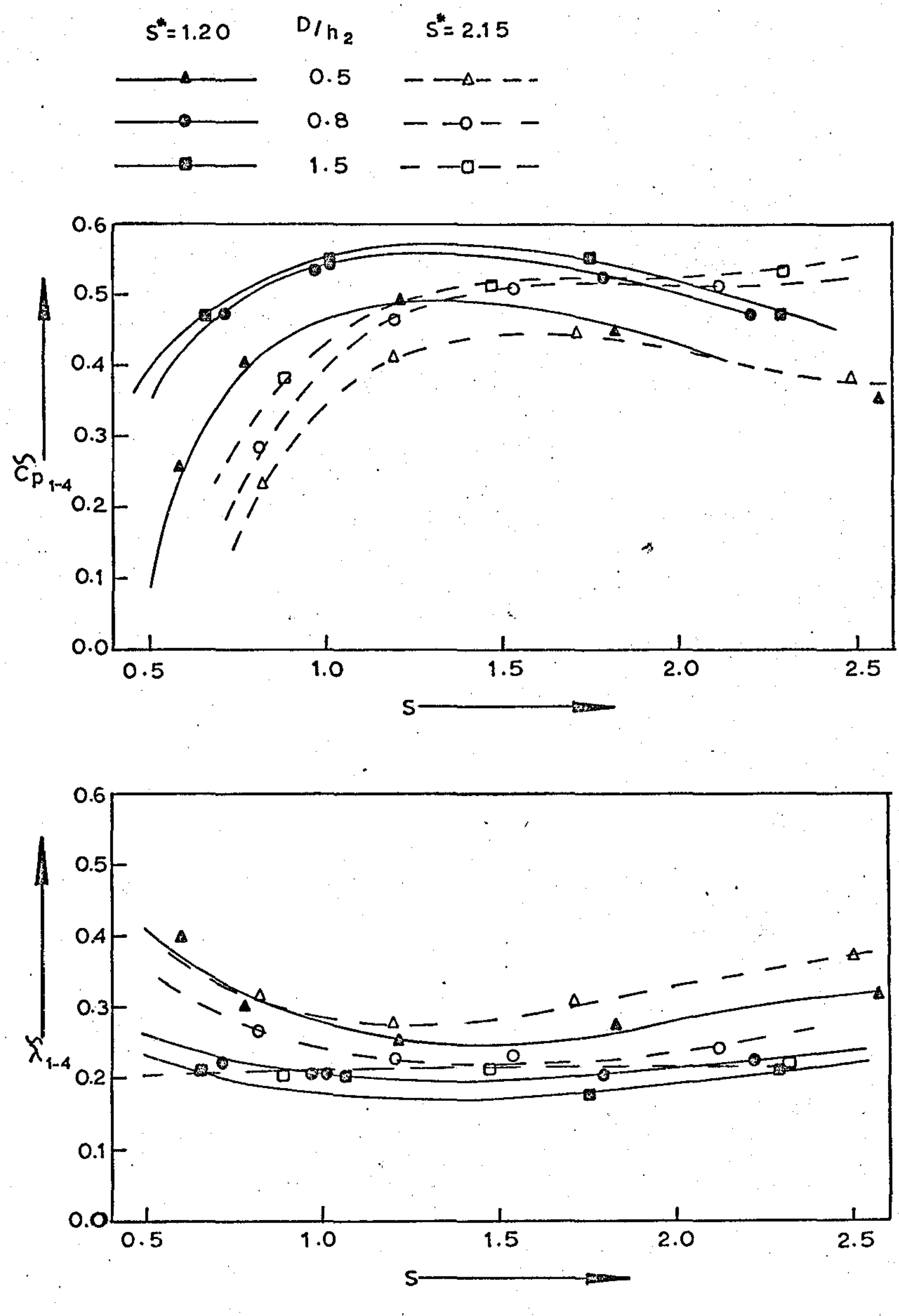


Fig.4.1.3 OVERALL PERFORMANCE — PRE-DIFFUSER No.3

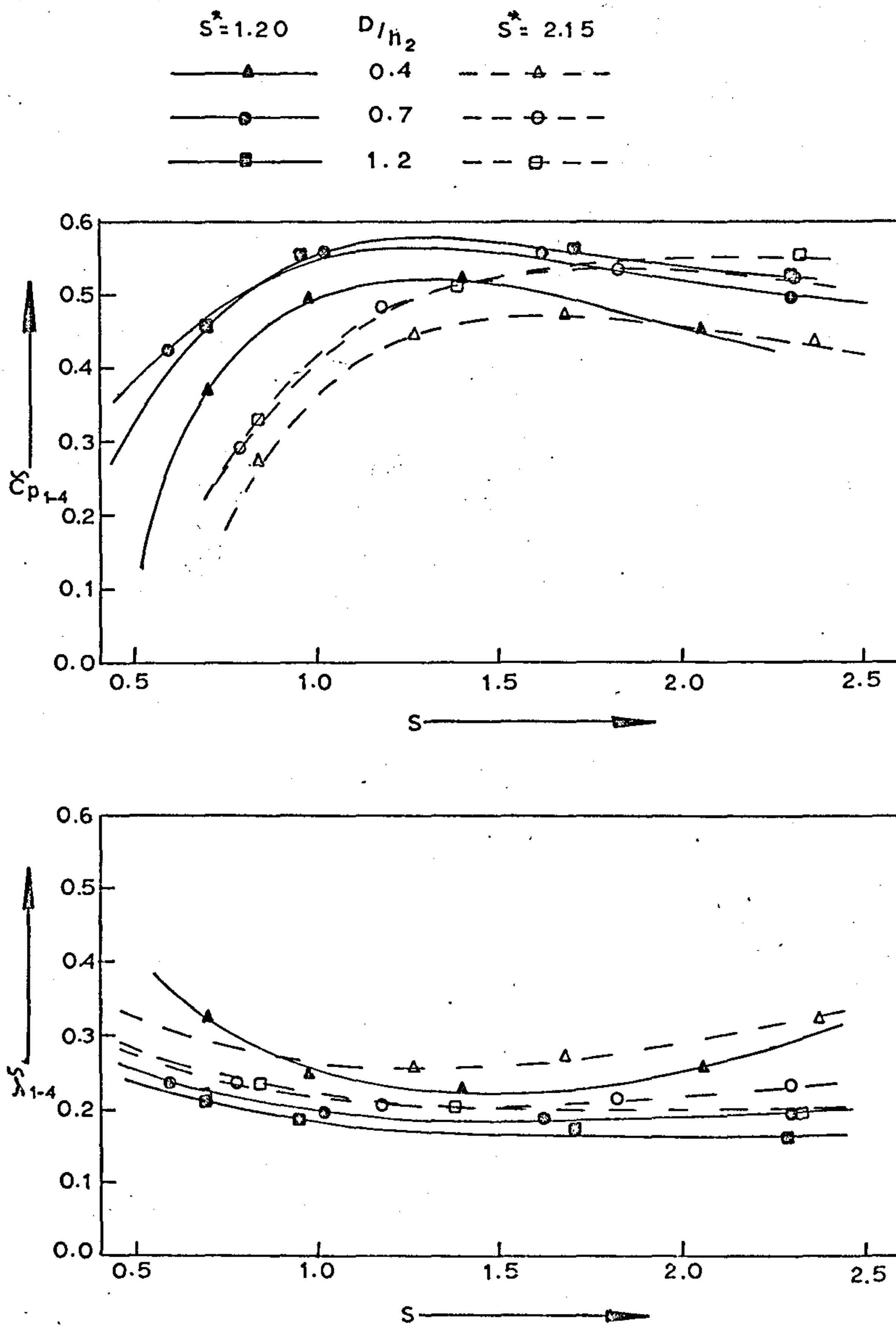
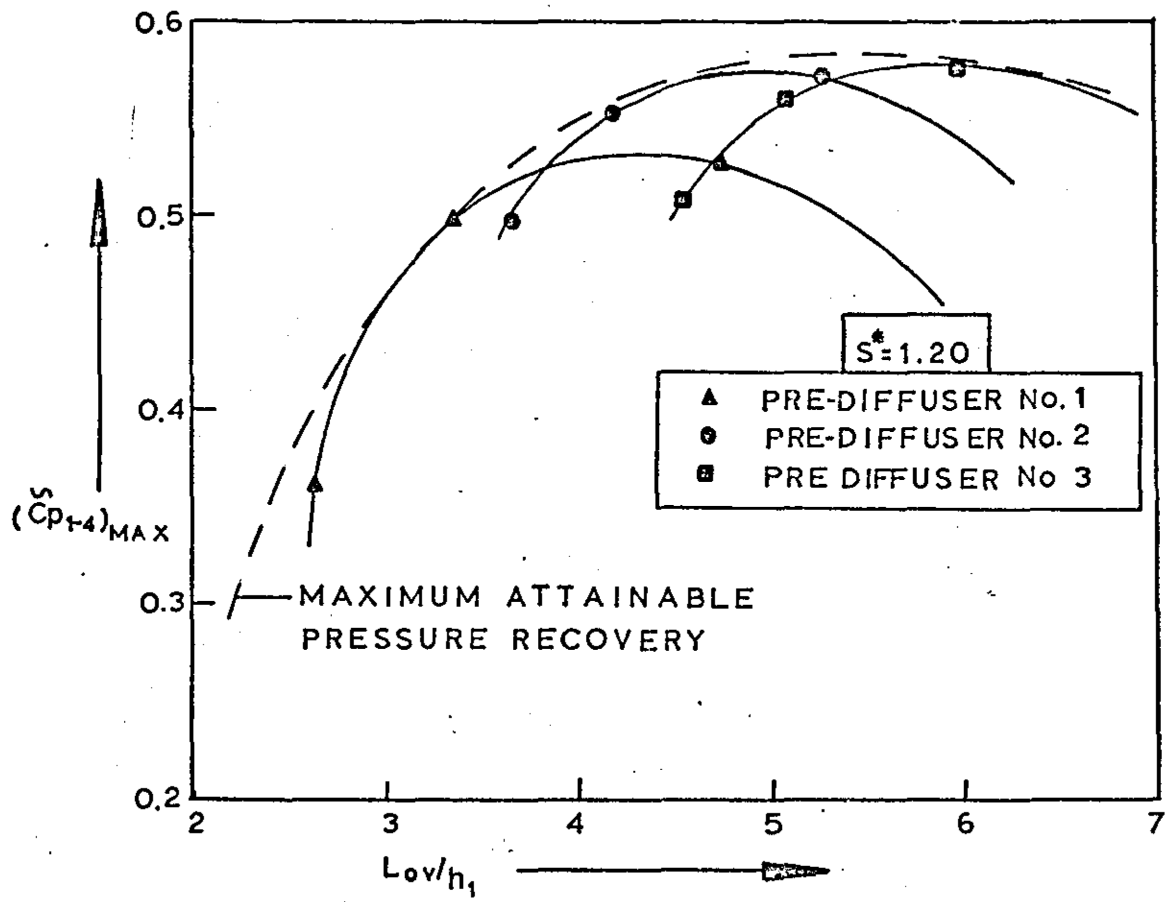


Fig. 4.1.4. VARIATION OF MAXIMUM PRESSURE RECOVERY AND MINIMUM LOSS WITH OVERALL LENGTH



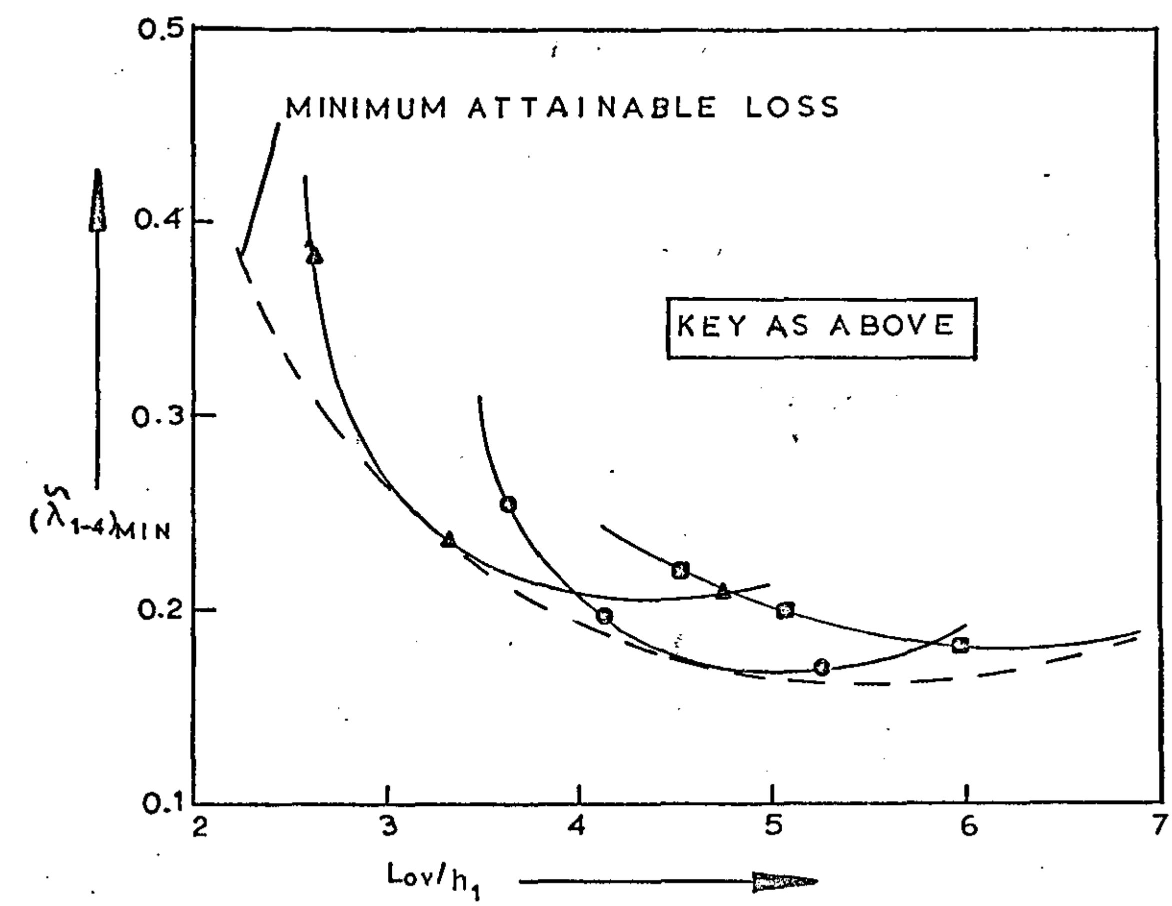


Fig. 4.1.5 EXAMPLE OF THE VARIATION OF INNER AND OUTER OVERALL PRESSURE RECOVERIES WITH FLOW SPLIT

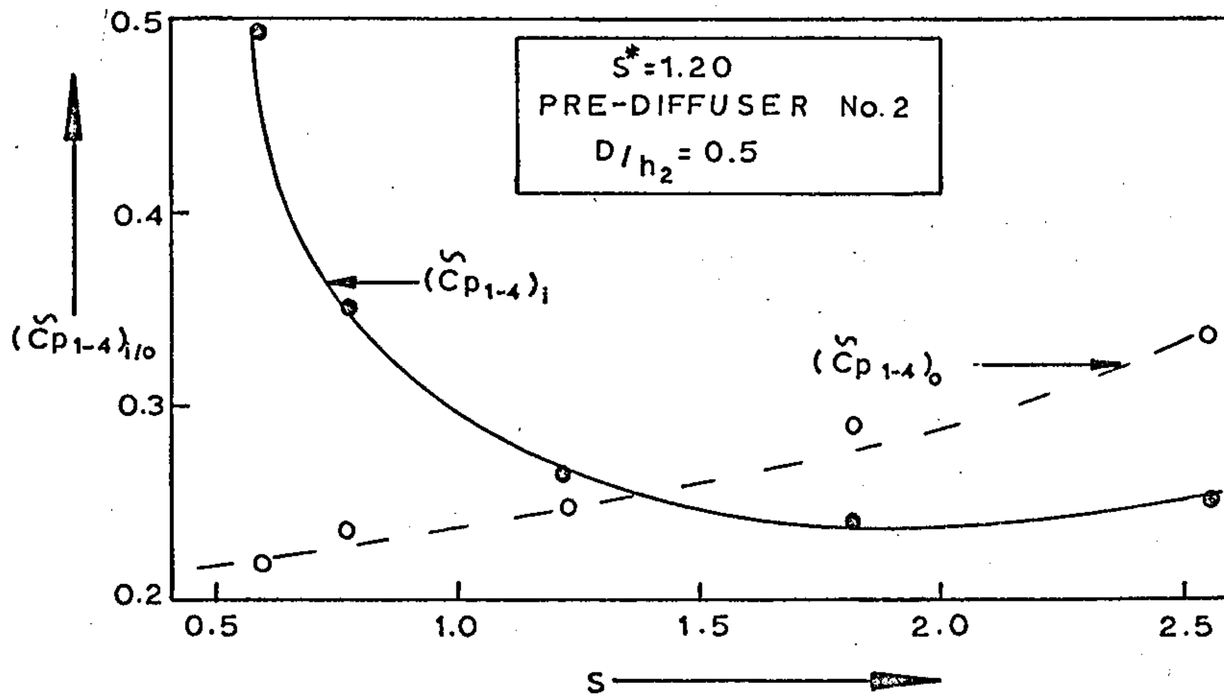


Fig 416 VARIATION OF INNER AND OUTER PRESSURE RECOVERIES WITH OVERALL LENGTH AT OPTIMUM FLOW SPLITS

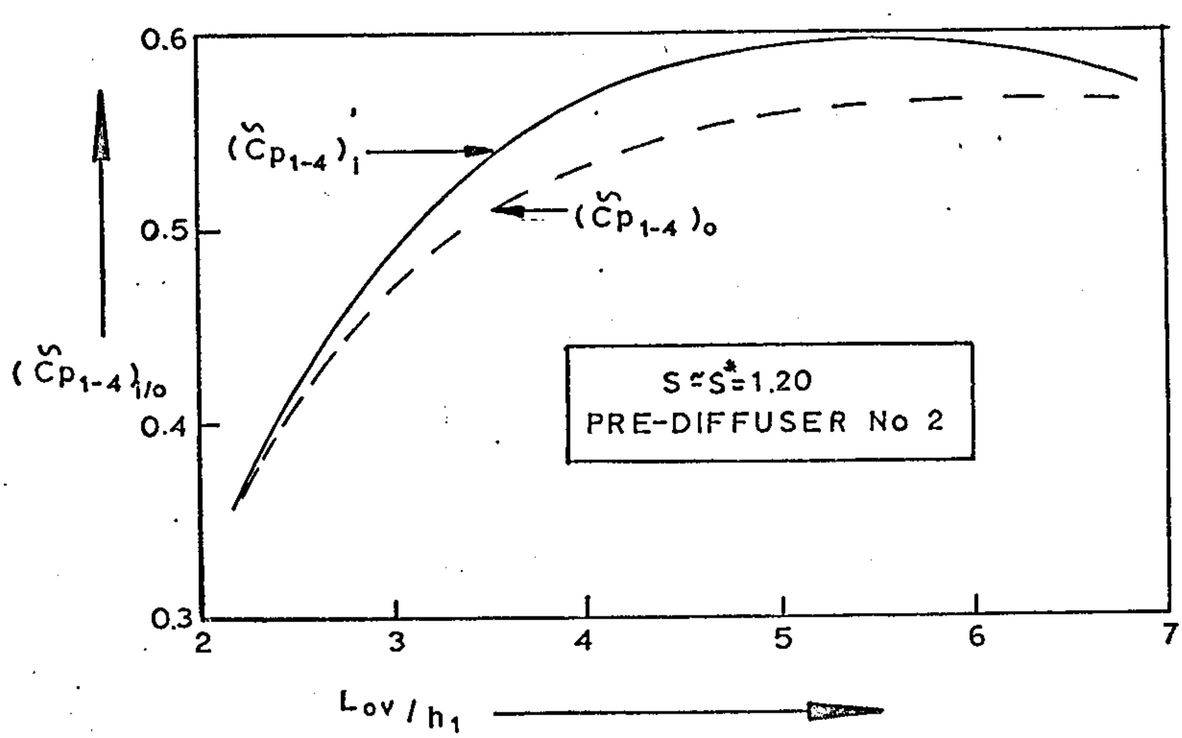


Fig.4.1.7 DESIGN CHART FOR MAXIMUM PRESSURE RECOVERY (S = 0.5–1.4)

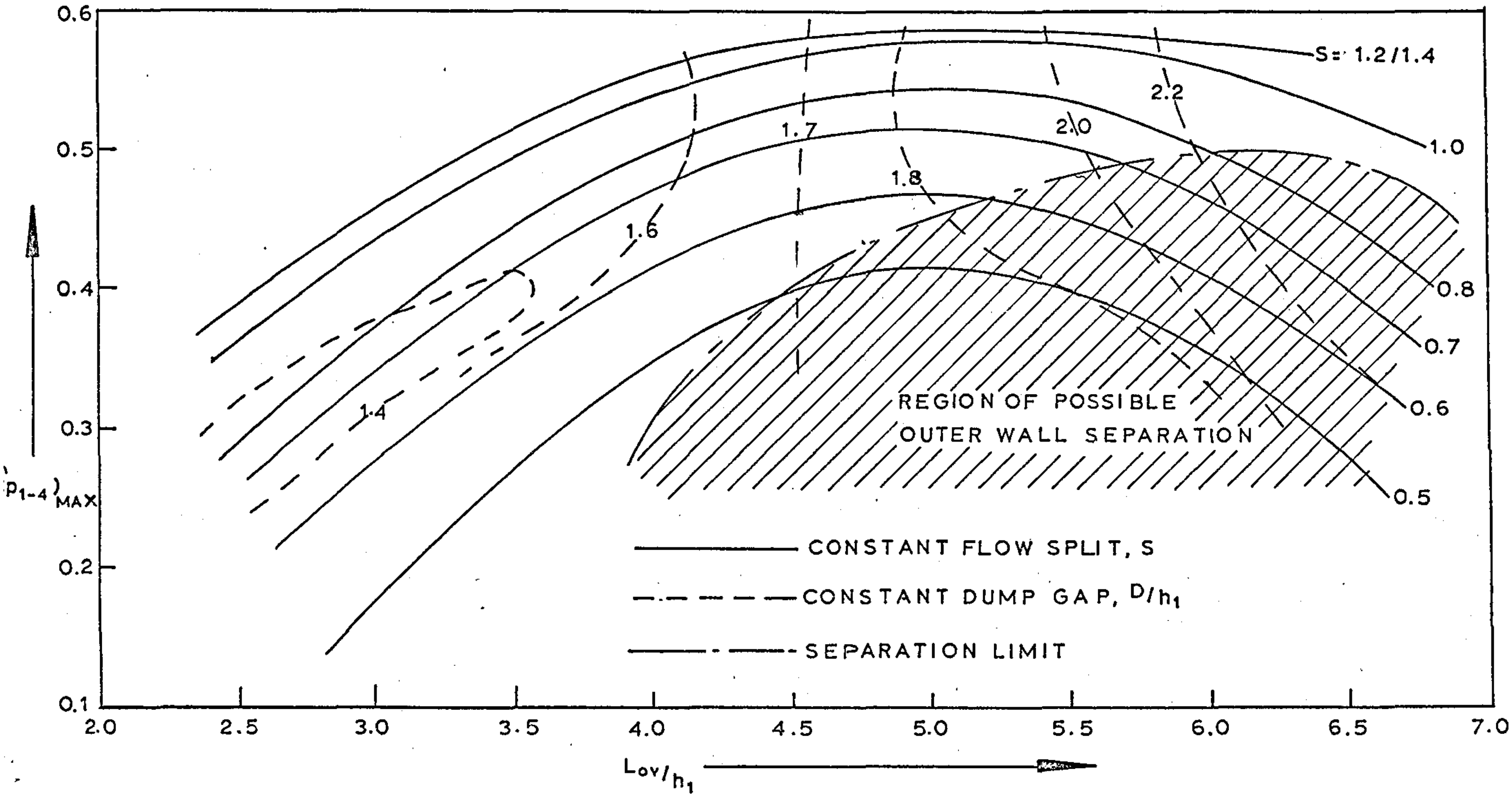


Fig.4.1.8 DESIGN CHART FOR MAXIMUM PRESSURE RECOVERY (S=1.2–2.2)

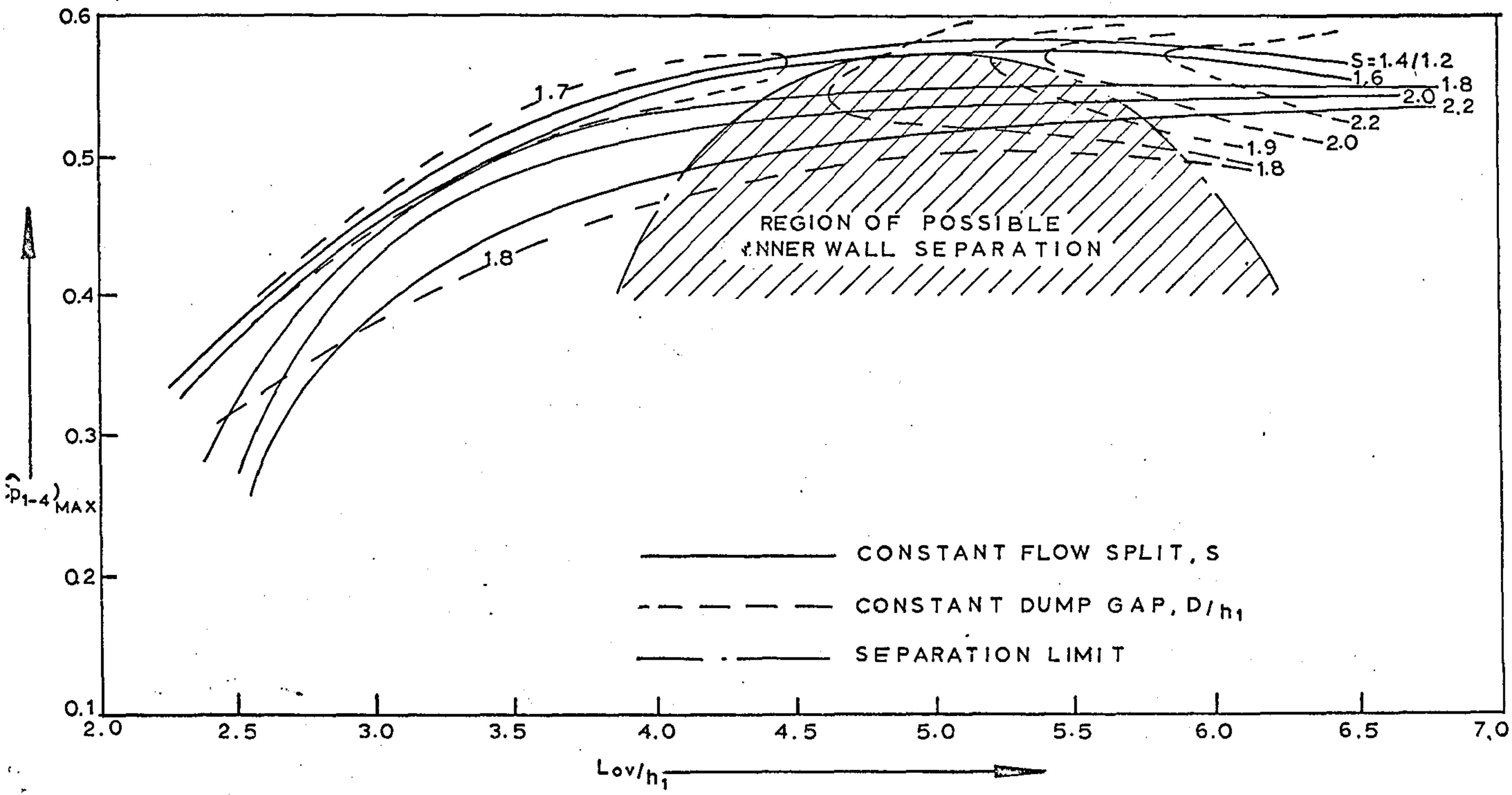


Fig. 4.1.9 DESIGN CHART FOR MINUMUM LOSS

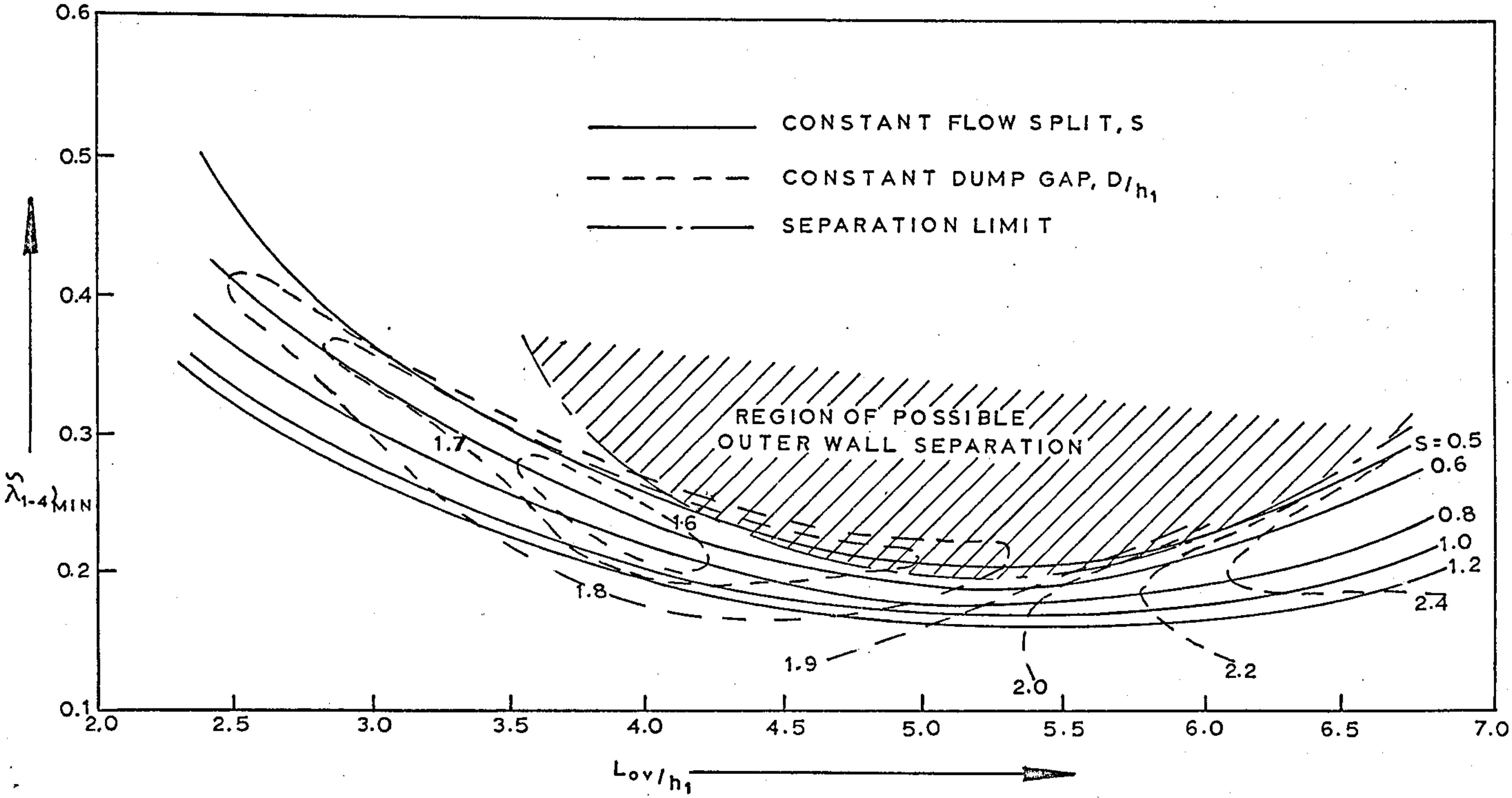


Fig. 4.1.10 EXAMPLES OF PRE-DIFFUSER AND OVERALL PERFORMANCE VARIATION WITH S, L, AND D

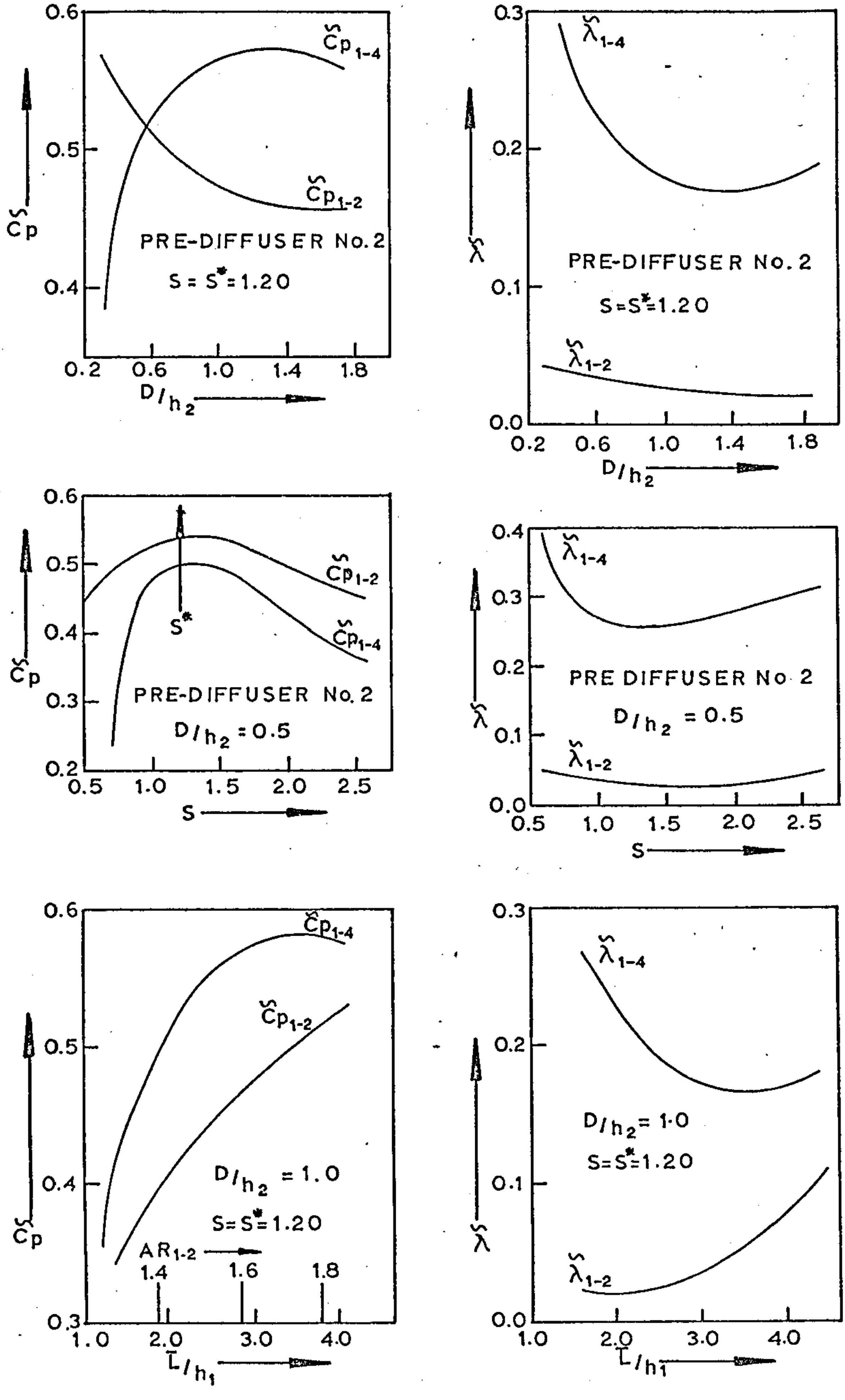
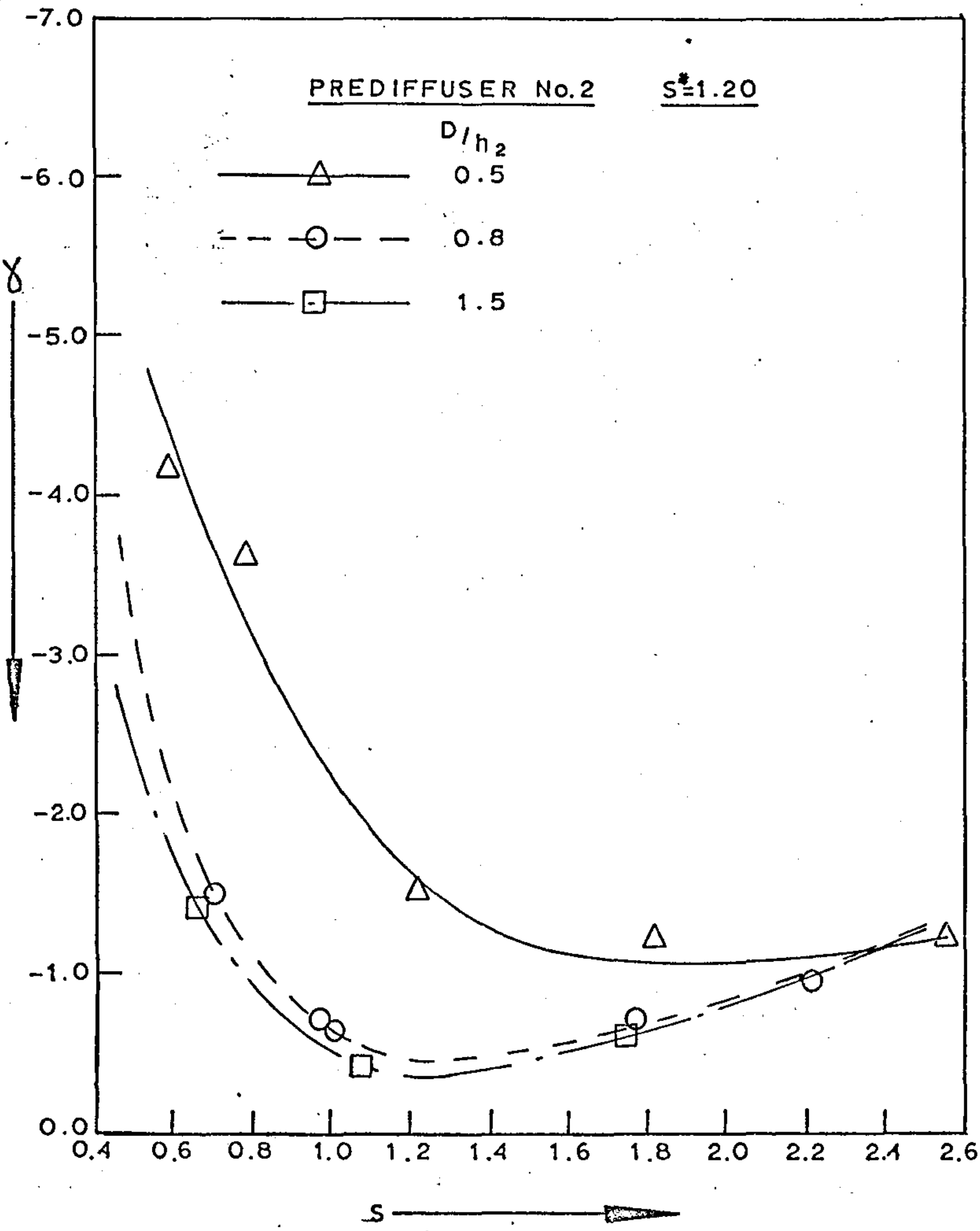


Fig. 4.1.11 GENERAL FLOW STABILITY



$$\text{STABILITY PARAMETER}, \gamma = \left[\frac{\partial (\breve{C}p_{1-4})_i}{\partial \left(\frac{Q_{4i}}{Q_1}\right)} + \frac{\partial (\breve{C}p_{1-4})_o}{\partial \left(\frac{Q_{4o}}{Q_1}\right)}\right]$$

Fig.4.1.12 OVERALL PERFORMANCE—PRE-DIFFUSER No.2

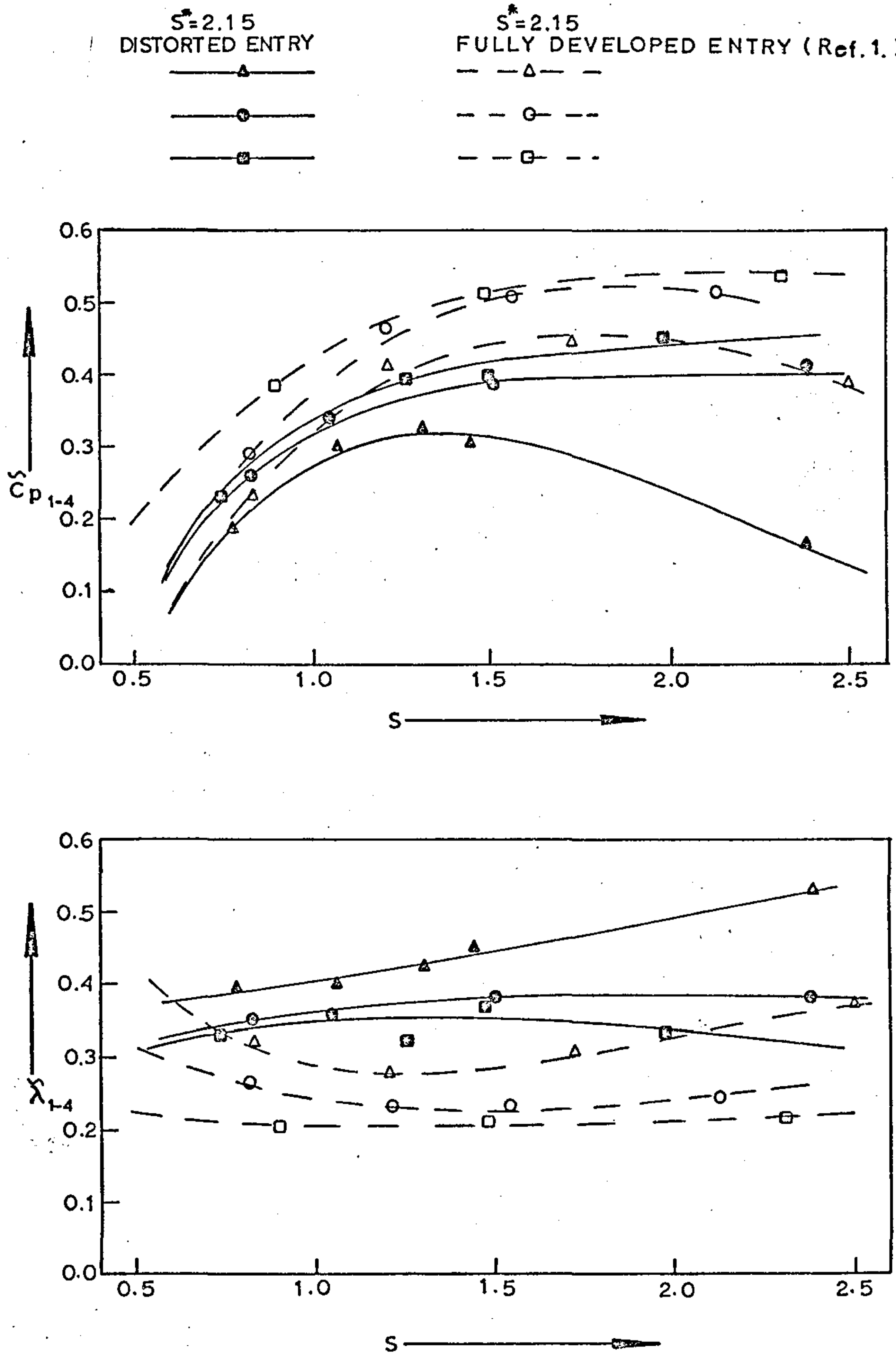


Fig. 4.2.1 EXAMPLE OF THE VARIATION OF PRE-DIFFUSER OUTLET PROFILES WITH DUMP GAP

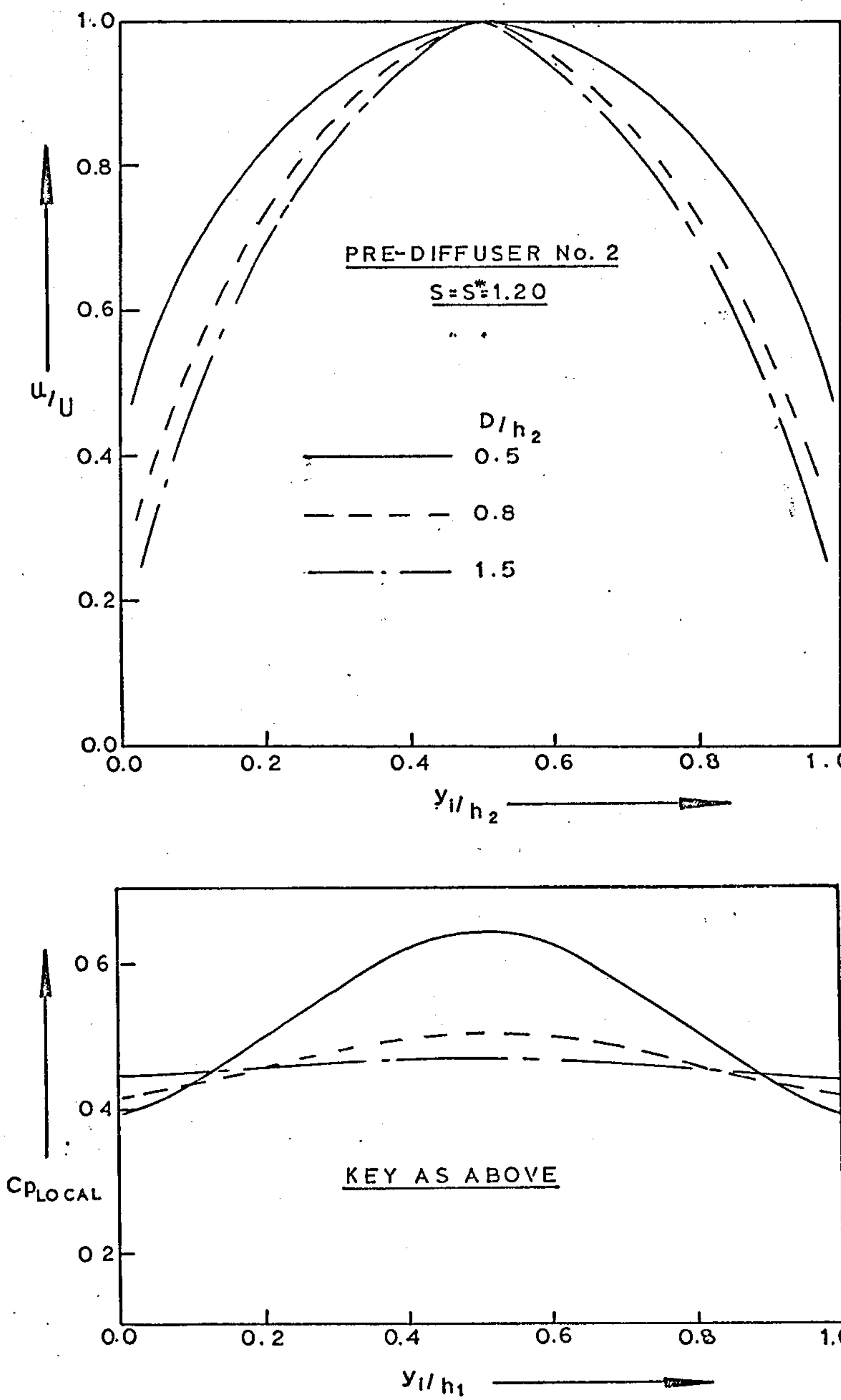


Fig 4.2.2 PRE-DIFFUSER OUTLET PROFILES FOR TEST SERIES 2-0.5

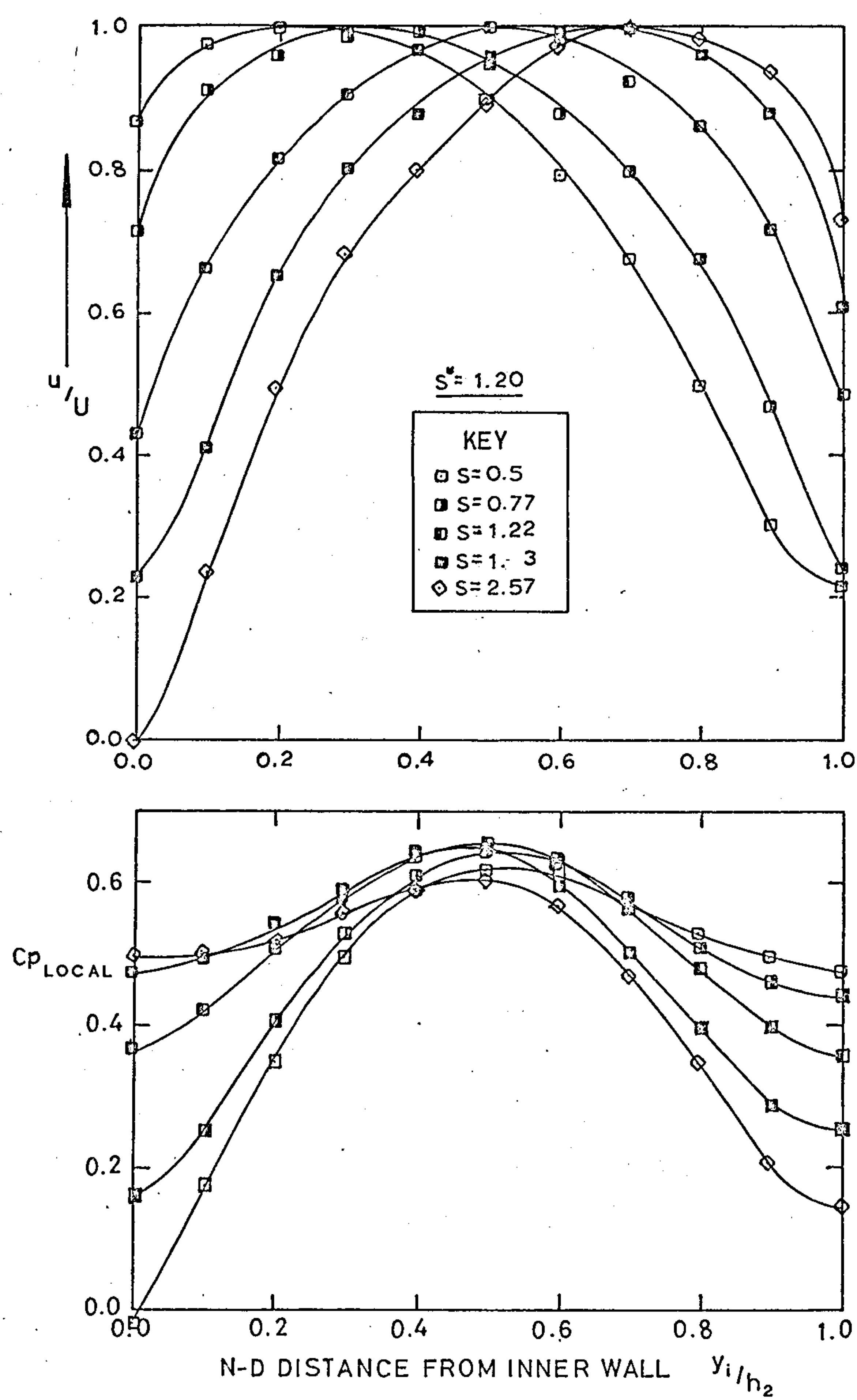


Fig. 4.2.3 PRE-DIFFUSER PERFORMANCE—PRE-DIFFUSER No.1

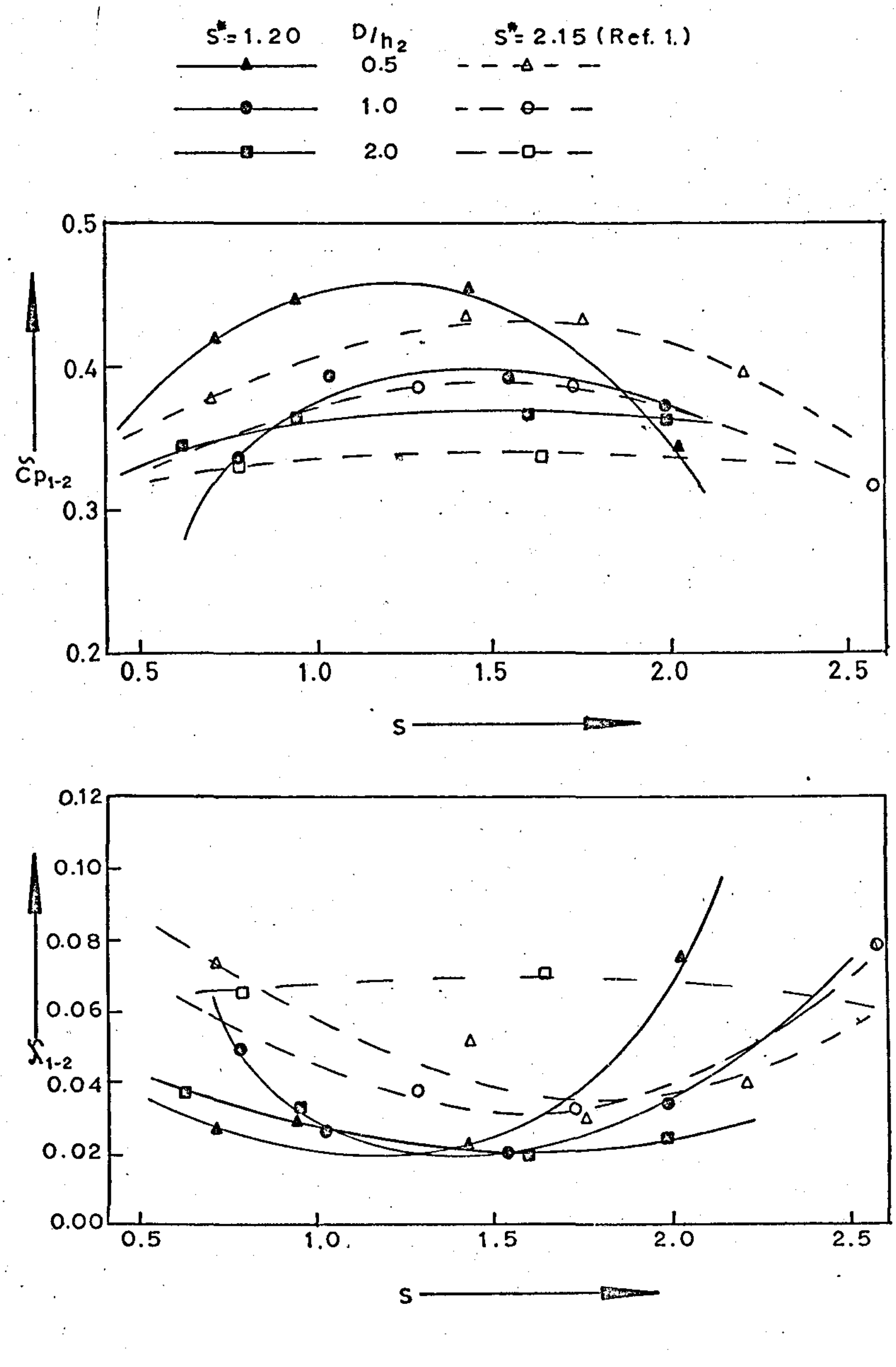


Fig. 4.2.4 PRE-DIFFUSER PERFORMANCE—PRE-DIFFUSER No. 2

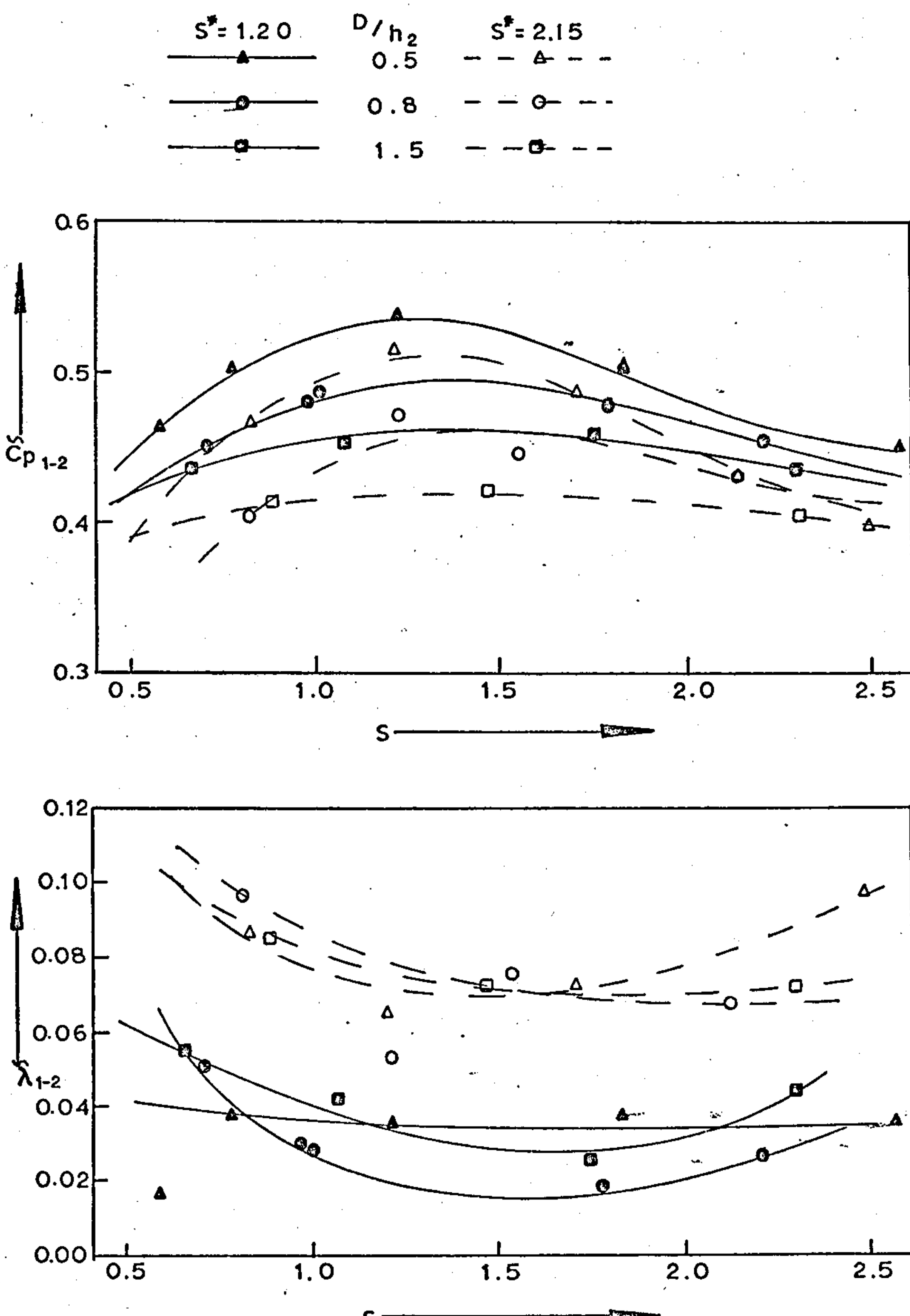


Fig. 4.2.5 PRE-DIFFUSER PERFORMANCE—PRE-DIFFUSER No. 3

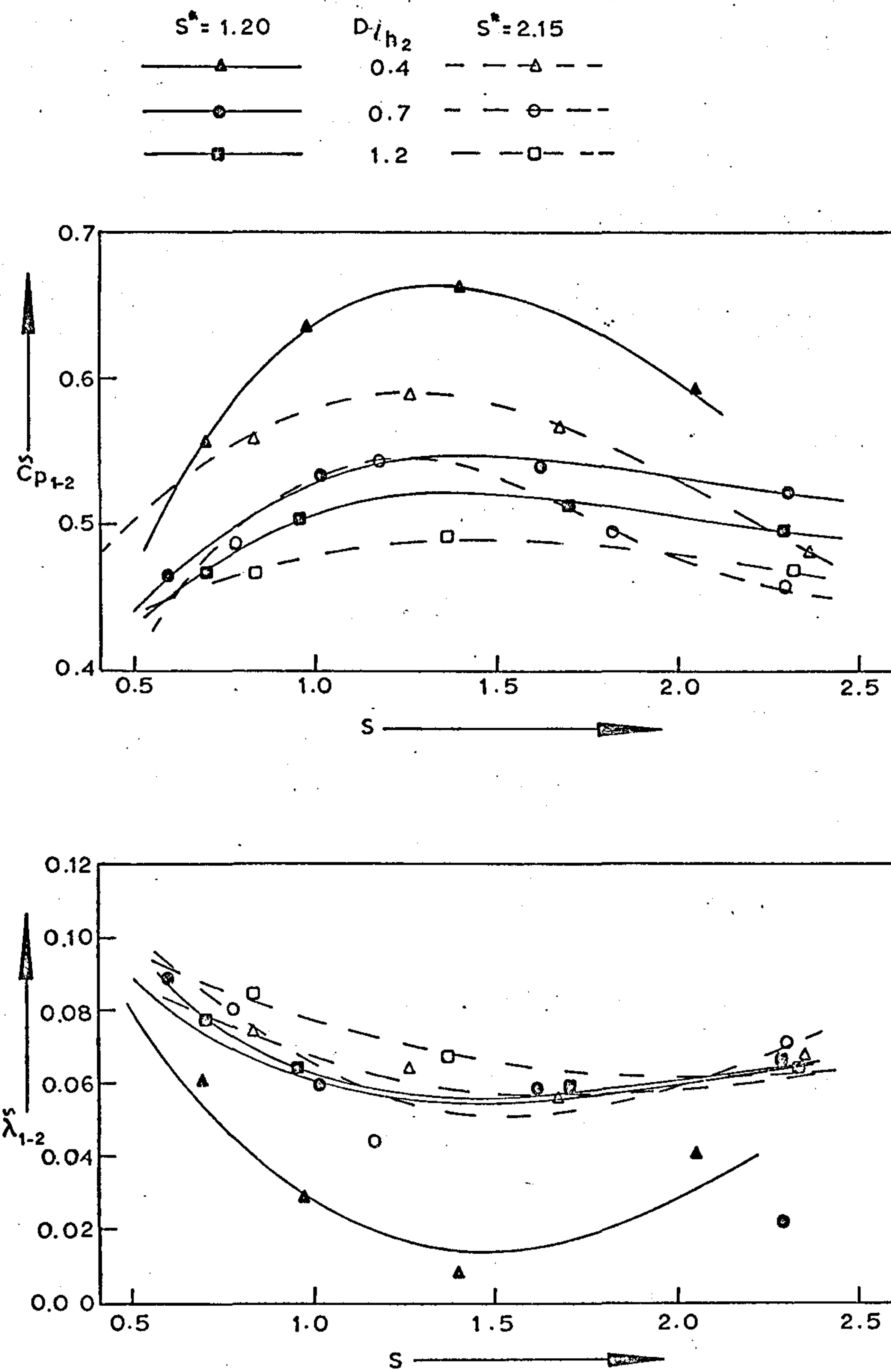
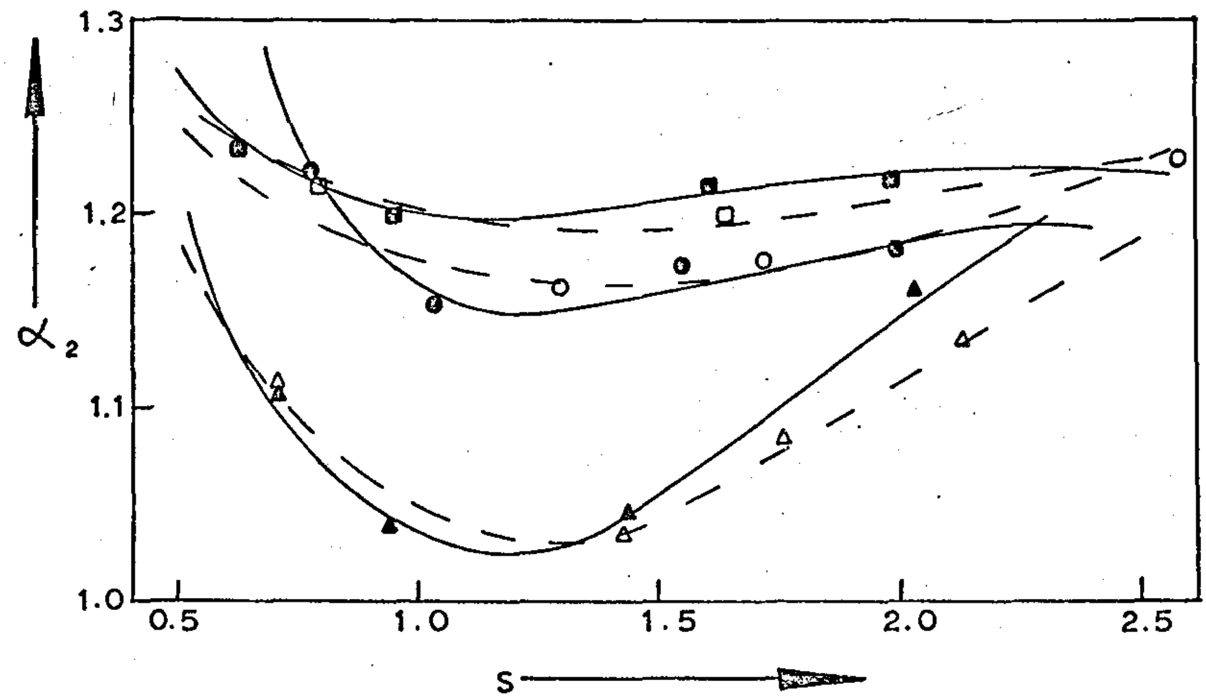


Fig.4.2.6 PRE-DIFFUSER OUTLET FLOW DISTORTION PARAMETERS— PRE DIFFUSER No.1



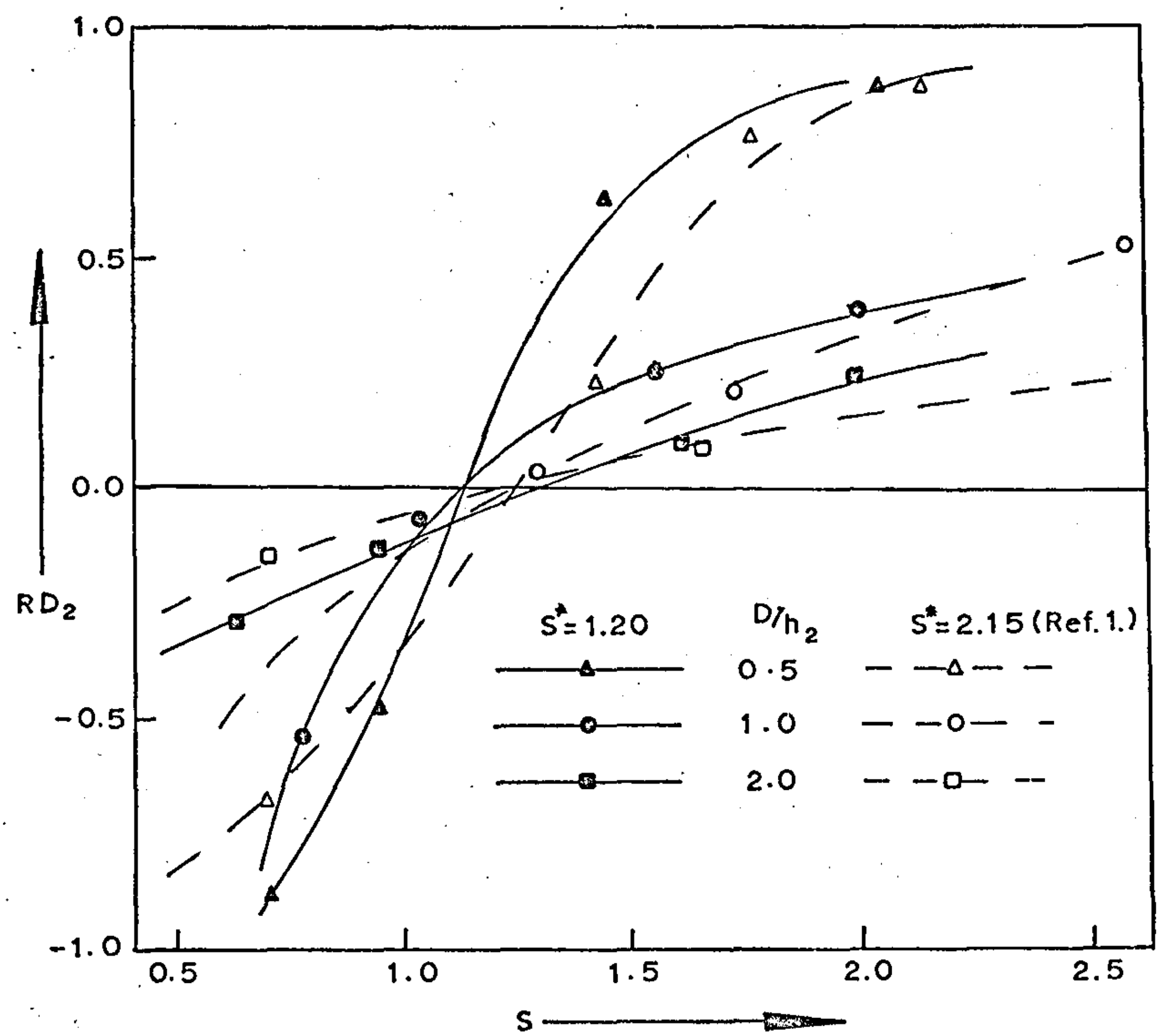


Fig 4.2.7 PRE-DIFFUSER OUTLET FLOW DISTORTION PARAMETERS—PRE-DIFFUSER No.2

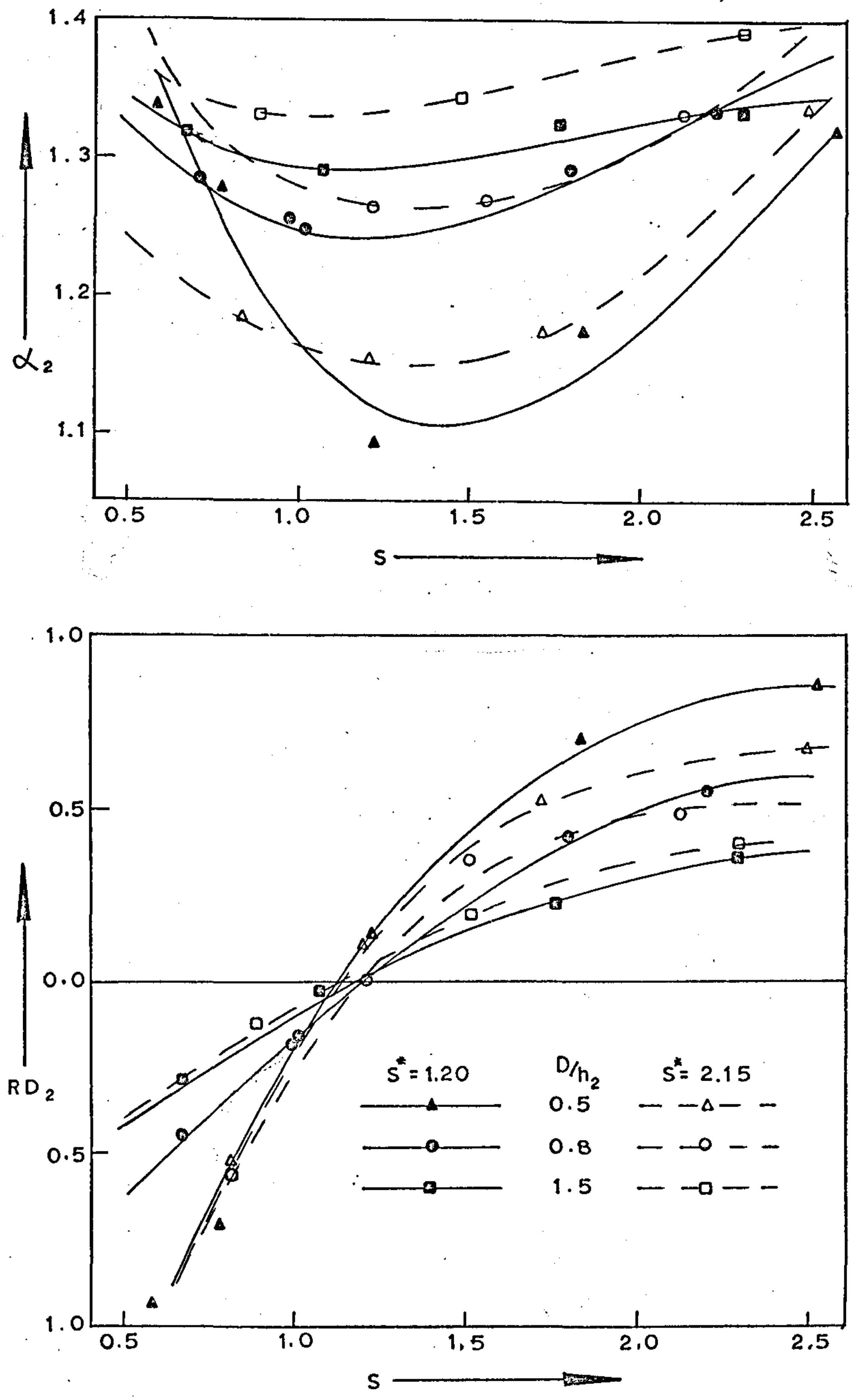
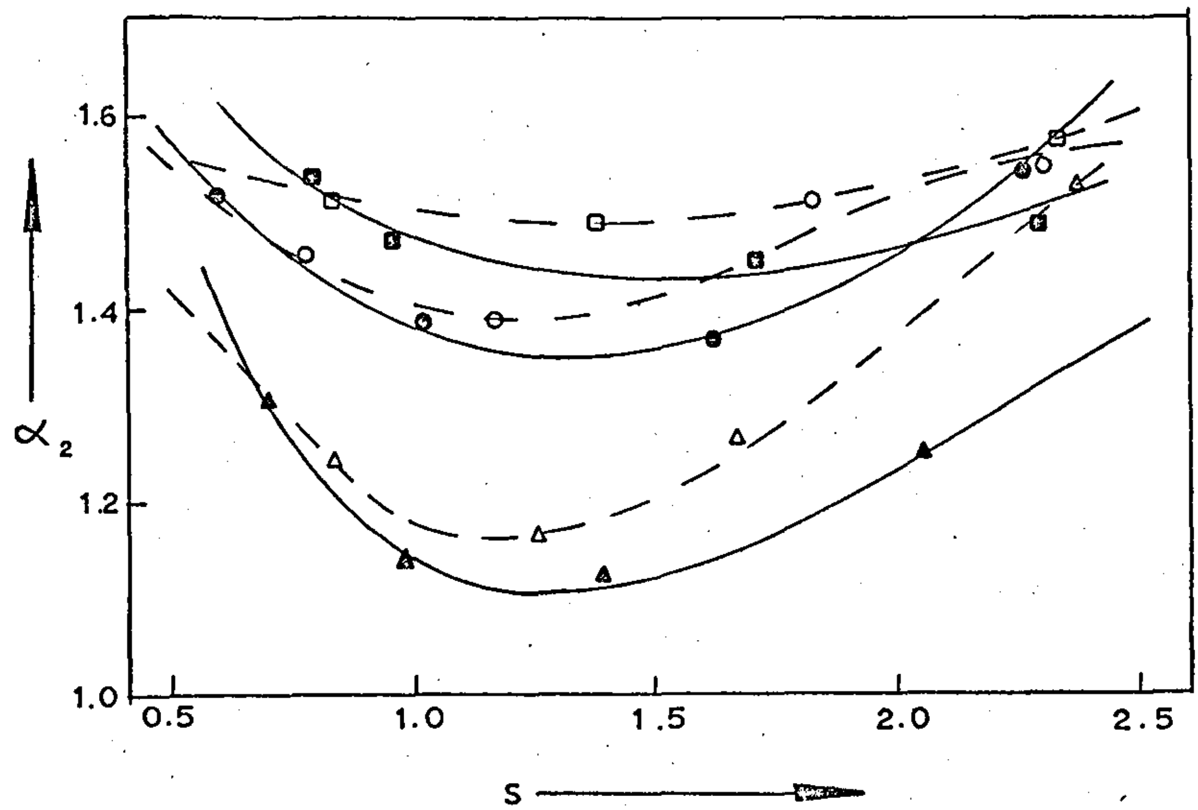


Fig.4.2.8 PRE-DIFFUSER OUTLET FLOW DISTORTION PARAMETERS—PRE-DIFFUSER No 3



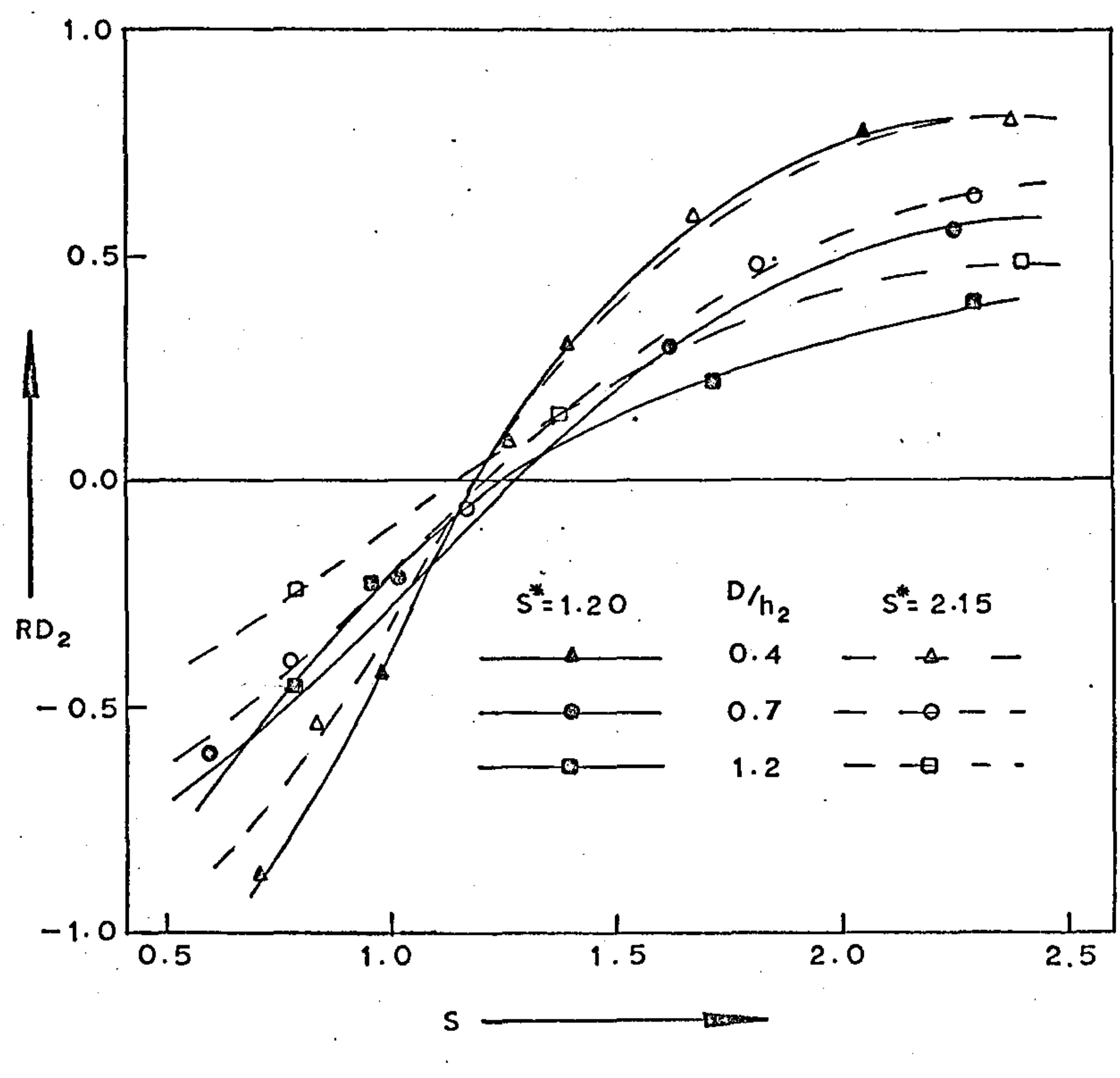
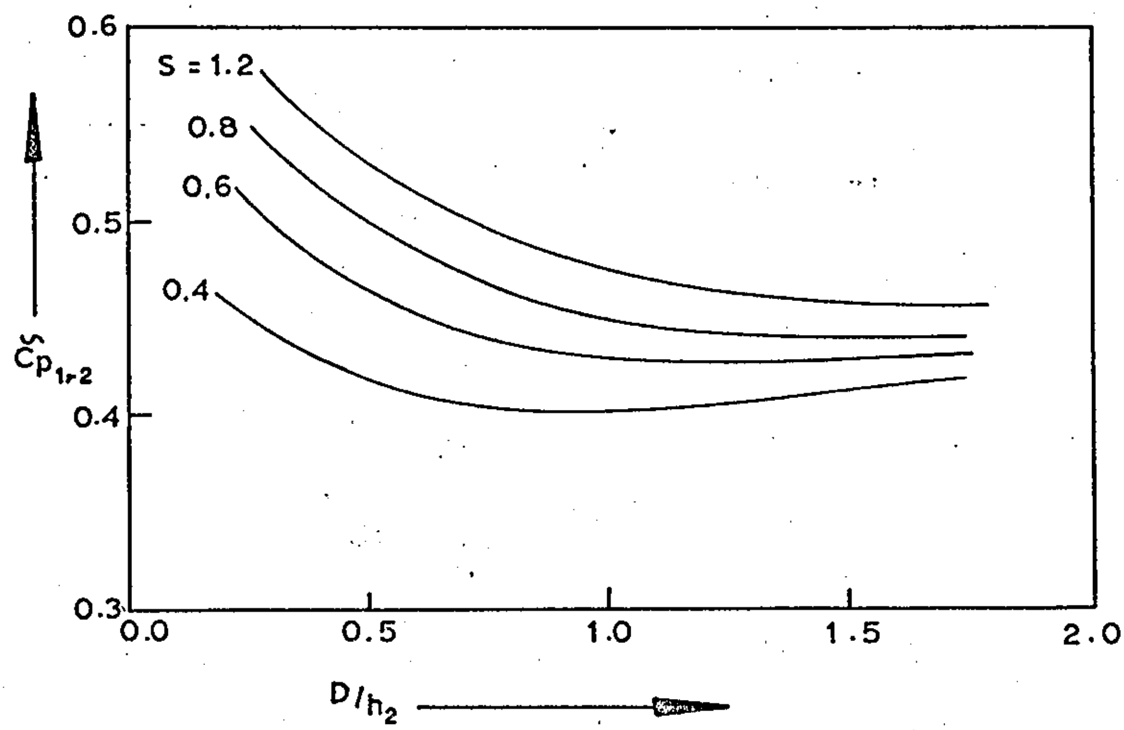


Fig 4.2.9 TYPICAL VARIATION OF PRE-DIFFUSER PRESSURE RECOVERY WITH DUMP GAP

PRE-DIFFUSER No 2 $S^* = 1.20$



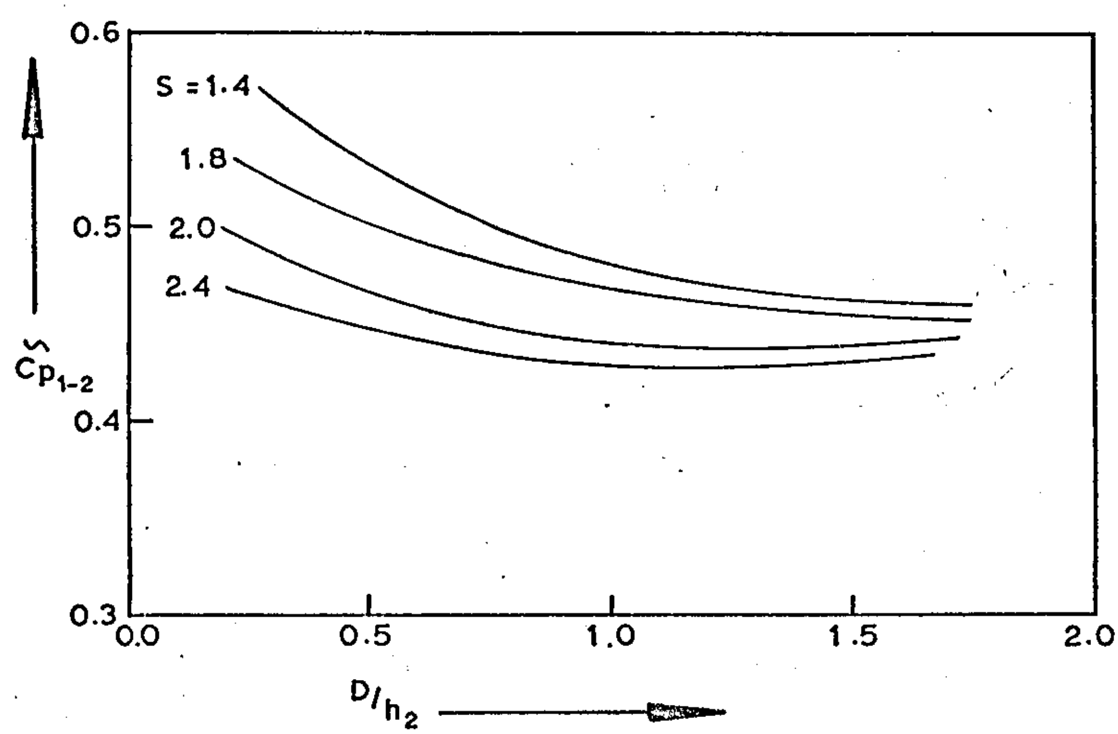
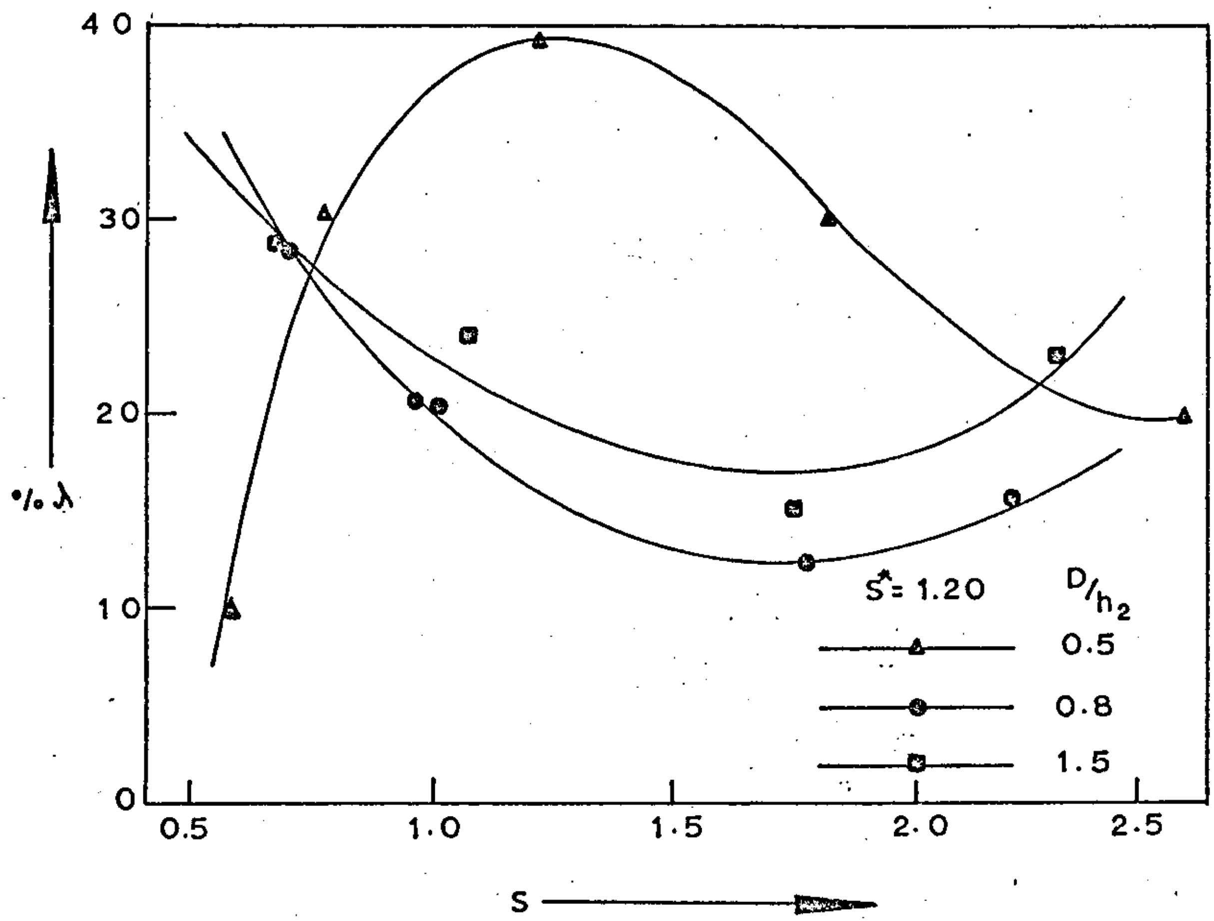


Fig.4.2.10 THE REDUCTION OF PRE-DIFFUSER PRESSURE RECOVERY ATTRIBUTABLE TO LOSS

PRE-DIFFUSER No.2

$$\% \lambda = (\lambda_{1-2}) / (Cp'_{1-2} - Cp_{1-2}) \times 100$$



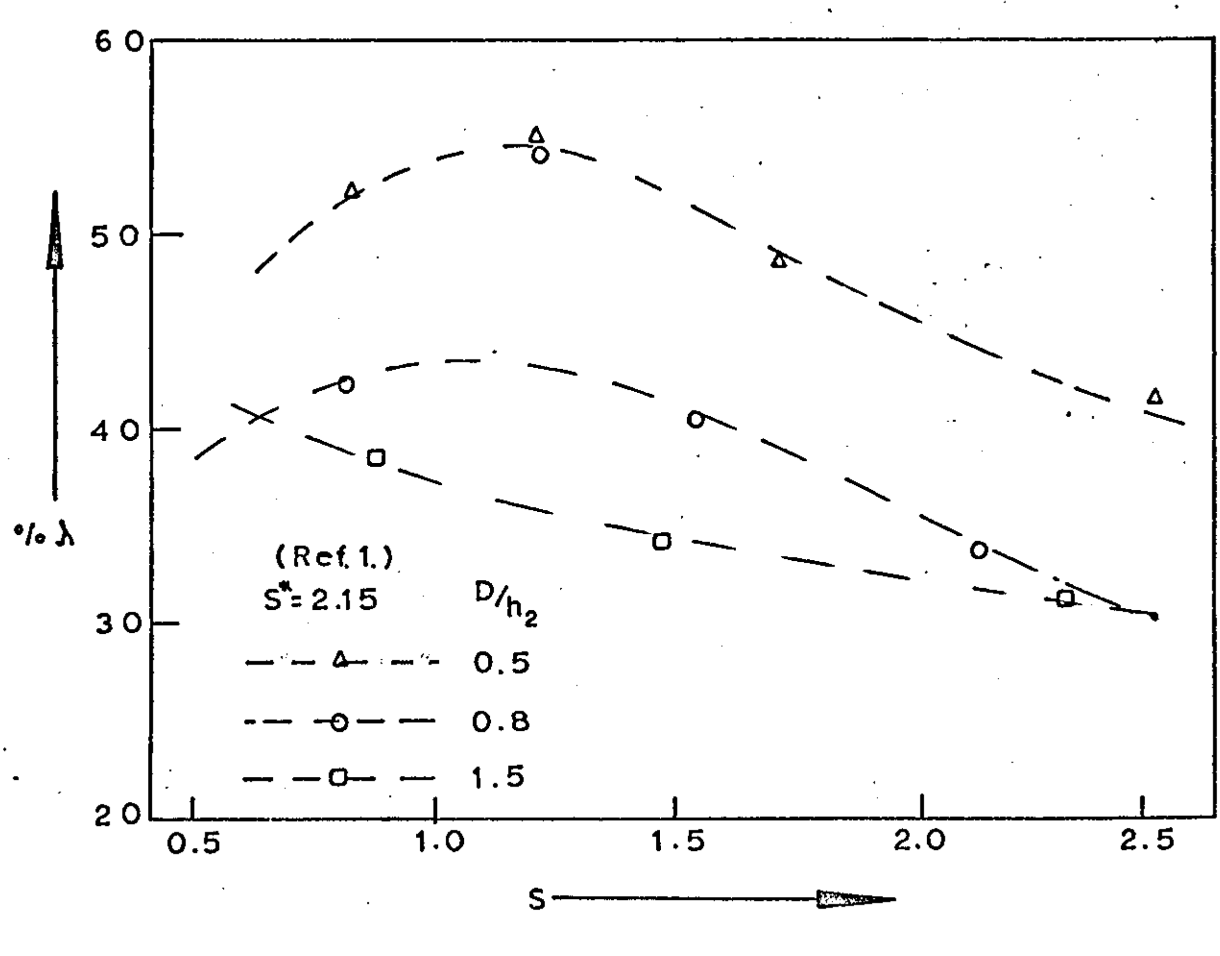
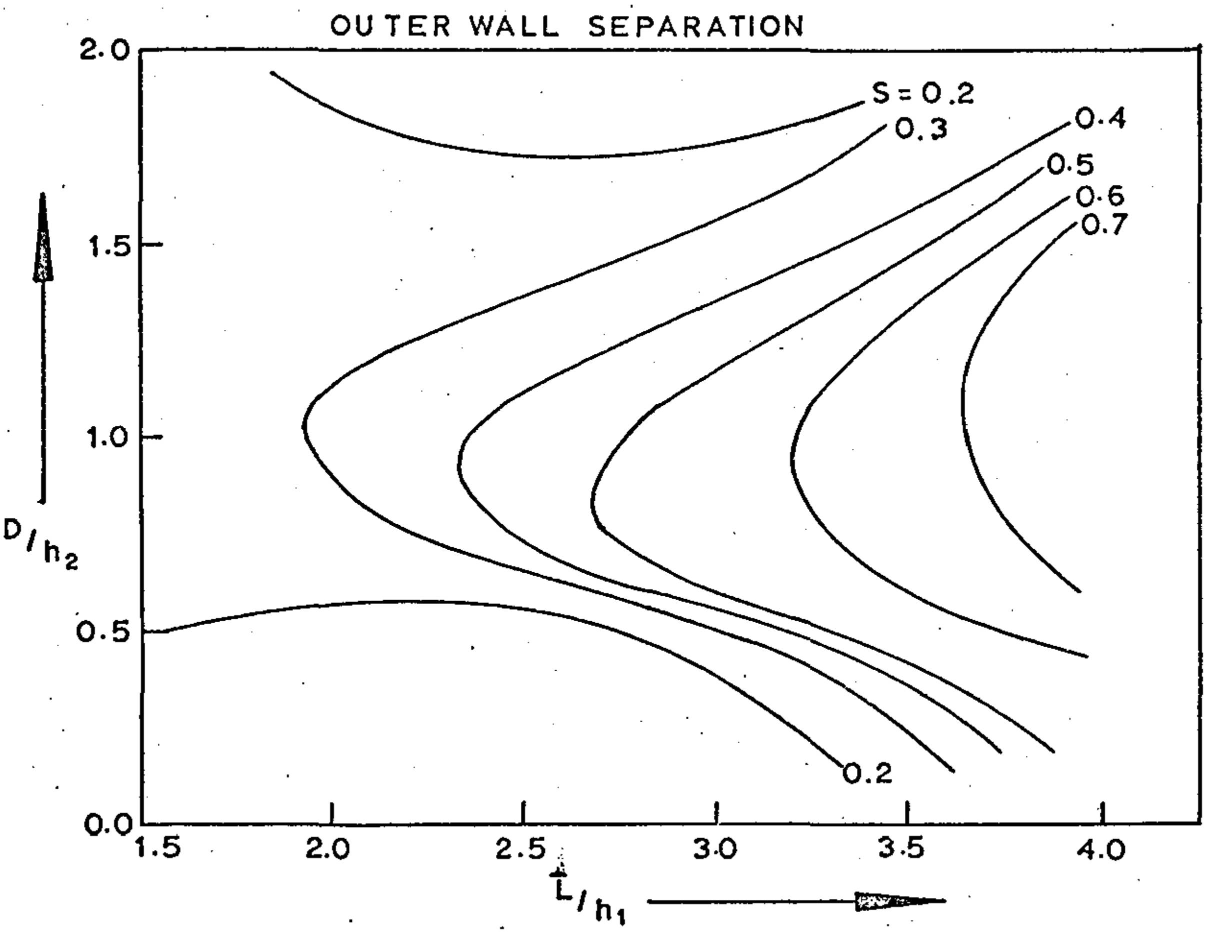


Fig. 4.2.11 PRE-DIFFUSER SEPARATION LIMITS (S^*=1.20)



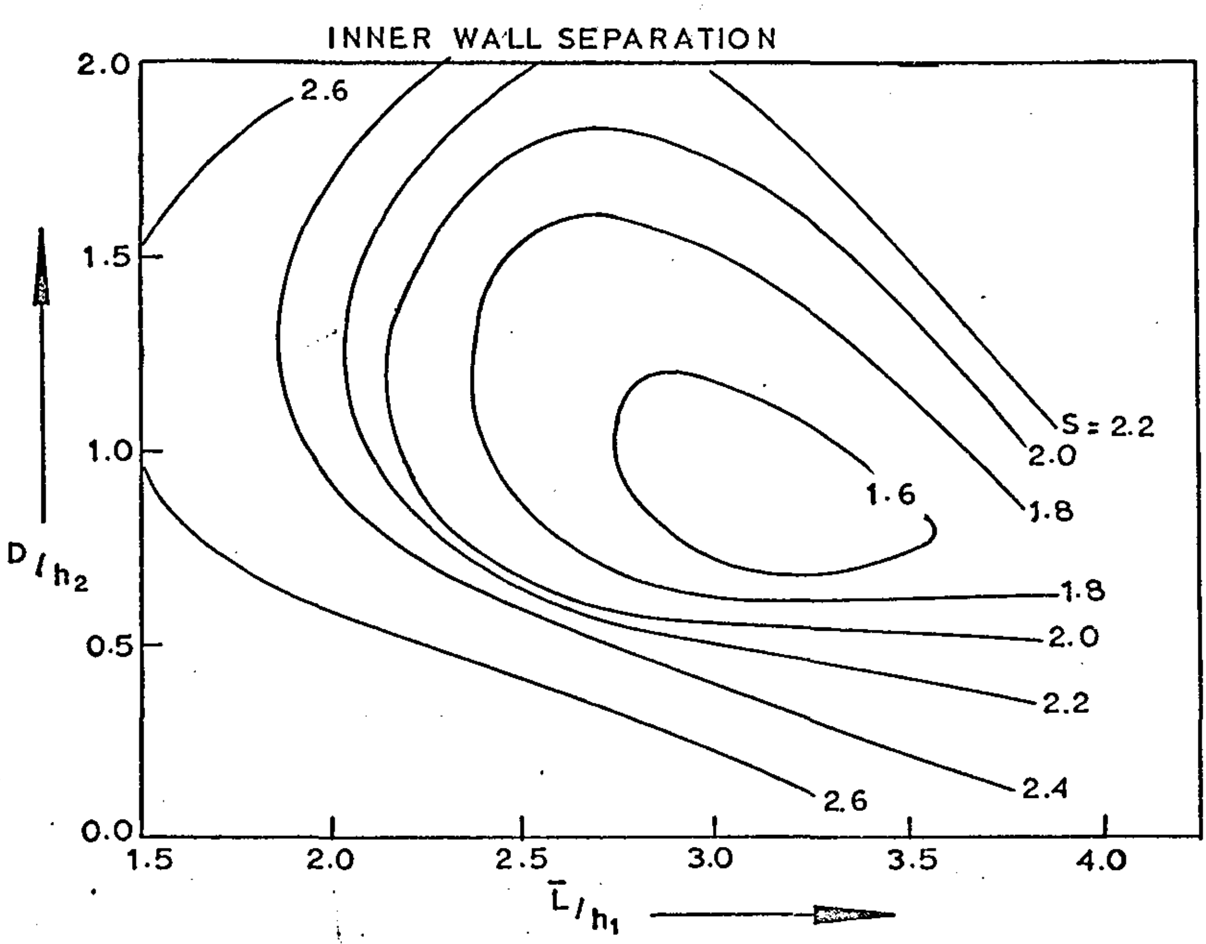


Fig. 4.2.12 PRE-DIFFUSER PERFORMANCE—PRE-DIFFUSER No. 2

$S^* = 2.15$

DISTORTED ENTRY	D/h_2	FULLY DEVELOPED ENTRY (Ref. 1.)
—▲—	0.5	– –△– –
—●—	0.8	– –○– –
—■—	1.5	– –□– –

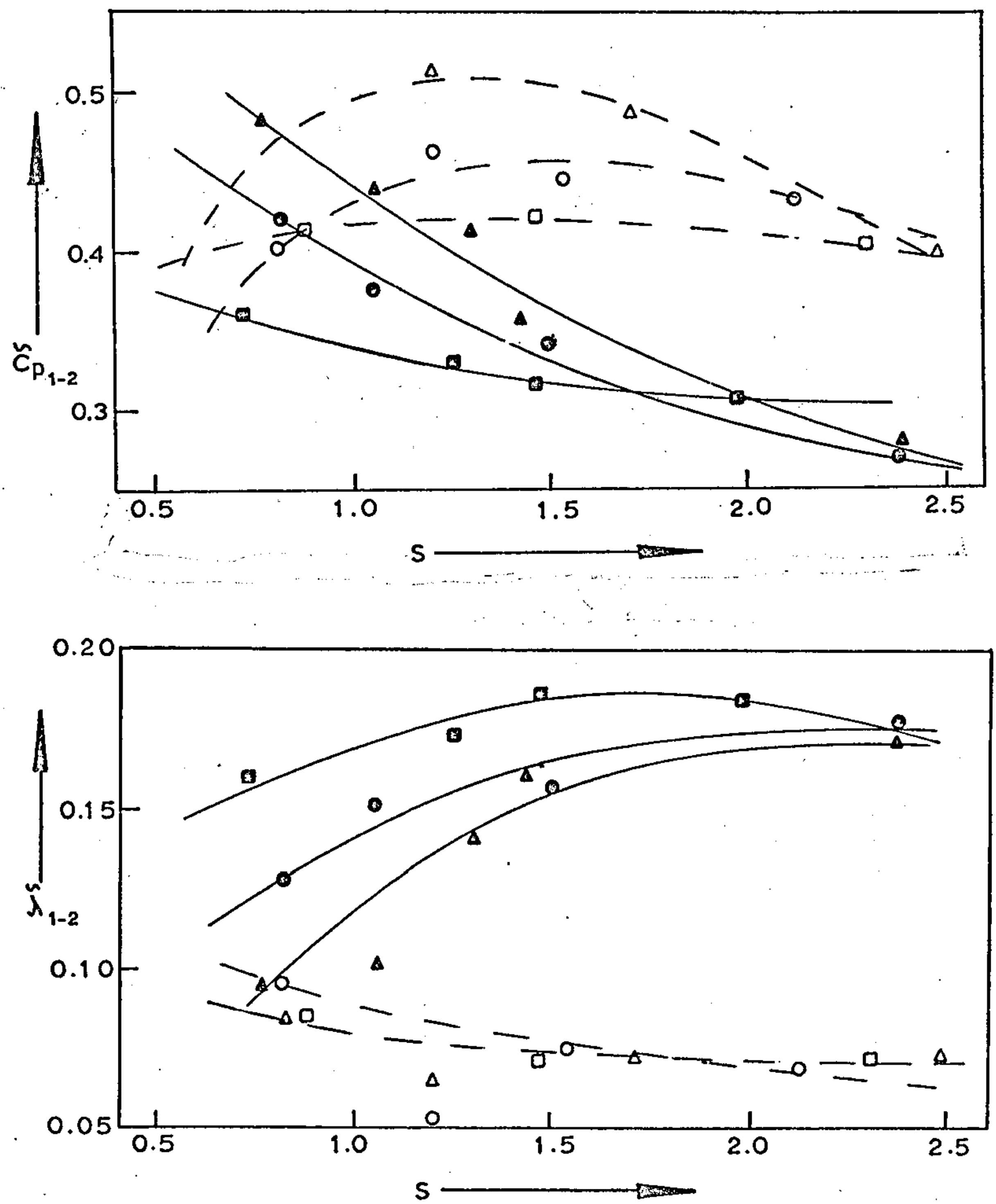


Fig. 4.2.13 PRE-DIFFUSER OUTLET KINETIC ENERGY FLUX COEFFICIENT VARIATION—PRE-DIFFUSER No.2

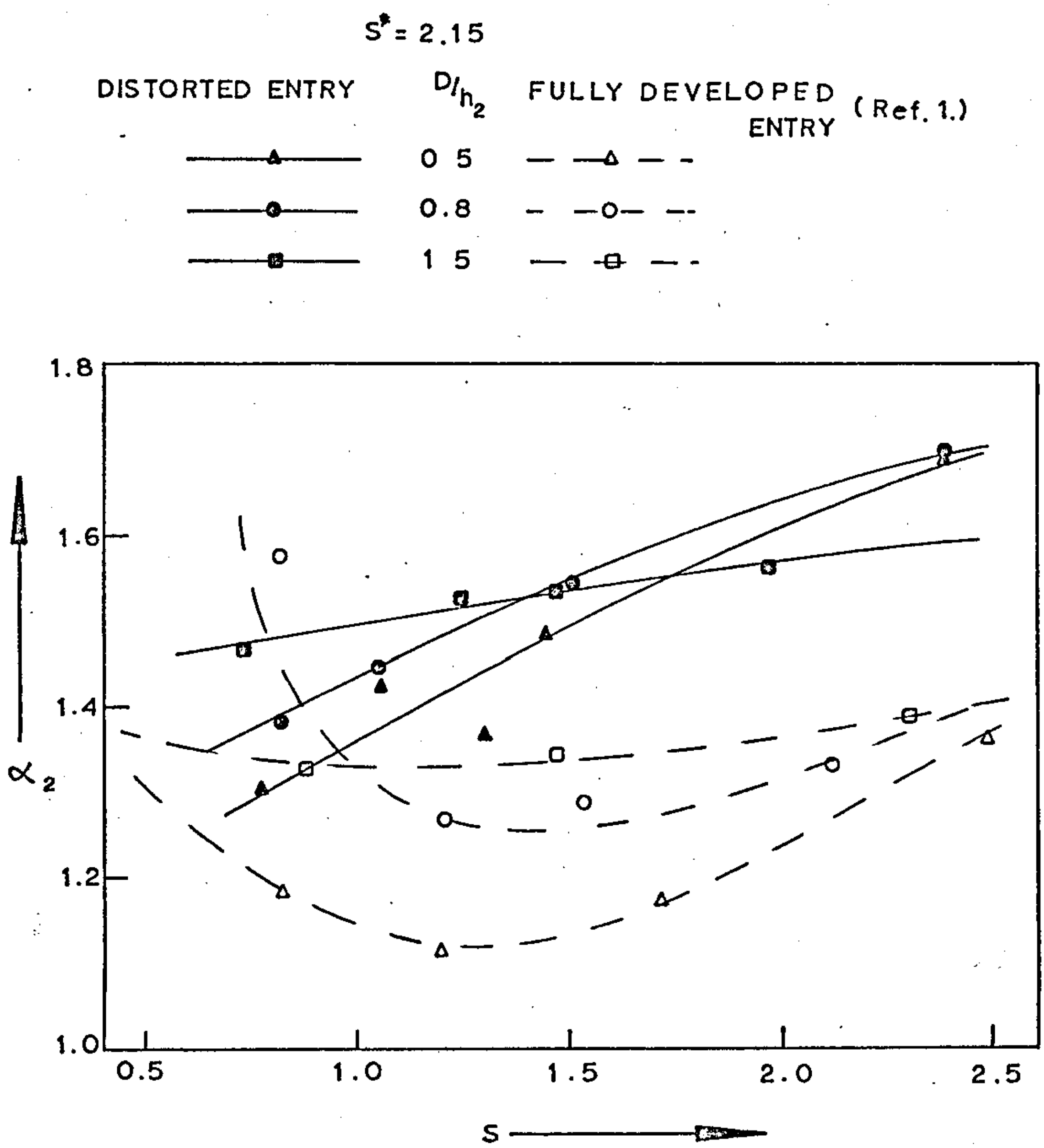


Fig.4.2.14 PRE-DIFFUSER OUTLET PROFILES FOR TEST SERIES 2-0 5

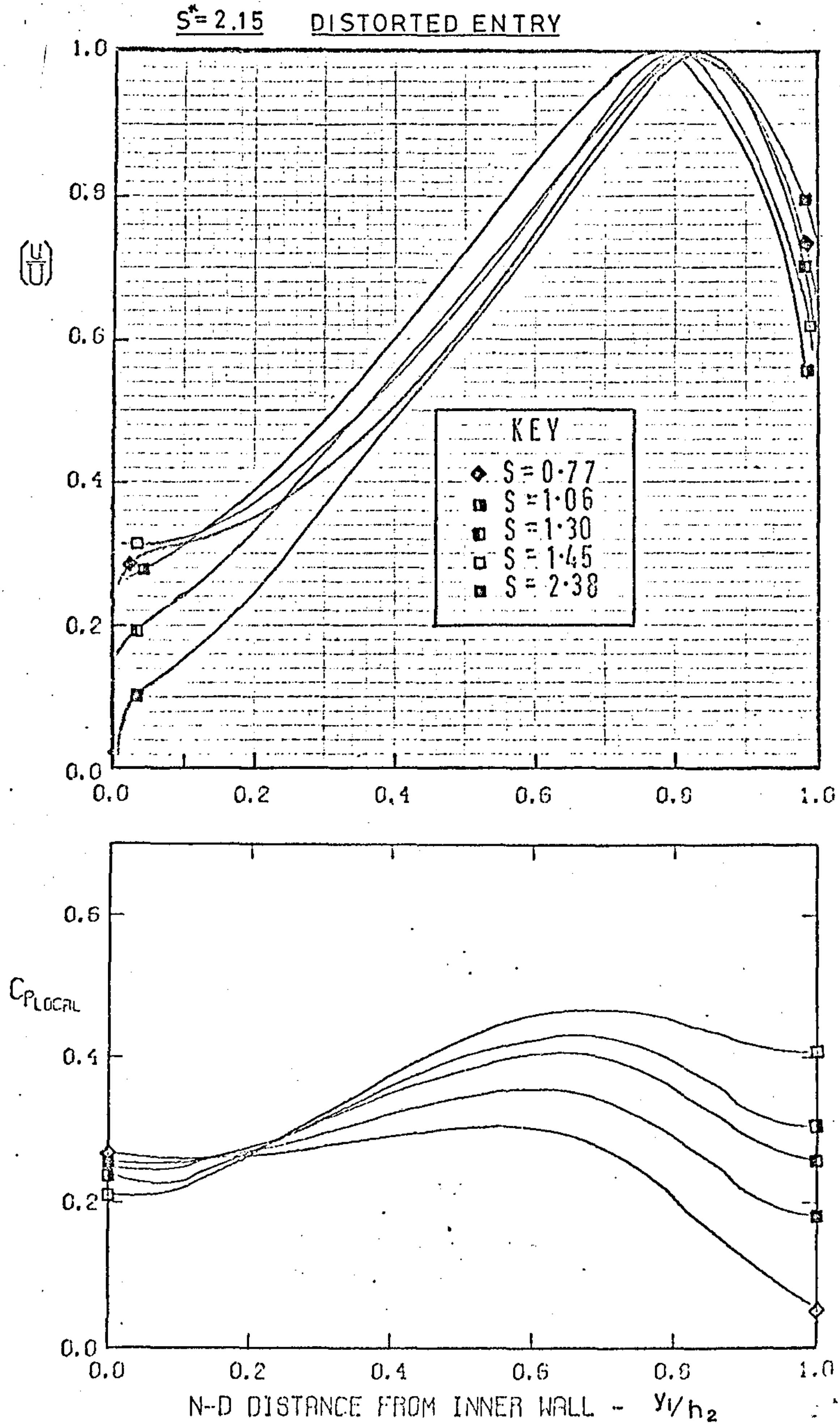


Fig.4.3.1 PERFORMANCE PARAMETERS FOR REGION 2-3 — PRE-DIFFUSER No. 2, S*=1.20

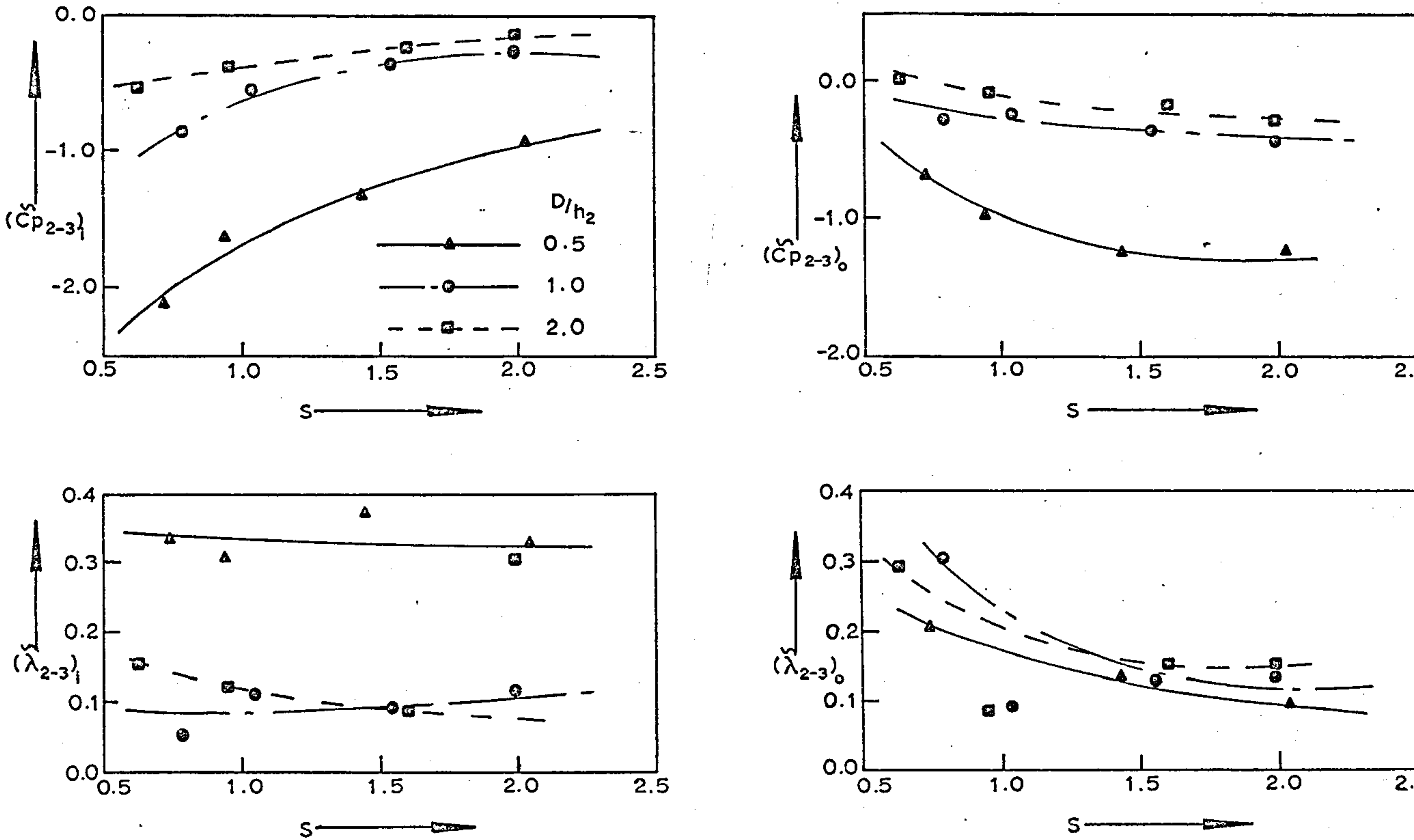


Fig.4.3.2 HEAD INNER PROFILES FOR TEST SERIES 2-0 5

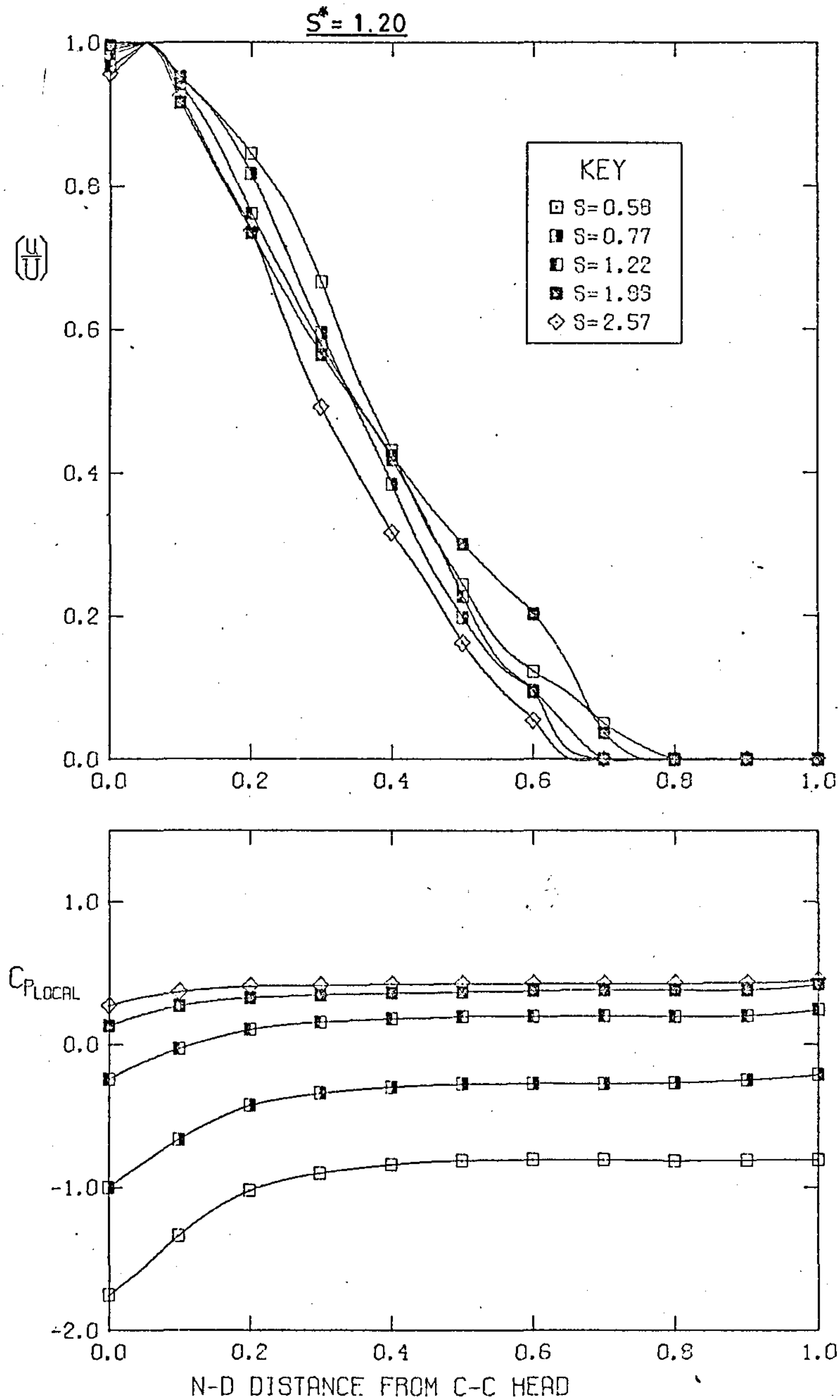


Fig.4.3.3 HEAD OUTER PROFILES FOR TEST SERIES 2-0 5

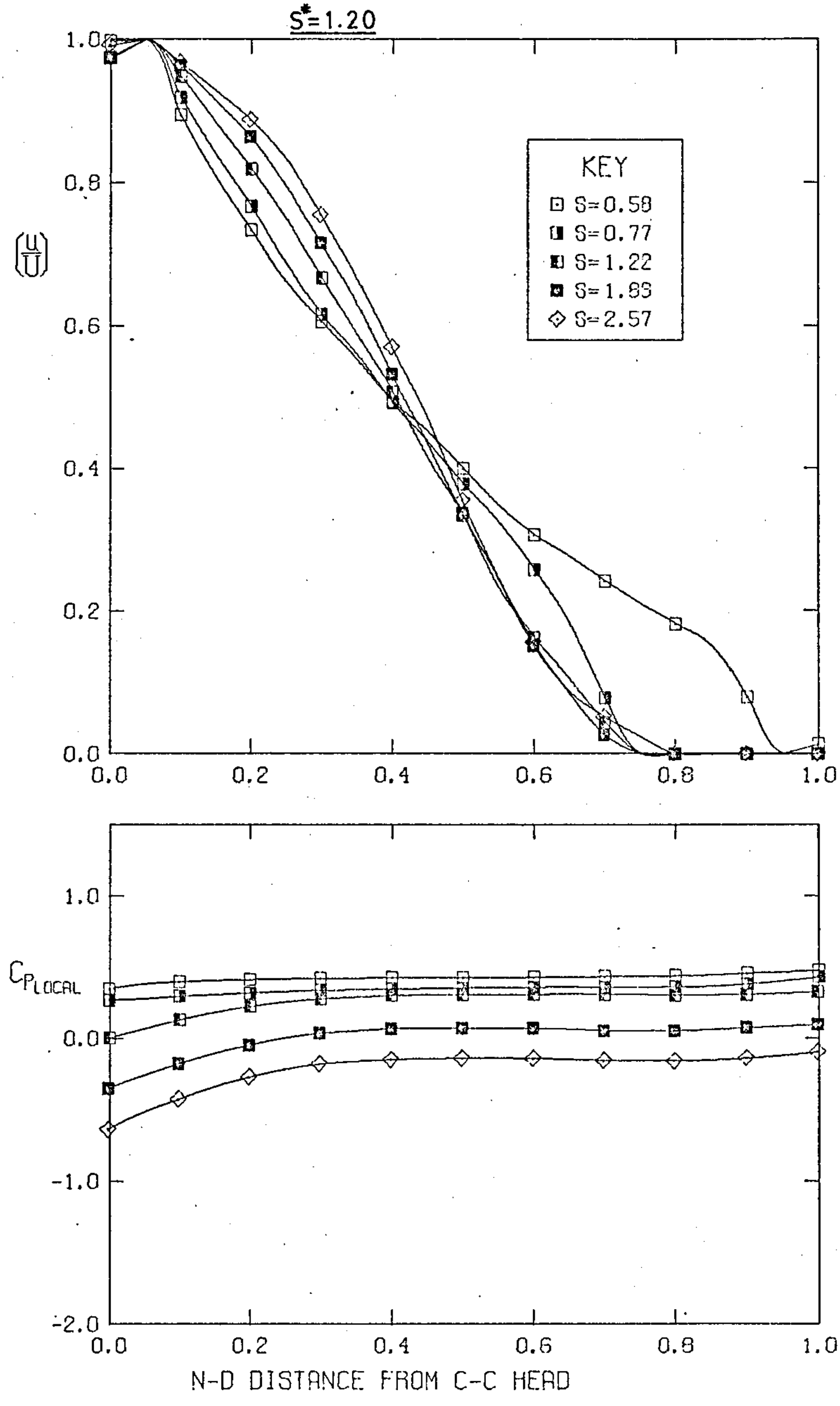


Fig 4.3.4 SOME FACTORS INFLUENCING PERFORMANCE BETWEEN STATIONS 2 AND 3

PRE-DIFFUSER No. 2 $S^{*}=1.20$

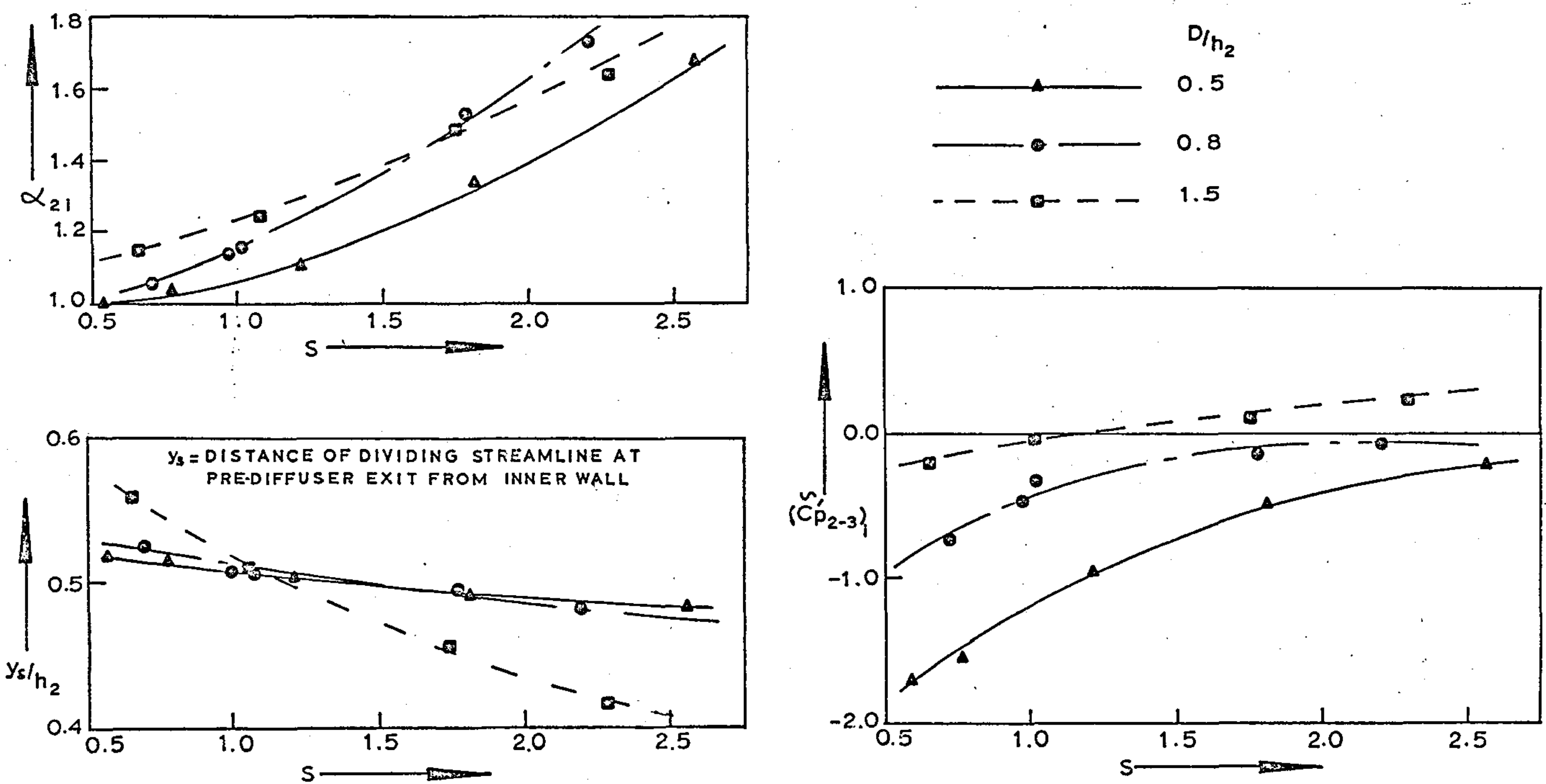
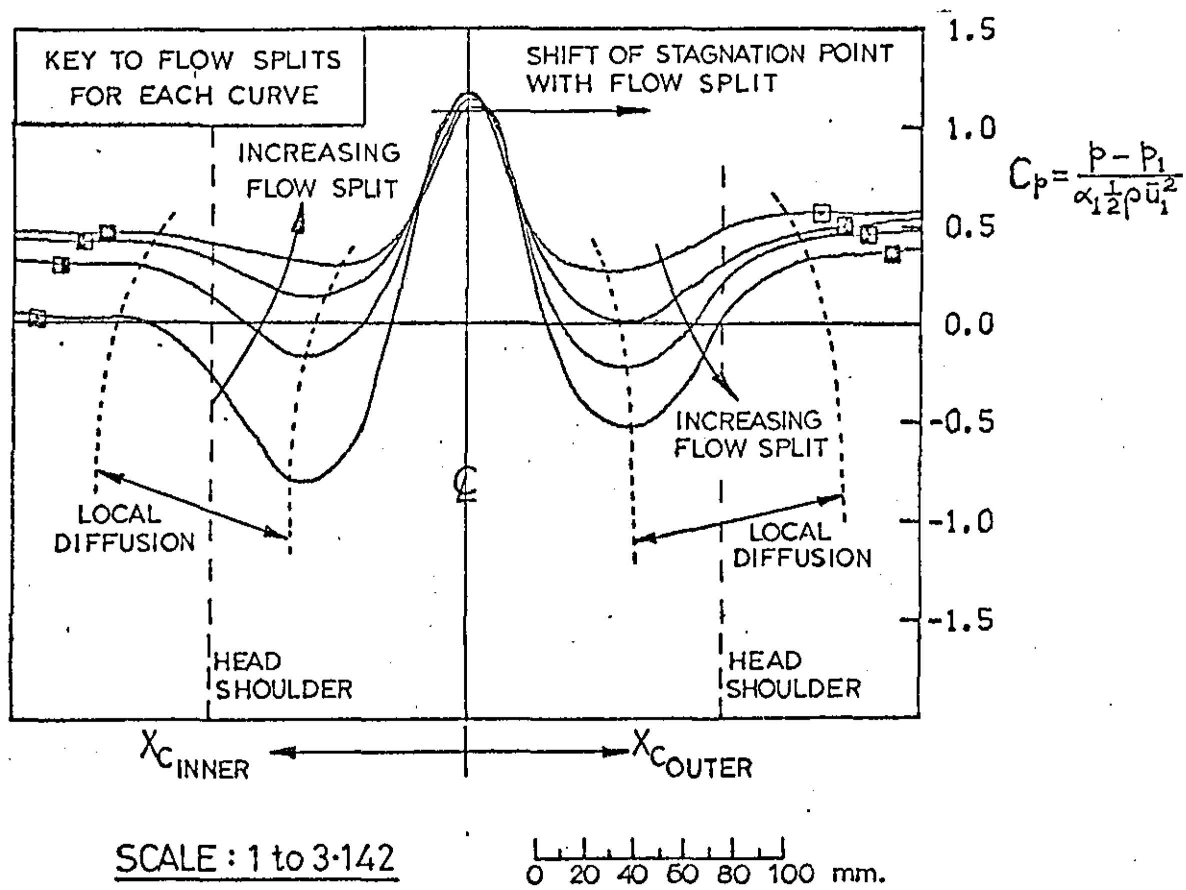


Fig. 4.3.5 KEY TO COMBUSTION CHAMBER STATIC PRESSURE DISTIBUTIONS



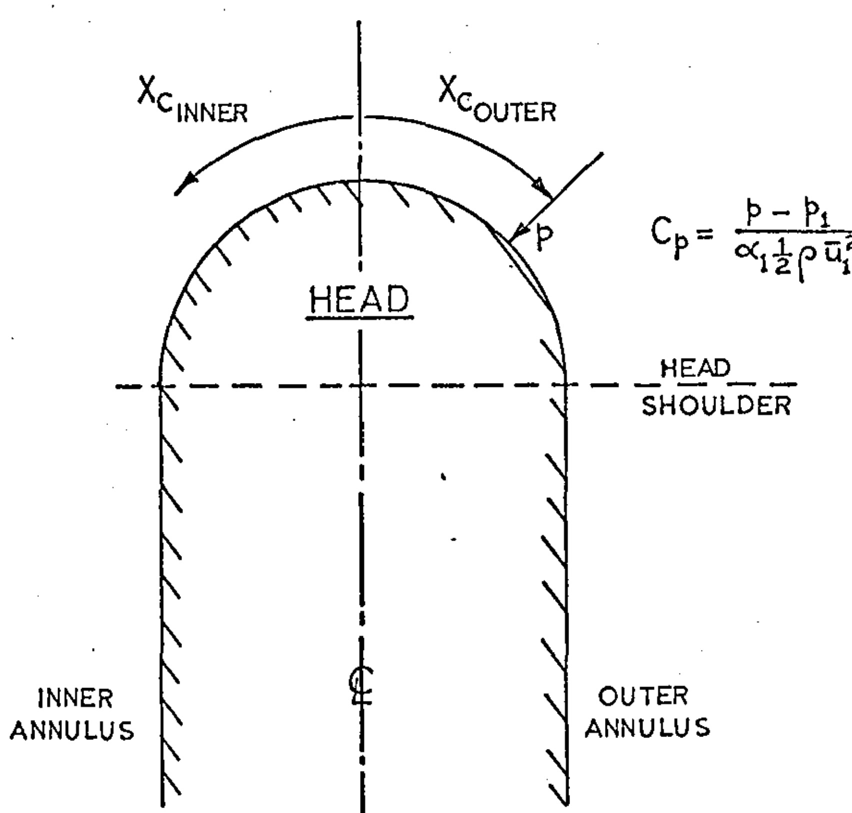


Fig4.3.6 'COMBUSTION CHAMBER' STATIC PRESSURE DISTRIBUTIONS FOR DIFFUSER 1

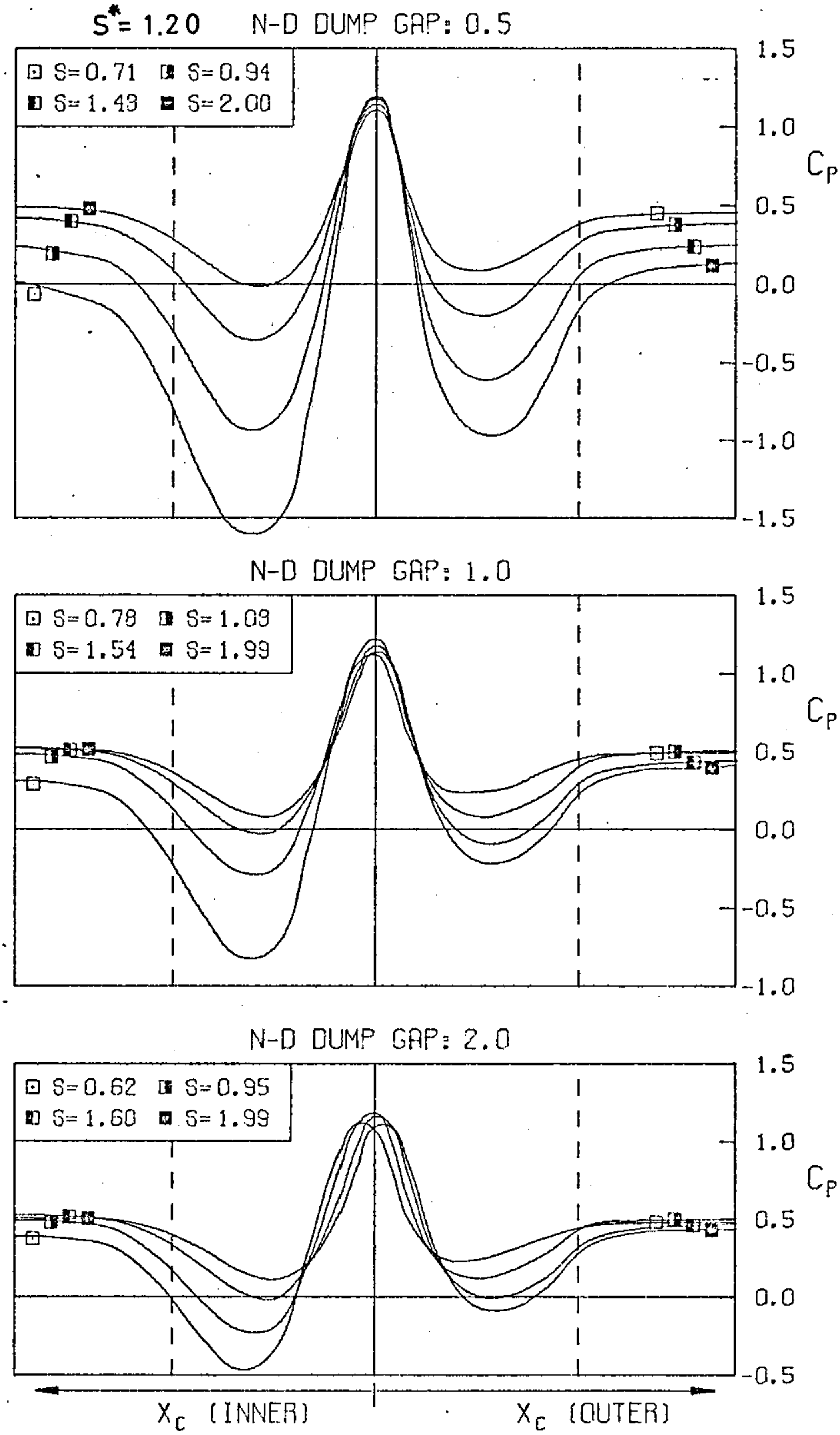


Fig 4.3.7 'COMBUSTION CHAMBER' STATIC PRESSURE DISTRIBUTIONS FOR DIFFUSER 2

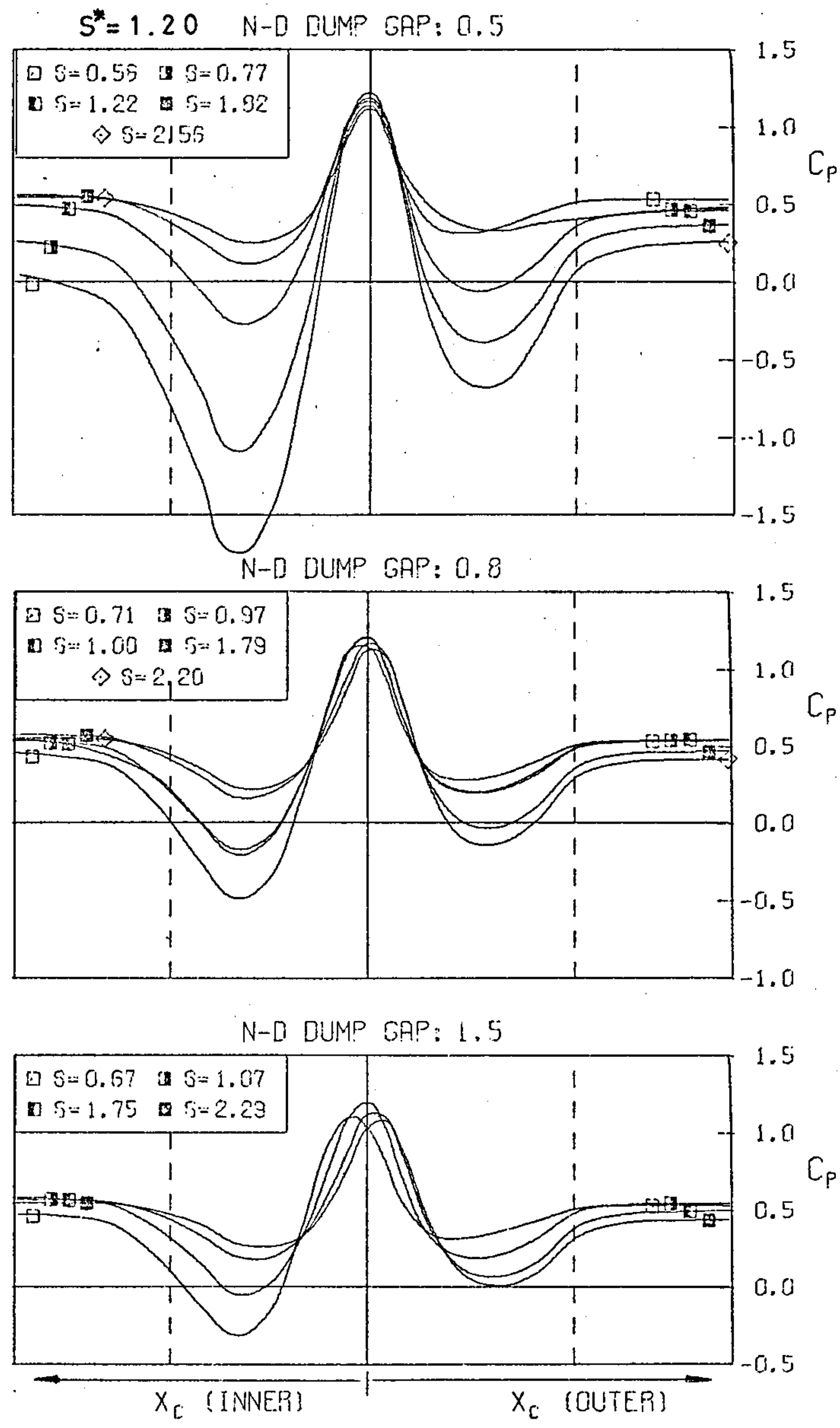


Fig.4.3.8 'COMBUSTION CHAMBER' STATIC PRESSURE DISTRIBUTIONS FOR DIFFUSER 3

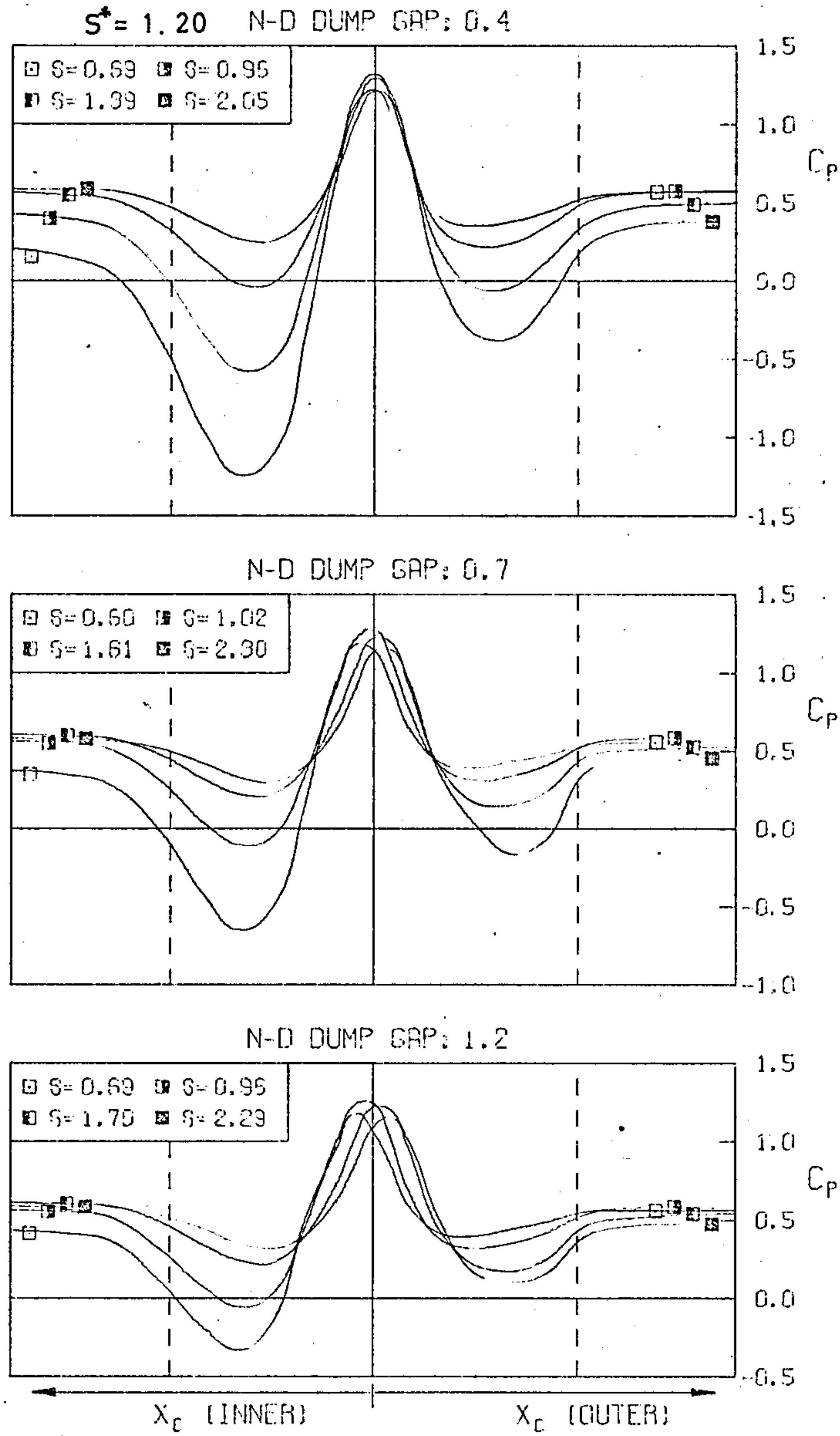


Fig.4.4.1 PERFORMANCE CHARACTERISTICS FOR REGION 3-4

PRE-DIFFUSER No.2 S*=1.20

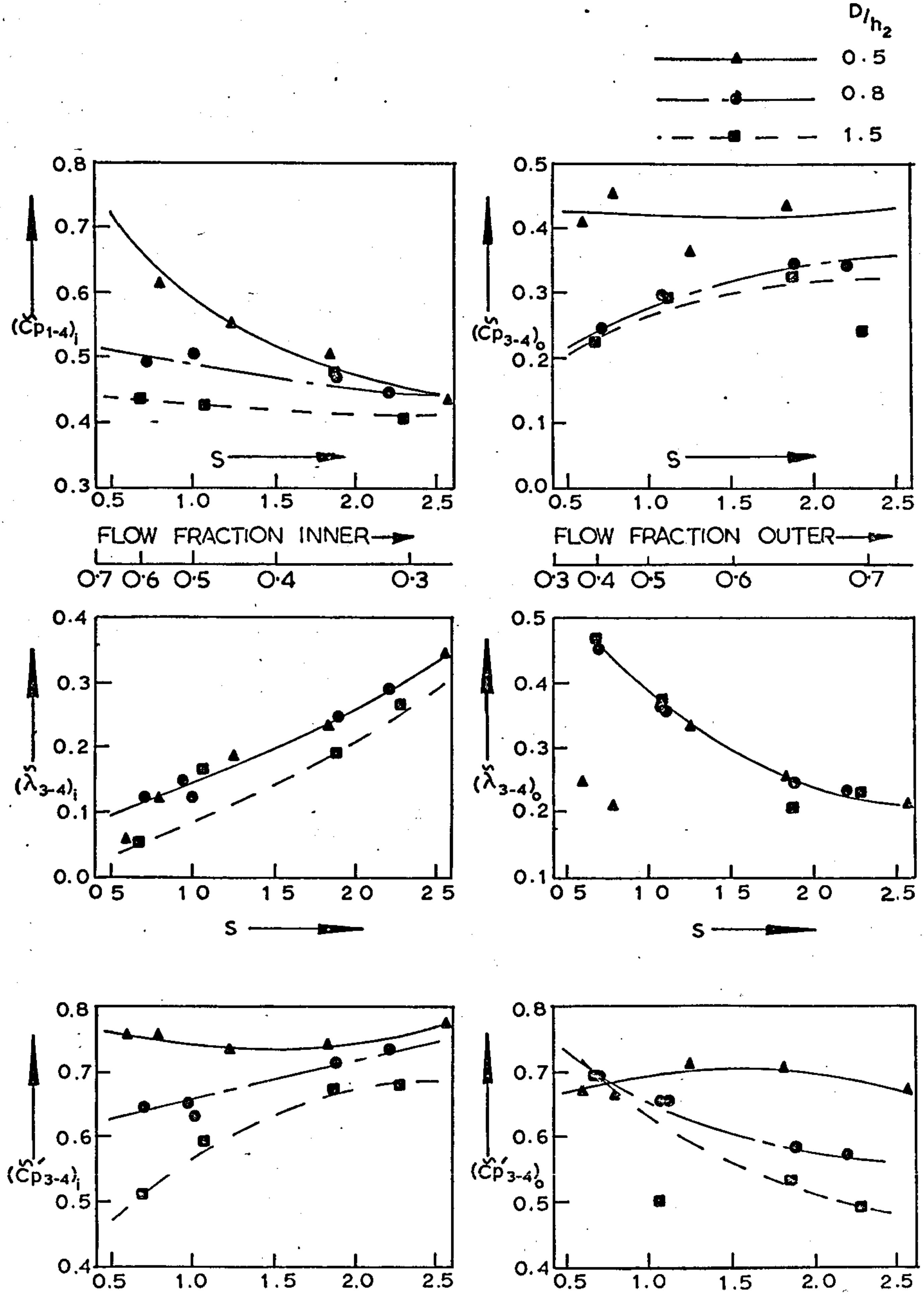
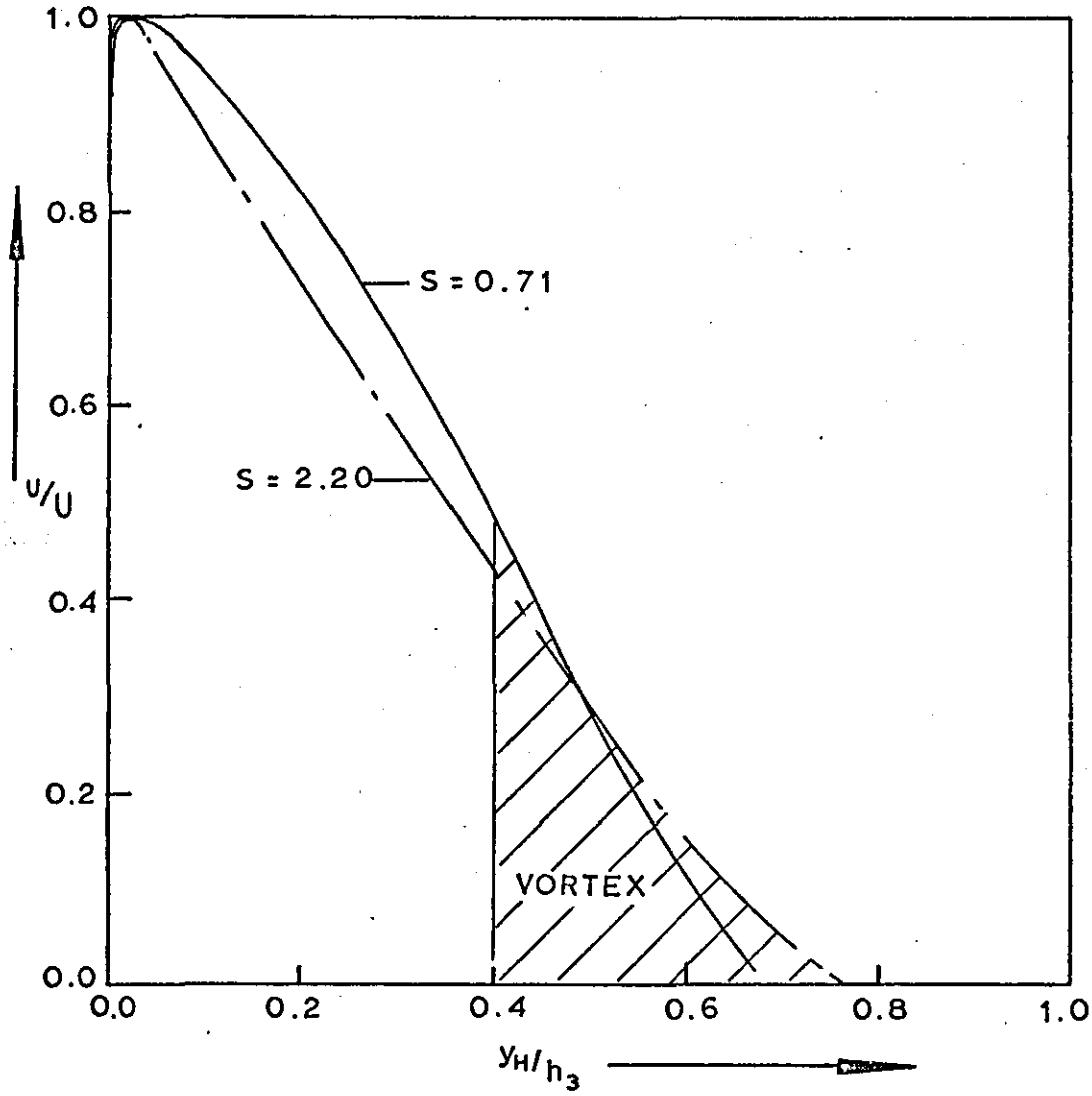


Fig 4.4.2 HEAD STATION (3i) VELOCITY PROFILE CHARACTERISTICS — PRE-DIFFUSER No.2

$S^* = 1.20 \quad D/h_2 = 0.8$



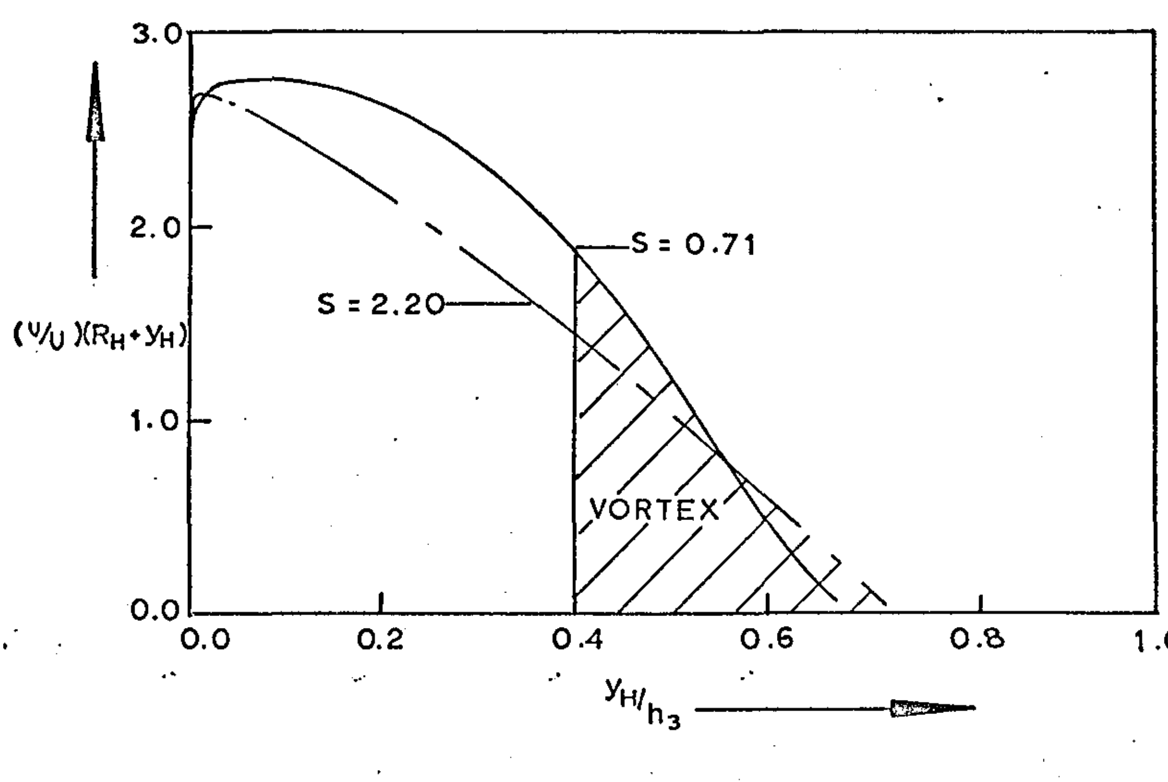


Fig.4.4.3 SETTLING LENGTH VELOCITY PROFILES FOR TEST SERIES 1-2 0

$S^* = 1.20$

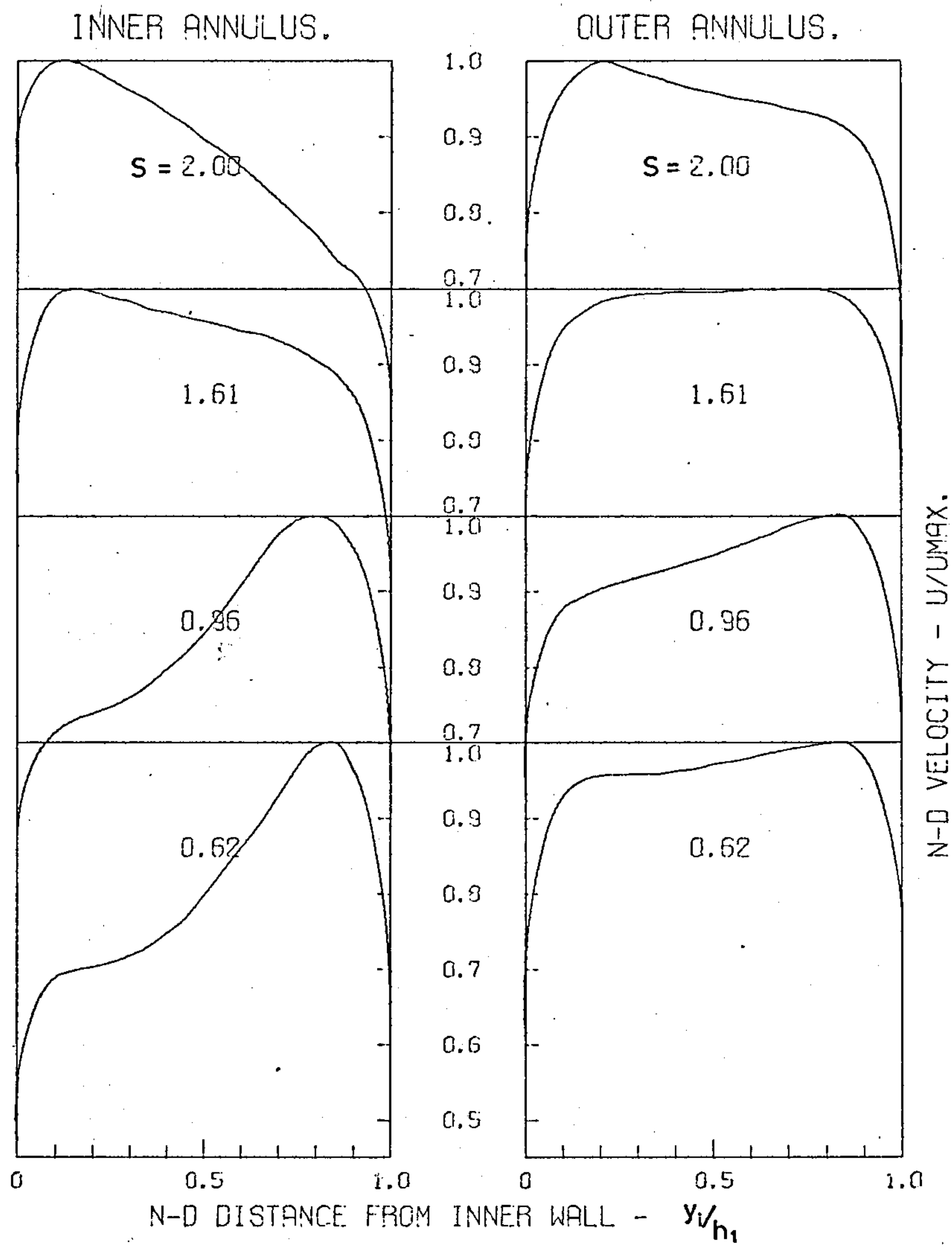


Fig 4.5.1 DIVISION OF LOSS THROUGHOUT THE SYSTEM

PRE-DIFFUSER No.1 $S^*=1.20$

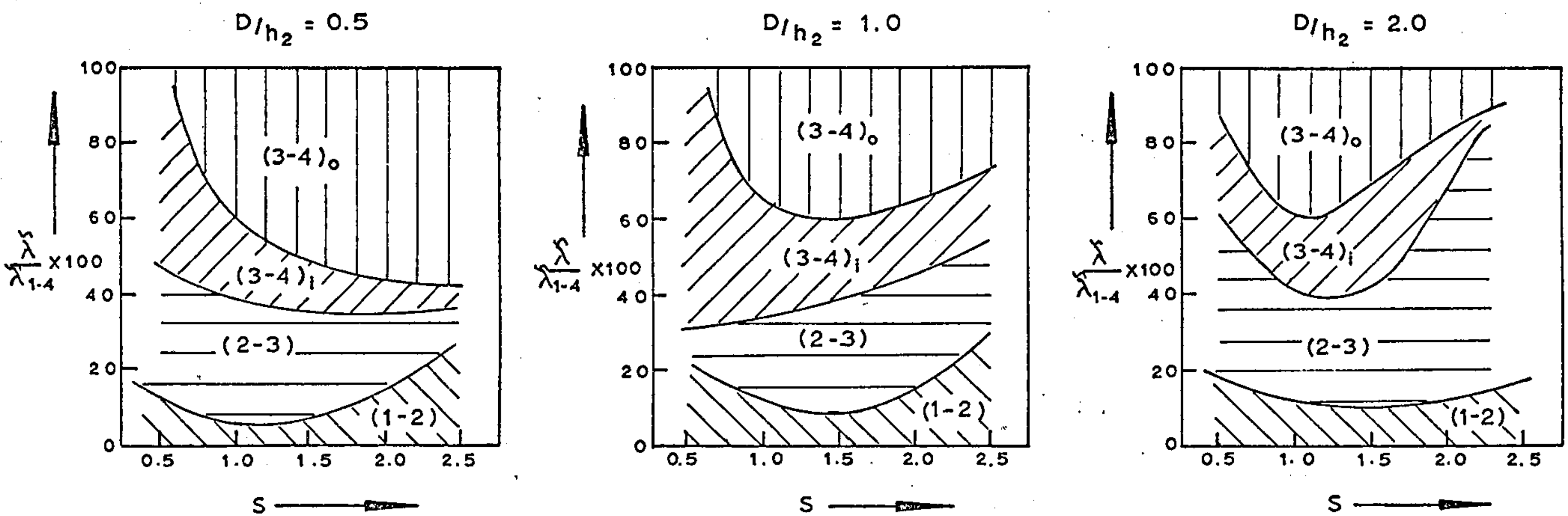


Fig.4.5.2 DIVISION OF LOSS THROUGHOUT THE SYSTEM

PRE-DIFFUSER No. 2 $S^* = 1.20$

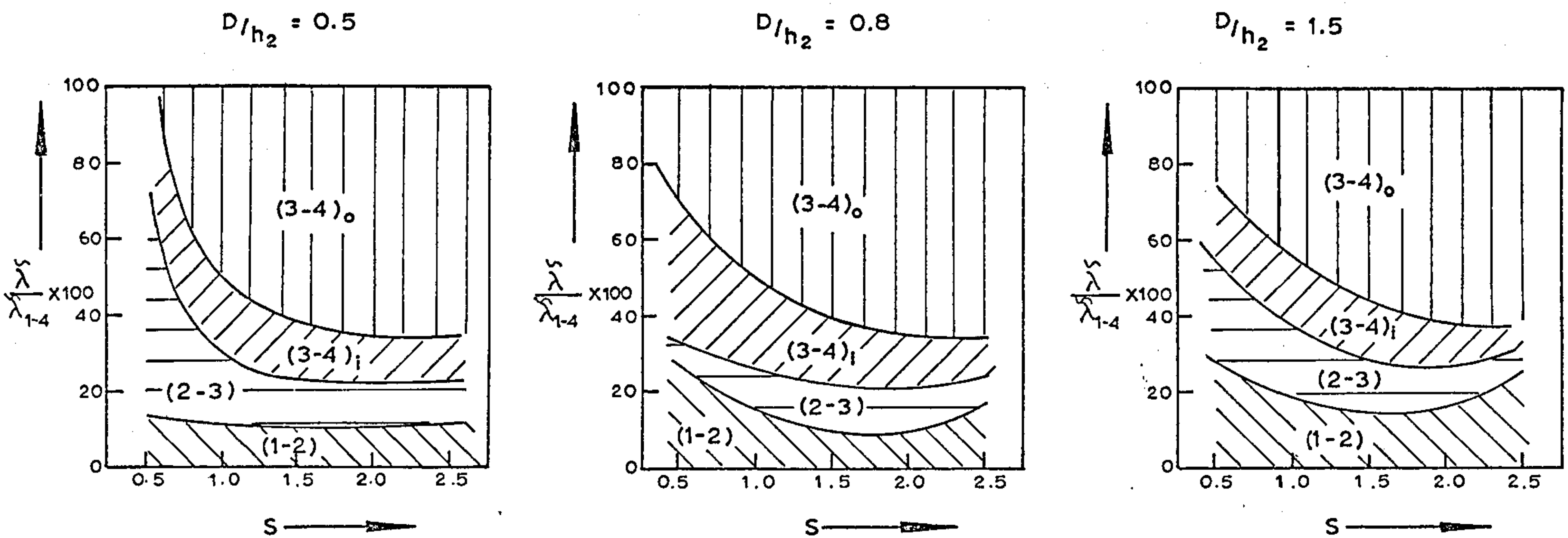
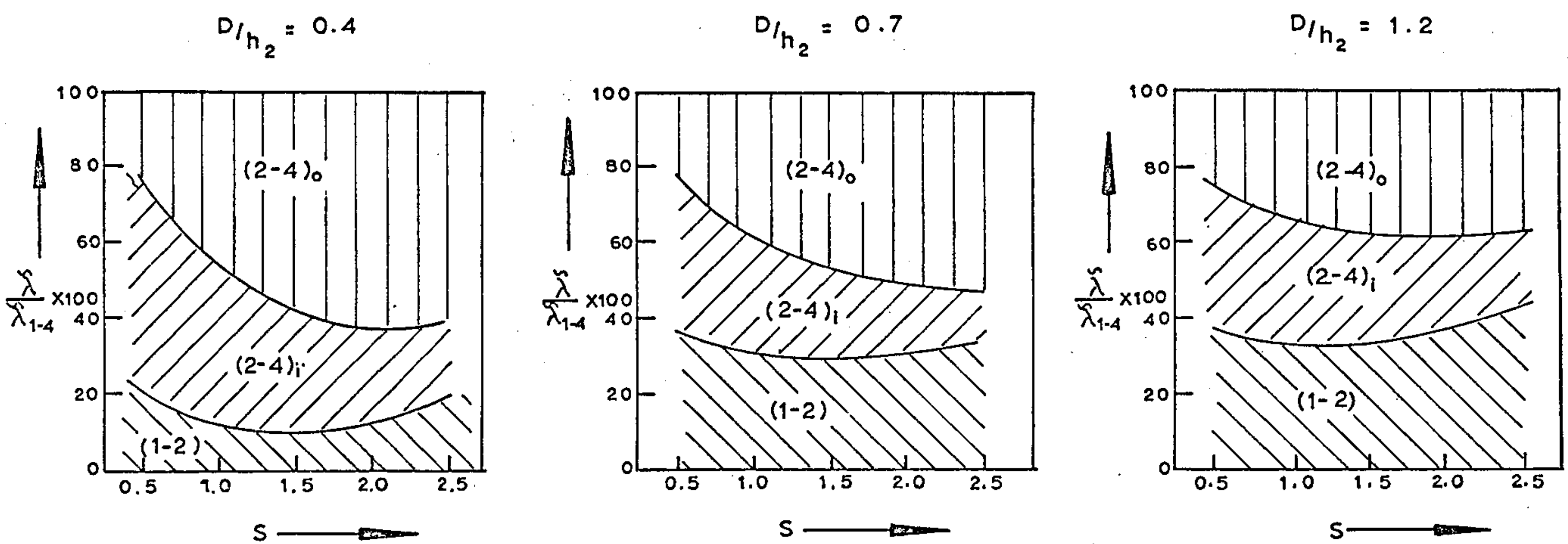


Fig.4.5.3 DIVISION OF LOSS THROUGHOUT THE SYSTEM

PRE-DIFFUSER No. 3 $S^{*}=1.20$



APPENDIX I DATA ANALYSIS

A1.1 DATA PREPARATION

In order to provide data for computer analysis, the total and static pressures obtained from traverses at stations 1, 2, 3 and 4 were plotted by hand, and smooth curves then drawn. Values were then read from these curves, the number depending upon the annulus size, and uniformity of the profile.

STATION	1	2	3_i	3_o	4_i	4_o
No. of points - total profile	42	30-34	27	23	28	30
No. of points - static profile	-	22-28	16	19	-	-

Profile data, and key static pressures, with related reference entry maximum dynamic heads, were coded on punched cards in preparation for computer analysis.

A1.2 COMPUTER PROGRAM

A flow diagram of the performance analysis program, written by the author, is presented in Figure A1.1. Details of the principal symbols are given in Table A1.2, and a listing of the program itself is presented in Table A1.3.

All performance and boundary layer parameters have been calculated according to the definitions of Section 1.4. Integration of profiles was accomplished by increasing the number of data points to 101 at stations 1 and 2, and 51 at other stations, by use of a tabular iteration sub-routine employing a second order curve fit between consecutive sets of three data points, and then using trapizoidal summation. It was found that no loss of accuracy over more sophisticated numerical integration techniques was incurred in this way.

Further programs were used for the purpose of obtaining computer aided graphical outputs of pressure and velocity profiles, and wall static pressure distributions. As well as providing a convenient way of displaying information, these graphical outputs provided a good check on the raw experimental data.

Fig. A1.1 FLOW DIAGRAM FOR PERFORMANCE ANALYSIS PROGRAM

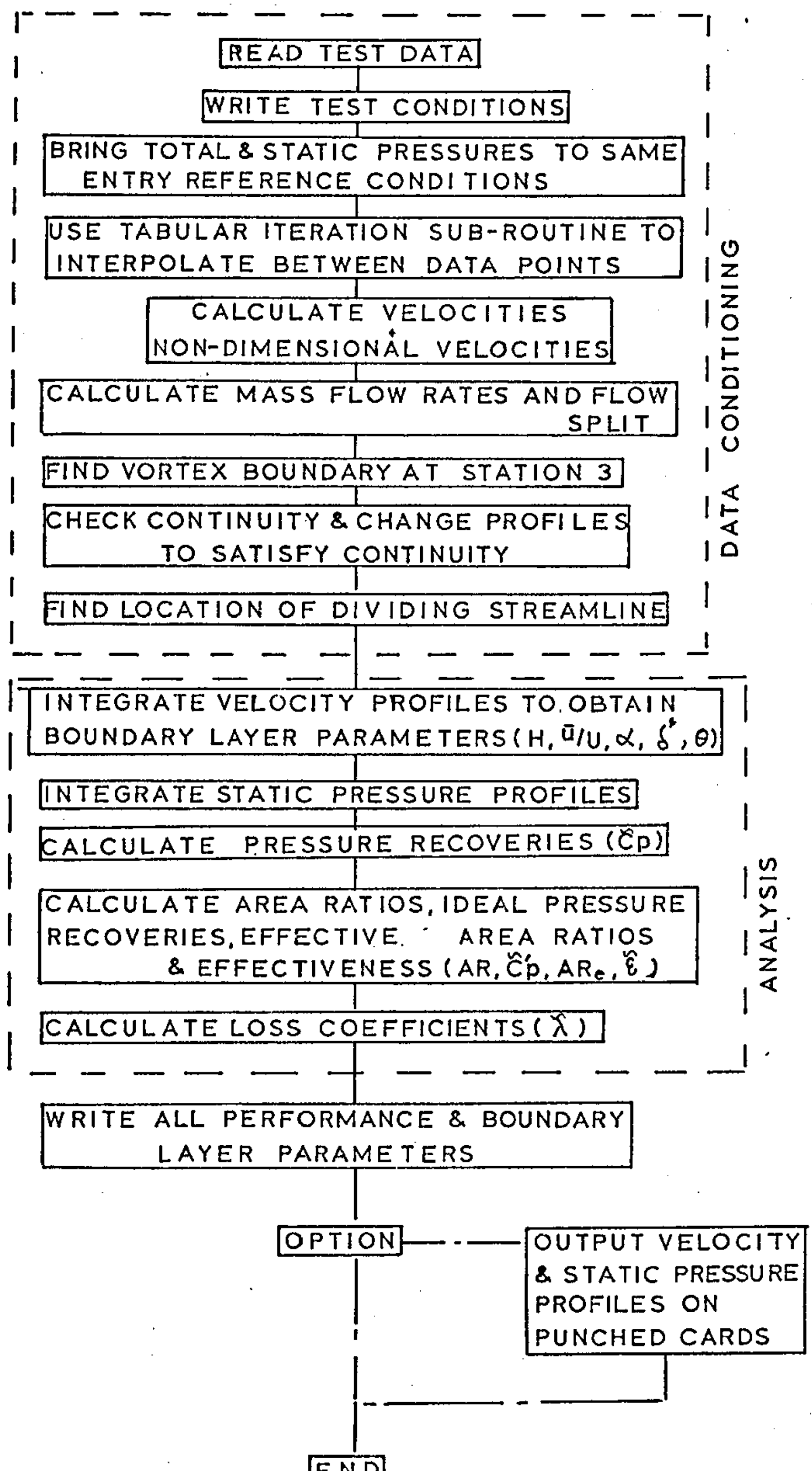


TABLE A1.2 LIST OF PRINCIPAL SYMBOLS IN ANALYSIS PROGRAM

A	area, A/π
ALPHA	α
ANH	annulus height
AR, ARAT	area ratio, AR
AREF	effective area ratio, ARe
CP	pressure recovery, $\breve{C}_p$
CPW	local wall pressure recovery, C_{pw}
DIFF	pre-diffuser reference number
DR	step distance
DSTAR	δ^*
LAMDA	loss coefficient, $\breve{\lambda}$
TMASF	mass flow, m
NTP	number of total pressure data points
NSP	number of static pressure data points
NTAB	number of points generated by tabular iteration
PS, PSTAT	static pressure, p
PT, PTOT	total pressure, P
PWALL	wall static pressure, p_w
Q	dynamic head, q
RMAX	radius at maximum velocity position
RUBAR	ratio of mean velocities (e.g. $\bar{u}_1/\bar{u}_2$)
RS	radius of dividing streamline
RW	wall radius, r
SPLIT	flow split, S
SUM	integral sum
THETA	θ
U	velocity, u

UBAR	mean velocity, $\bar{u}$
UMAX	maximum velocity, U

Subscripts (last character(s) of symbol)

1, 2	entry station
3, 4	pre-diffuser outlet
5, 6	settling length inner annulus
7, 8	settling length outer annulus
9, 10	head inner annulus
11, 12	head outer annulus
M	relating to complete annulus
SM	relating to flow up to maximum velocity point
SS	relating to flow up to dividing streamline

TABLE A1.3 LISTING OF PERFORMANCE ANALYSIS PROGRAM

```
JOB B502,B,KAG1752
JOBCORE 50000
LUFORTRAN
DOWN 22
PAPER PLAIN PAPER
RUN ,,2500
VOLUME 7500
****
DOCUMENT SOURCE
      LIBRARY (ED,SUBGROUPUSUB)
      PROGRAM(B502)
      INPUT 1 = CR0
      OUTPUT 2 = LP0
      OUTPUT 4 = CP0
      TRACE 2
      END
      MASTER DPAMK10
      CALL LINEUP(120,4,1,2)
      REAL LAMDA12,LAMDA120,LAMDA121,LAMDA14I,LAMDA140,LAMDA14,
     1 LAMDA24,LAMDA24I,LAMDA240
      REAL LAMDA23,LAMDA230,LAMDA23I,LAMDA13,LAMDA130,LAMDA13I,LAMDA34,
     1 LAMDA34I,LAMDA340
      DIMENSION PSHI(101),UNDHI(101)
      DIMENSION RUBARSS(12),CPI(101,12)
      DIMENSION THETAM(12),THETASM(12),THETASS(12),QMT(12),QMS(12),
     1RW(12),ANH(12),DR(12),NTP(12),NSP(12),NTAB(12),YT(50,12),PT(50,12)
     2,PS(50,12),PWALL(12),PTT(50),YTT(50),NTABM(12),RMAX(12),U(101,12),
     3RS(4),NTABS(12),YST(50),PST(50),VEL(101),Q(101),UND(101,12),
     4PTTAB(101),PSTAB(101),YTAB(102),PTOT(101,12),PSTAT(101,12),
     5QU(101,12),UBAR(12),ALPHAM(12),ALPHASM(12),ALPHASS(12),HM(12),
     6HSS(12),HSM(12),DSTARM(12),DSTARSM(12),DSTARSS(12),UBARM(12),
     7UBARSM(12),UBARSS(12),SUM(15,12),SUMP(3,12),TMASF(12),SMASF(12),
     8CPS(12),CP(12),P(101,12),RUBAR(12),RUBARS(12),A(12),SUM1(12),
     9SUM3(12),ASM(12),ASS(12),CPW(12),VELMAX(12),YS(50,12),UMAX(12)
      READ(1,700) MDIF
  700 FORMAT(I0)
      WRITE(4,720) MDIF
  720 FORMAT (I5)
      DO 701 NOD=1,MDIF
      KEV=0
      READ(1,702) DIFF,ARAT,ANG,MDUMP
  702 FORMAT(3F0.0,I0)
      WRITE(4,721) DIFF,MDUMP
  721 FORMAT(F10.4,I5)
      DO 704 NAD=1,MDUMP
      READ(1,705) MTEST,DDR
  705 FORMAT(I0,F0.0)
      WRITE(4,723) MTEST,DDR
  723 FORMAT(I5,F10.4)
      DO 706 NED=1,MTEST
```

```
      READ(1,707) KBO,KBI,ROA
  707 FORMAT(2I0,F0.0)
      READ(1,29) QIN,TEMP,BARO
   29 FORMAT(3F0.0)
      READ(1,5) (QMT(J),J=1,12,2),QMS(1),QMS(3),QMS(9),QMS(11),QMP
    5 FORMAT(11F0.0)
      DO 6 J=1,12,2
      IF(KEV.EQ.1.AND.J.EQ.1) GO TO 6
      READ(1,26) RW(J),RW(J+1),NTP(J),NSP(J),NTAB(J)
   26 FORMAT(2F0.0,3I0)
      IF(KEV.EQ.1) GO TO 10
      READ(1,8) (YT(I,J),I=1,NTP(J))
      IF(J.GT.3.AND.J.LT.8) GO TO 85
      READ(1,8) (YS(I,J),I=1,NSP(J))
    8 FORMAT (100F0.0)
   10 CONTINUE
   85 READ(1,9) (PT(I,J),I=1,NTP(J))
      IF(J.GT.3.AND.J.LT.8) GO TO 6
      READ(1,9) (PS(I,J),I=1,NSP(J))
    9 FORMAT (100F0.0)
    6 CONTINUE
      READ(1,11) (PWALL(J),J=3,12,2)
   11 FORMAT (5F0.0)
      WRITE(2,310)
      WRITE (2,4) DDR,ARAT,ANG,KBO,KBI,ROA
    4 FORMAT (10X,61H******************** TEST RIG GEOMETRY ***********
     1**********/10X,1H*,59X,1H*/10X,1H*,15X,23H  N-D DUMP GAP(D/DR) = ,
     2F4.2,17X,1H*/10X,1H*,59X,1H*/10X,31H*  PRE DIFFUSER : AREA RATIO =
     3 ,F4.2,16H INCLUDED ANGLE=,F4.1,7HDEG. * /10X,1H*,59X,1H*/10X,31H*
     4  BLOCKAGE(NOM): THROTTLE NT ,,I3,17H % INNER ANNULUS,,I3,7H %
     5*/10X,1H*,59X,1H*/10X,1H*,15X,23H  APPROX. FLOW SPLIT = ,F4.2,17X,
     61H*/10X,1H*,59X,1H*/10X,61H***************************************
     7**********************//)
      PIN=BARO-1.12*QIN/13.6
      RHOST=1.222
      RHOR=PIN*288./760./TEMP
      RHO=RHOST*RHOR
      VISC=0.00001455
      VIN=SQRT(19.62*QIN/RHO)
      PR=BARO/760.
      REDH=3.0*0.0254*VIN/VISC
      WRITE (2,7) VIN,REDH,TEMP,PR,RHOR
    7 FORMAT (15X,26H INLET MAXIMUM VELOCITY = ,F6.2,8H  M/SEC./15X,26H
     1INLET REYNOLDS' NUMBER = ,F7.0,6H (N-D)/15X,26H AMBIENT    TEMPER,
     2TURE = ,F6.1,8H  DEG.K./15X,26H AMBIENT PRESSURE RATIO = ,F6.3,11H
     3  (P/P-ISA)/15X,26H RIG AIR  DENSITY RATIO = ,F6.3,11H  (D/D-ISA),
     4//)
C     BRING TOTAL AND STATIC PRESSURES IN LINE
      DO 12 J=1,3,2
      DO 13 I=1,NSP(J)
```

```
      PS(I,J)=PS(I,J)*QMT(J)/QMS(J)
   13 CONTINUE
   12 CONTINUE
      DO 600 J=9,12,2
      DO 601 I=1,NSP(J)
      PS(I,J)=PS(I,J)*QMT(J)/QMS(J)
  601 CONTINUE
  600 CONTINUE
C     OBTAIN NTAB DATA POINTS FROM ORIGIONAL DATA USING S/R TABIT
      MORD=2
      DO 14 J=1,12,2
      ANH(J)=RW(J+1)-RW(J)
      DR(J)=ANH(J)/(FLOAT(NTAB(J))-1.0)
      DO 27 I=1,NTP(J)
      PTT(I)=PT(I,J)
      YTT(I)=YT(I,J)
   27 CONTINUE
      DO 28 I=1,NSP(J)
      IF(J.GT.3.AND.J.LT.8) GO TO 28
      PST(I)=PS(I,J)
      YST(I)=YS(I,J)
   28 CONTINUE
      DO 15 I=1,NTAB(J)
      YTAB(1)=0.0
      CALL TABIT (YTAB(I),PTTAB(I),MORD,NTP(J),YTT,PTT)
      IF(J.GT.3.AND.J.LT.8) GO TO 16
      CALL TABIT (YTAB(I),PSTAB(I),MORD,NSP(J),YST,PST)
      GO TO 17
   16 CONTINUE
   17 CONTINUE
      IF(J.GT.3.AND.J.LT.8) GO TO 111
      Q(I)=PTTAB(I)-PSTAB(I)
      GO TO 112
  111 Q(I)=PTTAB(I)
  112 IF (Q(I).LE.0.) GO TO 18
      VEL(I)=SQRT(Q(I))
      GO TO 19
   18 VEL(I)=0.0001
   19 CONTINUE
      YTAB(I+1)=YTAB(I)+DR(J)
   15 CONTINUE
   33 I=1
   20 MAX=I
      VELM=VEL(MAX)
C     FINDS POINT OF MAX VELOCITY
   21 DIF=VELM-VEL(I+1)
      IF (DIF) 22,22,23
   22 I=I+1
      IF (I.GE.NTAB(J)) GO TO 24
      GO TO 20
```

```
   23 I=I+1
      IF(I.GE.NTAB(J)) GO TO 24
      GO TO 21
   24 CONTINUE
C     BRING ALL PRESSURES TO SAME REFERENCE (IE Q AT TIME OF INLET TOTAL
      DO 25 IK=1,NTAB(J)
      UND(IK,J)=VEL(IK)/VELM
   37 PTOT(IK,J)=PTTAB(IK)*QMT(1)/QMT(J)
      QU(IK,J)=Q(IK)*QMT(1)/QMT(J)
      IF(J.GT.3.AND.J.LT.8) GO TO 120
      PSTAT(IK,J)=PSTAB(IK)*QMT(1)/QMT(J)
  120 CONTINUE
   25 CONTINUE
C     CALCULATE N-D VELOCITY PROFILE
      VELMAX(J)=VELM
      NTABM(J)=MAX
      NTABM(J+1)=NTAB(J)-NTABM(J)
      RMAX(J)=RW(J)+FLOAT(MAX-1)*DR(J)
      IF (J.LT.3) GO TO 14
      PWALL(J)=PWALL(J)*QMT(1)/QMP
   14 CONTINUE
C     AT THIS STAGE WE HAVE N-D VELOCITY PROFILES, TOTAL AND STATIC
C     PRESSURE PROFILES (UND,PTOT,PSTAT), ALSO DYNAMIC HEAD PROFILE(Q).
      WRITE(2,30)
   30 FORMAT(//36X,31H VELOCITY AND PRESSURE PROFILES/19X,96H INLET
     1OUTLET  S/LINNER  S/LOUTER    HEAD I     HEAD O          P1          P2
     2        PHI         PHO/)
      DO 32 I=1,NTAB(3)
      WRITE(2,31) UND(I,1),UND(I,3),UND(I,5),UND(I,7),UND(I,9),UND(I,11)
     1,PSTAT(I,1),PSTAT(I,3),PSTAT(I,9),PSTAT(I,11)
   31 FORMAT(15X,6F10.3,4F10.2)
   32 CONTINUE
C     CONVERT TO REAL VELOCITIES
      DO 34 J=1,12,2
      UMAX(J)=VELMAX(J)*SQRT(9.81*2.0/RHO)*SQRT(QMT(1)/QMT(J))
      DO 35 I=1,NTAB(J)
      U(I,J)=UND(I,J)*UMAX(J)
   35 CONTINUE
   34 CONTINUE
C     CALCULATE MASS FLOW RATES AT EACH STATION (TMASF=2PI*INT(URDR)*RH(
C     AND MEAN VELOCITIES (UBAR= 2PI*INT(URDR)/AREA )
      CONST=6.2832
      DO 97 J=1,8,2
      A(J)=RW(J+1)**2-RW(J)**2
      CALL INTEGRAL (1.0,NTAB(J),RW(J),RW(J+1),SUM1(J),U,101,12,DR(J),RW
     1(J),1.0,0.0,J)
      TMASF(J)=SUM1(J)*CONST*RHO*(25.4/1000.0)**2
      UBAR(J)=SUM1(J)/A(J)*2.0
   97 CONTINUE
      SPLIT=TMASF(7)/TMASF(5)
```

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      NTHO=NTAB(11)
      NTHI=NTAB(9)
      DO 1066 IK=1,NTAB(9)
      PSHI(IK)=PSTAT(IK,9)
      UNDHI(IK)=UND(IK,9)
 1066 CONTINUE
C       FIND VORTEX BOUNDARY AT HEAD
      DO 900 J=9,12,2
      L=1
      ANH(J)=RW(J+1)-RW(J)
      B=2.0
  904 CALL INTEGRAL (1,L,NTAB(J),RW(J),RW(J+1),SUM1(J),U,101,12,DR(J),RW
     1(J),1.0,0.0,J)
      TMASF(J)=SUM1(J)*CONST*RHO*(25.4/1000.0)**2*0.866
      IF(J.EQ.11) GO TO 901
      IF(B.GT.1.5) TMHI=TMASF(J)
         ERR1=TMASF(1)/(1.0+SPLIT)-TMASF(J)
      GO TO 902
  901 ERR1=TMASF(1)*SPLIT/(1.0+SPLIT)-TMASF(J)
      IF(B.GT.1.5) TMHO=TMASF(J)
  902 CONTINUE
      IF(B.GT.1.5) GO TO 903
      IF(ERR2.GT.0.0.AND.ERR1.LT.0.0) GO TO 905
      IF(ERR2.LT.0.0.AND.ERR1.GT.0.0) GO TO 905
      IF(ERR2.GT.0.0.AND.ERR1.GT.0.0) GO TO 905
      GO TO 903
  905 CONTINUE
      IF(ABS(ERR1).LT.ABS(ERR2)) GO TO 907
      IF(J.EQ.9) L=LL
      IF(J.EQ.9) RW(J)=R
      IF(J.EQ.11) RW(J+1)=R
      NTAB(J)=N
      SUM1(J)=S
      TMASF(J)=TM
  907 CONTINUE
      A(J)=RW(J+1)**2-RW(J)**2
      UBAR(J)=SUM1(J)/A(J)*2.0
      IF(J.EQ.9) PN=L
      GO TO 900
  903 CONTINUE
      ERR2=ERR1
      N=NTAB(J)
      IF(J.EQ.9) LL=L
      IF(J.EQ.9) L=L+1
      IF(J.EQ.9) R=RW(J)
      IF(J.EQ.9) RW(J)=RW(J)+DR(J)
      IF(J.EQ.11) R=RW(J+1)
      IF(J.EQ.11) RW(J+1)=RW(J+1)-DR(J)
      S=SUM1(J)
      TM=TMASF(J)
```

```
      B=1.0
      GO TO 904
  900 CONTINUE
C     RE-ORIENT INNER HEAD PROFILE
      NTAB(9)=NTAB(9)-PN+1
      DO 1100 IT=1,NTAB(9)
      IS=IT+PN-1
      U(IT,9)=U(IS,9)
      UND(IT,9)=UND(IS,9)
      PSTAT(IT,9)=PSTAT(IS,9)
      PTOT(IT,9)=PTOT(IS,9)
      QU(IT,9)=QU(IS,9)
 1100 CONTINUE
C     CHECK ON CONTINUITY
      CORRM1=TMASF(1)/TMASF(3)
      CORRM2=TMASF(1)/(TMASF(5)+TMASF(7))
      CORRM3=TMASF(1)/(TMASF(9)+TMASF(11))
      ERRM1=(TMASF(3)-TMASF(1))/TMASF(1)*100.0
      ERRM2=(TMASF(5)+TMASF(7)-TMASF(1))/TMASF(1)*100.0
      ERRM3=(TMHI+TMHO-TMASF(1))/TMASF(1)*100.0
      ERRM2I=(TMASF(5)-TMASF(1)/(1.0+SPLIT))/TMASF(1)*100.0
      ERRM2O=(TMASF(7)-TMASF(1)*SPLIT/(1.0+SPLIT))/TMASF(1)*100.0
      ERRM3I=(TMHI-TMASF(1)/(1.0+SPLIT))/TMASF(1)*100.0
      ERRM3O=(TMHO-TMASF(1)*SPLIT/(1.0+SPLIT))/TMASF(1)*100.0
      HSPLIT=TMHO/TMHI
      WRITE(2,38)
   38 FORMAT(///30X,16HCONTINUITY CHECK//31X,15HMASS FLOWS KG/S/25X,76H
     1INLET    OUTLET    S/LINNER    S/LOUTER    S/LMEAN    HEAD I    HEAD O
     1 HEAD MEAN/)
      TMASF3=TMASF(9)+TMASF(11)
      TMASF4=TMASF(5)+TMASF(7)
      WRITE (2,39) (TMASF(J),J=1,8,2),TMASF4,TMASF(9),TMASF(11),TMASF3
   39 FORMAT(24X,2F8.3,6F10.3)
      WRITE (2,40)
   40 FORMAT(22X,/34H PERCENTAGE ERROR (BASED ON INLET)/)
      WRITE(2,41) ERRM1,ERRM2I,ERRM2O,ERRM2,ERRM3I,ERRM3O,ERRM3
   41 FORMAT(30X,7F10.3)
C     CORRECT VELOCITIES TO SATISFY CONTINUITY
      DO 90 I=1,NTAB(3)
      U(I,3)=U(I,3)*CORRM1
   90 CONTINUE
      DO 91 I=1,NTAB(5)
      U(I,5)=U(I,5)*CORRM2
   91 CONTINUE
      DO 115 I=1,NTAB(7)
      U(I,7)=U(I,7)*CORRM2
  115 CONTINUE
C     CORRECT MEAN VELOCITIES TO SATISFY CONTINUITY,ALSO MASS FLOWS,MAX
      UBAR(3)=UBAR(3)*CORRM1
      UBAR(5)=UBAR(5)*CORRM2
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      UBAR(7)=UBAR(7)+CORRM2
      TMASF(3)=TMASF(1)
      TMASF(5)=TMASF(5)+CORRM2
      TMASF(7)=TMASF(7)+CORRM2
      UBARM3=(UBAR(9)*A(9)+UBAR(11)*A(11))/(A(9)+A(11))
      UBARM4=(UBAR(5)*A(5)+UBAR(7)*A(7))/(A(5)+A(7))
      UMAX(3)=UMAX(3)+CORRM1
      UMAX(5)=UMAX(5)+CORRM2
      UMAX(7)=UMAX(7)+CORRM2
      WRITE(2,36) (UMAX(LM),LM=1,12,2)
   36 FORMAT(//1X,20HMAX VELOCITIES M/S   ,4F10.3,10X,2F10.3,/)
      WRITE(2,42) UBAR(1),UBAR(3),UBAR(5),UBAR(7),UBARM4,UBAR(9),UBAR(11
     1),UBARM3
   42 FORMAT(//1X,20HMEAN VELOCITIES M/S ,8F10.3)
      WRITE(2,47) SPLIT,HSPLIT
   47 FORMAT(///37X,F5.3,15H (BASED ON S/L),/15X,22HFLOW SPLIT RATIO (S)
     1 =,/37X,F5.3,16H (BASED ON HEAD)//)
C     FIND S-S AT P-D INLET AND OUTLET
      DO 44 J=1,3,2
      Z=2.0
      RS(J)=(RW(J+1)+RW(J))/2.0
   93 CALL INTEGRAL(1,0,NTABS(J),RW(J),RS(J),SUM3(J),U,101,12,DR(J),RW(
     1),1.0,0.0,J)
      SMASF(J)=SUM3(J)*CONST*RHO*(25.4/1000.0)**2
      SMASF(J+1)=TMASF(J)-SMASF(J)
      PSPLIT=SMASF(J+1)/SMASF(J)
      ERR=SPLIT-PSPLIT
      IF(Z.GT.1.0) GO TO 150
      NDIF=IABS(NTABSJ-NTABS(J))
      IF(NDIF.EQ.0) GO TO 154
      IF(NDIF.GT.1) GO TO 150
      IF(ERR.GT.0.0) GO TO 151
      IF(ERR1.LT.0.0) GO TO 150
      GO TO 152
  151 IF(ERR1.GT.0.0) GO TO 150
  152 IF(ABS(ERR).GT.ABS(ERR1)) NTABS(J)=NTABSJ
      IF(ABS(ERR).GT.ABS(ERR1)) RS(J)=RSJ
      GO TO 154
  150 Z=0.0
      ERR1=ERR
      NTABSJ=NTABS(J)
      RSJ=RS(J)
      RS(J)=RS(J)+(TMASF(5)-SMASF(J))/TMASF(J)*(RW(J+1)-RW(J))
      GO TO 93
  154 CONTINUE
   45 CONTINUE
   44 CONTINUE
      WRITE(2,906) RS(1),NTABS(1),RS(3),NTABS(3),RW(9),NTAB(9),RW(12),NT
     1AB(11)
  906 FORMAT(//10X,48HFINAL ITTERATION RESULTS FOR SS AND VORTEX LIMIT,
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     110X,27HS/S-VORTEX LIMIT  NO OF PTS,/5X,10HINLET      ,F6.3,10X,I4,/
     25X,10HOUTLET     ,F6.3,10X,I4,/5X,10HHEAD I     ,F6.3,10X,I4,/5X,10H
     3HEAD O     ,F6.3,10X,I4)
C     FORM INTEGRALS OF U,U**2,U**3
C     MEAN PROFILES,PROFILES SPLIT ABOUT MAX VELOCITY AND S-S
      DO 100 J=1,12,2
      DO 94 I=1,3
      CALL INTEGRAL(I,0,NTAB(J),RW(J),RW(J+1),SUM(I,J),UND,101,12,DR(J),
     1RW(J),1.0,0.0,J)
      CALL INTEGRAL(I,0,NTABM(J),RW(J),RMAX(J),SUM((I+3),J),UND,101,12,
     1DR(J),RW(J),1.0,0.0,J)
      CALL INTEGRAL(I,NTABM(J),NTAB(J),RMAX(J),RW(J+1),SUM((I+6),J),UND,
     1101,12,DR(J),RMAX(J),1.0,2.0,J)
      IF(J.GT.3) GO TO 94
      CALL INTEGRAL(I,0,NTABS(J),RW(J),RS(J),SUM((I+9),J),UND,101,12,
     1DR(J),RW(J),1.0,0.0,J)
      CALL INTEGRAL(I,NTABS(J),NTAB(J),RS(J),RW(J+1),SUM((I+12),J),UND,
     1101,12,DR(J),RS(J),1.0,0.0,J)
   94 CONTINUE
  100 CONTINUE
      DO 101 J=1,12,2
C     CALCULAT MEAN B/L PARAMETERS
      DSTARM(J)=(A(J)/2.0/RW(J)-SUM(1,J)/RW(J))*100./ANH(J)
      THETAM(J)=(SUM(1,J)-SUM(2,J))/RW(J)*100./ANH(J)
      HM(J)=DSTARM(J)/THETAM(J)
      UBARM(J)=2.0*SUM(1,J)/A(J)
      ALPHAM(J)=2.0*SUM(3,J)/A(J)/UBARM(J)**3
  101 CONTINUE
C     B/L PARAMETERS SPLIT ABOUT MAX VELOCITY POINT
      DO 102 J=1,12,2
      ASM(J)=RMAX(J)**2-RW(J)**2
      ASM(J+1)=RW(J+1)**2-RMAX(J)**2
      UBARSM(J)=2.0*SUM(4,J)/ASM(J)
      UBARSM(J+1)=2.0*SUM(7,J)/ASM(J+1)
      DSTARSM(J)=(ASM(J)/2.0/RW(J)-SUM(4,J)/RW(J))*100.0/ANH(J)
      DSTARSM(J+1)=(ASM(J+1)/2.0/RW(J+1)-SUM(7,J)/RW(J+1))*100.0/ANH(J)
      THETASM(J)=(SUM(4,J)-SUM(5,J))/RW(J)*100.0/ANH(J)
      THETASM(J+1)=(SUM(7,J)-SUM(8,J))/RW(J+1)*100.0/ANH(J)
      HSM(J)=DSTARSM(J)/THETASM(J)
      HSM(J+1)=DSTARSM(J+1)/THETASM(J+1)
      ALPHASM(J)=2.0*SUM(6,J)/ASM(J)/UBARSM(J)**3
      ALPHASM(J+1)=2.0*SUM(9,J)/ASM(J+1)/UBARSM(J+1)**3
      IF(J.GT.3) GO TO 102
C     B/L PARAMETERS SPLIT ABOUT S/S
      ASS(J)=RS(J)**2-RW(J)**2
      ASS(J+1)=RW(J+1)**2-RS(J)**2
      UBARSS(J)=2.0*SUM(10,J)/ASS(J)
      UBARSS(J+1)=2.0*SUM(13,J)/ASS(J+1)
      DSTARSS(J)=(ASS(J)/2.0/RW(J)-SUM(10,J)/RW(J))*100.0/(RW(J+1)-RW(J)
     1)
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      DSTARSS(J+1)=(ASS(J+1)/2.0/RW(J+1)-SUM(13,J)/RW(J+1))*100.0/(RW(J
     11)-RW(J))
      THETASS(J)=(SUM(10,J)-SUM(11,J))/RW(J)*100.0/(RW(J+1)-RW(J))
      THETASS(J+1)=(SUM(13,J)-SUM(14,J))/RW(J+1)*100.0/(RW(J+1)-RW(J))
      HSS(J)=DSTARSS(J)/THETASS(J)
      HSS(J+1)=DSTARSS(J+1)/THETASS(J+1)
      ALPHASS(J)=2.0*SUM(12,J)/ASS(J)/UBARSS(J)**3
      ALPHASS(J+1)=2.0*SUM(15,J)/ASS(J+1)/UBARSS(J+1)**3
  102 CONTINUE
C     WRITE ALL B/L PARAMETERS
      WRITE(2,310)
      WRITE(2,103) DIFF,DDR,SPLIT
  103 FORMAT(//6X,41HBOUNDARY LAYER PARAMETERS FOR DIFFUSER NO,F2.0,10H
     1DUMP GAP ,F3.1,11H FLOW SPLIT,F6.3,//17X,9HUBAR/UMAX,8X,11HDELTAS
     2AR %,9X,7HTHETA %,8X,12HSHAPE FACTOR,10X,5HALPHA//19X,4HMEAN,14X,
     3HMEAN,14X,4HMEAN,14X,4HMEAN,14X,4HMEAN/)
      WRITE(2,52) UBARM(1),DSTARM(1),THETAM(1),HM(1),ALPHAM(1)
   52 FORMAT(7X,5HINLET,2X,F10.4,11X,F7.3,11X,F7.3,11X,F7.4,12X,F7.4/)
      WRITE(2,53) UBARM(3),DSTARM(3),THETAM(3),HM(3),ALPHAM(3)
   53 FORMAT(6X,6HOUTLET,2X,F10.4,11X,F7.3,11X,F7.3,11X,F7.4,12X,F7.4/)
      WRITE(2,54) UBARM(5),DSTARM(5),THETAM(5),HM(3),ALPHAM(5)
   54 FORMAT(4X,8HS/LINNER,2X,F10.4,11X,F7.3,11X,F7.3,11X,F7.4,12X,F7.4,
     1)
      WRITE(2,55) UBARM(7),DSTARM(7),THETAM(7),HM(7),ALPHAM(7)
   55 FORMAT(4X,8HS/LOUTER,2X,F10.4,11X,F7.3,11X,F7.3,11X,F7.4,12X,F7.4
     1)
      WRITE(2,604) UBARM(9),DSTARM(9),THETAM(9),HM(9),ALPHAM(9)
  604 FORMAT(2X,10HHEAD INNER,2X,F10.4,11X,F7.3,11X,F7.3,11X,F7.4,12X,
     1F7.4/)
      WRITE(2,605) UBARM(11),DSTARM(11),THETAM(11),HM(11),ALPHAM(11)
  605 FORMAT(2X,10HHEAD OUTER,2X,F10.4,11X,F7.3,11X,F7.3,11X,F7.4,12X,
     1F7.4//)
      WRITE(2,56)
   56 FORMAT(14X, 86HINNER     OUTER     INNER     OUTER     INNER     OUTER
     1    INNER     OUTER     INNER     OUTER//,28X,47HSPLIT BOUNDARY LAYER
     2PARAMETERS (ABOUT MAX VEL)/)
      WRITE(2,57) UBARSM(1),UBARSM(2),DSTARSM(1),DSTARSM(2),THETASM(1),
     1HETASM(2),HSM(1),HSM(2),ALPHASM(1),ALPHASM(2)
   57 FORMAT(7X,5HINLET,F8.4,F9.4,8F9.3,/)
      WRITE(2,58) UBARSM(3),UBARSM(4),DSTARSM(3),DSTARSM(4),THETASM(3),
     1HETASM(4),HSM(3),HSM(4),ALPHASM(3),ALPHASM(4)
   58 FORMAT(6X,6HOUTLET,F8.4,F9.4,8F9.3,/)
      WRITE(2,59) UBARSM(5),UBARSM(6),DSTARSM(5),DSTARSM(6),THETASM(5),
     1HETASM(6),HSM(5),HSM(7),ALPHASM(5),ALPHASM(6)
   59 FORMAT(4X,8HS/LINNER,F8.4,F9.4,8F9.3,/)
      WRITE(2,60) UBARSM(7),UBARSM(8),DSTARSM(7),DSTARSM(8),THETASM(7),
     1THETASM(8),HSM(7),HSM(8),ALPHASM(7),ALPHASM(8)
   60 FORMAT(4X,8HS/LOUTER,F8.4,F9.4,8F9.3,/)
      WRITE (2,607) UBARSM(9),UBARSM(10),DSTARSM(9),DSTARSM(10),THETASM
     19),THETASM(10),HSM(9),HSM(10),ALPHASM(9),ALPHASM(10)
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  607 FORMAT(2X,10HHEAD INNER,F8.4,F9.4,8F9.3,/)
      WRITE(2,608) UBARSM(11),UBARSM(12),DSTARSM(11),DSTARSM(12),THETAS
     1(11),THETASM(12),HSM(11),HSM(12),ALPHASM(11),ALPHASM(12)
  608 FORMAT(2X,10HHEAD OUTER,F8.4,F9.4,8F9.3,/)
      WRITE(2,61)
   61 FORMAT(28X,   43HSPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)/)
      WRITE(2,62) UBARSS(1),UBARSS(2),DSTARSS(1),DSTARSS(2),THETASS(1),
     1HETASS(2),HSS(1),HSS(2),ALPHASS(1),ALPHASS(2)
   62 FORMAT(7X,5HINLET,F8.4,F9.4,8F9.3,/)
      WRITE(2,63) UBARSS(3),UBARSS(4),DSTARSS(3),DSTARSS(4),THETASS(3),
     1HETASS(4),HSS(3),HSS(4),ALPHASS(3),ALPHASS(4)
   63 FORMAT(6X,6HOUTLET,F8.4,F9.4,8F9.3,/)
C     CALCULATE UBAR/UBAR1
      DO 71 J=1,12,2
      RUBAR(J)=UBARM(J)/UBARM(1)*UMAX(J)/UMAX(1)
      IF(J.GT.3)GO TO 77
      RUBARSS(J)=UBARSS(J)/UBARSS(1)*UMAX(J)/UMAX(1)
      RUBARSS(J+1)=UBARSS(J+1)/UBARSS(2)*UMAX(J)/UMAX(1)
      RUBARS(J)=UBARSS(J)/UBARM(1)*UMAX(J)/UMAX(1)
      RUBARS(J+1)=UBARSS(J+1)/UBARM(1)*UMAX(J)/UMAX(1)
      GO TO 71
   77 RUBARSS(J)=UBARM(J)/UBARSS(1)*UMAX(J)/UMAX(1)
      RUBARS(J)=UBARM(J)/UBARM(1)*UMAX(J)/UMAX(1)
   71 CONTINUE
C     START  CP  CALCULATION
      QBAR=QMT(1)*UBARM(1)**2*ALPHAM(1)
      DO 72 J=1,12,2
      IF (J.GT.3.AND.J.LT.8) GO TO 72
      DO 95 I=1,NTAB(J)
      P(I,J)=PSTAT(I,J)*UND(I,J)
   95 CONTINUE
      CALL INTEGRAL(1,0,NTAB(J),RW(J),RW(J+1),SUMP(1,J),P,101,12,DR(J),
     1RW(J),1.0,0.0,J)
   72 CONTINUE
C     CALCULATE MEAN CPS
      CPM1=2.0*SUMP(1,1)/A(1)/UBARM(1)/QBAR
      CPW(3)=PWALL(3)/QBAR
      CPM2=CPW(3)+2.0*SUMP(1,3)/A(3)/QBAR/UBARM(3)-CPM1
C     CALCULATE SPLIT CPS
      DO 73 J=1,4,2
      CALL INTEGRAL(1,0,NTABS(J),RW(J),RS(J),SUMP(2,J),P,101,12,DR(J),R
     1(J),1.0,0.0,J)
      CALL INTEGRAL(1,NTABS(J),NTAB(J),RS(J),RW(J+1),SUMP(3,J),P,101,12
     1DR(J),RS(J),1.0,0.0,J)
   73 CONTINUE
      CPS(1)=2.0*SUMP(2,1)/ASS(1)/UBARSS(1)/QBAR
      CPS(2)=2.0*SUMP(3,1)/ASS(2)/UBARSS(2)/QBAR
      CPS(3)=2.0*SUMP(2,3)/ASS(3)/UBARSS(3)/QBAR +CPW(3)-CPS(1)
      CPS(4)=2.0*SUMP(3,3)/ASS(4)/UBARSS(4)/QBAR +CPW(3)-CPS(2)
      CP(5)=PWALL(5)/QBAR-CPS(1)
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      CP(7)=PWALL(7)/QBAR-CPS(2)
      CPM4=(CP(5)*TMASF(5)+CP(7)*TMASF(7))/TMASF(1)
      CP24=CPM4-CPM2
      CP24I=CP(5)-CPS(3)
      CP24O=CP(7)-CPS(4)
      CPW(9)=PWALL(9)/QBAR
      CPW(11)=PWALL(11)/QBAR
      CP(9)=CPW(9)+2.0*SUMP(1,9)/A(9)/QBAR/UBARM(9)-CPS(1)
      CP(11)=CPW(11)+2.0*SUMP(1,11)/A(11)/QBAR/UBARM(11)-CPS(2)
      CPM3=(CP(9)*TMASF(5)+CP(11)*TMASF(7))/TMASF(1)
      CP12=CPM2
      CP12I=CPS(3)
      CP12O=CPS(4)
      CP23=CPM3-CPM2
      CP23I=CP(9)-CPS(3)
      CP23O=CP(11)-CPS(4)
      CP34=CPM4-CPM3
      CP34I=CP(5)-CP(9)
      CP34O=CP(7)-CP(11)
      CP14=CPM4
      CP14I=CP(5)
      CP14O=CP(7)
      CP24=CP14-CP12
      CP24I=CP14I-CP12I
      CP24O=CP14O-CP12O
      CP13=CPM3
      CP13I=CP(9)
      CP13O=CP(11)
C     START CALCULATION OF LOSS COEFFICIENTS (REF. MEAN INLET)
      LAMDA12=1.0-ALPHAM(3)/ALPHAM(1)*RUBAR(3)**2-CPM2
      LAMDA12O=ALPHASS(2)/ALPHAM(1)*RUBARS(2)**2-ALPHASS(4)/ALPHAM(1)*
     1RUBARS(4)**2-CPS(4)
      LAMDA12I=ALPHASS(1)/ALPHAM(1)*RUBARS(1)**2-ALPHASS(3)/ALPHAM(1)*
     1RUBARS(3)**2-CPS(3)
      LAMDA14I=ALPHASS(1)/ALPHAM(1)*RUBARS(1)**2-ALPHAM(5)/ALPHAM(1)*RUB
     1ARS(5)**2-CP(5)
      LAMDA14O=ALPHASS(2)/ALPHAM(1)*RUBARS(2)**2-ALPHAM(7)/ALPHAM(1)*RUB
     1ARS(7)**2-CP(7)
      LAMDA14=(LAMDA14I*TMASF(5)+LAMDA14O*TMASF(7))/TMASF(1)
      LAMDA24=LAMDA14-LAMDA12
      LAMDA24I=LAMDA14I-LAMDA12I
      LAMDA24O=LAMDA14O-LAMDA12O
      LAMDA13I=ALPHASS(1)/ALPHAM(1)*RUBARS(1)**2-ALPHAM(9)/ALPHAM(1)*RUB
     1ARS(9)**2-CP13I
      LAMDA13O=ALPHASS(2)/ALPHAM(1)*RUBARS(2)**2-ALPHAM(11)/ALPHAM(1)*RU
     1BARS(11)**2-CP13O
      LAMDA13=(LAMDA13I*TMASF(5)+LAMDA13O*TMASF(7))/TMASF(1)
      LAMDA23=LAMDA13-LAMDA12
      LAMDA23I=LAMDA13I-LAMDA12I
      LAMDA23O=LAMDA13O-LAMDA12O
```

```
      LAMDA34=LAMDA14-LAMDA13
      LAMDA34I=LAMDA14I-LAMDA13I
      LAMDA340=LAMDA140-LAMDA130
C     CALCULATE AREA RATIOS
      AR12=A(3)/A(1)
      AR14=(A(5)+A(7))/A(1)
      AR13=(A(9)+A(11))/A(1)*0.866
      AR24=(A(5)+A(7))/A(3)
      AR34=(A(5)+A(7))/(A(9)+A(11))*0.866
      AR12I=ASS(3)/A(1)
      AR120=ASS(4)/A(1)
      AR14I=A(5)/A(1)
      AR140=A(7)/A(1)
      AR24I=A(5)/A(3)
      AR240=A(7)/A(3)
      AR34I=A(5)/(A(9)+A(11))/0.866
      AR340=A(7)/(A(9)+A(11))/0.866
      AR23I=A(9)/A(3)*0.866
      AR230=A(11)/A(3)*0.866
      AR23=(A(9)+A(11))/A(3)*0.866
      AR13I=A(9)/A(1)*0.866
      AR130=A(11)/A(1)*0.866
C     CALCULATE IDEAL CPS AND ETAS
      CPI2=1.0-1.0/AR12**2/ALPHAM(1)
      CPI4=1.0-(1.0/(1.0+SPLIT))**3*(1.0/(A(5)**2/A(1)**2)+SPLIT**3/(A(
     1)**2/A(1)**2))/ALPHAM(1)
      CPI3=1.0-(1.0/(1.0+SPLIT))**3*(1.0/AR13I**2+SPLIT**3/AR130**2)/ALP
     1HAM(1)
      AREF14=SQRT(1.0/(1.0-CPI4)/ALPHAM(1))
      AREF13=SQRT(1.0/(1.0-CPI3)/ALPHAM(1))
      AREF23=AREF13/AR12
      AREF24=AREF14/AR12
      ETA2=CPM2/CPI2*100.0
      ETA3=CPM3/CPI3*100.0
      ETA4=CPM4/CPI4*100.0
      REP=0.0
      WRITE(2,310)
      WRITE(2,305) DIFF,DDR,SPLIT
  305 FORMAT(//6X,38HPERFORMANCE PARAMETERS FOR DIFFUSER NO.F3.0,10H DUM
     1P GAP ,F3.1,11H FLOW SPLIT,F6.3,//18X,19HPRESSURE RECOVERIES,9X,1
     2HLOSS COEFFICIENTS,/X,4HETA%,10X,11HAREA RATIOS,/16X,86HMEAN      I
     3NNER    OUTER     MEAN     INNER    OUTER                  MEAN     INNE
     4R    OUTER/)
      WRITE(2,609)
  609 FORMAT(21X,42HBASED ON OVERALL INLET M.W.M. DYNAMIC HEAD,15X,23HEF
     1FECTIVE    MEAN INLET,/)
  617 WRITE(2,610) CP12,CP12I,CP120,LAMDA12,LAMDA12I,LAMDA120,ETA2,AR12,
     1AR12I,AR120
  610 FORMAT(1X,11HOUTLET(1-2),10F9.3,/)
      WRITE(2,611) CP13,CP13I,CP130,LAMDA13,LAMDA13I,LAMDA130,ETA3,AREF
```

```
     13,AR13I,AR130
611  FORMAT(3X,9HHEAD(1-3),10F9.3,/)
     WRITE(2,612) CP14,CP14I,CP140,LAMDA14,LAMDA14I,LAMDA140,ETA4,AREF
     14,AR14I,AR140
612  FORMAT(4X,8HS/L(1-4),10F9.3,/)
     WRITE(2,613) CP23,CP23I,CP230,LAMDA23,LAMDA23I,LAMDA230,AREF23,AR
     13I,AR230
613  FORMAT(4X,8H(2-3)    ,6F9.3,9X,3F9.3,/)
     WRITE(2,614) CP24,CP24I,CP240,LAMDA24,LAMDA24I,LAMDA240,AREF24,AR
     14I,AR240
614  FORMAT(4X,8H(2-4)    ,6F9.3,9X,3F9.3,/)
     WRITE(2,615) CP34,CP34I,CP340,LAMDA34,LAMDA34I,LAMDA340,AR34I,AR3
     10
615  FORMAT(4X,8H(3-4)    ,6F9.3,18X,2F9.3)
     IF(REP.GT.0.5) GO TO 618
     CON1=1.0/RUBARS(1)**2*ALPHAM(1)/ALPHASS(1)
     CON2=1.0/RUBARS(2)**2*ALPHAM(1)/ALPHASS(2)
     CP12I=CP12I*CON1
     CP13I=CP13I*CON1
     CP14I=CP14I*CON1
     CP23I=CP23I*CON1
     CP24I=CP24I*CON1
     CP34I=CP34I*CON1
     CP120=CP120*CON2
     CP130=CP130*CON2
     CP140=CP140*CON2
     CP230=CP230*CON2
     CP240=CP240*CON2
     CP340=CP340*CON2
     LAMDA12I=LAMDA12I*CON1
     LAMDA13I=LAMDA13I*CON1
     LAMDA14I=LAMDA14I*CON1
     LAMDA23I=LAMDA23I*CON1
     LAMDA24I=LAMDA24I*CON1
     LAMDA34I=LAMDA34I*CON1
     LAMDA120=LAMDA120*CON2
     LAMDA130=LAMDA130*CON2
     LAMDA140=LAMDA140*CON2
     LAMDA230=LAMDA230*CON2
     LAMDA240=LAMDA240*CON2
     LAMDA340=LAMDA340*CON2
     AR12I=ASS(3)/ASS(1)
     AR120=ASS(4)/ASS(2)
     AR14I=A(5)/ASS(1)
     AR140=A(7)/ASS(2)
     AR24I=A(5)/ASS(3)
     AR240=A(7)/ASS(4)
     AR13I=A(9)/ASS(1)*0.866
     AR130=A(11)/ASS(2)*0.866
     AREF24=AR24
```

```
      AREF14=AR14
      AREF13=AR13
      AREF23=AR23
      AR23I=A(9)/ASS(3)*0.866
      AR23O=A(11)/ASS(4)*0.866
      AR34I=A(5)/A(9)/0.866
      AR34O=A(7)/A(11)/0.866
      WRITE(2,616)
  616 FORMAT(21X,40HBASED ON SPLIT INLET M.W.M. DYNAMIC HEAD,17X,23HGEOM
     1ETRIC    SPLIT INLET,/)
      REP=1.0
      GO TO 617
  618 CONTINUE
      CON3=(UBARM(1)*UMAX(1)/UBARM(3)/UMAX(3))**2*ALPHAM(1)/ALPHAM(3)/
     1CON1
      CON4=(UBARM(1)*UMAX(1)/UBARM(3)/UMAX(3))**2*ALPHAM(1)/ALPHAM(3)/
     1CON2
      CON5=1.0/RUBARS(9)**2*ALPHAM(1)/ALPHAM(9)/CON1
      CON6=1.0/RUBARS(11)**2*ALPHAM(1)/ALPHAM(11)/CON2
      CON7=(UBARM(3)/UBARSS(3))**2*ALPHAM(3)/ALPHASS(3)
      CON8=(UBARM(3)/UBARSS(4))**2*ALPHAM(3)/ALPHASS(4)
      CON9=(UBARM(1)*UMAX(1)/UBARM(3)/UMAX(3))**2*ALPHAM(1)/ALPHAM(3)
      Q3I=1.0/(1.0+SPLIT)*(UBARM(9)*UMAX(9))**2*ALPHAM(9)
      Q3O=SPLIT/(1.0+SPLIT)*(UBARM(11)*UMAX(11))**2*ALPHAM(11)
      Q3=Q3I+Q3O
      Q1=(UBARM(1)*UMAX(1))**2*ALPHAM(1)
      CON10=Q1/Q3
      CP34=CP34*CON10
      LAMDA34=LAMDA34*CON10
      CP23=CP23*CON9
      CP24=CP24*CON9
      CP23I=CP23I*CON3
      CP23O=CP23O*CON4
      CP24I=CP24I*CON3
      CP24O=CP24O*CON4
      CP34I=CP34I*CON5
      CP34O=CP34O*CON6
      LAMDA23=LAMDA23*CON9
      LAMDA24=LAMDA24*CON9
      LAMDA23I=LAMDA23I*CON3
      LAMDA23O=LAMDA23O*CON4
      LAMDA24I=LAMDA24I*CON3
      LAMDA24O=LAMDA24O*CON4
      LAMDA34I=LAMDA34I*CON5
      LAMDA34O=LAMDA34O*CON6
      WRITE(2,619)
  619 FORMAT(39X,48HBASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD,/)
      WRITE(2,620) CP23,CP23I,CP23O,LAMDA23,LAMDA23I,LAMDA23O
  620 FORMAT(4X,8H(2-3)    ,6F9.3,/)
      WRITE(2,621) CP24,CP24I,CP24O,LAMDA24,LAMDA24I,LAMDA24O
```

```
621  FORMAT(4X,8H(2-4)    ,6F9.3,/)
     WRITE(2,622) CP34,CP34I,CP340,LAMDA34,LAMDA34I,LAMDA340
622  FORMAT(4X,8H(3-4)    ,6F9.3)
     LAMDA23I=LAMDA23I*CON7
     LAMDA230=LAMDA230*CON8
     LAMDA24I=LAMDA24I*CON7
     LAMDA240=LAMDA240*CON8
     CP23I=CP23I*CON7
     CP230=CP230*CON8
     CP24I=CP24I*CON7
     CP240=CP240*CON8
     WRITE(2,623)
623  FORMAT(40X,46HBASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD,/)

     WRITE(2,624) CP23I,CP230,LAMDA23I,LAMDA230
624  FORMAT(4X,8H(2-3)    ,9X,2F9.3,9X,2F9.3,/)
     WRITE(2,625) CP24I,CP240,LAMDA24I,LAMDA240
625  FORMAT(4X,8H(2-4)    ,9X,2F9.3,9X,2F9.3,/)
310  FORMAT(1H1)
     WRITE(4,634) NTAB(3),NTAB(5),NTAB(7),NTHI,NTHO
634  FORMAT(5I5)
     WRITE(4,635) SPLIT
635  FORMAT(F10.4)
     DO 630 I=1,NTAB(3)
     CPL(I,3)=(PSTAT(I,3)+PWALL(3))/QBAR-CPM1
630  CONTINUE
     DO 632 I=1,NTHI
     K=NTHI-I+1
     CPL(I,9)=(PSHI(K)+PWALL(9))/QBAR-CPM1
     UND(I,9)=UNDHI(K)
632  CONTINUE
     DO 633 I=1,NTHO
     CPL(I,11)=(PSTAT(I,11)+PWALL(11))/QBAR-CPM1
633  CONTINUE
     DO 636 J=3,8,2
     WRITE(4,637) (UND(I,J),I=1,NTAB(J))
636  CONTINUE
     WRITE(4,637) (UND(I,9),I=1,NTHI)
     WRITE(4,637) (UND(I,11),I=1,NTHO)
637  FORMAT(13F6.3)
     WRITE(4,638) (CPL(I,3),I=1,NTAB(3))
     WRITE(4,638) (CPL(I,9),I=1,NTHI)
     WRITE(4,638) (CPL(I,11),I=1,NTHO)
638  FORMAT(11F7.3)
     KEV=1
706  CONTINUE
704  CONTINUE
701  CONTINUE
     STOP
     END
```

```
      SUBROUTINE INTEGRAL(IPOWER,N1,N2,R1,R2,SUM,V,NR,NC,DR,RW,W,ANG,J)
      DIMENSION V(NR,NC),FACT(200),R(200)
      IF (N1.EQ.0) N1=1
      SUM=0.0
      DO 1 I=N1,NR
      R(I)=R1+FLOAT(I-N1)*DR
      R(I+1) = R(I)+DR
      FACT(I)=V(I,J)**IPOWER*R(I)
      K=I+1
      FACT(K)=V(K,J)**IPOWER*R(K)
      SUM=SUM+FACT(I)+FACT(K)
      IF(R(K).GE.(R2-0.5*DR)) GO TO 2
    1 CONTINUE
    2 N2=K
      SUM = SUM*DR/2.0
      RETURN
      END
      SUBROUTINE TABIT (X,Y,M,N,VARI,VARD)
      DIMENSION VARI(N),VARD(N),V(3),YY(2)
      IF (M.EQ.0.AND.N.EQ.0) GO TO 1
      IF(M.EQ.0.AND.N.NE.0) GO TO 97
      IF(N.LE.IABS(M)) GO TO 97
      IF(M.GT.0) GO TO 31
C ***     M.LT.0
      DO 44 IYY=1,N
      I=IYY
      IF(VARI(I)-X)800,119,44
   44 CONTINUE
      I=N+M
C ***     IF X.LT.X(N),EXTRAPOLATE
      IF(M.EQ.-1)GO TO 801
      GO TO 802
C ***     IF X.GT.X(1),EXTRAPOLATE
  800 IF(I.EQ.1.AND.M.EQ.-1) GO TO 801
      IF(I.EQ.1.AND.M.EQ.-2) GO TO 802
      IF(M.NE.-1) GO TO 622
C ***     M=-1
      I=I-1
  801 IF(VARI(I).LE.VARI(I+1)) GO TO 97
      GO TO 1701
C ***     M=-2
  622 IF(I.NE.N) GO TO 1622
      I=N-2
      GO TO 802
C ***     COMPARE WITH NEXT
 1622 IF(VARI(I+1)-X)803,97,97
  803 I=I-1
      IF(I.EQ.1) GO TO 802
C ***     SEE WHICH THREE
      IF((VARI(I-1)-X).LT.(X-VARI(I+2)))I=I-1
```

```
  802 IF(VARI(I).LE.VARI(I+1).OR.VARI(I+1).LE.VARI(I+2))GO TO 97
      GO TO 1702
C ***     M.GT.0
   31 DO 4 IYY=1,N
      I=IYY
      IF(X-VARI(I))700,119,4
    4 CONTINUE
      I=N-M
C ***     IF X.GT.X(N),EXTRAPOLATE
      IF(M.EQ.1) GO TO 701
      GO TO 702
C ***     IF X.LT.X(1),EXTRAPOLATE
  700 IF(I.EQ.1.AND.M.EQ.1) GO TO 701
      IF(I.EQ.1.AND.M.EQ.2) GO TO 702
      IF(M.NE.1) GO TO 222
C ***     M=1
      I=I-1
  701 IF(VARI(I+1).LE.VARI(I)) GO TO 97
C ***     LINEAR
 1701 Y=(VARD(I)*(VARI(I+1)-X)-VARD(I+1)*(VARI(I)-X))/
     1 (VARI(I+1)-VARI(I))
      RETURN
C ***     M=2
  222 IF(I.NE.N) GO TO 1222
      I=N-2
      GO TO 702
C ***     COMPARE WITH NEXT
 1222 IF(X-VARI(I+1))703,97,97
  703 I=I-1
      IF(I.EQ.1) GO TO 702
C ***     SEE WHICH THREE
      IF((X-VARI(I-1)).LT.(VARI(I+2)-X))I=I-1
  702 IF(VARI(I+1).LE.VARI(I).OR.VARI(I+2).LE.VARI(I+1)) GO TO 97
C ***     SECOND ORDER
 1702 V(1)=VARI(I)-X
      V(2)=VARI(I+1)-X
      V(3)=VARI(I+2)-X
      K=I
      DO 704 J=1,2
      YY(J)=(VARD(K)*V(J+1)-VARD(K+1)*V(J))/(VARI(K+1)-VARI(K))
  704 K=K+1
      Y=(YY(1)*V(3)-YY(2)*V(1))/(VARI(I+2)-VARI(I))
      RETURN
C ***     ZERO ORDER (Y=Y(1))
    1 Y=VARD(1)
      RETURN
C ***     Y=Y(I)
  119 Y=VARD(I)
      RETURN
C ***
```

```
C ***       ERROR PRINT
   97 WRITE(2,103)
  103 FORMAT(1X,31H ERROR WAS ENCOUNTERED IN FTLUP)
      WRITE(2,1103) M,N,X
 1103 FORMAT(1X,2HM=,I5,5X,2HN=,I5,5X,2HX=,E20.8)
       WRITE (2,55) I,VARD(I)
  55   FORMAT (2X,I4,2X,F20.8)
      IF(N.EQ.0) STOP
      IF(M.EQ.0) STOP
      WRITE(2,1104)
 1104 FORMAT(1X,19H TABLE OUT OF ORDER)
      RETURN
      END
      FINISH
****
```

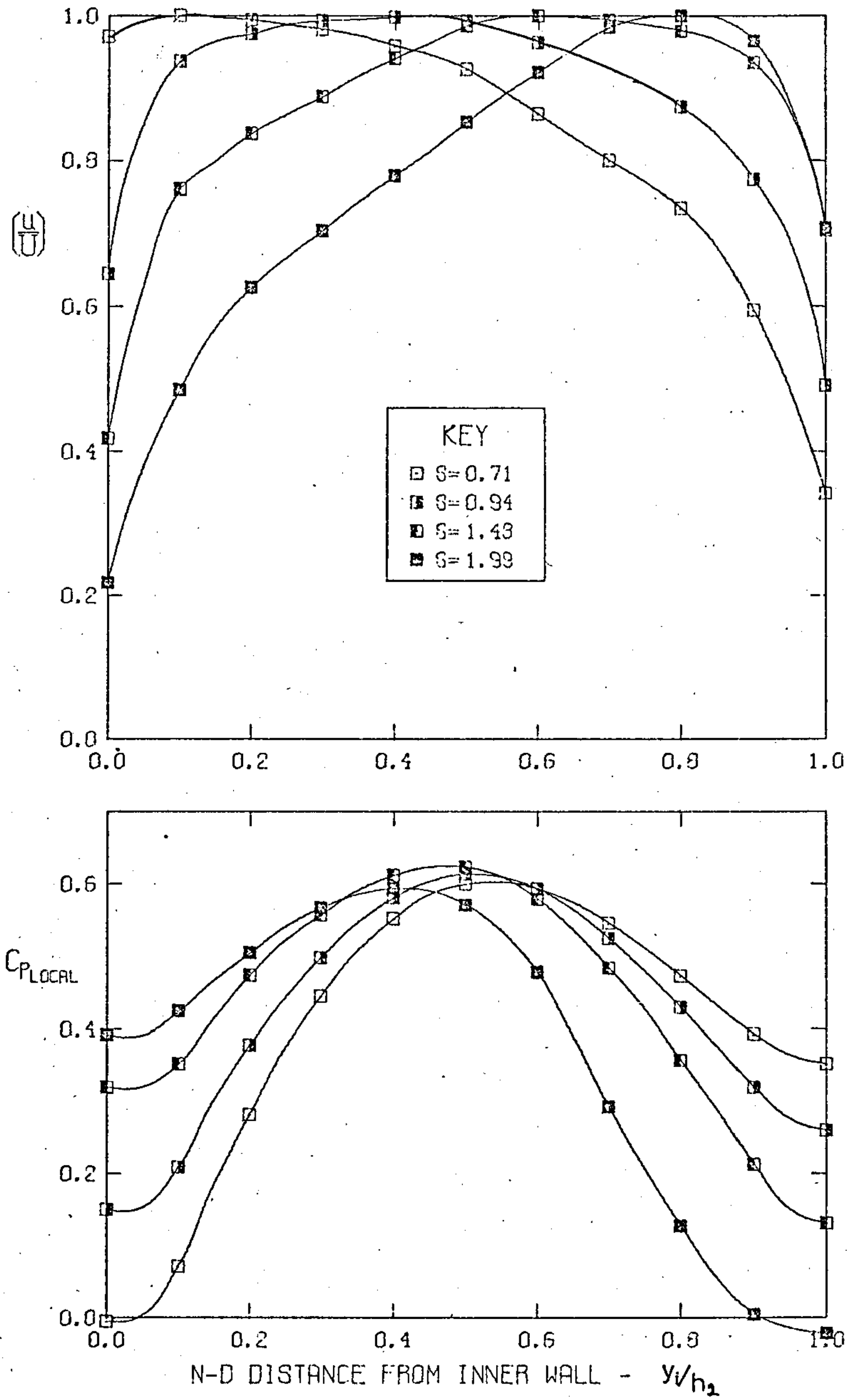
APPENDIX 2

PRE-DIFFUSER OUTLET PROFILES

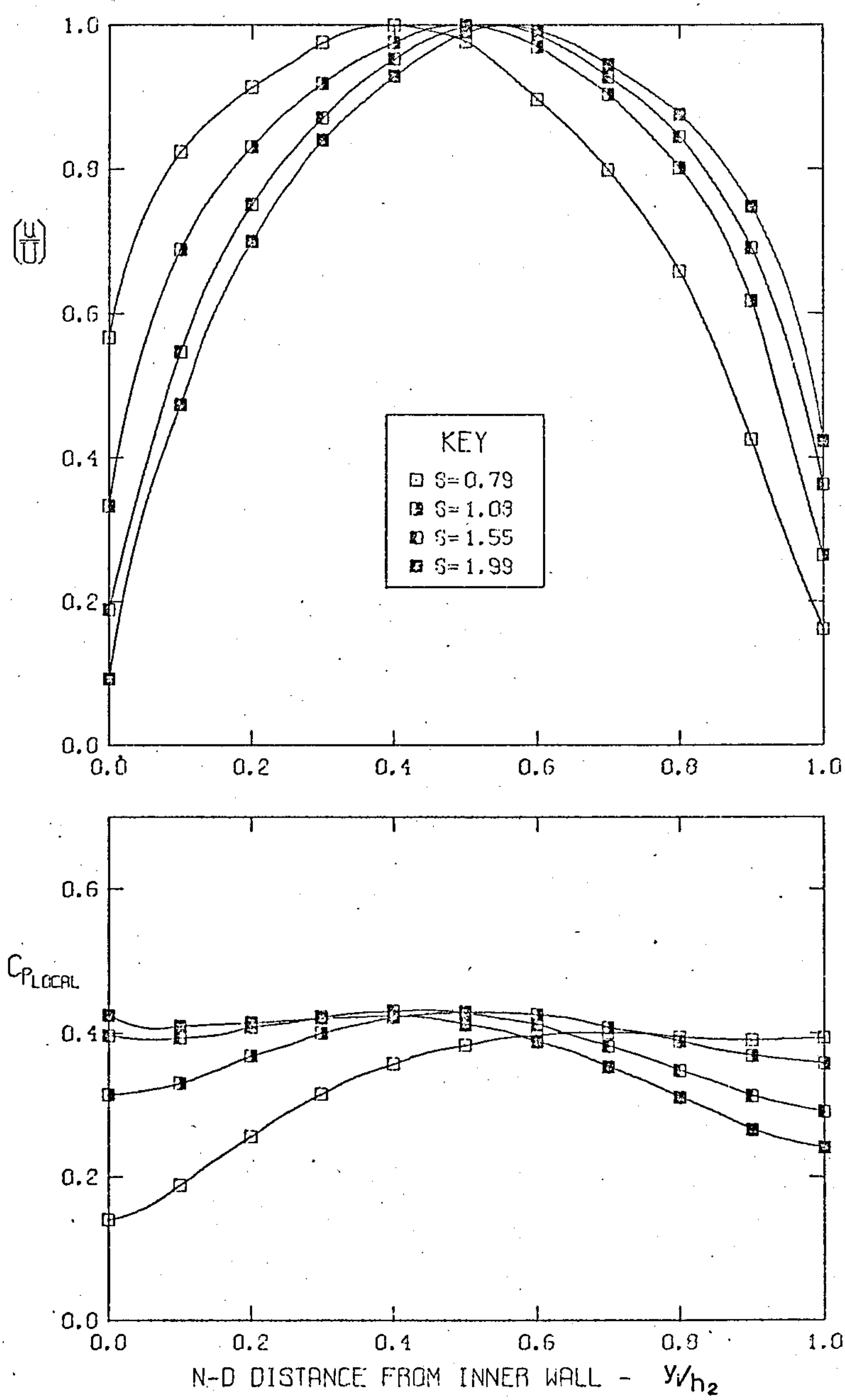
$S^{*} = 1.20$

FULLY DEVELOPED ENTRY CONDITIONS

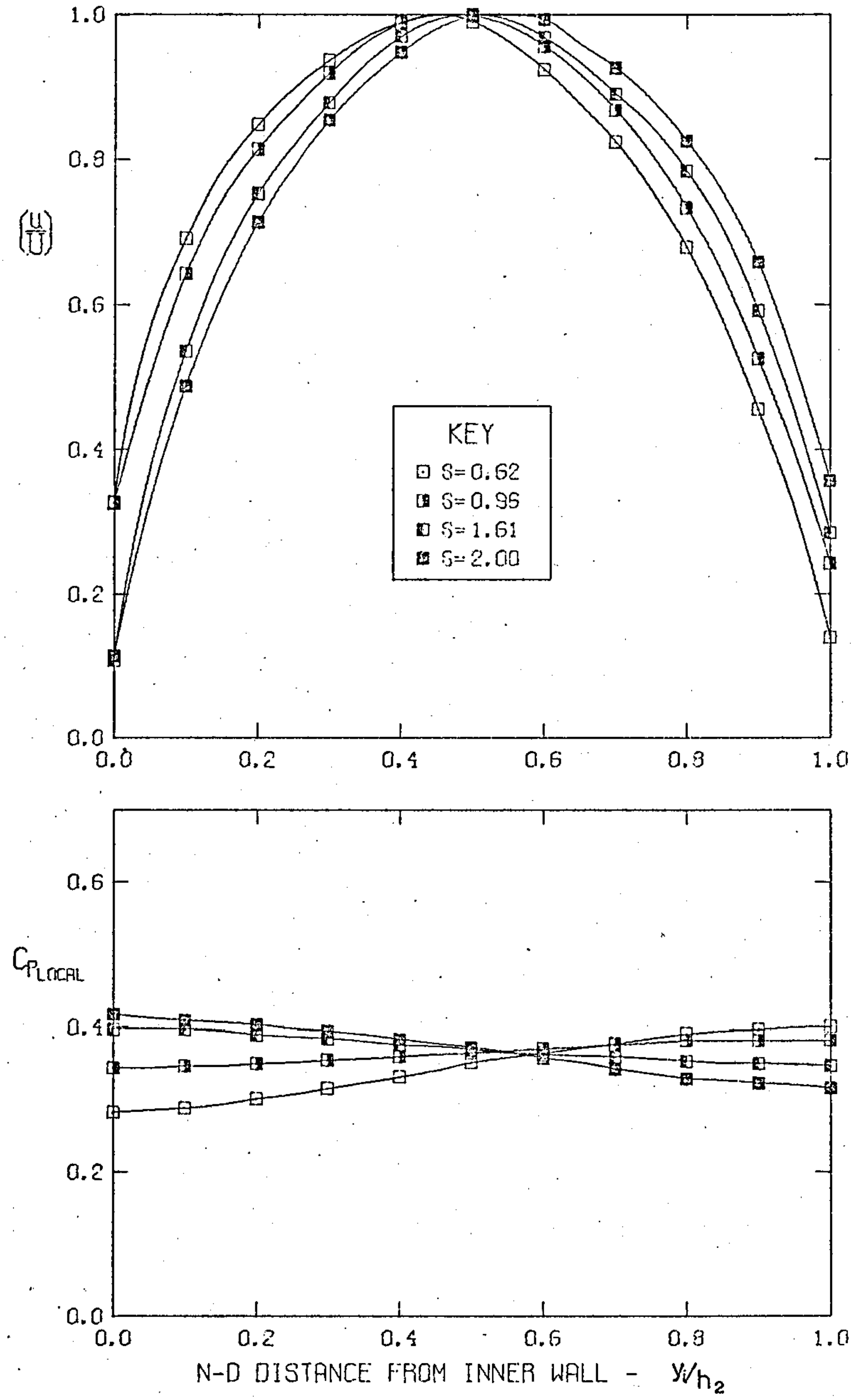
PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 1-0 5



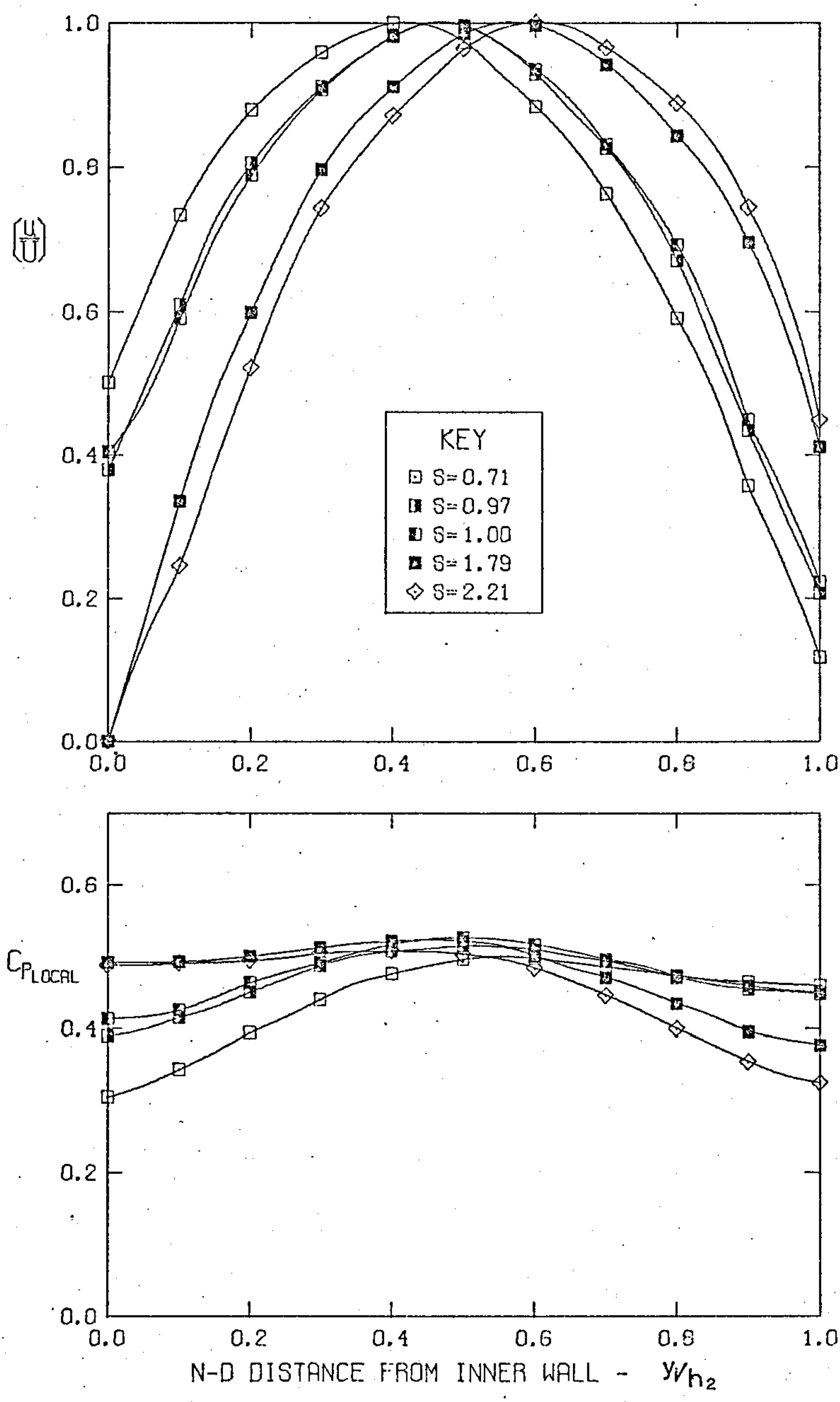
PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 1-1 O



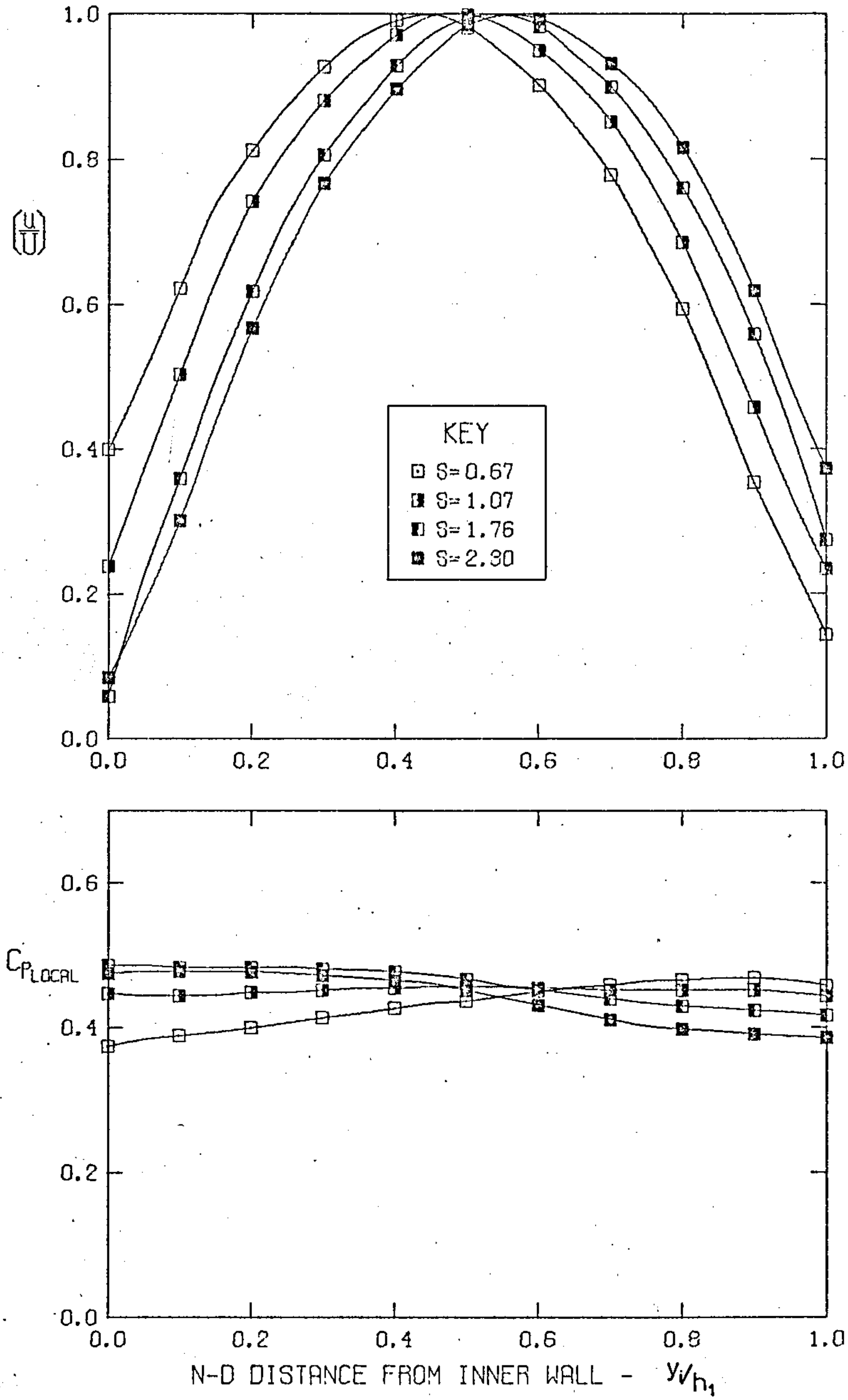
PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 1-2 O



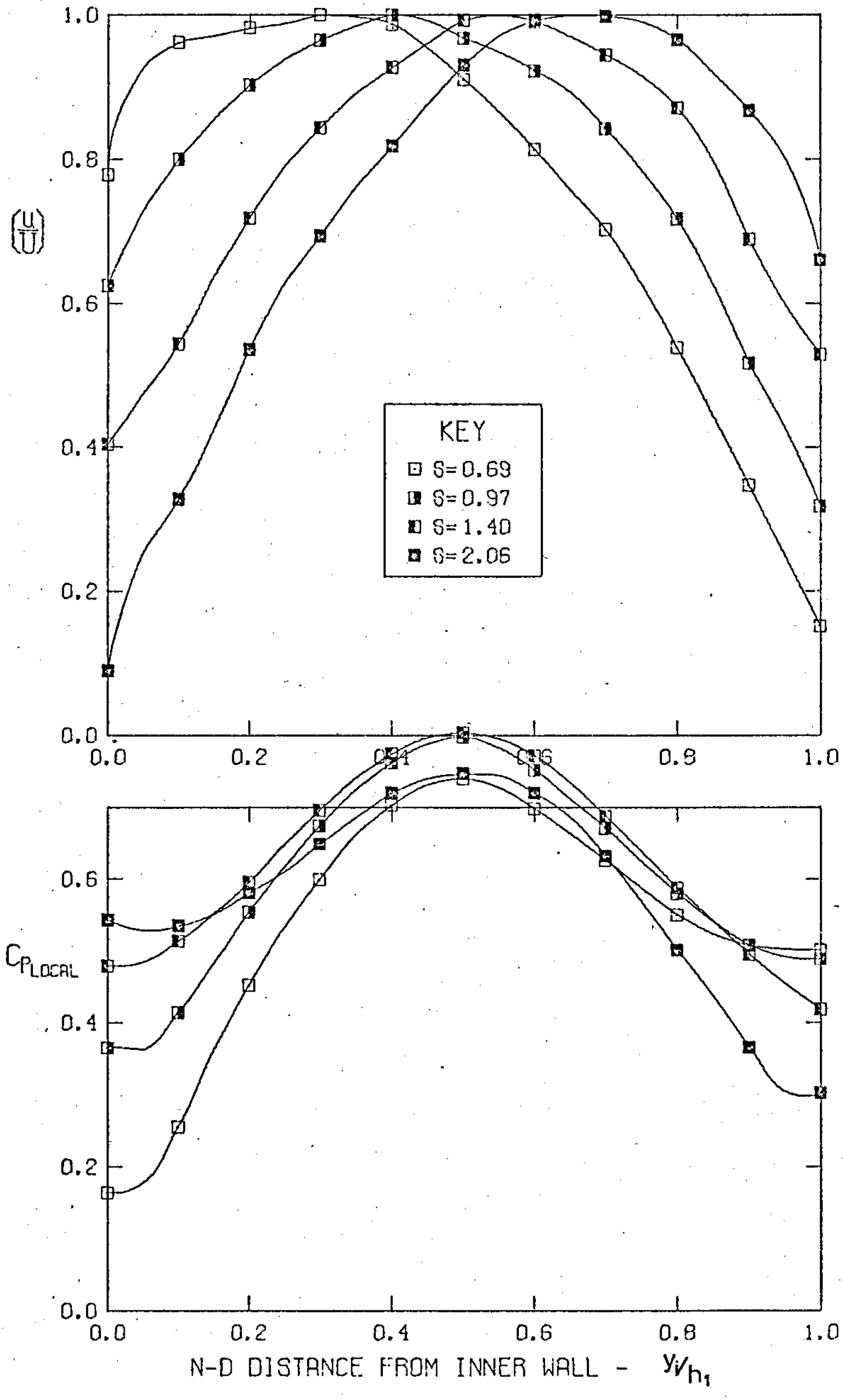
PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 2-0 8



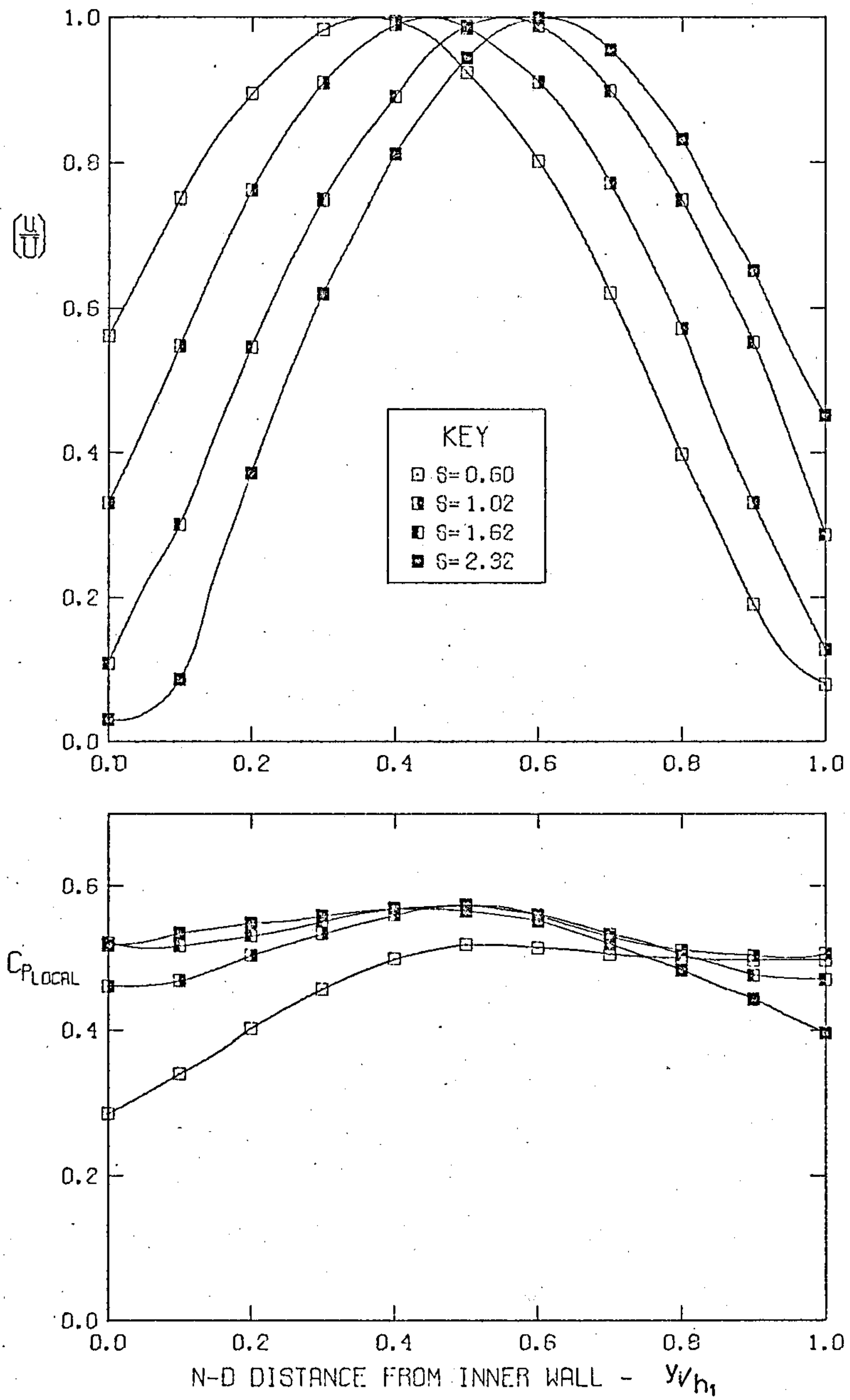
PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 2-1 5



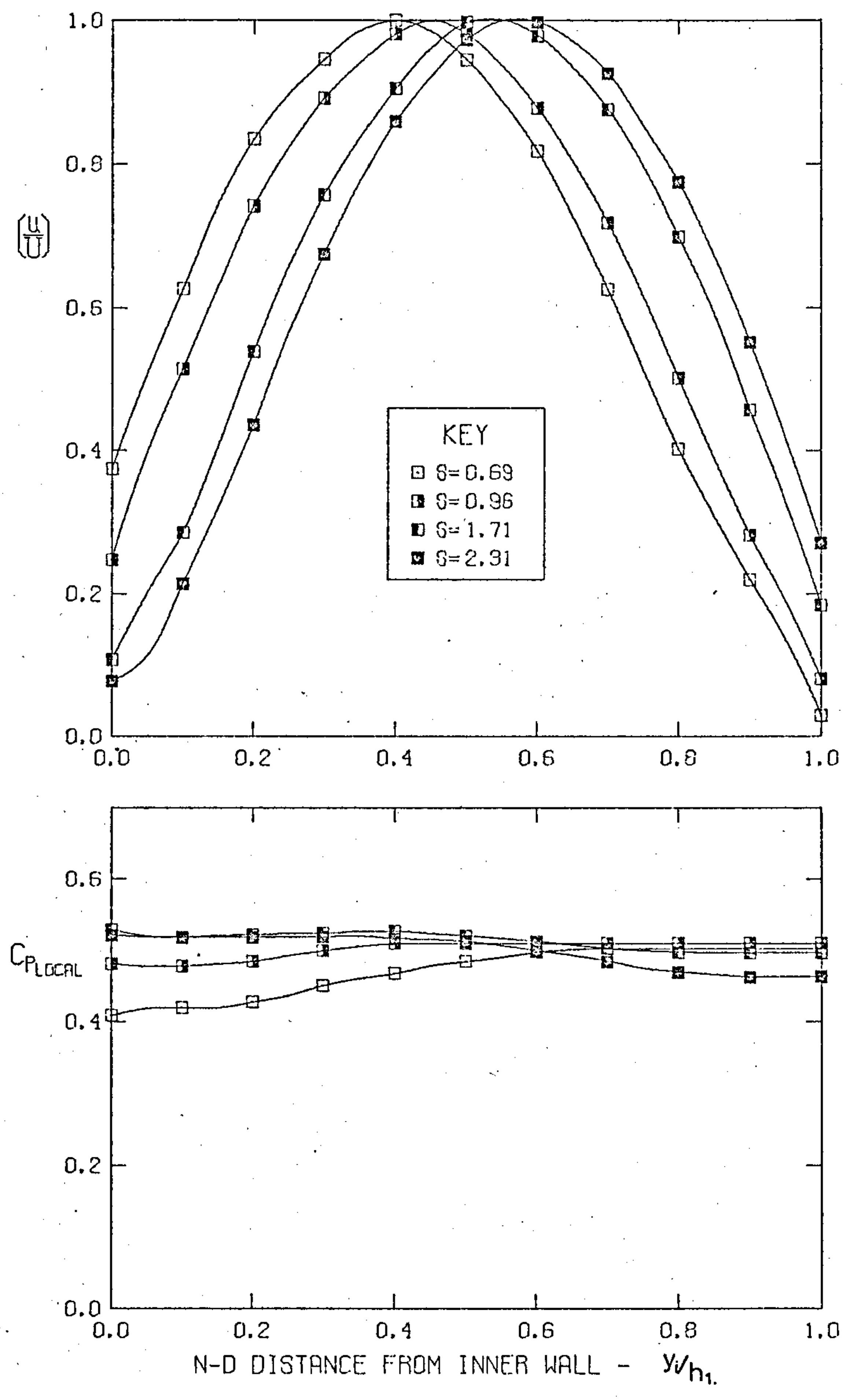
PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 3-0 4



PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 3-0.7



PRE-DIFFUSER OUTLET PROFILES
FOR TEST SERIES 3-1 2



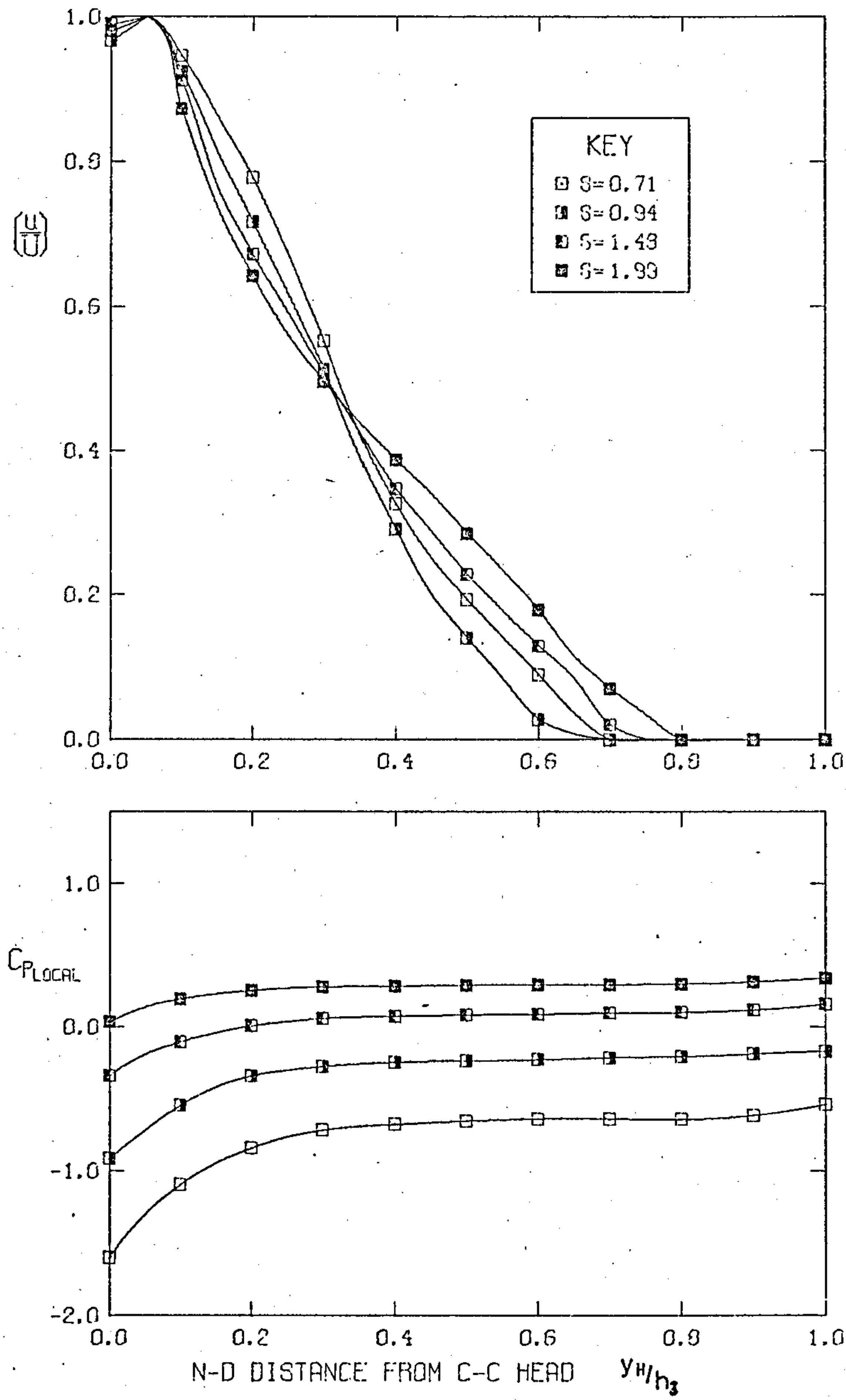
APPENDIX 3

HEAD STATION (3) PROFILES

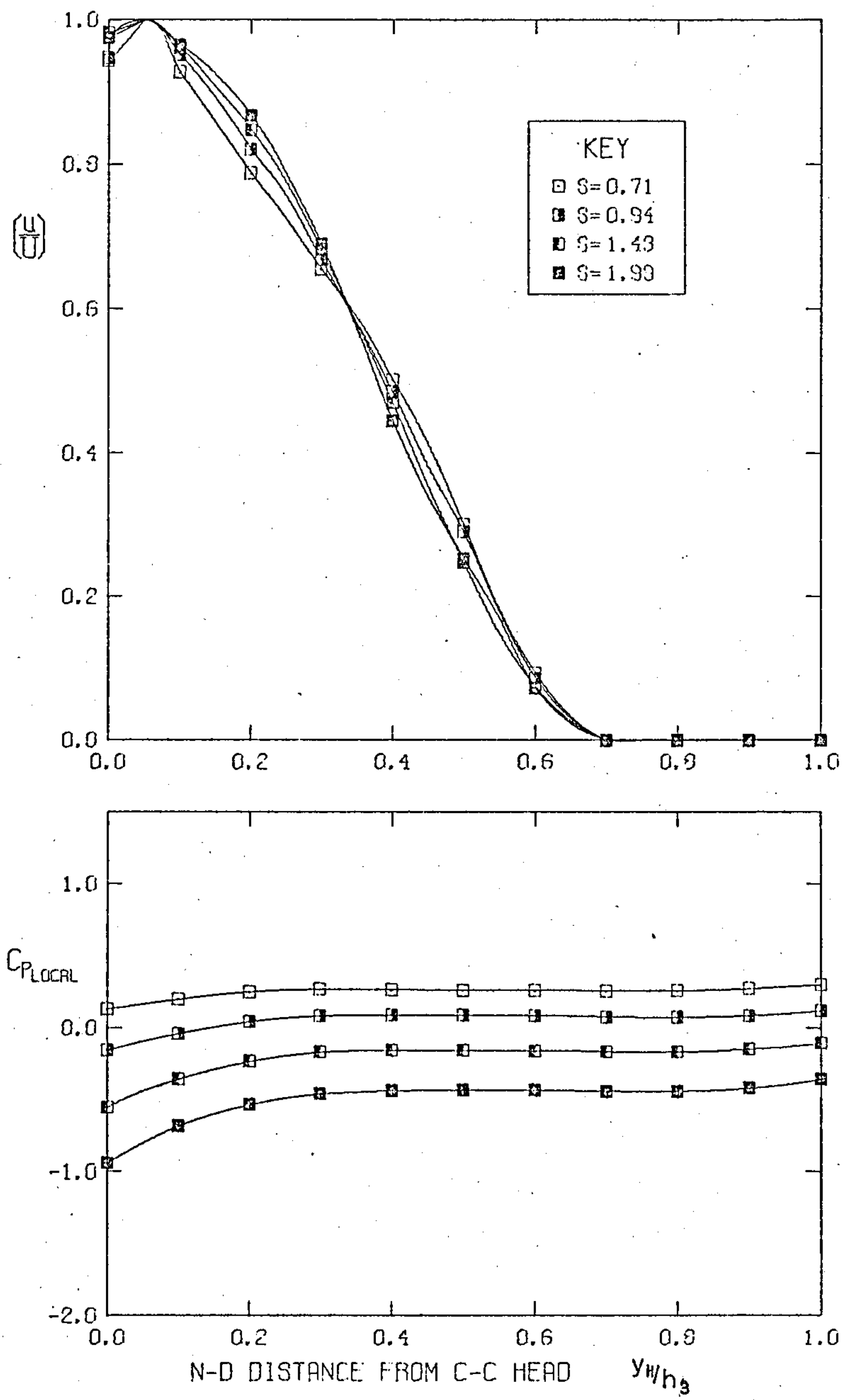
$S^{*} = 1.20$

FULLY DEVELOPED ENTRY CONDITIONS

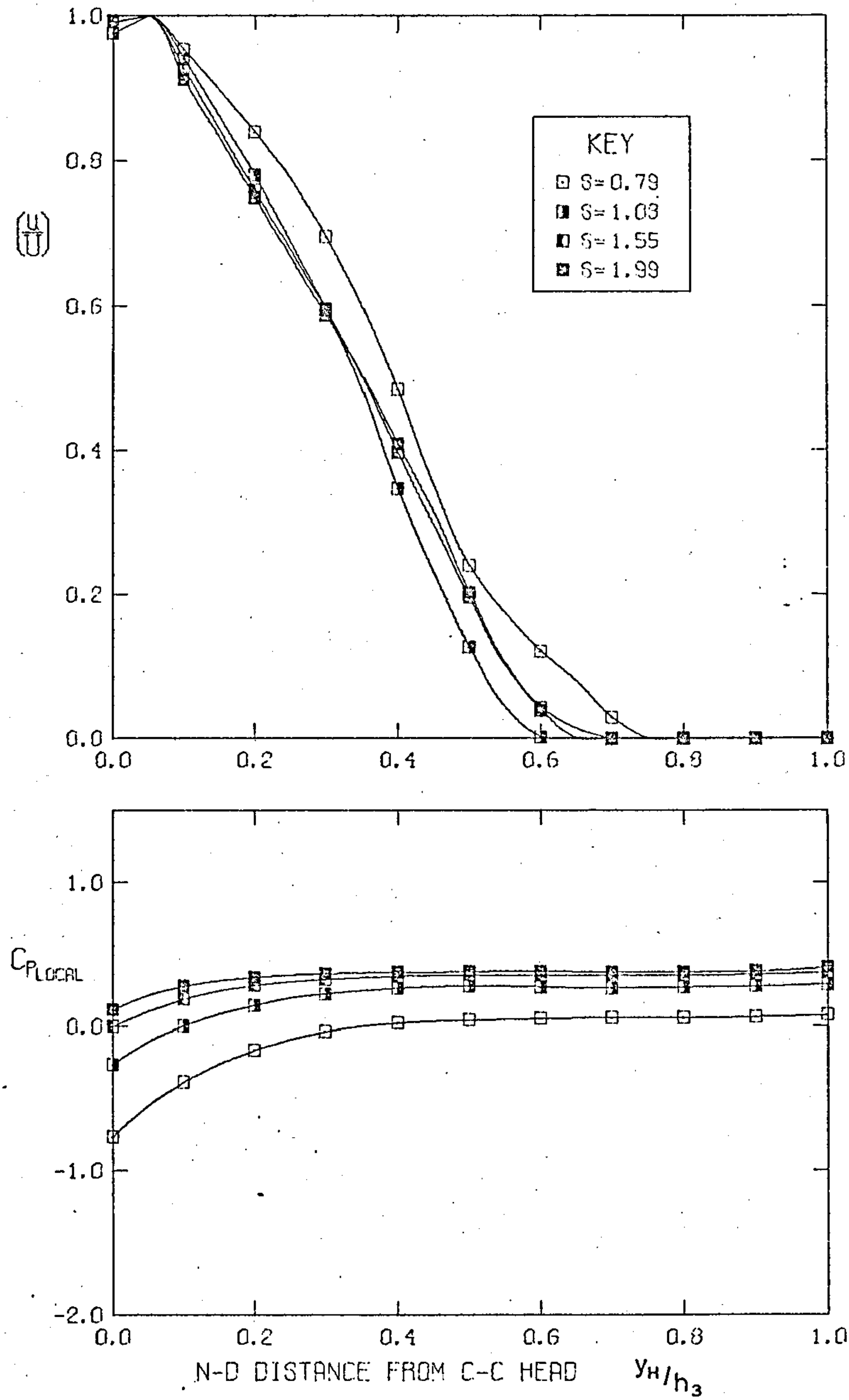
HEAD INNER PROFILES
FOR TEST SERIES 1-0 5



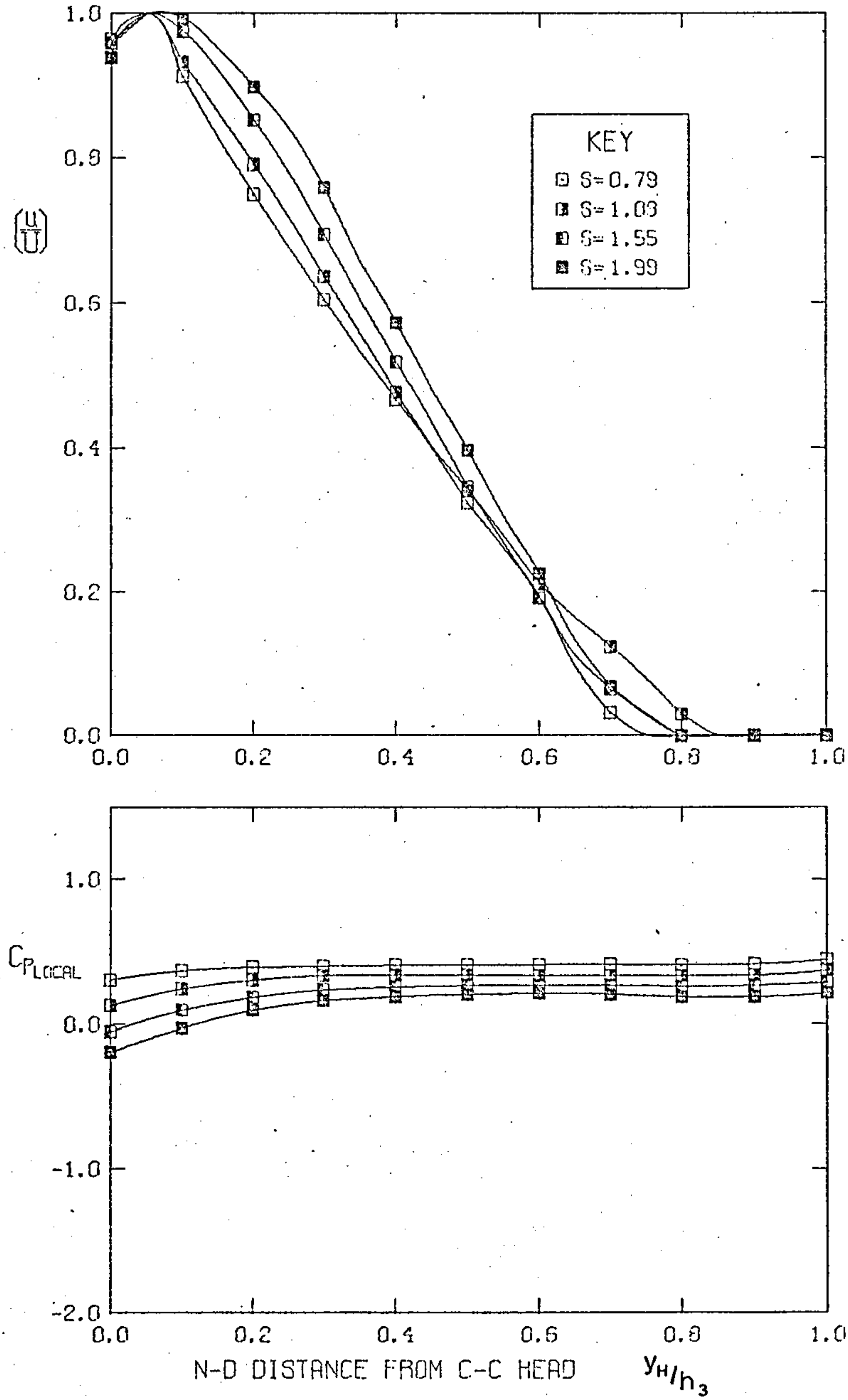
HEAD OUTER PROFILES
FOR TEST SERIES 1-0 5



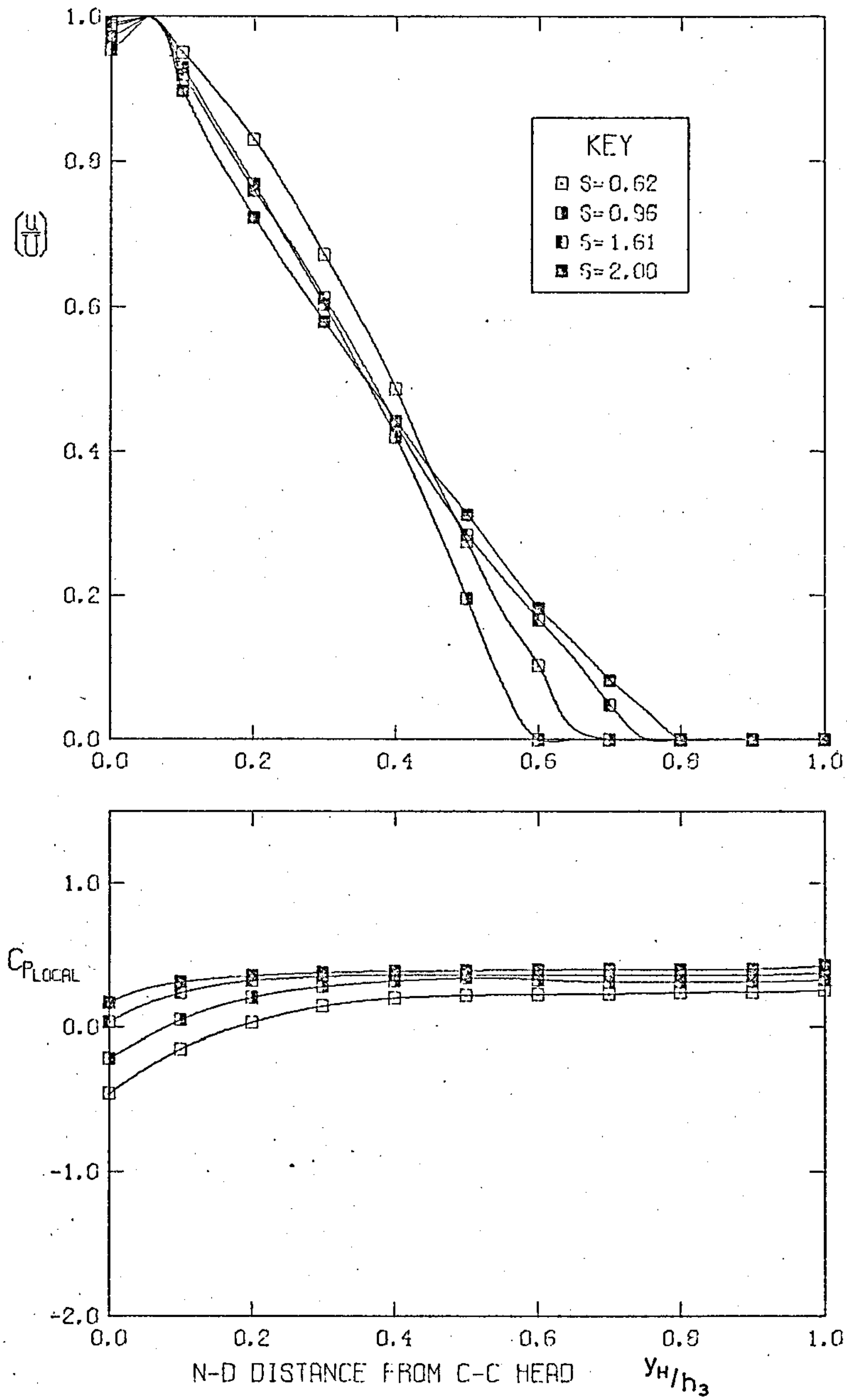
HEAD INNER PROFILES FOR TEST SERIES 1-1.0



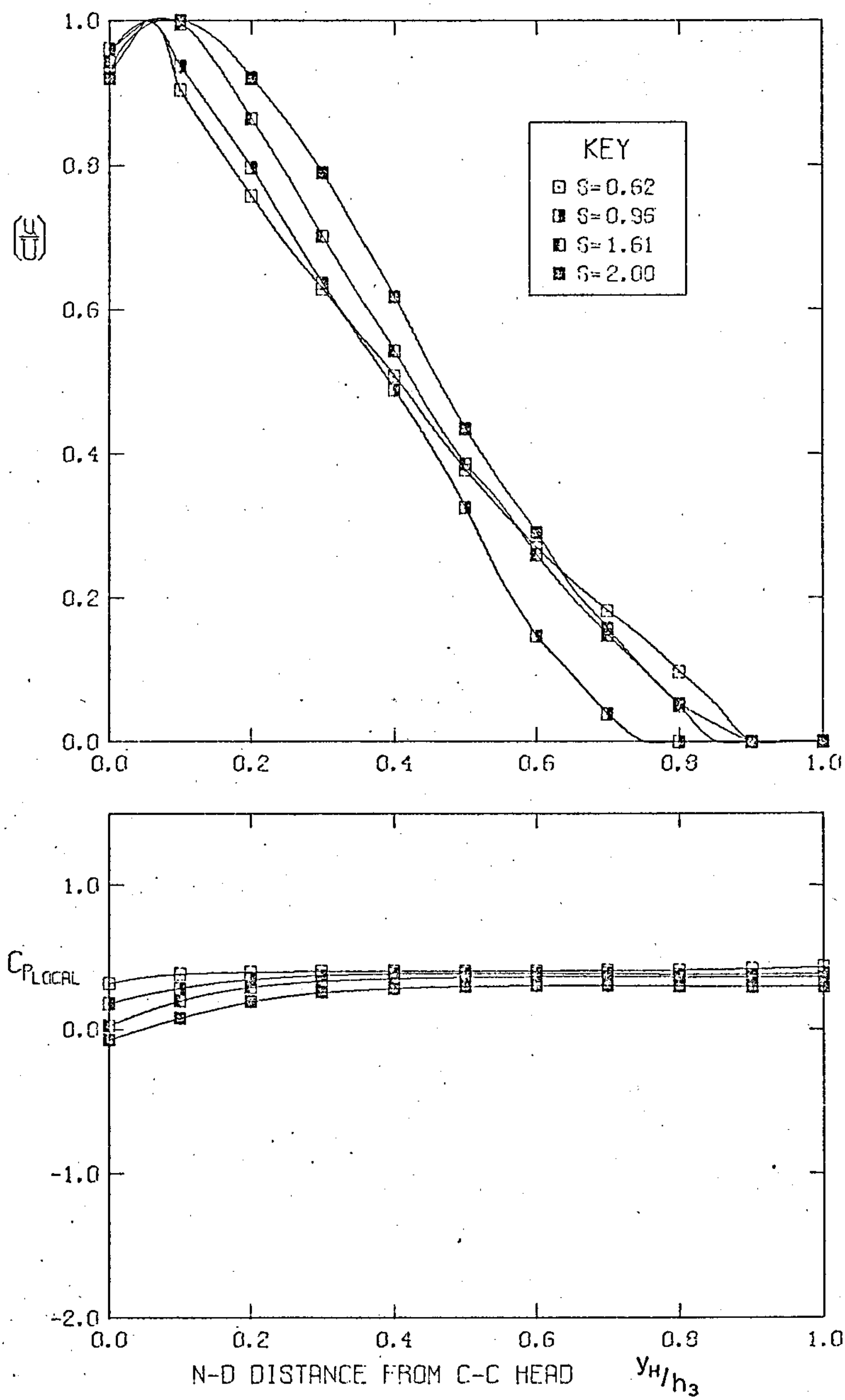
HEAD OUTER PROFILES
FOR TEST SERIES 1-1 0



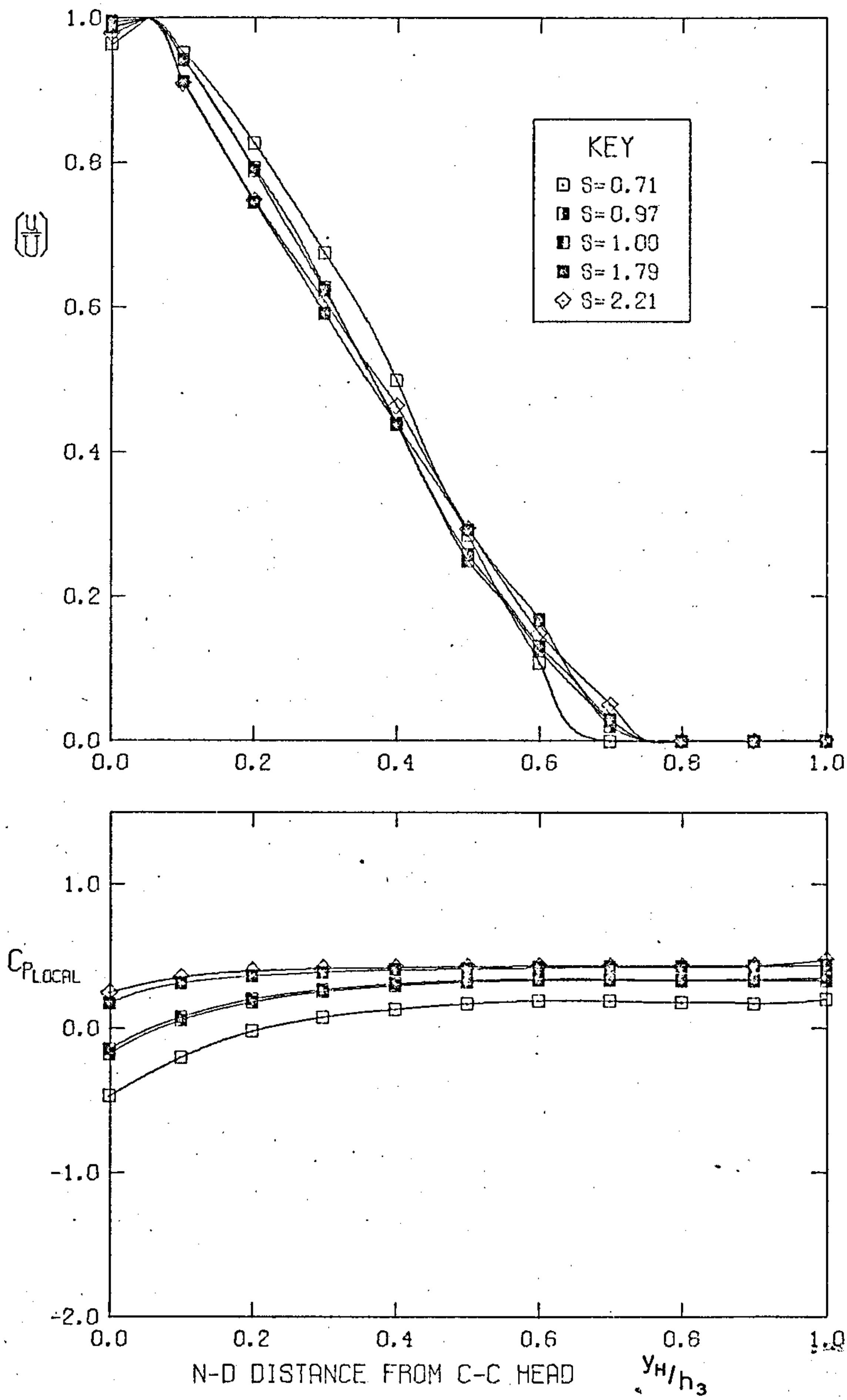
HEAD INNER PROFILES
FOR TEST SERIES 1-2 0



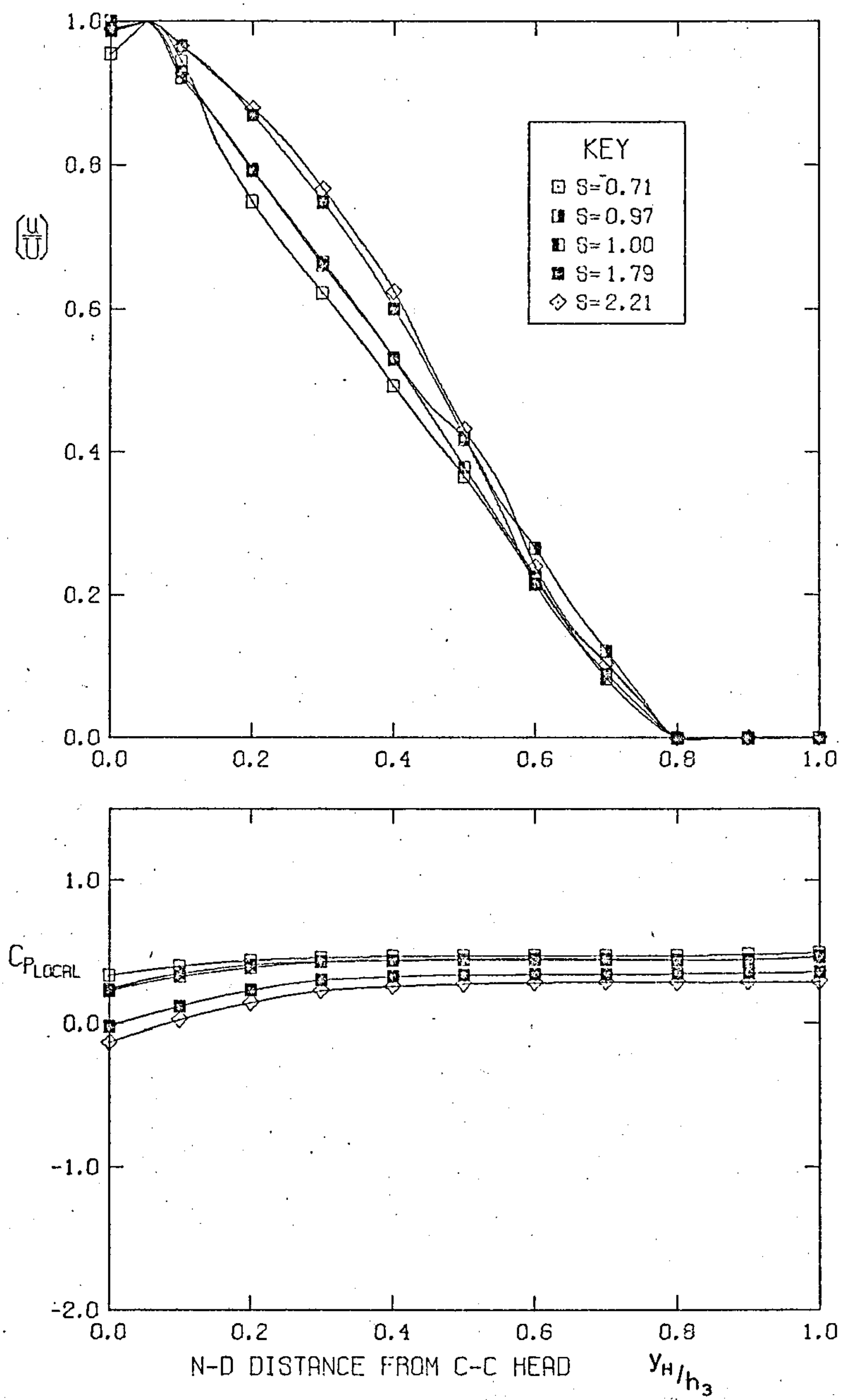
HEAD OUTER PROFILES
FOR TEST SERIES 1-2 0



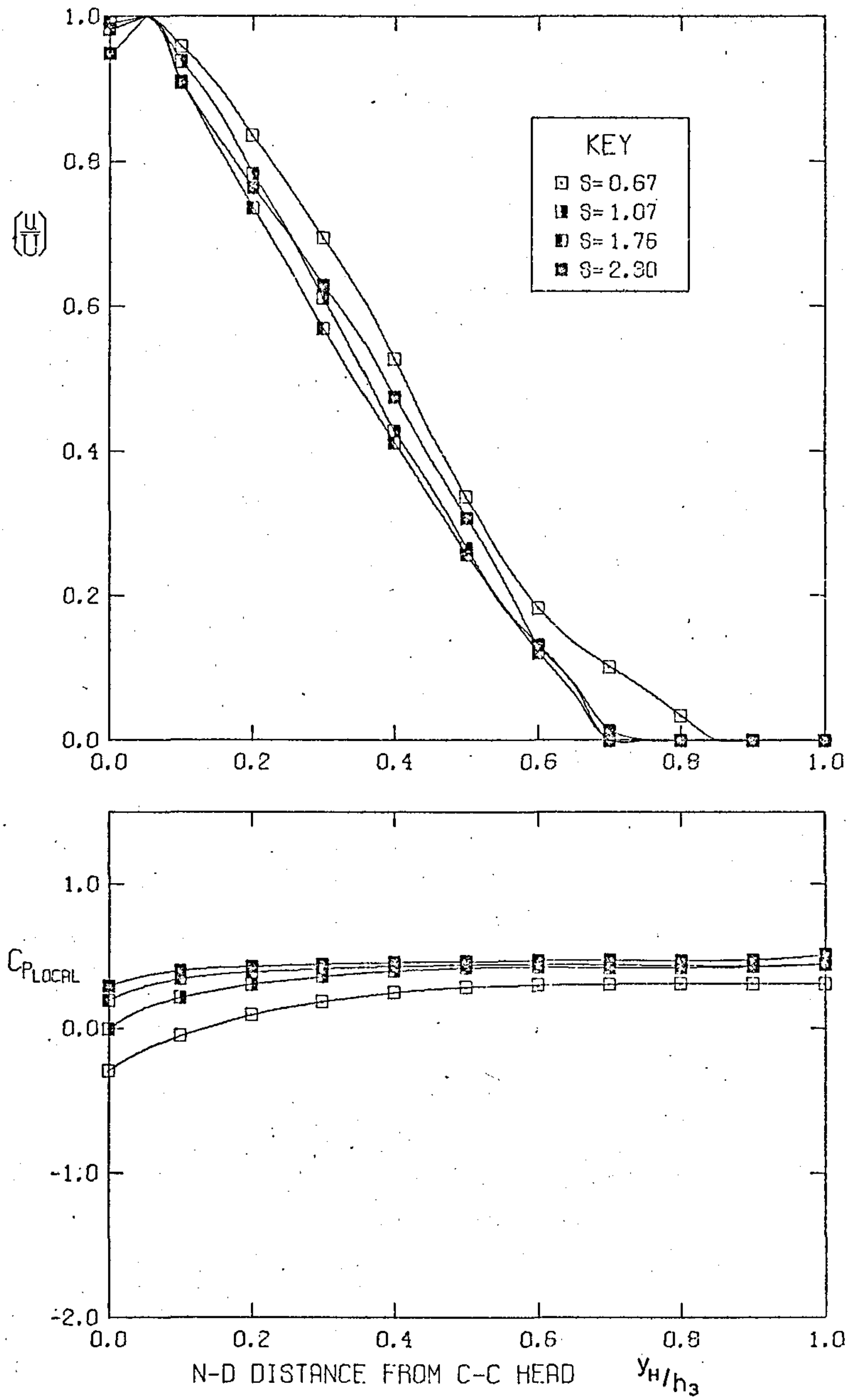
HEAD INNER PROFILES
FOR TEST SERIES 2-0 8



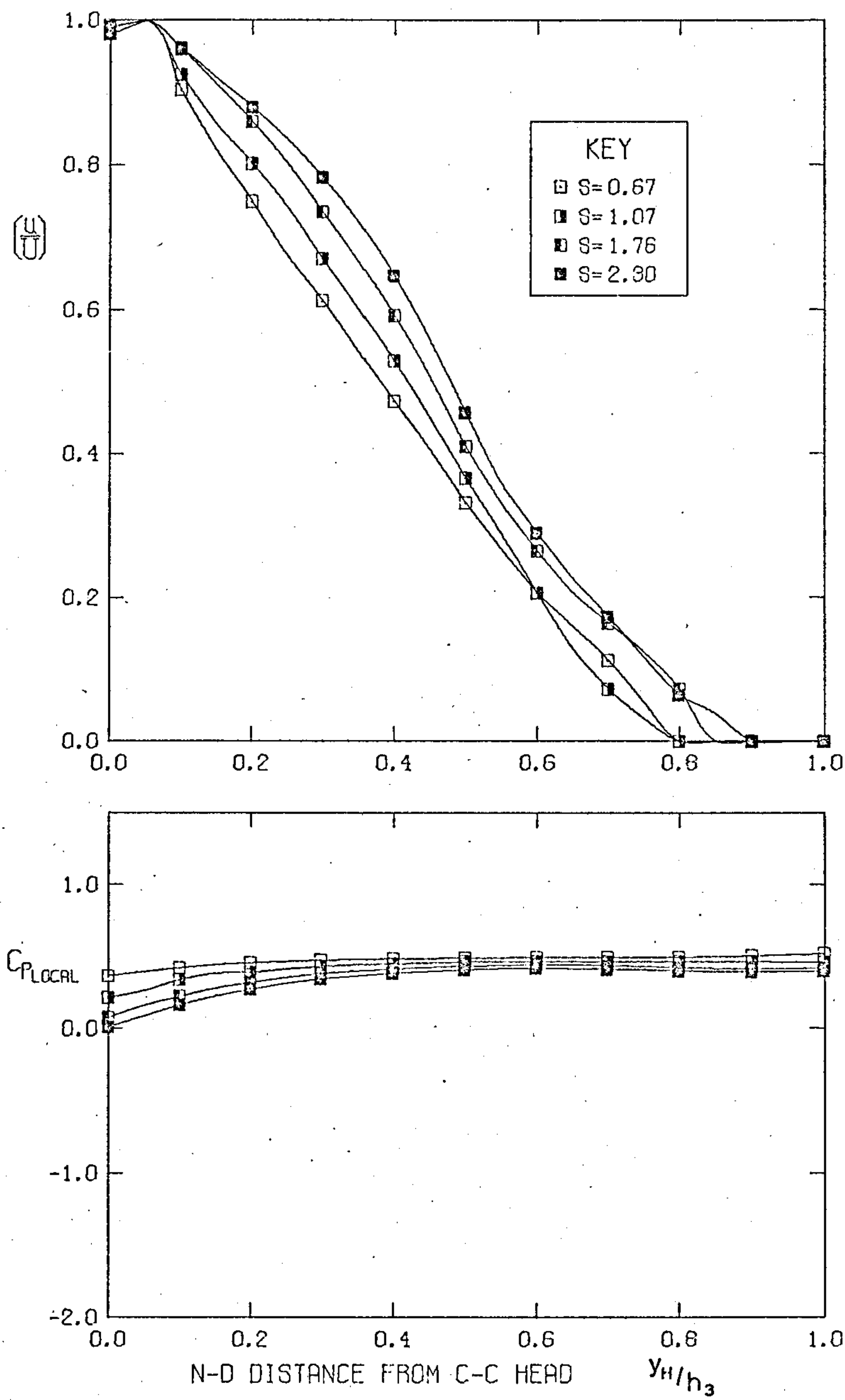
HEAD OUTER PROFILES
FOR TEST SERIES 2-0 8



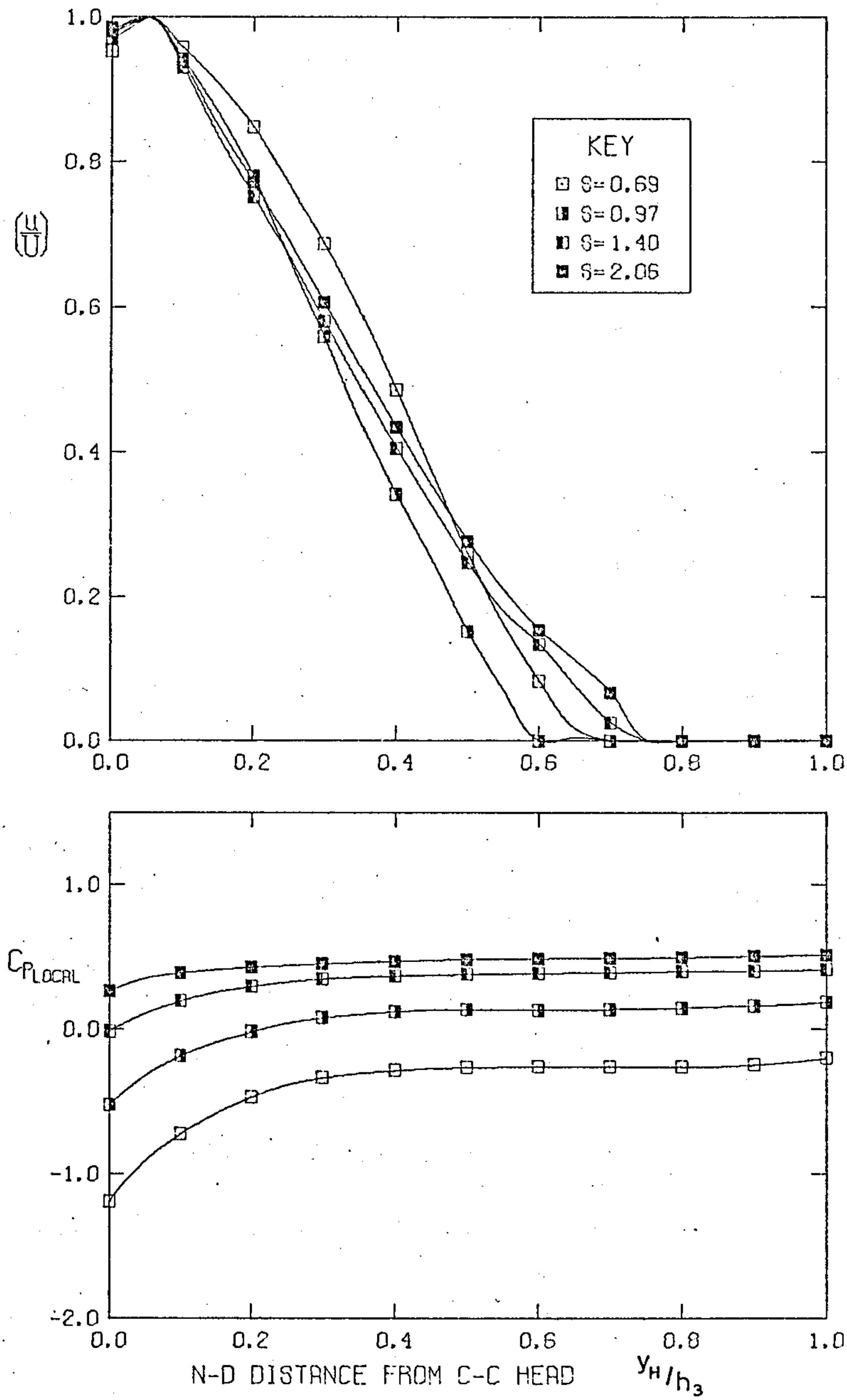
HEAD INNER PROFILES
FOR TEST SERIES 2-1 5



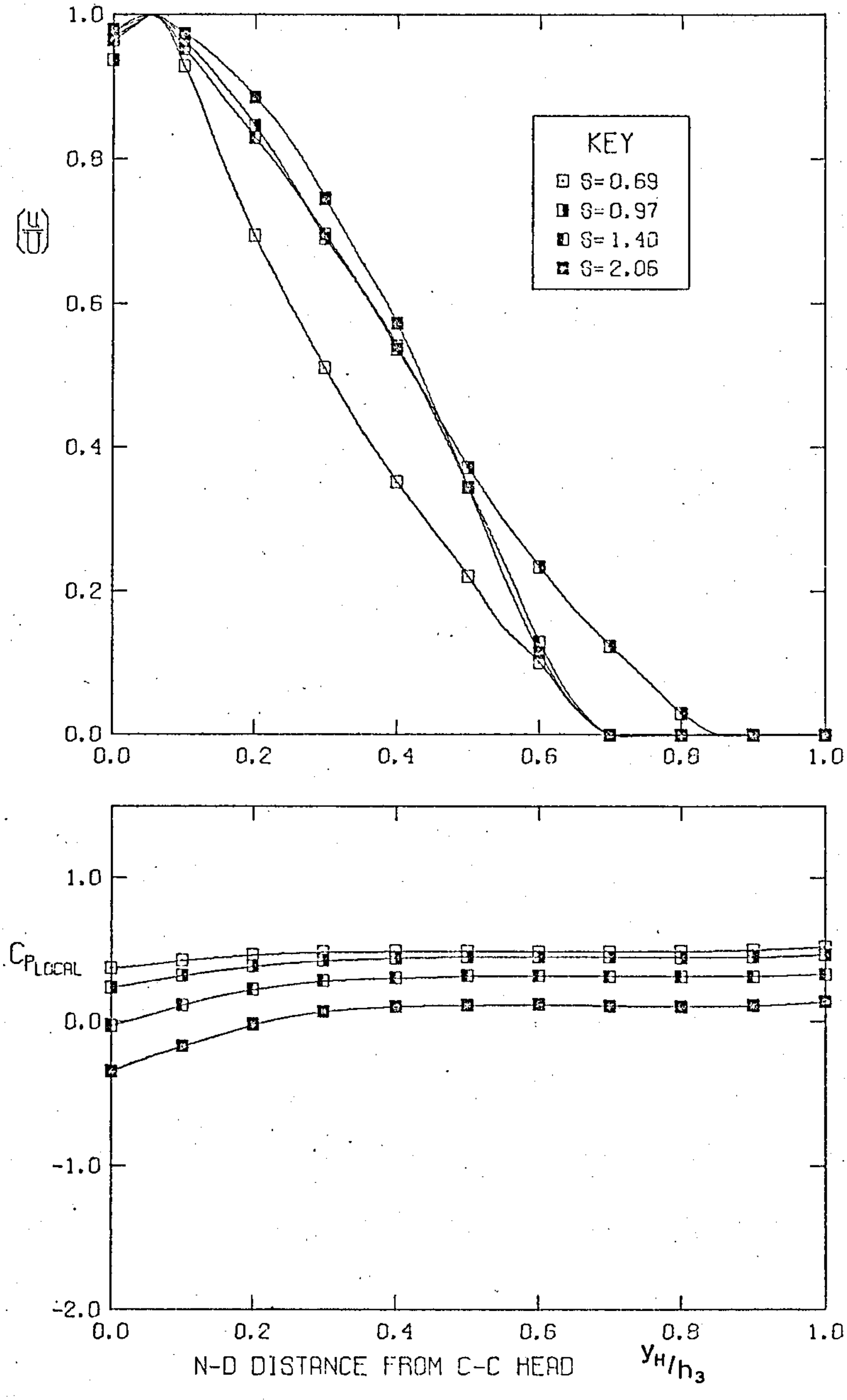
HEAD OUTER PROFILES
FOR TEST SERIES 2-1.5



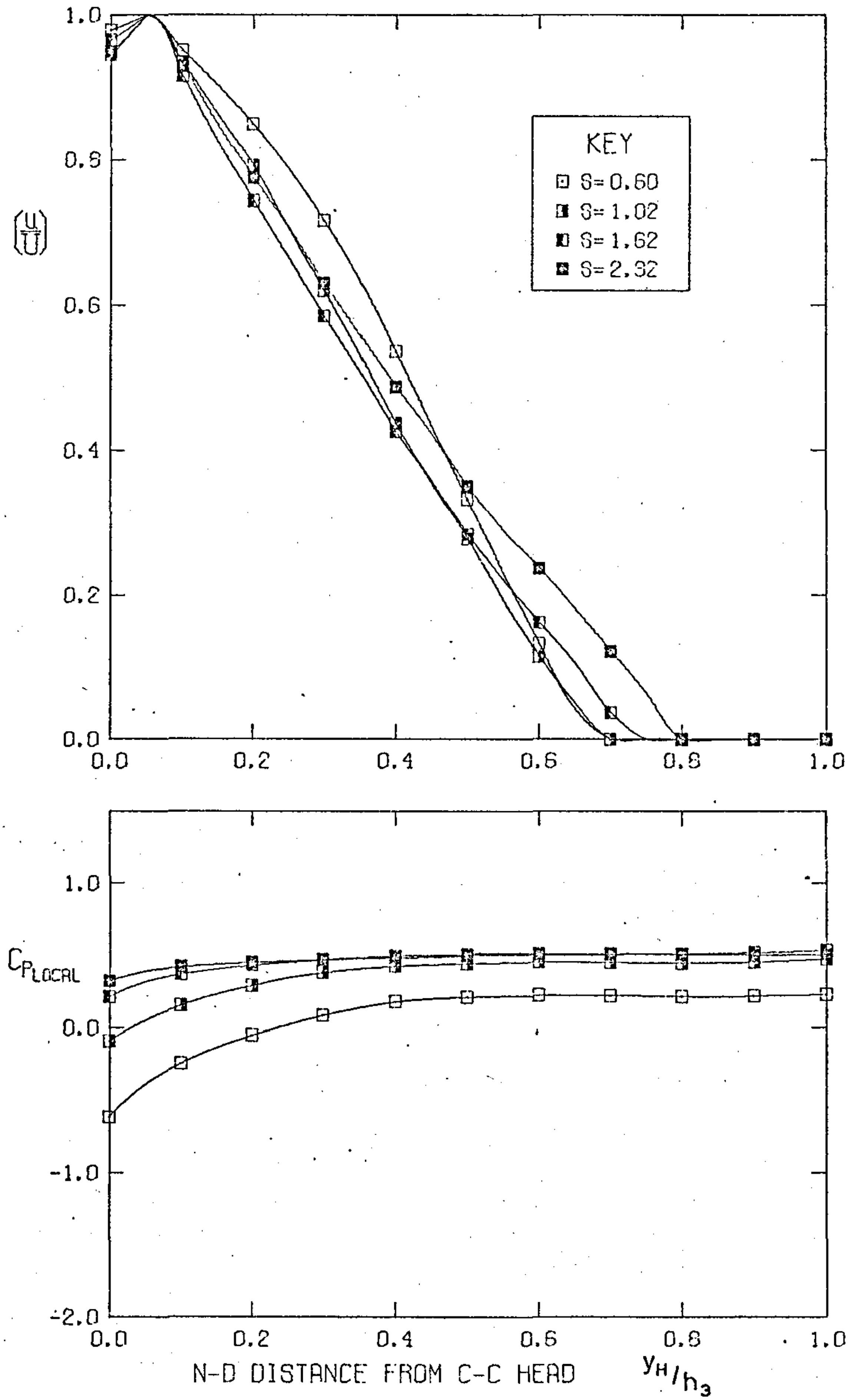
HEAD INNER PROFILES
FOR TEST SERIES 3-0 4



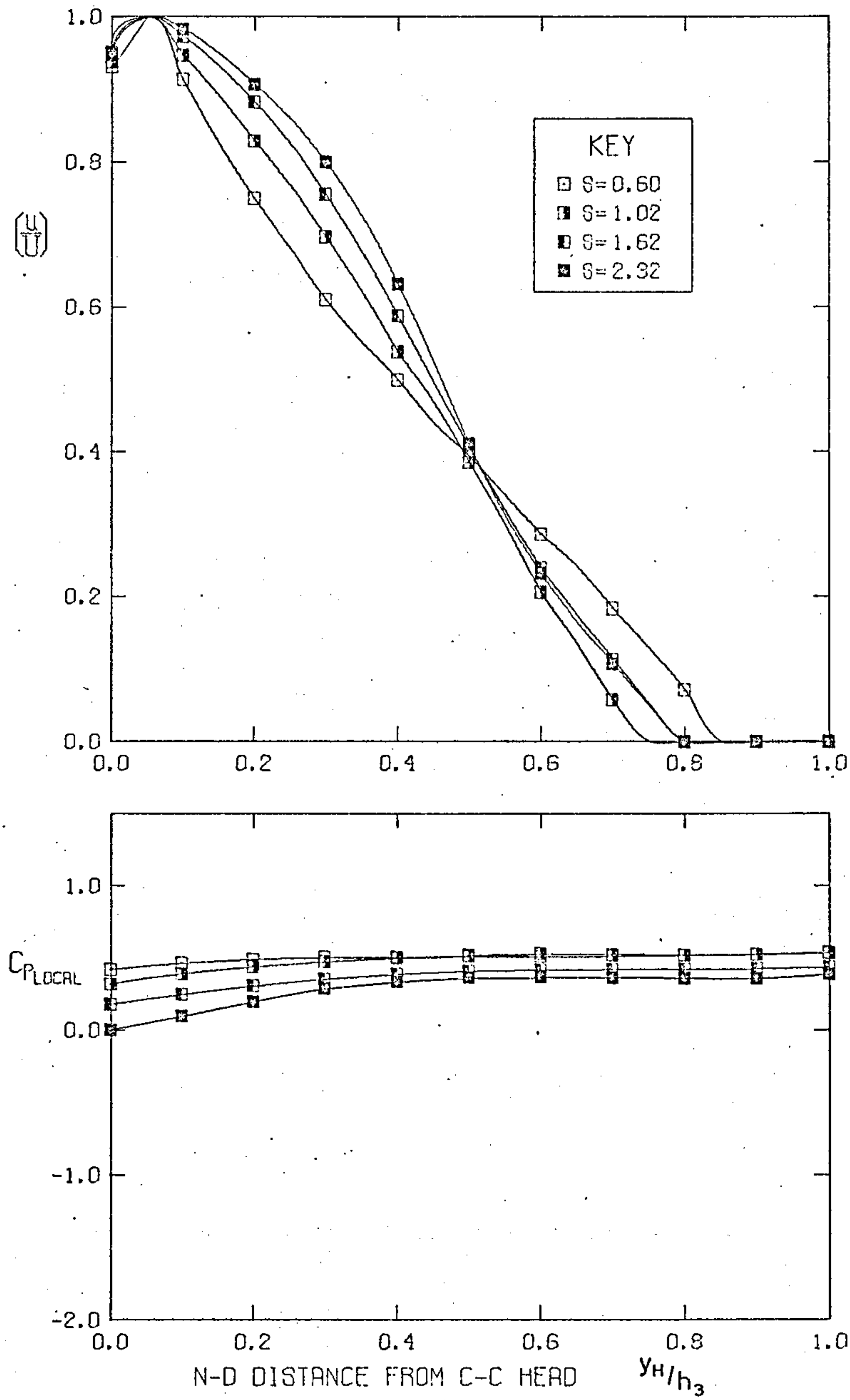
HEAD OUTER PROFILES
FOR TEST SERIES 3-0 4



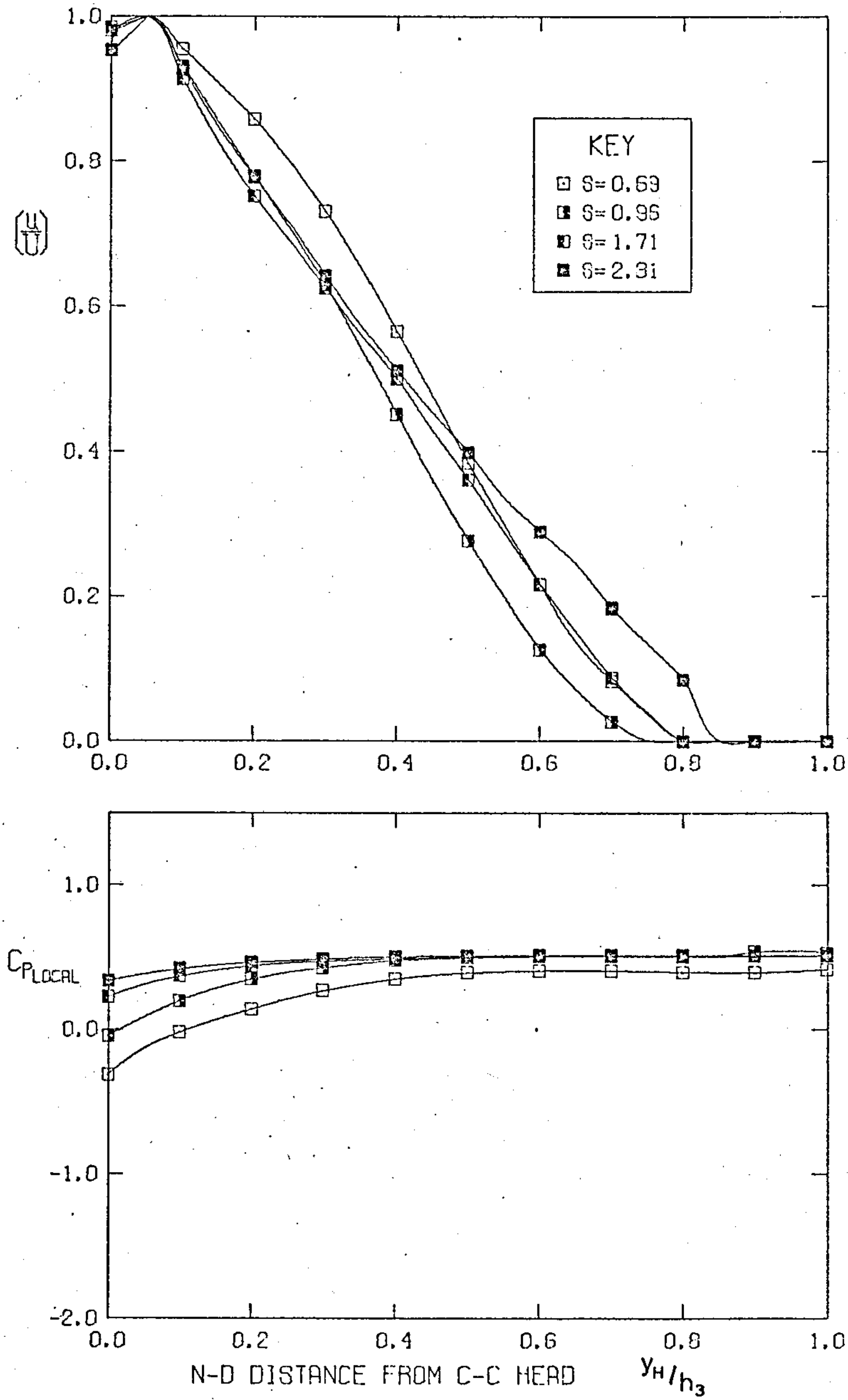
HEAD INNER PROFILES
FOR TEST SERIES 3-0 7



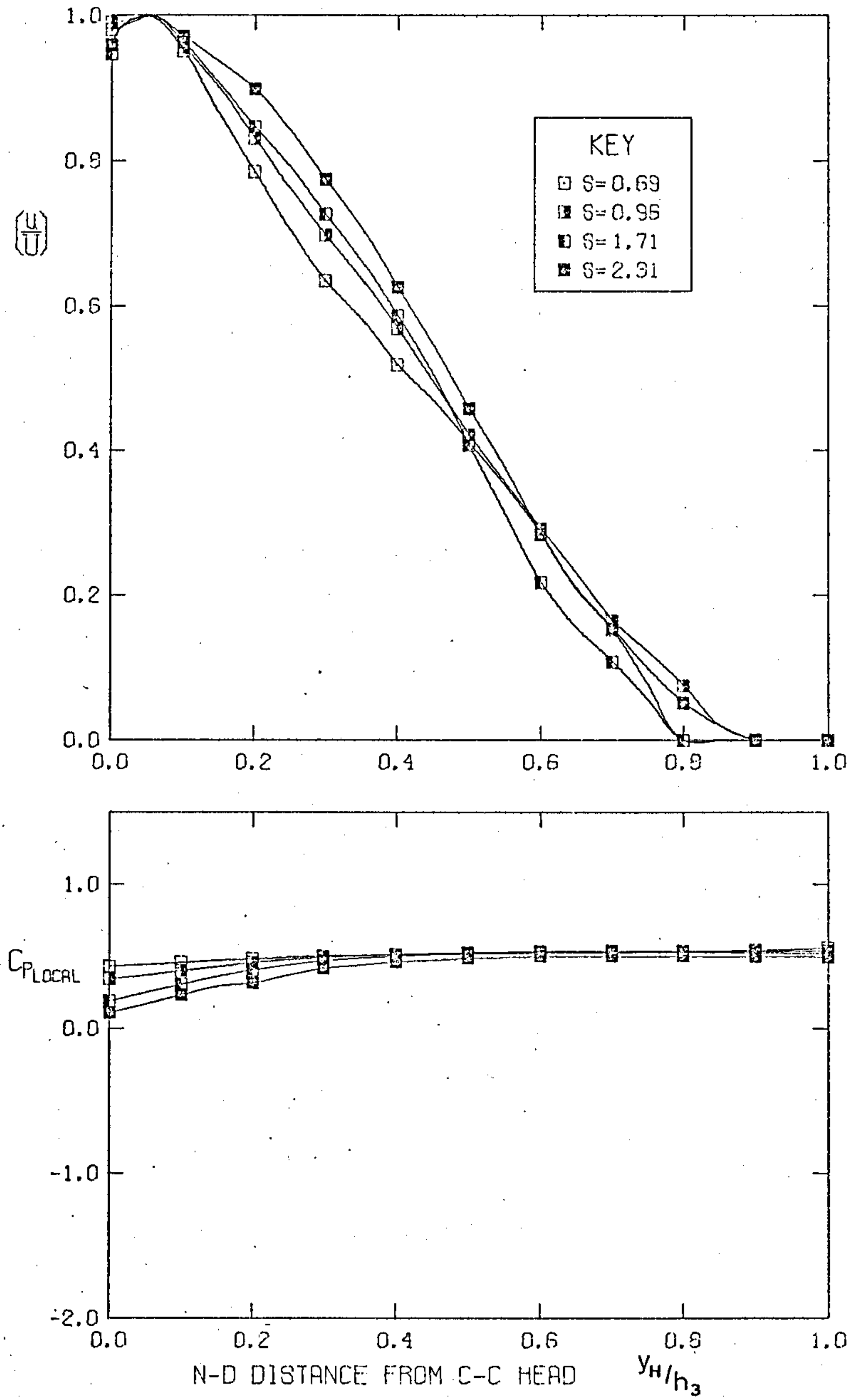
HEAD OUTER PROFILES
FOR TEST SERIES 3-0 7



HEAD INNER PROFILES
FOR TEST SERIES 3-1 2



HEAD OUTER PROFILES
FOR TEST SERIES 3-1 2



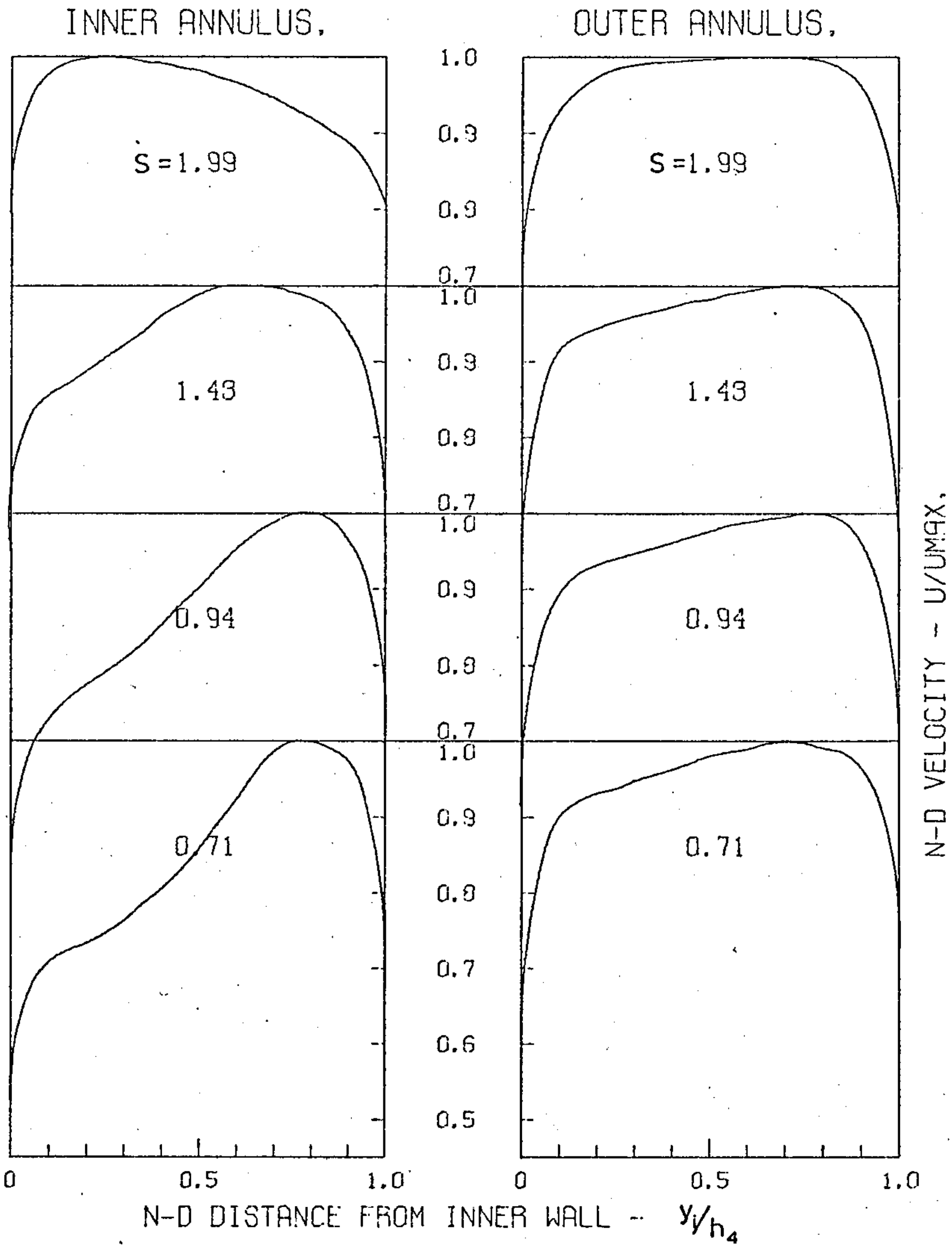
APPENDIX 4

SETTLING LENGTH PROFILES

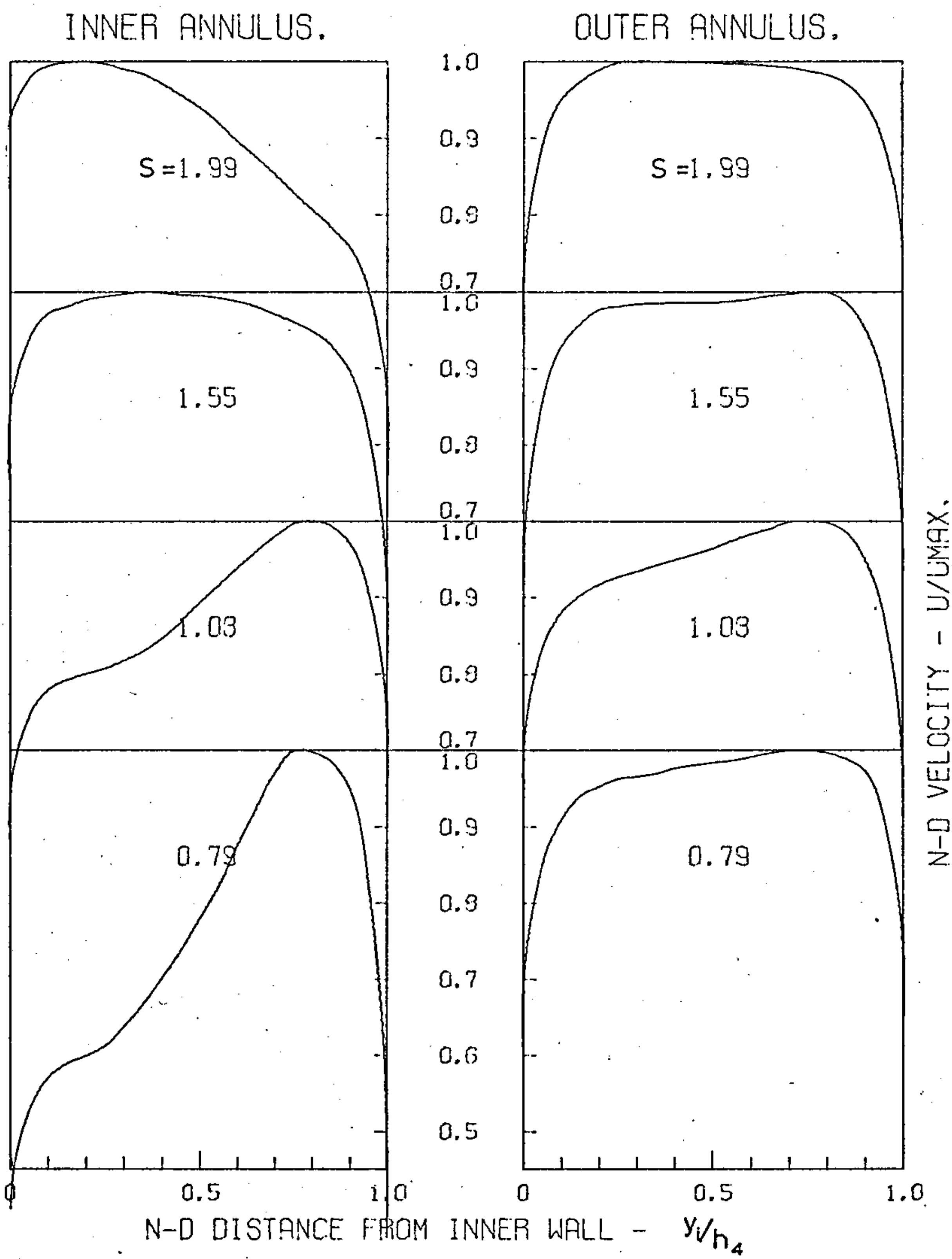
$S^{*}=1.20$

FULLY DEVELOPED ENTRY CONDITIONS

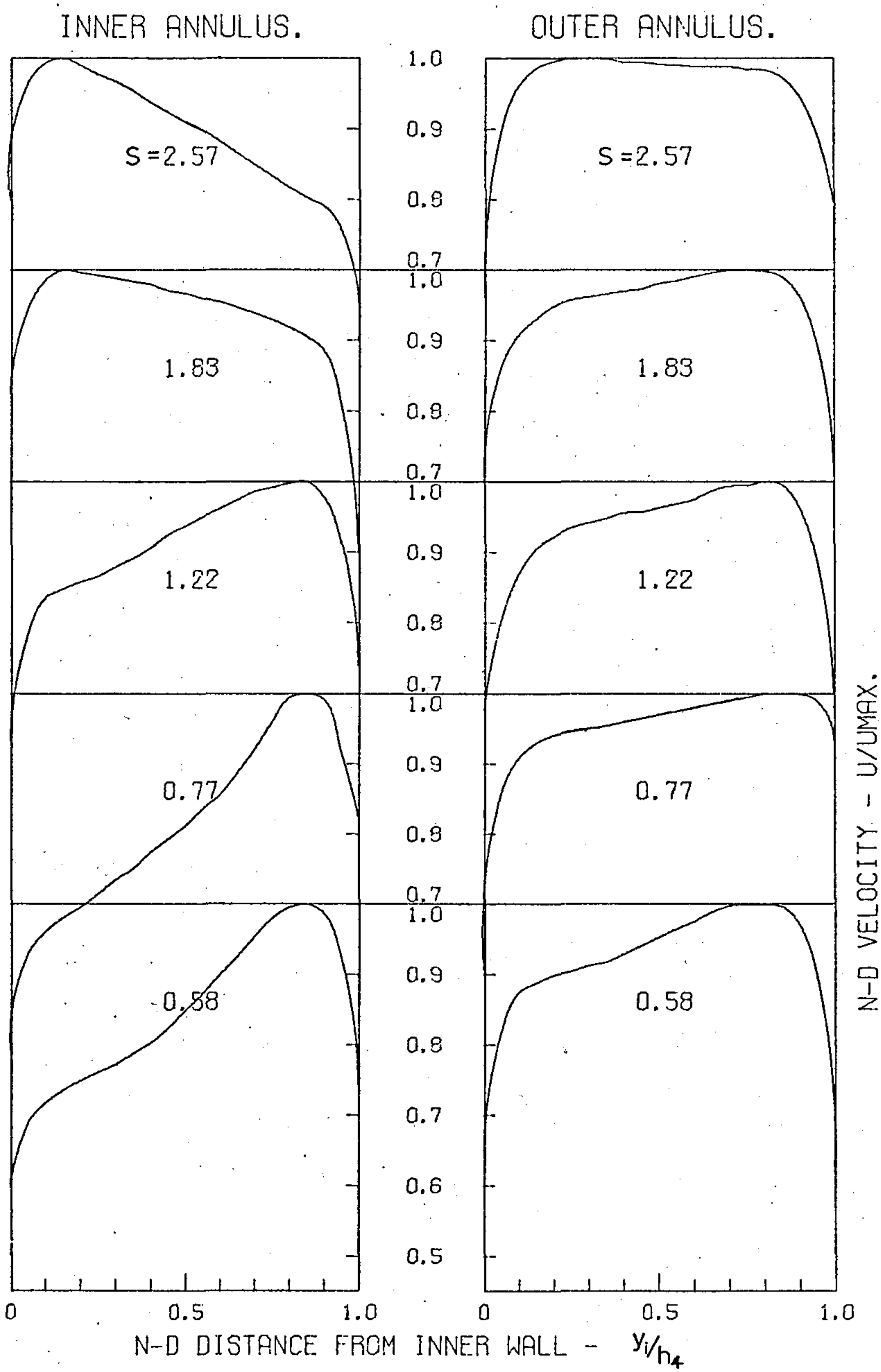
SETTLING LENGTH VELOCITY PROFILES FOR TEST SERIES 1-0 5



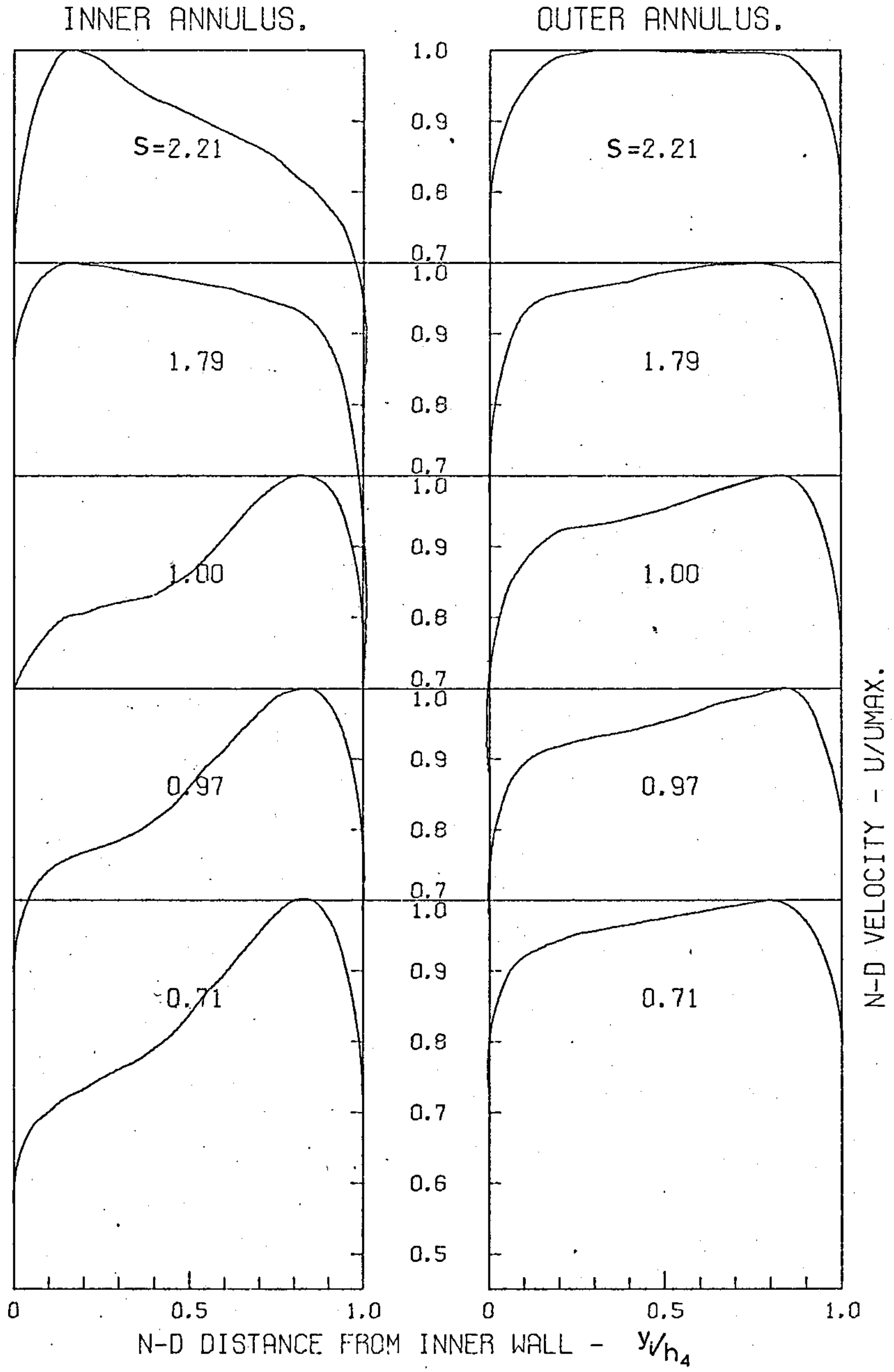
SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 1-1 0



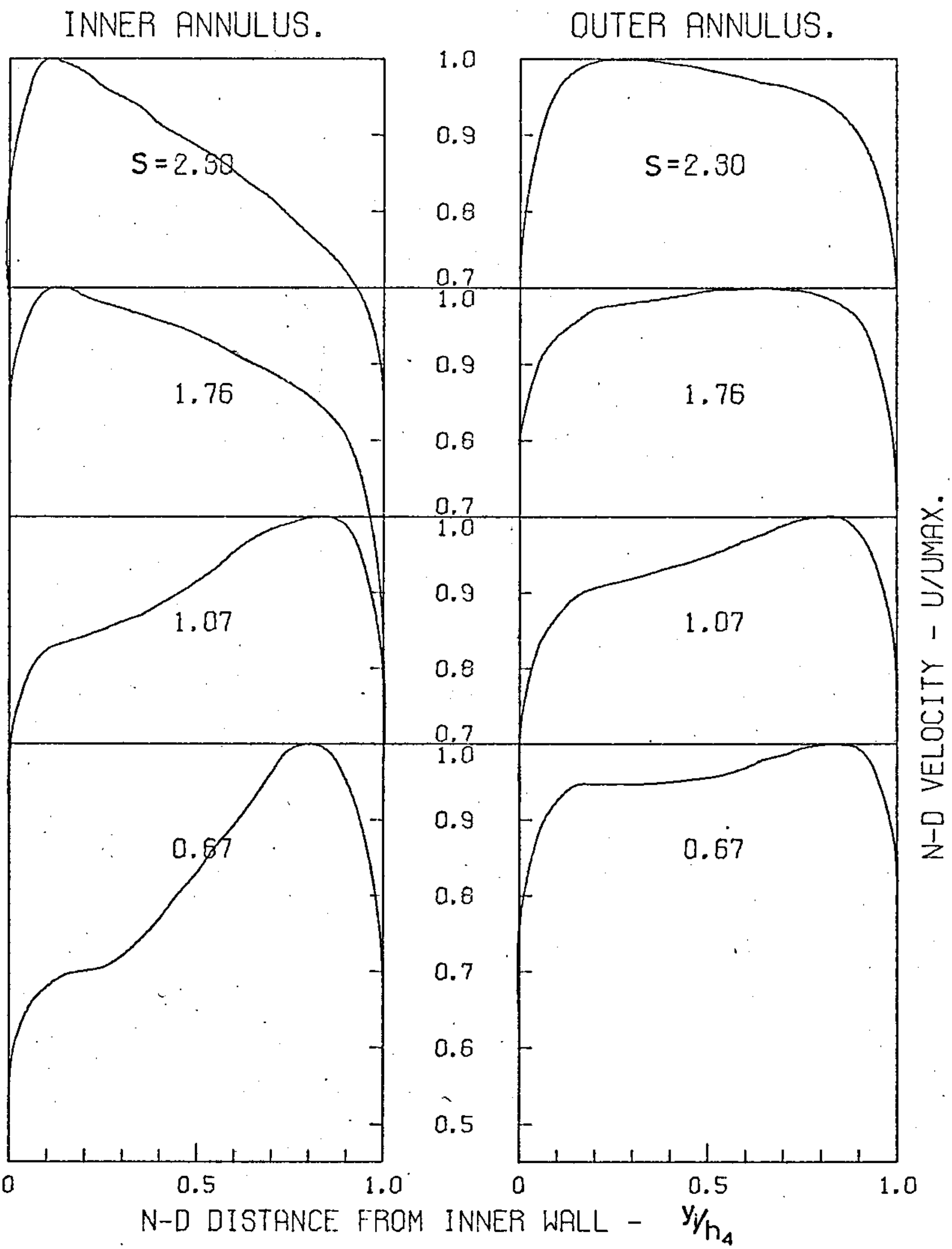
SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 2-0 5



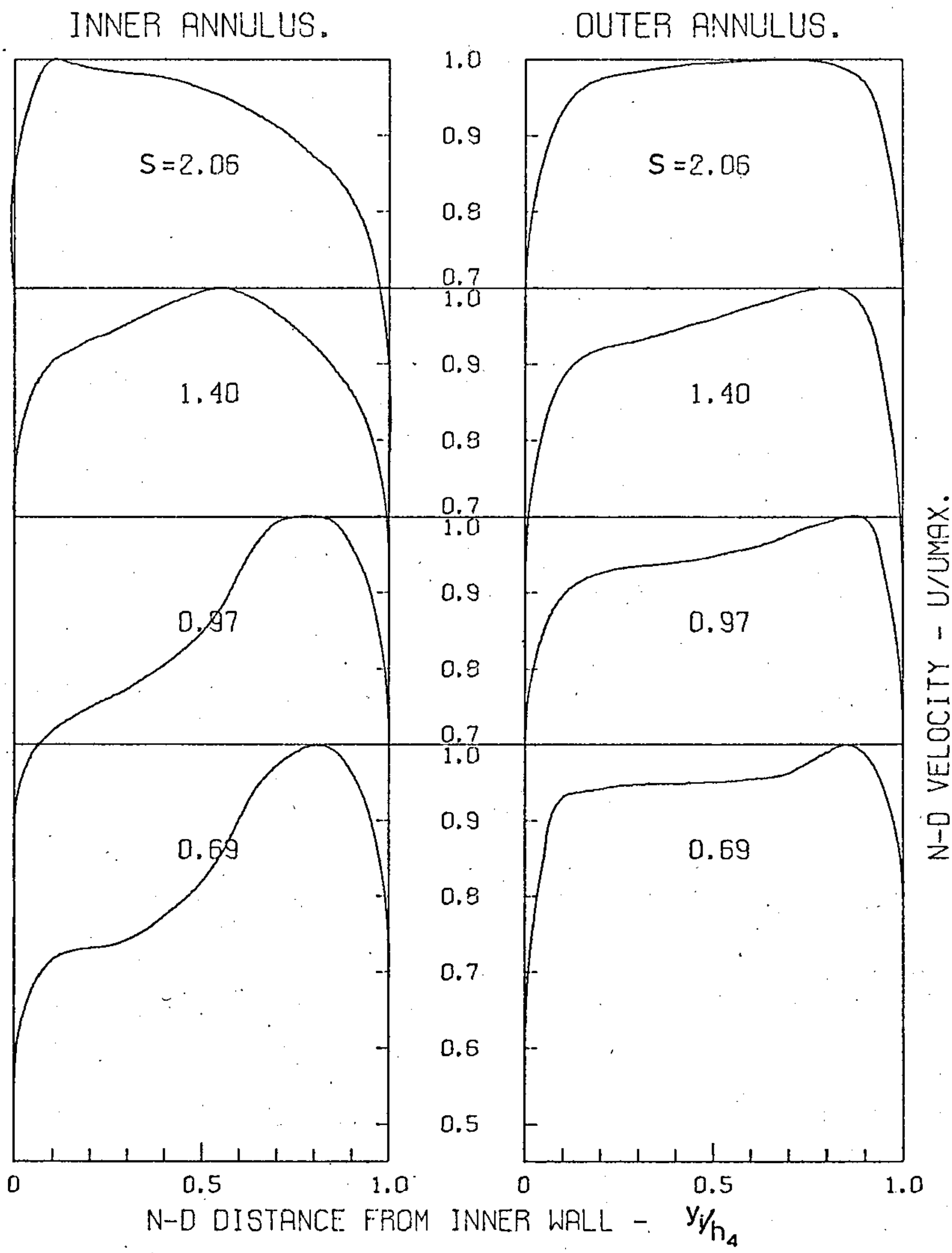
SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 2-0 8



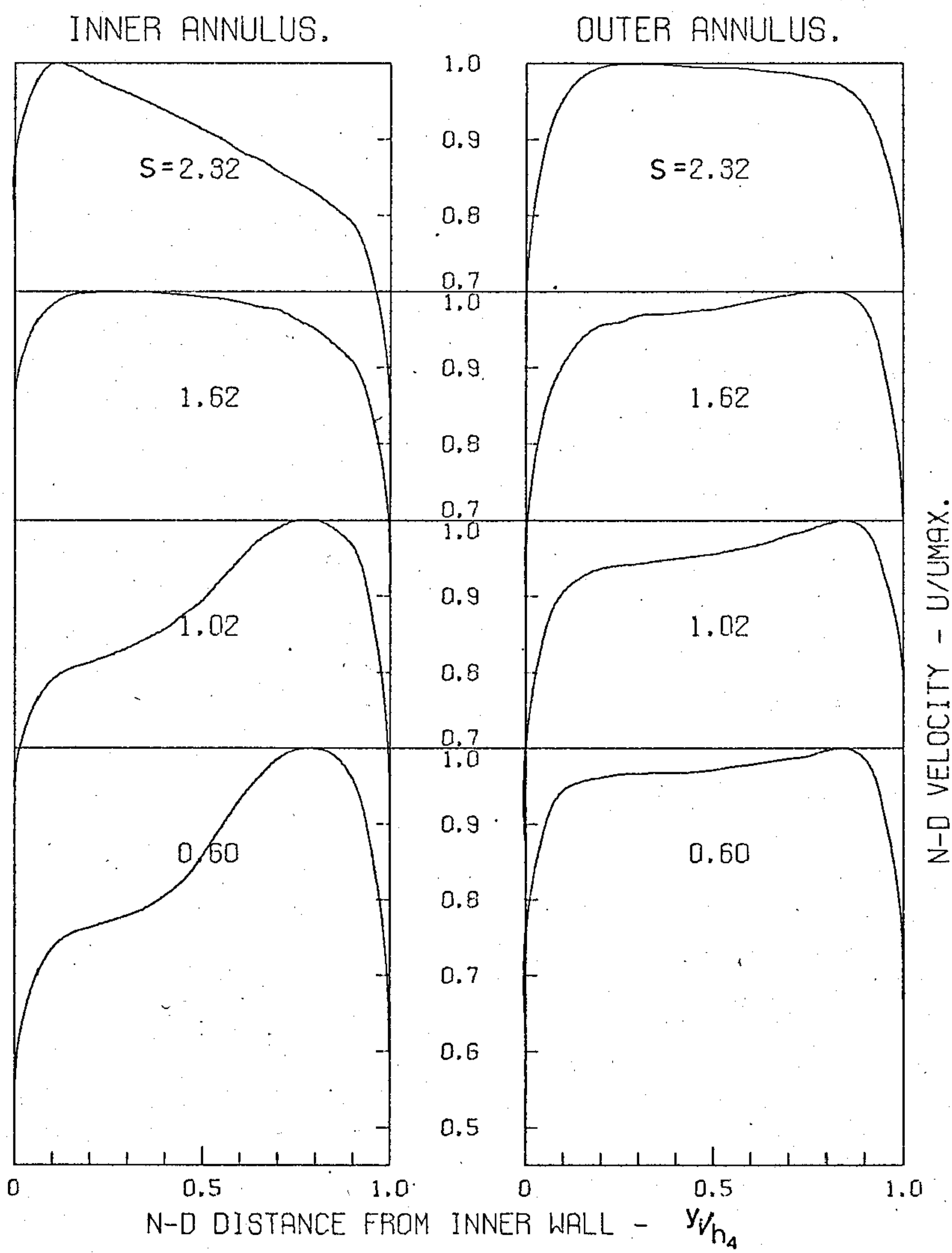
SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 2-1 5



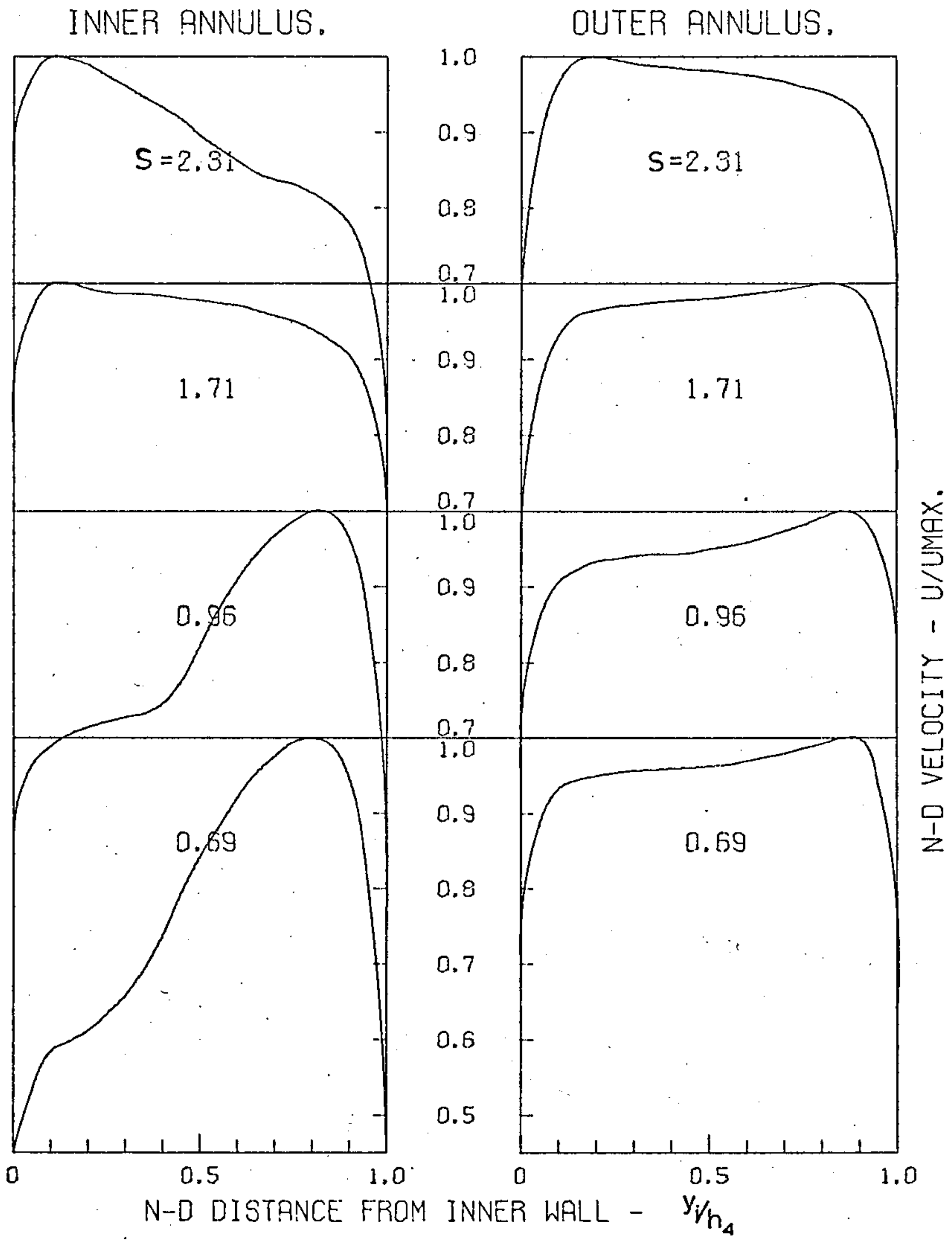
SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 3-O 4



SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 3-0 7



SETTLING LENGTH VELOCITY PROFILES
FOR TEST SERIES 3-1 2



APPENDIX 5

PERFORMANCE PARAMETERS

$S^* = 1.20$

FULLY DEVELOPED ENTRY CONDITIONS

EXPLANATORY NOTES

Performance Parameters

Description/Examples or Equation(s) Giving Definitions

Based on overall inlet m.w.m. dynamic head

1.4.9, 1.4.10, 1.4.26

Based on split inlet m.w.m. dynamic head

1.4.9, 1.4.10, 1.4.29

Based on overall local inlet m.w.m. dynamic head

1.4.27, 1.4.30

Based on split local entry m.w.m. dynamic head

1.4.31

Area Ratios

Mean effective

1.4.24

Mean geometric

(e.g. $AR_{1-2} = \frac{A_2}{A_1}$, $AR_{2-3} = \frac{A_3}{A_1}$

Inner/Outer - mean inlet

(e.g. $(AR_{1-2})_i = \frac{A_{2i}}{A_1}$, $(AR_{2-4})_i = \frac{A_{4i}}{A_2}$)

Inner/Outer - split inlet

(e.g. $(AR_{1-2})_i = \frac{A_{2i}}{A_{1i}}$, $(AR_{2-4})_i = \frac{A_{4i}}{A_{2i}}$

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 0.5 FLOW SPLIT 0.712

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.417	0.358	0.502	0.027	0.044	0.006	83.862	1.380	0.705	0.675
HEAD(1-3)	-0.526	-1.058	0.220	0.194	0.268	0.089	233.186	0.883	0.436	0.553
S/L(1-4)	0.254	0.099	0.472	0.444	0.549	0.297	35.743	1.820	0.909	1.088
(2-3)	-0.944	-1.416	-0.281	0.166	0.224	0.083		0.640	0.316	0.400
(2-4)	-0.163	-0.259	-0.030	0.417	0.505	0.292		1.319	0.659	0.789
(3-4)	0.780	1.157	0.251	0.251	0.281	0.209			0.919	1.101
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.417	0.337	0.550	0.027	0.041	0.006	83.862	1.380	1.257	1.537
HEAD(1-3)	-0.526	-0.995	0.242	0.194	0.252	0.097	233.186	0.989	0.778	1.258
S/L(1-4)	0.254	0.093	0.517	0.444	0.516	0.326	35.743	1.997	1.621	2.478
(2-3)	-0.944	-1.331	-0.309	0.166	0.211	0.091		0.717	0.619	0.819
(2-4)	-0.163	-0.243	-0.033	0.417	0.475	0.320		1.447	1.290	1.612
(3-4)	0.780	1.088	0.276	0.251	0.264	0.229			2.083	1.970
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.699	-2.550	-0.507	0.300	0.404	0.149				
(2-4)	-0.294	-0.466	-0.054	0.751	0.909	0.525				
(3-4)	0.585	0.624	0.417	0.188	0.151	0.346				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-2.140	-0.695		0.339	0.205				
[illegible]		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 0.5 FLOW SPLIT 0.939

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.448	0.432	0.466	0.029	0.041	0.018	90.038	1.380	0.675	0.705
HEAD(1-3)	-0.263	-0.515	-0.006	0.118	0.217	0.014	426.340	0.949	0.464	0.490
S/L(1-4)	0.349	0.294	0.407	0.392	0.429	0.353	46.564	1.954	0.909	1.088
(2-3)	-0.716	-0.947	-0.472	0.089	0.175	-0.004		0.687	0.336	0.355
(2-4)	-0.099	-0.138	-0.058	0.363	0.387	0.336		1.416	0.659	0.789
(3-4)	0.617	0.809	0.413	0.274	0.212	0.340			0.954	1.141
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.448	0.414	0.488	0.029	0.040	0.019	90.038	1.380	1.353	1.407
HEAD(1-3)	-0.268	-0.493	-0.006	0.118	0.208	0.014	426.340	0.953	0.929	0.978
S/L(1-4)	0.349	0.282	0.427	0.392	0.411	0.370	46.564	1.997	1.822	2.172
(2-3)	-0.716	-0.907	-0.494	0.089	0.168	-0.004		0.691	0.687	0.695
(2-4)	-0.099	-0.132	-0.061	0.363	0.371	0.352		1.447	1.346	1.544
(3-4)	0.617	0.775	0.433	0.274	0.203	0.356			1.961	2.222
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.371	-1.812	-0.903	0.171	0.336	-0.008				
(2-4)	-0.190	-0.264	-0.112	0.695	0.741	0.642				
(3-4)	0.537	0.603	0.437	0.238	0.158	0.359				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.661	-1.002		0.308	-0.009				
[illegible]		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 0.5 FLOW SPLIT 1.427

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.453	0.507	0.414	0.022	0.031	0.016	90.912	1.380	0.623	0.757
HEAD(1-3)	-0.212	-0.089	-0.298	0.137	0.199	0.094	-408.222	1.004	0.464	0.553
S/L(1-4)	0.357	0.452	0.290	0.393	0.339	0.432	47.259	1.975	0.909	1.088
(2-3)	-0.665	-0.596	-0.712	0.115	0.168	0.078		0.728	0.336	0.400
(2-4)	-0.096	-0.055	-0.124	0.371	0.308	0.416		1.431	0.659	0.789
(3-4)	0.569	0.541	0.588	0.256	0.140	0.338			0.895	1.071
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.453	0.511	0.411	0.022	0.031	0.016	90.912	1.380	1.525	1.280
HEAD(1-3)	-0.212	-0.090	-0.297	0.137	0.201	0.093	-408.222	1.016	1.134	0.934
S/L(1-4)	0.357	0.456	0.288	0.393	0.342	0.429	47.259	1.997	2.224	1.841
(2-3)	-0.665	-0.601	-0.708	0.115	0.170	0.078		0.736	0.744	0.730
(2-4)	-0.096	-0.056	-0.123	0.371	0.311	0.413		1.447	1.459	1.438
(3-4)	0.569	0.546	0.585	0.256	0.141	0.336			1.961	1.970
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.265	-1.135	-1.355	0.219	0.320	0.149				
(2-4)	-0.182	-0.105	-0.235	0.707	0.586	0.792				
(3-4)	0.529	0.614	0.486	0.238	0.159	0.279				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.314	-1.235		0.371	0.135				
[illegible]		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 0.5 FLOW SPLIT 2.025

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.344	0.528	0.255	0.074	0.059	0.082	69.023	1.380	0.587	0.793
HEAD(1-3)	-0.348	0.196	-0.617	0.156	0.175	0.146	346.545	0.932	0.464	0.553
S/L(1-4)	0.260	0.508	0.137	0.452	0.300	0.528	36.323	1.835	0.909	1.088
(2-3)	-0.692	-0.332	-0.872	0.082	0.115	0.065		0.676	0.336	0.400
(2-4)	-0.084	-0.019	-0.117	0.378	0.240	0.446		1.330	0.659	0.789
(3-4)	0.608	0.312	0.755	0.297	0.125	0.381			0.895	1.071
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.344	0.563	0.247	0.074	0.063	0.079	69.023	1.380	1.710	1.207
HEAD(1-3)	-0.348	0.209	-0.598	0.156	0.187	0.142	346.545	1.016	1.352	0.841
S/L(1-4)	0.260	0.542	0.133	0.452	0.320	0.512	36.323	1.997	2.651	1.657
(2-3)	-0.692	-0.354	-0.845	0.082	0.123	0.063		0.736	0.790	0.696
(2-4)	-0.084	-0.021	-0.114	0.378	0.257	0.433		1.447	1.550	1.372
(3-4)	0.608	0.333	0.732	0.297	0.133	0.370			1.961	1.970
				BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)	-1.188	-0.569	-1.496	0.141	0.198	0.111				
(2-4)	-0.143	-0.033	-0.201	0.650	0.413	0.766				
(3-4)	0.510	0.551	0.502	0.249	0.221	0.254				
				BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)		-0.948	-1.254		0.330	0.093				
(2-4)		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 1.0 FLOW SPLIT 0.783

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.337	0.290	0.396	0.050	0.059	0.041	67.604	1.380	0.666	0.714
HEAD(1-3)	-0.005	-0.303	0.382	0.095	0.021	0.190	-2.492	1.083	0.491	0.839
S/L(1-4)	0.401	0.331	0.490	0.295	0.308	0.278	55.051	1.874	0.909	1.088
(2-3)	-0.341	-0.598	-0.014	0.045	-0.038	0.149		0.785	0.356	0.608
(2-4)	0.064	0.041	0.094	0.245	0.249	0.237		1.358	0.659	0.789
(3-4)	0.405	0.638	0.108	0.200	0.287	0.089			0.684	0.819
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.337	0.274	0.428	0.050	0.055	0.045	67.604	1.380	1.225	1.565
HEAD(1-3)	-0.005	-0.291	0.412	0.095	0.020	0.205	-2.492	1.329	0.902	1.839
S/L(1-4)	0.401	0.312	0.528	0.295	0.291	0.300	55.051	1.997	1.671	2.387
(2-3)	-0.341	-0.565	-0.015	0.045	-0.036	0.160		0.963	0.736	1.175
(2-4)	0.064	0.038	0.101	0.245	0.236	0.256		1.447	1.364	1.525
(3-4)	0.405	0.603	0.116	0.200	0.271	0.096			1.853	1.298
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.556	-0.975	-0.023	0.073	-0.061	0.242				
(2-4)	0.104	0.066	0.153	0.399	0.407	0.387				
(3-4)	0.445	0.475	0.303	0.220	0.213	0.250				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.842	-0.029		-0.053	0.304				
(2-4)		0.057	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 1.0 FLOW SPLIT 1.027

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETAX	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.395	0.389	0.402	0.027	0.047	0.008	79.418	1.380	0.660	0.720
HEAD(1-3)	0.171	0.062	0.277	0.086	0.113	0.059	45.301	1.239	0.570	0.679
S/L(1-4)	0.511	0.509	0.514	0.238	0.233	0.243	67.608	1.980	0.909	1.088
(2-3)	-0.225	-0.327	-0.125	0.059	0.067	0.051		0.898	0.413	0.492
(2-4)	0.116	0.120	0.112	0.212	0.187	0.235		1.435	0.659	0.789
(3-4)	0.340	0.447	0.237	0.152	0.120	0.184			0.728	0.871
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.395	0.376	0.415	0.027	0.045	0.008	79.418	1.380	1.363	1.396
HEAD(1-3)	0.171	0.060	0.286	0.086	0.110	0.061	45.301	1.249	1.178	1.316
S/L(1-4)	0.511	0.492	0.531	0.238	0.226	0.251	67.608	1.997	1.878	2.110
(2-3)	-0.225	-0.316	-0.129	0.059	0.064	0.053		0.905	0.864	0.943
(2-4)	0.116	0.116	0.116	0.212	0.181	0.243		1.447	1.377	1.512
(3-4)	0.340	0.432	0.245	0.152	0.116	0.190			1.595	1.603
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.389	-0.565	-0.217	0.102	0.115	0.088				
(2-4)	0.200	0.207	0.193	0.366	0.323	0.406				
(3-4)	0.458	0.520	0.375	0.205	0.140	0.291				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.546	-0.224		0.111	0.092				
(2-4)		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 1.0 FLOW SPLIT 1.543

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.391	0.417	0.375	0.020	0.034	0.011	78.620	1.380	0.591	0.789
HEAD(1-3)	0.179	0.210	0.159	0.090	0.084	0.094	48.261	1.233	0.491	0.743
S/L(1-4)	0.499	0.549	0.467	0.246	0.253	0.241	66.630	1.953	0.909	1.088
(2-3)	-0.212	-0.207	-0.216	0.070	0.050	0.083		0.893	0.356	0.538
(2-4)	0.108	0.133	0.092	0.226	0.219	0.230		1.415	0.659	0.789
(3-4)	0.320	0.339	0.308	0.156	0.168	0.148			0.737	0.883
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.391	0.423	0.371	0.020	0.034	0.011	78.620	1.380	1.487	1.310
HEAD(1-3)	0.179	0.213	0.157	0.090	0.085	0.093	48.261	1.233	1.234	1.233
S/L(1-4)	0.499	0.558	0.462	0.246	0.257	0.239	66.630	1.997	2.287	1.807
(2-3)	-0.212	-0.210	-0.213	0.070	0.051	0.082		0.894	0.830	0.941
(2-4)	0.108	0.135	0.091	0.226	0.222	0.228		1.447	1.538	1.379
(3-4)	0.320	0.345	0.305	0.156	0.171	0.146			1.853	1.466
				BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)	-0.361	-0.351	-0.366	0.119	0.085	0.141				
(2-4)	0.183	0.225	0.157	0.383	0.372	0.391				
(3-4)	0.438	0.492	0.406	0.213	0.244	0.195				
				BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)		-0.387	-0.345		0.094	0.132				
(2-4)		0.249	0.148		0.410	0.368				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 1.0 FLOW SPLIT 1.985

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD								EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.371	0.418	0.348	0.035	0.051	0.027	74.525	1.380	0.541	0.839
HEAD(1-3)	0.141	0.283	0.070	0.111	0.107	0.113	38.859	1.226	0.464	0.774
S/L(1-4)	0.463	0.541	0.423	0.251	0.260	0.247	64.352	1.845	0.909	1.088
(2-3)	-0.230	-0.135	-0.278	0.076	0.056	0.086		0.889	0.336	0.561
(2-4)	0.092	0.123	0.075	0.217	0.209	0.220		1.337	0.659	0.789
(3-4)	0.321	0.258	0.353	0.141	0.153	0.134			0.734	0.879
BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD								GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.371	0.446	0.337	0.035	0.055	0.026	74.525	1.380	1.565	1.282
HEAD(1-3)	0.141	0.302	0.068	0.111	0.114	0.109	38.859	1.238	1.342	1.183
S/L(1-4)	0.463	0.578	0.410	0.251	0.277	0.240	64.352	1.997	2.631	1.663
(2-3)	-0.230	-0.144	-0.270	0.076	0.060	0.083		0.897	0.857	0.923
(2-4)	0.092	0.132	0.073	0.217	0.223	0.213		1.447	1.681	1.297
(3-4)	0.321	0.276	0.342	0.141	0.163	0.130			1.961	1.405
BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD										
(2-3)	-0.386	-0.227	-0.468	0.128	0.094	0.144				
(2-4)	0.154	0.208	0.127	0.365	0.351	0.370				
(3-4)	0.430	0.472	0.416	0.188	0.280	0.158				
BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD										
(2-3)		-0.288	-0.423		0.119	0.131				
[illegible]		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 2.0 FLOW SPLIT 0.623

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.345	0.321	0.382	0.037	0.047	0.021	69.269	1.380	0.752	0.628
HEAD(1-3)	0.130	-0.031	0.388	0.160	0.157	0.165	29.916	1.299	0.698	0.711
S/L(1-4)	0.431	0.399	0.483	0.235	0.204	0.286	63.087	1.739	0.909	1.088
(2-3)	-0.215	-0.352	0.005	0.123	0.110	0.144		0.942	0.506	0.515
(2-4)	0.086	0.073	0.100	0.198	0.157	0.265		1.260	0.659	0.789
(3-4)	0.302	0.430	0.095	0.075	0.047	0.121			0.645	0.773
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.345	0.300	0.430	0.037	0.044	0.024	69.269	1.380	1.273	1.534
HEAD(1-3)	0.130	-0.020	0.436	0.160	0.147	0.185	29.916	1.409	1.182	1.736
S/L(1-4)	0.431	0.373	0.543	0.235	0.190	0.322	63.087	1.997	1.539	2.658
(2-3)	-0.215	-0.329	0.006	0.123	0.103	0.162		1.021	0.928	1.132
(2-4)	0.086	0.073	0.113	0.198	0.146	0.298		1.447	1.209	1.733
(3-4)	0.302	0.402	0.107	0.075	0.044	0.137			1.303	1.531
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.348	-0.570	0.009	0.199	0.178	0.232				
(2-4)	0.140	0.127	0.162	0.320	0.253	0.429				
(3-4)	0.424	0.456	0.282	0.106	0.049	0.361				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.502	0.011		0.157	0.296				
(2-4)		0.111	[illegible]		[illegible]	0.546				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 2.0 FLOW SPLIT 0.951

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.365	0.355	0.370	0.033	0.048	0.018	73.304	1.380	0.658	0.722
HEAD(1-3)	0.220	0.125	0.321	0.097	0.126	0.068	51.618	1.292	0.622	0.679
S/L(1-4)	0.516	0.512	0.520	0.225	0.210	0.240	68.695	1.959	0.909	1.088
(2-3)	-0.145	-0.230	-0.055	0.064	0.078	0.050		0.936	0.451	0.492
(2-4)	0.151	0.157	0.144	0.192	0.163	0.222		1.419	0.659	0.789
(3-4)	0.295	0.387	0.199	0.128	0.085	0.173			0.699	0.837
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.365	0.340	0.394	0.033	0.046	0.019	73.304	1.380	1.306	1.455
HEAD(1-3)	0.220	0.120	0.336	0.097	0.120	0.071	51.618	1.301	1.234	1.369
S/L(1-4)	0.516	0.491	0.544	0.225	0.202	0.252	68.695	1.997	1.804	2.195
(2-3)	-0.145	-0.220	-0.058	0.064	0.075	0.052		0.943	0.945	0.941
(2-4)	0.151	0.151	0.151	0.192	0.156	0.233		1.447	1.381	1.508
(3-4)	0.295	0.371	0.208	0.128	0.081	0.181			1.462	1.603
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.240	-0.382	-0.091	0.107	0.130	0.083				
(2-4)	0.251	0.262	0.239	0.319	0.271	0.370				
(3-4)	0.433	0.488	0.351	0.187	0.107	0.305				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.358	-0.098		0.122	0.089				
(2-4)		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 2.0 FLOW SPLIT 1.600

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD								EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.369	0.385	0.359	0.020	0.017	0.021	74.154	1.380	0.568	0.812
HEAD(1-3)	0.262	0.254	0.267	0.100	0.069	0.120	54.581	1.356	0.491	0.871
S/L(1-4)	0.521	0.545	0.506	0.221	0.248	0.204	69.799	1.940	0.909	1.088
(2-3)	-0.107	-0.131	-0.092	0.080	0.052	0.098		0.983	0.356	0.631
(2-4)	0.152	0.160	0.147	0.201	0.231	0.183		1.406	0.659	0.789
(3-4)	0.259	0.290	0.239	0.121	0.180	0.084			0.668	0.799
BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD								GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.369	0.398	0.352	0.020	0.018	0.021	74.154	1.380	1.474	1.321
HEAD(1-3)	0.262	0.262	0.262	0.100	0.071	0.118	54.581	1.361	1.274	1.416
S/L(1-4)	0.521	0.562	0.496	0.221	0.256	0.200	69.799	1.997	2.361	1.770
(2-3)	-0.107	-0.135	-0.090	0.080	0.054	0.097		0.987	0.864	1.072
(2-4)	0.152	0.165	0.144	0.201	0.239	0.179		1.447	1.602	1.340
(3-4)	0.259	0.300	0.234	0.121	0.185	0.083			1.853	1.250
BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD										
(2-3)	-0.176	-0.214	-0.151	0.131	0.085	0.161				
(2-4)	0.248	0.261	0.240	0.329	0.379	0.299				
(3-4)	0.406	0.450	0.378	0.190	0.278	0.133				
BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD										
(2-3)		-0.231	-0.144		0.091	0.154				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 1. DUMP GAP 2.0 FLOW SPLIT 1.986

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.364	0.397	0.348	0.025	0.042	0.017	73.104	1.380	0.533	0.847
HEAD(1-3)	0.226	0.323	0.177	0.145	0.195	0.120	47.147	1.354	0.544	0.839
S/L(1-4)	0.504	0.522	0.495	0.208	0.277	0.174	70.090	1.845	0.909	1.088
(2-3)	-0.138	-0.075	-0.171	0.120	0.153	0.103		0.981	0.394	0.608
(2-4)	0.140	0.125	0.147	0.183	0.235	0.156		1.337	0.659	0.789
(3-4)	0.278	0.190	0.318	0.063	0.082	0.054			0.658	0.787
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.364	0.424	0.337	0.025	0.045	0.017	73.104	1.380	1.546	1.292
HEAD(1-3)	0.226	0.344	0.171	0.145	0.208	0.116	47.147	1.382	1.576	1.280
S/L(1-4)	0.504	0.557	0.480	0.208	0.295	0.168	70.090	1.997	2.635	1.662
(2-3)	-0.138	-0.080	-0.166	0.120	0.163	0.100		1.002	1.019	0.991
(2-4)	0.140	0.133	0.143	0.183	0.251	0.152		1.447	1.704	1.286
(3-4)	0.278	0.212	0.309	0.063	0.087	0.052			1.672	1.298
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.226	-0.122	-0.280	0.196	0.250	0.168				
(2-4)	0.229	0.204	0.241	0.299	0.384	0.256				
(3-4)	0.443	0.475	0.433	0.100	0.195	0.073				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.150	-0.256		0.307	0.154				
[illegible]		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.5 FLOW SPLIT 0.583

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.463	0.402	0.566	0.016	0.021	0.005	75.854	1.567	0.760	0.806
HEAD(1-3)	-0.633	-1.240	0.408	0.292	0.381	0.159	280.743	0.883	0.464	0.679
S/L(1-4)	0.259	0.095	0.540	0.394	0.495	0.220	58.750	1.697	0.909	1.088
(2-3)	-1.096	-1.642	-0.158	0.276	0.360	0.154		0.564	0.296	0.455
(2-4)	-0.204	-0.308	-0.026	0.378	0.474	0.216		1.083	0.580	0.695
(3-4)	0.892	1.355	0.153	0.102	0.114	0.082			0.796	0.953
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.463	0.375	0.649	0.016	0.020	0.005	75.854	1.567	1.250	2.059
HEAD(1-3)	-0.633	-1.156	0.467	0.292	0.356	0.159	280.743	1.142	0.762	1.754
S/L(1-4)	0.259	0.088	0.619	0.394	0.462	0.252	58.750	1.997	1.494	2.780
(2-3)	-1.096	-1.551	-0.181	0.276	0.336	0.154		0.729	0.610	0.842
(2-4)	-0.204	-0.287	-0.029	0.378	0.442	0.247		1.275	1.196	1.550
(3-4)	0.892	1.244	0.152	0.102	0.106	0.094			1.961	1.605
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-2.105	-3.154	-0.304	0.550	0.692	0.257				
(2-4)	-0.392	-0.591	-0.049	0.725	0.910	0.414				
(3-4)	0.666	0.691	0.406	0.076	0.059	0.250				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-2.529	-0.523		0.555	0.444				
(2-4)		-0.444	-0.085		0.730	0.714				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.5 FLOW SPLIT 0.772

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.504	0.460	0.562	0.037	0.055	0.012	82.642	1.567	0.755	0.812
HEAD(1-3)	-0.202	-0.601	0.514	0.152	0.164	0.158	-714.129	0.992	0.464	0.679
S/L(1-4)	0.410	0.320	0.527	0.301	0.349	0.238	56.559	1.865	0.909	1.088
(2-3)	-0.707	-1.061	-0.247	0.115	0.109	0.126		0.633	0.296	0.435
(2-4)	-0.094	-0.140	-0.055	0.264	0.294	0.226		1.191	0.580	0.695
(3-4)	0.612	0.921	0.212	0.148	0.185	0.100			0.796	0.955
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.504	0.453	0.611	0.037	0.052	0.015	82.642	1.567	1.379	1.795
HEAD(1-3)	-0.202	-0.566	0.542	0.152	0.154	0.150	-714.129	1.142	0.847	1.500
S/L(1-4)	0.410	0.302	0.573	0.301	0.329	0.259	56.559	1.997	1.661	2.405
(2-3)	-0.707	-0.999	-0.269	0.115	0.102	0.157		0.729	0.614	0.856
(2-4)	-0.094	-0.152	-0.058	0.264	0.277	0.246		1.275	1.204	1.541
(3-4)	0.612	0.868	0.251	0.148	0.175	0.109			1.961	1.605
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.540	-2.312	-0.559	0.252	0.237	0.274				
(2-4)	-0.205	-0.505	-0.076	0.575	0.641	0.495				
(3-4)	0.584	0.615	0.455	0.141	0.124	0.215				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.941	-0.714		0.199	0.364				
(2-4)		-0.256	-0.100		0.538	0.654				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.5 FLOW SPLIT 1.219

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.539	0.551	0.550	0.034	0.053	0.018	88.366	1.567	0.717	0.850
HEAD(1-3)	0.106	0.008	0.186	0.028	0.099	-0.029	48.698	1.106	0.491	0.616
S/L(1-4)	0.498	0.510	0.487	0.258	0.268	0.250	65.447	1.997	0.909	1.088
(2-3)	-0.435	-0.542	-0.344	-0.006	0.045	-0.047		0.706	0.313	0.395
(2-4)	-0.042	-0.040	-0.043	0.224	0.215	0.232		1.275	0.580	0.695
(3-4)	0.391	0.502	0.301	0.230	0.169	0.280			0.822	0.984
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.539	0.541	0.538	0.034	0.053	0.018	88.366	1.567	1.597	1.542
HEAD(1-3)	0.106	0.008	0.189	0.028	0.097	-0.030	48.698	1.106	1.093	1.117
S/L(1-4)	0.498	0.501	0.494	0.258	0.264	0.254	65.447	1.997	2.025	1.975
(2-3)	-0.435	-0.533	-0.349	-0.006	0.045	-0.048		0.706	0.684	0.724
(2-4)	-0.042	-0.040	-0.044	0.224	0.211	0.236		1.275	1.268	1.281
(3-4)	0.391	0.493	0.305	0.230	0.166	0.284			1.853	1.768
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.016	-1.272	-0.806	-0.013	0.107	-0.111				
(2-4)	-0.098	-0.095	-0.101	0.526	0.504	0.545				
(3-4)	0.452	0.551	0.363	0.266	0.186	0.338				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.311	-0.786		0.110	-0.108				
(2-4)		-0.098	-0.098		0.519	0.532				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.5 FLOW SPLIT 1.820

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.504	0.582	0.462	0.037	0.035	0.038	82.654	1.567	0.694	0.872
HEAD(1-3)	0.037	0.276	-0.094	0.045	0.106	0.012	25.984	1.057	0.491	0.616
S/L(1-4)	0.454	0.564	0.593	0.274	0.241	0.293	62.018	1.887	0.909	1.088
(2-3)	-0.467	-0.506	-0.555	0.008	0.071	-0.026		0.675	0.313	0.393
(2-4)	-0.051	-0.018	-0.069	0.237	0.205	0.254		1.204	0.580	0.695
(3-4)	0.416	0.288	0.486	0.229	0.135	0.280			0.822	0.984
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.504	0.610	0.450	0.037	0.037	0.037	82.654	1.567	1.928	1.563
HEAD(1-3)	0.037	0.290	-0.091	0.045	0.111	0.012	25.984	1.106	1.362	0.962
S/L(1-4)	0.454	0.592	0.583	0.274	0.252	0.285	62.018	1.997	2.524	1.701
(2-3)	-0.467	-0.521	-0.542	0.008	0.074	-0.026		0.706	0.706	0.706
(2-4)	-0.051	-0.018	-0.067	0.237	0.215	0.248		1.275	1.309	1.248
(3-4)	0.416	0.302	0.474	0.229	0.141	0.274			1.853	1.768
				BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)	-1.020	-0.667	-1.213	0.017	0.154	-0.057				
(2-4)	-0.111	-0.038	-0.151	0.517	0.448	0.555				
(3-4)	0.454	0.504	0.459	0.250	0.236	0.253				
				BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)		-0.909	-1.057		0.210	-0.050				
(2-4)		-0.052	-0.151		0.611	0.484				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.5 FLOW SPLIT 2.561

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.450	0.558	0.408	0.035	0.045	0.031	73.767	1.567	0.661	0.905
HEAD(1-3)	-0.127	0.569	-0.521	0.070	0.112	0.054	-243.865	1.004	0.464	0.647
S/L(1-4)	0.357	0.547	0.283	0.313	0.252	0.336	53.019	1.713	0.909	1.088
(2-3)	-0.577	-0.189	-0.729	0.035	0.067	0.025		0.641	0.296	0.413
(2-4)	-0.093	-0.011	-0.125	0.277	0.208	0.305		1.093	0.580	0.695
(3-4)	0.484	0.178	0.604	0.242	0.140	0.282			0.818	0.980
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.450	0.624	0.392	0.035	0.050	0.030	73.767	1.567	2.271	1.277
HEAD(1-3)	-0.127	0.413	-0.308	0.070	0.125	0.052	-243.865	1.111	1.593	0.913
S/L(1-4)	0.357	0.612	0.272	0.313	0.282	0.325	53.019	1.997	3.123	1.535
(2-3)	-0.577	-0.211	-0.700	0.035	0.076	0.022		0.709	0.701	0.715
(2-4)	-0.093	-0.012	-0.120	0.277	0.232	0.293		1.275	1.375	1.202
(3-4)	0.484	0.199	0.580	0.242	0.157	0.271			1.961	1.682
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.122	-0.367	-1.416	0.068	0.131	0.045				
(2-4)	-0.181	-0.021	-0.243	0.539	0.403	0.595				
(3-4)	0.459	0.452	0.462	0.229	0.340	0.216				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.649	-1.211		0.232	0.039				
(2-4)		-0.057	-0.207		0.713	0.507				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.8 FLOW SPLIT 0.709

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.450	0.427	0.483	0.050	0.053	0.048	73.721	1.567	0.780	0.787
HEAD(1-3)	0.112	-0.107	0.421	0.053	0.075	0.022	45.162	1.127	0.570	0.647
S/L(1-4)	0.478	0.456	0.557	0.222	0.212	0.255	67.260	1.818	0.909	1.088
(2-3)	-0.338	-0.554	-0.062	0.003	0.022	-0.027		0.720	0.364	0.413
(2-4)	0.028	0.009	0.054	0.172	0.159	0.187		1.160	0.580	0.695
(3-4)	0.366	0.543	0.116	0.169	0.137	0.213			0.747	0.894
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.450	0.401	0.550	0.050	0.050	0.055	73.721	1.567	1.383	1.805
HEAD(1-3)	0.112	-0.101	0.462	0.053	0.071	0.024	45.162	1.217	1.010	1.485
S/L(1-4)	0.478	0.410	0.589	0.222	0.199	0.258	67.260	1.997	1.611	2.498
(2-3)	-0.338	-0.502	-0.068	0.003	0.021	-0.029		0.777	0.731	0.823
(2-4)	0.028	0.009	0.059	0.172	0.149	0.205		1.275	1.165	1.384
(3-4)	0.366	0.511	0.127	0.169	0.129	0.234			1.595	1.682
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.676	-1.068	-0.124	0.007	0.044	-0.053				
(2-4)	0.056	0.018	0.108	0.344	0.318	0.375				
(3-4)	0.438	0.496	0.247	0.202	0.125	0.455				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.915	-0.163		0.038	-0.070				
(2-4)		0.016	0.142		0.272	0.491				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.8 FLOW SPLIT 0.969

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.480	0.473	0.488	0.031	0.041	0.020	78.702	1.567	0.731	0.836
HEAD(1-3)	0.246	0.115	0.380	0.037	0.073	-0.000	66.857	1.229	0.570	0.679
S/L(1-4)	0.539	0.529	0.549	0.206	0.204	0.208	71.646	1.965	0.909	1.088
(2-3)	-0.235	-0.358	-0.108	0.006	0.032	-0.020		0.785	0.364	0.435
(2-4)	0.059	0.056	0.061	0.176	0.164	0.188		1.254	0.580	0.695
(3-4)	0.293	0.414	0.169	0.169	0.132	0.208			0.728	0.871
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.480	0.453	0.511	0.031	0.039	0.021	78.702	1.567	1.466	1.667
HEAD(1-3)	0.246	0.110	0.399	0.037	0.070	-0.000	66.857	1.249	1.143	1.354
S/L(1-4)	0.539	0.507	0.576	0.206	0.196	0.218	71.646	1.997	1.823	2.171
(2-3)	-0.235	-0.343	-0.113	0.006	0.031	-0.021		0.797	0.780	0.812
(2-4)	0.059	0.054	0.064	0.176	0.157	0.197		1.275	1.244	1.302
(3-4)	0.293	0.397	0.177	0.169	0.126	0.218			1.595	1.603
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.480	-0.752	-0.220	0.013	0.066	-0.041				
(2-4)	0.120	0.114	0.125	0.359	0.335	0.385				
(3-4)	0.409	0.484	0.294	0.236	0.154	0.362				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.676	-0.241		0.060	-0.045				
(2-4)		0.106	0.137		0.309	0.421				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.8 FLOW SPLIT 1.004

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.488	0.483	0.493	0.028	0.036	0.019	79.992	1.567	0.729	0.837
HEAD(1-3)	0.254	0.159	0.368	0.049	0.106	-0.008	62.766	1.267	0.596	0.679
S/L(1-4)	0.543	0.539	0.547	0.206	0.204	0.208	71.966	1.974	0.909	1.088
(2-3)	-0.234	-0.344	-0.125	0.022	0.070	-0.027		0.809	0.381	0.433
(2-4)	0.055	0.055	0.054	0.178	0.168	0.189		1.260	0.580	0.695
(3-4)	0.289	0.399	0.179	0.157	0.097	0.216			0.713	0.854
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.488	0.465	0.513	0.028	0.034	0.020	79.992	1.567	1.489	1.641
HEAD(1-3)	0.254	0.134	0.383	0.049	0.102	-0.008	62.766	1.275	1.217	1.351
S/L(1-4)	0.543	0.519	0.570	0.206	0.196	0.217	71.966	1.997	1.856	2.134
(2-3)	-0.234	-0.351	-0.130	0.022	0.068	-0.028		0.814	0.817	0.811
(2-4)	0.055	0.053	0.057	0.178	0.161	0.197		1.275	1.246	1.300
(3-4)	0.289	0.384	0.187	0.157	0.094	0.225			1.525	1.603
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.484	-0.710	-0.258	0.044	0.145	-0.056				
(2-4)	0.113	0.114	0.112	0.368	0.346	0.390				
(3-4)	0.415	0.503	0.298	0.225	0.123	0.360				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.662	-0.279		0.135	-0.061				
(2-4)		0.107	0.121		0.323	0.421				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.8 FLOW SPLIT 1.789

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.479	0.511	0.461	0.018	0.023	0.014	78.469	1.567	0.683	0.883
HEAD(1-3)	0.251	0.325	0.210	0.032	0.096	-0.004	66.547	1.239	0.517	0.743
S/L(1-4)	0.522	0.573	0.493	0.208	0.228	0.197	71.106	1.895	0.909	1.088
(2-3)	-0.228	-0.186	-0.251	0.014	0.073	-0.018		0.791	0.330	0.474
(2-4)	0.043	0.062	0.032	0.190	0.205	0.183		1.209	0.580	0.695
(3-4)	0.270	0.248	0.283	0.177	0.132	0.202			0.722	0.864
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.479	0.536	0.449	0.018	0.025	0.014	78.469	1.567	1.893	1.382
HEAD(1-3)	0.251	0.341	0.205	0.032	0.101	-0.004	66.547	1.260	1.433	1.162
S/L(1-4)	0.522	0.601	0.481	0.208	0.239	0.192	71.106	1.997	2.519	1.703
(2-3)	-0.228	-0.195	-0.245	0.014	0.076	-0.018		0.804	0.757	0.841
(2-4)	0.043	0.065	0.031	0.190	0.215	0.179		1.275	1.331	1.252
(3-4)	0.270	0.260	0.276	0.177	0.139	0.197			1.757	1.466
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.455	-0.369	-0.499	0.027	0.145	-0.036				
(2-4)	0.085	0.124	0.064	0.378	0.407	0.365				
(3-4)	0.377	0.466	0.345	0.247	0.248	0.246				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.442	-0.455		0.173	-0.035				
(2-4)		0.149	0.058		0.489	0.355				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 0.8 FLOW SPLIT 2.202

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.454	0.501	0.433	0.027	0.049	0.017	74.374	1.567	0.658	0.909
HEAD(1-3)	0.200	0.361	0.127	0.036	0.117	-0.000	63.592	1.181	0.491	0.743
S/L(1-4)	0.477	0.557	0.440	0.223	0.247	0.211	67.875	1.792	0.909	1.088
(2-3)	-0.254	-0.140	-0.305	0.010	0.069	-0.017		0.754	0.313	0.474
(2-4)	0.023	0.056	0.007	0.196	0.198	0.195		1.144	0.580	0.695
(3-4)	0.276	0.196	0.313	0.186	0.130	0.212			0.737	0.883
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.454	0.544	0.418	0.027	0.053	0.016	74.374	1.567	2.051	1.338
HEAD(1-3)	0.200	0.392	0.123	0.036	0.127	-0.000	63.592	1.233	1.529	1.093
S/L(1-4)	0.477	0.605	0.425	0.223	0.268	0.204	67.875	1.997	2.834	1.602
(2-3)	-0.254	-0.152	-0.295	0.010	0.074	-0.016		0.787	0.746	0.817
(2-4)	0.023	0.061	0.007	0.196	0.216	0.188		1.275	1.381	1.198
(3-4)	0.276	0.213	0.302	0.186	0.141	0.204			1.853	1.466
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.489	-0.270	-0.588	0.019	0.132	-0.032				
(2-4)	0.044	0.107	0.014	0.377	0.382	0.375				
(3-4)	0.362	0.443	0.544	0.244	0.293	0.255				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.378	-0.521		0.185	-0.028				
(2-4)		0.151	0.013		0.535	0.352				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 1.5 FLOW SPLIT 0.666

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.434	0.416	0.460	0.053	0.064	0.057	71.032	1.567	0.820	0.746
HEAD(1-3)	0.207	0.051	0.440	0.105	0.150	0.057	48.123	1.295	0.698	0.647
S/L(1-4)	0.469	0.426	0.553	0.213	0.200	0.234	67.122	1.780	0.909	1.088
(2-3)	-0.227	-0.365	-0.020	0.051	0.086	0.000		0.826	0.446	0.413
(2-4)	0.035	0.010	0.073	0.160	0.136	0.197		1.136	0.580	0.695
(3-4)	0.262	0.375	0.093	0.109	0.050	0.197			0.676	0.809
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.434	0.389	0.513	0.053	0.060	0.041	71.032	1.567	1.423	1.762
HEAD(1-3)	0.207	0.048	0.491	0.105	0.140	0.041	48.123	1.345	1.211	1.528
S/L(1-4)	0.469	0.399	0.594	0.213	0.187	0.261	67.122	1.997	1.577	2.569
(2-3)	-0.227	-0.341	-0.022	0.051	0.080	0.000		0.859	0.851	0.867
(2-4)	0.035	0.009	0.081	0.160	0.127	0.220		1.275	1.108	1.458
(3-4)	0.262	0.351	0.103	0.109	0.047	0.220			1.303	1.682
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.442	-0.711	-0.039	0.100	0.167	0.000				
(2-4)	0.068	0.019	0.142	0.311	0.264	0.384				
(3-4)	0.380	0.452	0.221	0.158	0.057	0.469				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.620	-0.050		0.146	0.000				
(2-4)		0.017	0.182		0.230	0.493				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 1.5 FLOW SPLIT 1.068

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.453	0.453	0.454	0.043	0.057	0.030	74.278	1.567	0.730	0.856
HEAD(1-3)	0.314	0.259	0.365	0.032	0.097	-0.029	68.757	1.326	0.648	0.679
S/L(1-4)	0.550	0.547	0.553	0.203	0.211	0.197	72.577	1.988	0.909	1.088
(2-3)	-0.140	-0.193	-0.089	-0.011	0.040	-0.059		0.847	0.413	0.453
(2-4)	0.097	0.095	0.099	0.161	0.154	0.167		1.269	0.580	0.695
(3-4)	0.236	0.288	0.188	0.172	0.114	0.226			0.685	0.821
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.453	0.438	0.469	0.043	0.055	0.031	74.278	1.567	1.523	1.607
HEAD(1-3)	0.314	0.251	0.377	0.032	0.093	-0.050	68.757	1.326	1.350	1.305
S/L(1-4)	0.550	0.529	0.571	0.203	0.204	0.205	72.577	1.997	1.895	2.092
(2-3)	-0.140	-0.187	-0.092	-0.011	0.039	-0.061		0.847	0.886	0.812
(2-4)	0.097	0.092	0.102	0.161	0.149	0.175		1.275	1.245	1.302
(3-4)	0.236	0.279	0.194	0.172	0.110	0.233			1.404	1.603
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.277	-0.384	-0.177	-0.022	0.080	-0.116				
(2-4)	0.192	0.188	0.196	0.319	0.306	0.352				
(3-4)	0.361	0.425	0.297	0.263	0.168	0.357				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.369	-0.185		0.076	-0.121				
(2-4)		0.181	0.204		0.294	0.345				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 1.5 FLOW SPLIT 1.754

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.458	0.481	0.444	0.026	0.037	0.019	75.029	1.567	0.657	0.910
HEAD(1-3)	0.324	0.354	0.307	0.053	0.145	-0.000	67.615	1.355	0.570	0.807
S/L(1-4)	0.553	0.570	0.542	0.179	0.234	0.148	75.068	1.903	0.909	1.088
(2-3)	-0.134	-0.127	-0.138	0.027	0.108	-0.019		0.865	0.364	0.515
(2-4)	0.095	0.089	0.098	0.154	0.197	0.129		1.215	0.580	0.695
(3-4)	0.228	0.216	0.236	0.127	0.089	0.148			0.660	0.791
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.458	0.501	0.435	0.026	0.039	0.018	75.029	1.567	1.760	1.452
HEAD(1-3)	0.324	0.369	0.300	0.053	0.151	-0.000	67.615	1.377	1.528	1.287
S/L(1-4)	0.553	0.593	0.531	0.179	0.243	0.145	75.068	1.997	2.437	1.756
(2-3)	-0.134	-0.132	-0.135	0.027	0.112	-0.019		0.879	0.868	0.886
(2-4)	0.095	0.092	0.096	0.154	0.205	0.127		1.275	1.384	1.196
(3-4)	0.228	0.225	0.250	0.127	0.092	0.145			1.595	1.549
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.259	-0.246	-0.266	0.052	0.209	-0.037				
(2-4)	0.183	0.172	0.190	0.298	0.381	0.250				
(3-4)	0.366	0.468	0.329	0.203	0.192	0.207				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.287	-0.246		0.244	-0.054				
(2-4)		0.201	0.175		0.444	0.231				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 2. DUMP GAP 1.5 FLOW SPLIT 2.289

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.436	0.473	0.420	0.044	0.062	0.036	71.489	1.567	0.615	0.951
HEAD(1-3)	0.309	0.406	0.267	0.059	0.160	0.015	68.580	1.320	0.544	0.839
S/L(1-4)	0.478	0.546	0.448	0.211	0.252	0.195	68.767	1.772	0.909	1.088
(2-3)	-0.127	-0.067	-0.154	0.015	0.097	-0.021		0.842	0.347	0.555
(2-4)	0.042	0.073	0.028	0.167	0.189	0.158		1.131	0.580	0.695
(3-4)	0.169	0.140	0.182	0.152	0.092	0.179			0.658	0.787
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.436	0.519	0.405	0.044	0.068	0.034	71.489	1.567	1.967	1.384
HEAD(1-3)	0.309	0.446	0.257	0.059	0.175	0.014	68.580	1.382	1.738	1.221
S/L(1-4)	0.478	0.600	0.452	0.211	0.276	0.186	68.767	1.997	2.905	1.584
(2-3)	-0.127	-0.073	-0.148	0.015	0.107	-0.020		0.882	0.884	0.882
(2-4)	0.042	0.080	0.027	0.167	0.208	0.152		1.275	1.477	1.144
(3-4)	0.169	0.154	0.175	0.152	0.101	0.172			1.672	1.298
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.245	-0.128	-0.296	0.028	0.187	-0.040				
(2-4)	0.080	0.141	0.054	0.321	0.365	0.304				
(3-4)	0.268	0.405	0.240	0.241	0.267	0.236				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.178	-0.264		0.259	-0.036				
(2-4)		0.195	0.048		0.504	0.271				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.4 FLOW SPLIT 0.694

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.555	0.505	0.627	0.060	0.079	0.032	78.756	1.800	0.833	0.967
HEAD(1-3)	-0.199	-0.647	0.447	0.056	0.021	0.106	-2092.593	0.983	0.464	0.935
S/L(1-4)	0.370	0.245	0.550	0.323	0.397	0.218	52.331	1.805	0.909	1.088
(2-3)	-0.754	-1.152	-0.181	-0.004	-0.058	0.075		0.546	0.258	0.520
(2-4)	-0.185	-0.260	-0.078	0.263	0.318	0.185		1.003	0.505	0.605
(3-4)	0.569	0.892	0.103	0.268	0.376	0.112			0.650	0.778
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.555	0.474	0.694	0.060	0.074	0.036	78.756	1.800	1.465	2.241
HEAD(1-3)	-0.199	-0.607	0.494	0.056	0.020	0.117	-2092.593	1.399	0.815	2.169
S/L(1-4)	0.370	0.230	0.608	0.323	0.372	0.241	52.331	1.997	1.599	2.525
(2-3)	-0.754	-1.081	-0.200	-0.004	-0.054	0.081		0.777	0.556	0.968
(2-4)	-0.185	-0.244	-0.086	0.263	0.298	0.205		1.110	1.091	1.126
(3-4)	0.569	0.837	0.114	0.268	0.352	0.124			1.961	1.165
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.959	-2.993	-0.470	-0.011	-0.150	0.190				
(2-4)	-0.482	-0.676	-0.203	0.684	0.826	0.481				
(3-4)	0.497	0.527	0.292	0.234	0.222	0.319				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-2.389	-0.740		-0.120	0.300				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3, DUMP GAP 0.4 FLOW SPLIT 0.964

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.635	0.614	0.656	0.028	0.048	0.007	90.106	1.800	0.819	0.981
HEAD(1-3)	0.104	-0.140	0.358	-0.019	0.023	-0.062	58.989	1.078	0.491	0.616
S/L(1-4)	0.495	0.444	0.549	0.248	0.284	0.209	65.900	1.963	0.909	1.088
(2-3)	-0.531	-0.754	-0.299	-0.047	-0.025	-0.069		0.599	0.273	0.342
(2-4)	-0.140	-0.170	-0.108	0.219	0.236	0.205		1.090	0.505	0.605
(3-4)	0.391	0.584	0.191	0.266	0.261	0.272			0.822	0.984
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.635	0.589	0.688	0.028	0.046	0.007	90.106	1.800	1.646	1.955
HEAD(1-3)	0.104	-0.134	0.375	-0.019	0.022	-0.065	58.989	1.106	0.986	1.225
S/L(1-4)	0.495	0.426	0.575	0.248	0.273	0.219	65.900	1.997	1.827	2.166
(2-3)	-0.531	-0.723	-0.313	-0.047	-0.024	-0.072		0.615	0.599	0.627
(2-4)	-0.140	-0.163	-0.113	0.219	0.226	0.212		1.110	1.110	1.109
(3-4)	0.391	0.560	0.200	0.266	0.250	0.285			1.853	1.768
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.577	-2.240	-0.887	-0.140	-0.075	-0.205				
(2-4)	-0.415	-0.505	-0.320	0.651	0.702	0.602				
(3-4)	0.428	0.503	0.289	0.291	0.225	0.412				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.980	-1.025		-0.066	-0.237				
(2-4)		-0.447	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.4 FLOW SPLIT 1.389

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD								EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.660	0.672	0.651	0.007	0.028	-0.008	93.646	1.800	0.818	0.982
HEAD(1-3)	0.197	0.219	0.182	-0.024	0.013	-0.050	75.975	1.137	0.491	0.647
S/L(1-4)	0.521	0.554	0.497	0.230	0.235	0.226	68.827	1.982	0.909	1.088
(2-3)	-0.463	-0.454	-0.469	-0.031	-0.015	-0.045		0.631	0.273	0.360
(2-4)	-0.139	-0.119	-0.154	0.223	0.207	0.234		1.101	0.505	0.605
(3-4)	0.323	0.335	0.315	0.254	0.222	0.277			0.799	0.957
BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD								GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.660	0.674	0.650	0.007	0.028	-0.008	93.646	1.800	1.952	1.690
HEAD(1-3)	0.197	0.219	0.182	-0.024	0.013	-0.050	75.975	1.138	1.170	1.114
S/L(1-4)	0.521	0.555	0.496	0.230	0.236	0.226	68.827	1.997	2.169	1.874
(2-3)	-0.463	-0.455	-0.468	-0.031	-0.015	-0.042		0.632	0.599	0.659
(2-4)	-0.139	-0.119	-0.154	0.223	0.208	0.234		1.110	1.111	1.109
(3-4)	0.323	0.336	0.314	0.254	0.223	0.277			1.853	1.682
BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD										
(2-3)	-1.391	-1.365	-1.409	-0.094	-0.046	-0.128				
(2-4)	-0.419	-0.356	-0.464	0.670	0.623	0.704				
(3-4)	0.391	0.437	0.362	0.307	0.290	0.318				
BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD										
(2-3)		-1.524	-1.309		-0.051	-0.119				
(2-4)		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.4 FLOW SPLIT 2.049

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.591	0.651	0.560	0.040	0.047	0.036	83.811	1.800	0.796	1.004
HEAD(1-3)	0.087	0.593	-0.063	-0.001	0.060	-0.031	52.099	1.071	0.491	0.647
S/L(1-4)	0.451	0.570	0.393	0.257	0.238	0.267	63.190	1.829	0.909	1.088
(2-3)	-0.504	-0.258	-0.623	-0.041	0.013	-0.067		0.595	0.273	0.560
(2-4)	-0.139	-0.081	-0.167	0.217	0.190	0.250		1.016	0.505	0.605
(3-4)	0.364	0.177	0.456	0.258	0.178	0.297			0.799	0.957
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.591	0.695	0.544	0.040	0.051	0.035	83.811	1.800	2.350	1.519
HEAD(1-3)	0.087	0.420	-0.061	-0.001	0.064	-0.030	52.099	1.138	1.449	0.979
S/L(1-4)	0.451	0.608	0.381	0.257	0.254	0.259	63.190	1.997	2.685	1.646
(2-3)	-0.504	-0.276	-0.604	-0.041	0.014	-0.065		0.632	0.617	0.644
(2-4)	-0.139	-0.087	-0.162	0.217	0.203	0.225		1.110	1.143	1.084
(3-4)	0.364	0.189	0.442	0.258	0.189	0.288			1.853	1.682
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-1.365	-0.699	-1.688	-0.111	0.035	-0.181				
(2-4)	-0.378	-0.220	-0.453	0.588	0.516	0.624				
(3-4)	0.399	0.366	0.405	0.282	0.367	0.264				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.083	-1.455		0.054	-0.154				
(2-4)		-0.341	-0.385		0.799	0.551				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.7 FLOW SPLIT 0.596

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.463	0.435	0.508	0.089	0.097	0.075	65.672	1.800	0.850	0.950
HEAD(1-3)	0.093	-0.138	0.479	0.018	-0.025	0.089	51.969	1.079	0.570	0.711
S/L(1-4)	0.424	0.357	0.536	0.234	0.236	0.251	62.919	1.711	0.909	1.088
(2-3)	-0.370	-0.573	-0.029	-0.072	-0.123	0.014		0.599	0.317	0.395
(2-4)	-0.039	-0.079	0.028	0.145	0.138	0.156		0.951	0.505	0.605
(3-4)	0.331	0.495	0.057	0.217	0.261	0.142			0.710	0.850
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.463	0.406	0.577	0.089	0.091	0.085	65.672	1.800	1.418	2.370
HEAD(1-3)	0.093	-0.129	0.544	0.018	-0.024	0.101	51.969	1.281	0.952	1.773
S/L(1-4)	0.424	0.333	0.608	0.234	0.220	0.262	62.919	1.997	1.518	2.715
(2-3)	-0.370	-0.535	-0.033	-0.072	-0.114	0.016		0.712	0.671	0.748
(2-4)	-0.039	-0.073	0.052	0.145	0.129	0.177		1.110	1.070	1.145
(3-4)	0.331	0.462	0.065	0.217	0.244	0.161			1.595	1.551
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.827	-1.281	-0.065	-0.161	-0.274	0.052				
(2-4)	-0.087	-0.175	0.062	0.323	0.309	0.349				
(3-4)	0.372	0.401	0.182	0.243	0.211	0.453				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-1.064	-0.098		-0.228	0.048				
(2-4)		-0.146	0.007		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.7 FLOW SPLIT 1.017

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.532	0.526	0.559	0.060	0.070	0.049	75.528	1.800	0.791	1.009
HEAD(1-3)	0.325	0.219	0.430	-0.015	-0.007	-0.023	81.622	1.261	0.570	0.711
S/L(1-4)	0.552	0.546	0.558	0.196	0.198	0.195	73.071	1.978	0.909	1.088
(2-3)	-0.207	-0.307	-0.108	-0.075	-0.077	-0.072		0.701	0.317	0.395
(2-4)	0.020	0.020	0.020	0.137	0.128	0.146		1.099	0.505	0.605
(3-4)	0.227	0.327	0.128	0.212	0.205	0.218			0.710	0.850
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.532	0.506	0.560	0.060	0.067	0.051	75.528	1.800	1.626	1.965
HEAD(1-3)	0.325	0.211	0.448	-0.015	-0.007	-0.024	81.622	1.281	1.172	1.384
S/L(1-4)	0.552	0.525	0.581	0.196	0.190	0.205	73.071	1.997	1.869	2.120
(2-3)	-0.207	-0.296	-0.113	-0.075	-0.074	-0.075		0.712	0.721	0.705
(2-4)	0.020	0.019	0.021	0.137	0.123	0.152		1.110	1.149	1.079
(3-4)	0.227	0.315	0.153	0.212	0.197	0.227			1.595	1.551
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.507	-0.753	-0.265	-0.183	-0.188	-0.177				
(2-4)	0.048	0.048	0.049	0.335	0.314	0.358				
(3-4)	0.329	0.395	0.231	0.307	0.247	0.394				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.693	-0.290		-0.173	-0.195				
(2-4)		0.044	0.053		0.289	[illegible]				

- 220 -

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.7 FLOW SPLIT 1.611

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.538	0.551	0.529	0.059	0.080	0.046	76.286	1.800	0.796	1.004
HEAD(1-3)	0.340	0.394	0.307	0.032	0.071	0.008	73.945	1.331	0.570	0.774
S/L(1-4)	0.555	0.591	0.533	0.185	0.211	0.169	74.464	1.938	0.909	1.088
(2-3)	-0.197	-0.157	-0.222	-0.027	-0.009	-0.038		0.739	0.317	0.430
(2-4)	0.017	0.040	0.003	0.126	0.131	0.124		1.077	0.505	0.605
(3-4)	0.215	0.197	0.225	0.153	0.140	0.161			0.676	0.809
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.538	0.564	0.522	0.059	0.081	0.045	76.286	1.800	2.044	1.644
HEAD(1-3)	0.340	0.403	0.303	0.032	0.073	0.008	73.945	1.345	1.463	1.269
S/L(1-4)	0.555	0.605	0.525	0.185	0.216	0.167	74.464	1.997	2.334	1.785
(2-3)	-0.197	-0.161	-0.219	-0.027	-0.009	-0.057		0.747	0.716	0.772
(2-4)	0.017	0.041	0.003	0.126	0.134	0.122		1.110	1.142	1.084
(3-4)	0.215	0.202	0.222	0.153	0.143	0.159			1.595	1.405
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.489	-0.390	-0.550	-0.066	-0.021	-0.094				
(2-4)	0.043	0.099	0.008	0.313	0.325	0.306				
(3-4)	0.342	0.386	0.322	0.244	0.273	0.251				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.455	-0.505		-0.025	-0.086				
(2-4)		0.116	0.008		0.379	0.281				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 0.7 FLOW SPLIT 2.298

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.523	0.561	0.506	0.022	0.022	0.021	74.206	1.800	0.790	1.010
HEAD(1-3)	0.274	0.427	0.207	0.041	0.121	0.006	67.972	1.266	0.517	0.807
S/L(1-4)	0.498	0.566	0.469	0.191	0.233	0.172	71.746	1.770	0.909	1.088
(2-3)	-0.249	-0.134	-0.299	0.019	0.099	-0.015		0.703	0.287	0.448
(2-4)	-0.025	0.005	-0.037	0.169	0.212	0.152		0.983	0.505	0.605
(3-4)	0.224	0.138	0.262	0.150	0.112	0.167			0.687	0.822
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.523	0.616	0.488	0.022	0.024	0.020	74.206	1.800	2.505	1.475
HEAD(1-3)	0.274	0.469	0.200	0.041	0.133	0.006	67.972	1.324	1.641	1.178
S/L(1-4)	0.498	0.621	0.452	0.191	0.256	0.166	71.746	1.997	2.884	1.589
(2-3)	-0.249	-0.147	-0.288	0.019	0.109	-0.014		0.735	0.655	0.798
(2-4)	-0.025	0.005	-0.036	0.169	0.233	0.146		1.110	1.151	1.077
(3-4)	0.224	0.152	0.252	0.150	0.123	0.160			1.757	1.349
				BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)	-0.548	-0.294	-0.657	0.041	0.219	-0.032				
(2-4)	-0.054	0.011	-0.082	0.371	0.466	0.334				
(3-4)	0.328	0.382	0.517	0.219	0.310	0.202				
				BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD						
(2-3)		-0.406	-0.585		0.303	-0.029				
(2-4)		0.015	-0.073		0.644	0.297				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 1.2 FLOW SPLIT 0.691

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.469	0.448	0.498	0.077	0.079	0.075	66.502	1.800	0.841	0.959
HEAD(1-3)	0.248	0.085	0.484	0.034	-0.032	0.129	70.776	1.214	0.596	0.859
S/L(1-4)	0.455	0.399	0.537	0.216	0.207	0.230	64.550	1.802	0.909	1.088
(2-3)	-0.220	-0.363	-0.014	-0.043	-0.111	0.057		0.674	0.331	0.466
(2-4)	-0.013	-0.049	0.039	0.139	0.128	0.158		1.001	0.505	0.605
(3-4)	0.207	0.314	0.053	0.182	0.239	0.101			0.634	0.759
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.469	0.429	0.551	0.077	0.074	0.080	66.502	1.800	1.471	2.259
HEAD(1-3)	0.248	0.080	0.535	0.034	-0.030	0.143	70.776	1.435	1.043	1.958
S/L(1-4)	0.455	0.374	0.594	0.216	0.194	0.255	64.550	1.997	1.590	2.541
(2-3)	-0.220	-0.340	-0.015	-0.043	-0.104	0.065		0.797	0.709	0.875
(2-4)	-0.015	-0.046	0.043	0.139	0.120	0.175		1.110	1.081	1.135
(3-4)	0.207	0.294	0.059	0.182	0.224	0.112			1.525	1.298
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.485	-0.799	-0.051	-0.095	-0.245	0.125				
(2-4)	-0.029	-0.108	0.086	0.307	0.281	0.348				
(3-4)	0.289	0.310	0.183	0.254	0.236	0.348				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.673	-0.042		-0.206	0.170				
(2-4)		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 1.2 FLOW SPLIT 0.955

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.503	0.496	0.510	0.064	0.070	0.057	71.357	1.800	0.804	0.996
HEAD(1-3)	0.358	0.276	0.444	-0.019	-0.007	-0.030	83.835	1.292	0.622	0.679
S/L(1-4)	0.553	0.549	0.557	0.187	0.171	0.204	73.591	1.960	0.909	1.088
(2-3)	-0.145	-0.221	-0.065	-0.083	-0.078	-0.087		0.718	0.346	0.377
(2-4)	0.050	0.052	0.047	0.123	0.100	0.147		1.089	0.505	0.605
(3-4)	0.195	0.273	0.112	0.205	0.178	0.254			0.699	0.857
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.503	0.476	0.534	0.064	0.067	0.059	71.357	1.800	1.601	2.001
HEAD(1-3)	0.358	0.264	0.465	-0.019	-0.007	-0.032	83.835	1.301	1.238	1.564
S/L(1-4)	0.553	0.526	0.583	0.187	0.164	0.215	73.591	1.997	1.809	2.187
(2-3)	-0.145	-0.211	-0.068	-0.083	-0.074	-0.091		0.723	0.773	0.682
(2-4)	0.050	0.050	0.049	0.123	0.096	0.154		1.110	1.131	1.093
(3-4)	0.195	0.262	0.118	0.205	0.171	0.245			1.462	1.605
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.334	-0.509	-0.151	-0.191	-0.179	-0.201				
(2-4)	0.115	0.123	0.109	0.284	0.232	0.340				
(3-4)	0.295	0.352	0.208	0.311	0.230	0.455				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.463	-0.168		-0.163	-0.224				
(2-4)		[illegible]	[illegible]		[illegible]	[illegible]				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 1.2 FLOW SPLIT 1.703

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.513	0.524	0.506	0.059	0.083	0.045	72.728	1.800	0.770	1.030
HEAD(1-3)	0.397	0.394	0.400	0.004	0.071	-0.036	80.099	1.378	0.544	0.839
S/L(1-4)	0.565	0.565	0.553	0.172	0.224	0.141	76.393	1.916	0.909	1.088
(2-3)	-0.115	-0.130	-0.107	-0.055	-0.012	-0.081		0.765	0.302	0.466
(2-4)	0.052	0.069	0.047	0.113	0.141	0.096		1.064	0.505	0.605
(3-4)	0.167	0.191	0.153	0.168	0.152	0.177			0.658	0.787
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.513	0.549	0.497	0.059	0.085	0.044	72.728	1.800	2.036	1.657
HEAD(1-3)	0.397	0.406	0.392	0.004	0.073	-0.036	80.099	1.382	1.438	1.549
S/L(1-4)	0.565	0.604	0.543	0.172	0.231	0.139	76.393	1.997	2.404	1.750
(2-3)	-0.115	-0.134	-0.105	-0.055	-0.012	-0.079		0.768	0.706	0.814
(2-4)	0.052	0.063	0.046	0.113	0.145	0.095		1.110	1.181	1.056
(3-4)	0.167	0.197	0.151	0.168	0.157	0.174			1.672	1.298
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.269	-0.303	-0.249	-0.128	-0.027	-0.189				
(2-4)	0.122	0.143	0.110	0.264	0.328	0.225				
(3-4)	0.279	0.379	0.234	0.281	0.302	0.271				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.358	-0.228		-0.032	-0.175				
(2-4)		0.169	0.100		0.388	0.206				

PERFORMANCE PARAMETERS FOR DIFFUSER NO 3. DUMP GAP 1.2 FLOW SPLIT 2.288

	PRESSURE RECOVERIES			LOSS COEFFICIENTS			ETA%	AREA RATIOS		
	MEAN	INNER	OUTER	MEAN	INNER	OUTER		MEAN	INNER	OUTER
	BASED ON OVERALL INLET M.W.M. DYNAMIC HEAD							EFFECTIVE	MEAN INLET	
OUTLET(1-2)	0.496	0.518	0.487	0.066	0.089	0.056	70.389	1.800	0.736	1.064
HEAD(1-3)	0.372	0.435	0.345	0.024	0.117	-0.016	73.818	1.389	0.517	0.903
S/L(1-4)	0.526	0.574	0.506	0.162	0.224	0.155	75.689	1.772	0.909	1.088
(2-3)	-0.124	-0.082	-0.142	-0.042	0.027	-0.072		0.772	0.287	0.502
(2-4)	0.030	0.056	0.019	0.096	0.135	0.078		0.984	0.505	0.605
(3-4)	0.154	0.158	0.161	0.137	0.107	0.150			0.640	0.766
	BASED ON SPLIT INLET M.W.M. DYNAMIC HEAD							GEOMETRIC	SPLIT INLET	
OUTLET(1-2)	0.496	0.568	0.469	0.066	0.098	0.054	70.389	1.800	2.350	1.549
HEAD(1-3)	0.372	0.478	0.352	0.024	0.128	-0.015	73.818	1.420	1.652	1.315
S/L(1-4)	0.526	0.630	0.487	0.162	0.246	0.150	75.689	1.997	2.903	1.584
(2-3)	-0.124	-0.090	-0.137	-0.042	0.030	-0.070		0.789	0.703	0.849
(2-4)	0.030	0.061	0.018	0.096	0.148	0.075		1.110	1.235	1.023
(3-4)	0.154	0.152	0.155	0.137	0.118	0.145			1.757	1.205
	BASED ON OVERALL LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)	-0.283	-0.188	-0.325	-0.095	0.063	-0.165				
(2-4)	0.069	0.128	0.043	0.218	0.308	0.179				
(3-4)	0.256	0.385	0.227	0.228	0.299	0.212				
	BASED ON SPLIT LOCAL INLET M.W.M. DYNAMIC HEAD									
(2-3)		-0.271	-0.287		0.090	-0.146				
(2-4)		0.184	[illegible]		[illegible]	[illegible]				

APPENDIX 6

BOUNDARY LAYER PARAMETERS

$S^{*} = 1.20$

FULLY DEVELOPED ENTRY CONDITIONS

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1, DUMP GAP 0.5 FLOW SPLIT 0.710

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	15.839	10.771	1.2848	1.0456
OUTLET	0.8554	18.528	12.475	1.4852	1.1059
S/LINNER	0.8580	17.994	13.759	1.3077	1.0531
S/LOUTER	0.9581	6.502	5.131	1.2674	1.0273
HEAD INNER	0.8527	5.343	3.840	1.3914	1.0802
HEAD OUTER	0.7999	7.378	5.242	1.4074	1.0836

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.9340	0.8235	0.804	14.157	0.700	9.405	1.148	1.505	1.014	1.115
S/LINNER	0.8294	0.9410	16.078	1.249	12.170	1.056	1.321	1.231	1.054	1.021
S/LOUTER	0.9361	0.9427	4.635	1.695	3.766	1.259	1.251	1.368	1.024	1.035
HEAD INNER	0.8213	0.9825	5.304	0.035	3.802	0.034	1.395	1.036	1.081	1.001
HEAD OUTER	0.9645	0.7905	0.071	6.967	0.066	4.955	1.077	1.412	1.004	1.085
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8984	0.8405	6.231	6.449	4.652	5.204	1.359	1.239	1.050	1.029
OUTLET	0.9560	0.7087	2.541	12.767	2.302	8.126	1.104	1.571	1.006	1.119

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 0.5 FLOW SPLIT 0.936

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.859	10.771	1.2848	1.0456
OUTLET	0.9052	10.676	8.340	1.2801	1.0404
S/LINNER	0.8797	15.235	11.995	1.2701	1.0417
S/LOUTER	0.9553	6.802	5.318	1.2790	1.0293
HEAD INNER	0.7806	7.507	4.881	1.5378	1.1581
HEAD OUTER	0.8711	4.215	3.405	1.2378	1.0319

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.9497	0.8739	2.336	6.661	1.965	5.092	1.189	1.308	1.017	1.051
S/LINNER	0.8585	0.9413	13.329	1.243	10.383	1.051	1.284	1.236	1.045	1.018
S/LOUTER	0.9389	0.9242	4.821	1.798	3.901	1.286	1.236	1.398	1.023	1.049
HEAD INNER	0.7667	0.9765	7.454	0.047	4.831	0.045	1.543	1.049	1.140	1.002
HEAD OUTER	0.9687	0.8647	0.063	3.979	0.059	3.207	1.067	1.241	1.003	1.032
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8924	0.8534	5.863	6.774	4.554	5.285	1.288	1.282	1.044	1.044
OUTLET	0.9610	0.8511	2.150	6.827	2.002	5.060	1.074	1.349	1.007	1.061

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1, DUMP GAP 0.5 FLOW SPLIT 1.422

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.859	10.771	1.2848	1.0456
OUTLET	0.8990	11.577	8.724	1.3041	1.0460
S/LINNER	0.9502	8.840	7.332	1.2057	1.0226
S/LOUTER	0.9415	6.144	4.823	1.2738	1.0266
HEAD INNER	0.7513	8.511	5.329	1.5970	1.1655
HEAD OUTER	0.8488	5.258	3.952	1.3305	1.0597

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8658	0.9454	8.815	2.047	6.533	1.751	1.349	1.169	1.063	1.016
S/LINNER	0.9138	0.9486	5.771	2.001	4.830	1.632	1.195	1.143	1.022	1.021
S/LOUTER	0.9506	0.9192	3.685	2.232	3.222	1.453	1.143	1.536	1.012	1.064
HEAD INNER	0.7336	1.0000	8.511	-0.000	5.329	-0.000	1.597	1.000	1.161	1.000
HEAD OUTER	0.9852	0.8405	0.030	4.998	0.029	3.751	1.031	1.333	1.001	1.060

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8682	0.8762	5.899	6.730	4.537	5.301	1.300	1.271	1.048	1.044
OUTLET	0.8264	0.9594	8.862	1.996	6.439	1.826	1.376	1.093	1.069	1.008

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 0.5 FLOW SPLIT 2.020

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7960	22.967	14.157	1.6224	1.1601
S/LINNER	0.9339	8.369	7.063	1.1849	1.0194
S/LOUTER	0.9616	4.037	3.326	1.2138	1.0156
HEAD INNER	0.6775	11.781	6.735	1.7493	1.2292
HEAD OUTER	0.8466	5.657	4.116	1.3745	1.0738

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7563	0.9303	21.173	1.433	12.659	1.196	1.673	1.198	1.190	1.022
S/LINNER	0.9651	0.9261	0.891	4.876	0.796	4.086	1.119	1.197	1.008	1.022
S/LOUTER	0.9654	0.9545	2.359	1.523	1.970	1.230	1.197	1.237	1.013	1.020
HEAD INNER	0.6566	0.9901	11.758	0.020	6.712	0.019	1.752	1.020	1.211	1.000
HEAD OUTER	0.9854	0.8386	0.029	5.366	0.028	3.897	1.030	1.377	1.001	1.075

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

INLET	0.8394	0.8909	6.025	6.612	4.439	5.385	1.357	1.228	1.060	1.035
OUTLET	0.6203	0.9289	18.430	3.636	10.342	3.046	1.782	1.194	1.165	1.020

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 1.0 FLOW SPLIT 0.777

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.859	10.771	1.2848	1.0456
OUTLET	0.7785	24.943	13.768	1.8117	1.2208
S/LINNER	0.7766	28.300	17.835	1.5868	1.1530
S/LOUTER	0.9427	6.020	4.169	1.4440	1.0568
HEAD INNER	0.8501	5.476	4.182	1.3094	1.0527
HEAD OUTER	0.6570	20.320	10.187	1.9947	1.3673

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8787	0.7236	4.830	16.065	3.780	7.978	1.278	2.014	1.043	1.329
S/LINNER	0.7577	0.8895	24.715	2.358	15.383	1.599	1.607	1.177	1.159	1.076
S/LOUTER	0.9514	0.9214	3.627	2.172	3.082	0.986	1.177	2.202	1.015	1.093
HEAD INNER	0.8414	0.9798	5.430	0.040	4.138	0.039	1.312	1.042	1.052	1.001
HEAD OUTER	0.9696	0.6246	0.061	18.877	0.057	9.439	1.065	2.000	1.003	1.365
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9059	0.8325	5.610	7.006	4.627	5.221	1.212	1.342	1.030	1.057
OUTLET	0.9026	0.6620	5.319	15.655	3.926	7.866	1.355	1.990	1.051	1.347

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 1.0 FLOW SPLIT 1.024

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.8061	21.834	13.573	1.6086	1.1512
S/LINNER	0.8809	15.088	12.028	1.2544	1.0569
S/LOUTER	0.9278	7.585	6.102	1.2431	1.0273
HEAD INNER	0.7505	10.878	6.540	1.6634	1.1912
HEAD OUTER	0.7354	11.988	7.317	1.6382	1.1812

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8280	0.7872	8.946	10.294	5.969	6.073	1.499	1.695	1.112	1.186
S/LINNER	0.8666	0.9224	12.572	1.641	10.196	1.195	1.233	1.159	1.029	1.047
S/LOUTER	0.9300	0.9225	5.224	2.143	4.507	1.447	1.159	1.481	1.015	1.057
HEAD INNER	0.7374	0.9797	10.830	0.040	6.494	0.039	1.668	1.042	1.193	1.001
HEAD OUTER	0.9750	0.7244	0.050	11.266	0.048	6.861	1.053	1.642	1.002	1.180
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8895	0.8575	5.769	6.859	4.544	5.293	1.270	1.296	1.041	1.048
OUTLET	0.8401	0.7743	8.625	10.573	5.971	6.068	1.445	1.742	1.097	1.204

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 1.0 FLOW SPLIT 1.532

	UBAR/UMAX		DELTASTAR %		THETA %		SHAPE FACTOR		ALPHA	
	MEAN		MEAN		MEAN		MEAN		MEAN	
INLET	0.8728		13.839		10.771		1.2848		1.0456	
OUTLET	0.7933		23.275		14.004		1.6620		1.1719	
S/LINNER	0.9477		6.622		5.474		1.2098		1.0194	
S/LOUTER	0.9474		5.527		3,731		1.4811		1.0364	
HEAD INNER	0.7934		7.546		5.153		1.4643		1.1074	
HEAD OUTER	0.7579		11.998		7.165		1.6745		1,1973	
	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7695	0.8173	13.035	8.181	7.233	5.408	1.802	1.513	1.227	1.120
S/LINNER	0.9673	0.9389	1.292	3.476	1.109	2.846	1.165	1.171	1.011	1.023
S/LOUTER	0.9640	0.8972	2,839	2.439	2.424	1.186	1.171	2,056	1.012	1.115
HEAD INNER	0.7805	0.9367	7.516	0.026	5.124	0.026	1.467	1.027	1.106	1.007
HEAD OUTER	0.9853	0.7379	0.059	11.210	0.057	6.674	1.032	1.680	1.001	1.202
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8551	0.8850	6,225	6,430	4.526	5,312	1.375	1.212	1.064	1,032
OUTLET	0.7211	0.8475	13.374	7.874	7.168	5.464	1.866	1.441	1.268	1.095

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1, DUMP GAP 1.0 FLOW SPLIT 1.978

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7912	23.507	13.777	1.7063	1.1853
S/LINNER	0.8826	14.868	11.577	1.2843	1.0448
S/LOUTER	0.9617	4.022	3.268	1.2306	1.0167
HEAD INNER	0.7860	7.322	5.067	1.4450	1.0971
HEAD OUTER	0.7942	10.201	6.467	1.5772	1.1506

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7471	0.8415	15.162	6.666	7.872	4.716	1.926	1.413	1.279	1.085
S/LINNER	0.9672	0.8658	0.692	9.244	0.591	7.164	1.170	1.208	1.011	1.047
S/LOUTER	0.9477	0.9680	1.702	2.105	1.409	1.687	1.208	1.248	1.020	1.015
HEAD INNER	0.7725	0.9765	7.269	0.047	5.016	0.045	1.449	1.050	1.094	1.002
HEAD OUTER	0.9789	0.7686	0.127	9.458	0.122	5.958	1.043	1.587	1.001	1.159

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8424	0.8391	5.892	6.736	4.439	5.384	1.327	1.251	1.052	1.039
OUTLET	0.6759	0.8674	14.585	7.159	7.635	4.903	1.910	1.460	1.300	1.086

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 2.0 FLOW SPLIT 0.619

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7625	26.739	14.862	1.7992	1.2306
S/LINNER	0.8190	22.932	16.992	1.3496	1.0630
S/LOUTER	0.9443	5.857	4.758	1.2311	1.0212
HEAD INNER	0.7228	15.492	8.521	1.8180	1.2622
HEAD OUTER	0.7055	13.967	8.394	1.6640	1.1879

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8252	0.7159	8.262	14.758	5.491	7.485	1.505	1.972	1.115	1.321
S/LINNER	0.7939	0.9126	20.595	1.524	15.101	1.233	1.364	1.134	1.060	1.031
S/LOUTER	0.9518	0.9115	4.116	1.580	3.630	1.023	1.134	1.544	1.010	1.070
HEAD INNER	0.7106	0.9868	15.460	0.026	8.490	0.026	1.821	1.027	1.266	1.001
HEAD OUTER	0.9556	0.6945	0.089	13.064	0.081	7.825	1.098	1.669	1.006	1.185
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9011	0.8319	6.401	6.303	4.756	5.116	1.346	1.232	1.050	1.025
OUTLET	0.8529	0.6538	9.067	14.088	5.730	7.301	1.582	1.930	1.117	1.315

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 2.0 FLOW SPLIT 0.946

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7765	25.168	14.702	1.7119	1.1985
S/LINNER	0.8478	19.275	14.575	1.3225	1.0564
S/LOUTER	0.9241	7.977	6.501	1.2270	1.0250
HEAD INNER	0.7257	13.285	7.669	1.7321	1.2264
HEAD OUTER	0.7459	11.516	7.110	1.6197	1.1742

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8010	0.7578	9.682	12.369	6.092	6.877	1.589	1.799	1.149	1.238
S/LINNER	0.8510	0.9031	16.406	1.871	12.553	1.319	1.307	1.137	1.049	1.062
S/LOUTER	0.9290	0.9028	6.064	1.736	5.334	1.059	1.137	1.639	1.012	1.086
HEAD INNER	0.7129	0.9720	13.216	0.056	7.605	0.055	1.738	1.059	1.229	1.002
HEAD OUTER	0.9838	0.7225	0.045	10.825	0.043	6.669	1.045	1.623	1.001	1.169

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.9014	0.8442	5.315	7.272	4.554	5.281	1.167	1.377	1.023	1.067
OUTLET	0.8251	0.7315	9.452	12.569	6.101	6.867	1.549	1.830	1.131	1.259

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 2.0 FLOW SPLIT 1.595

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.859	10.771	1.2848	1.0456
OUTLET	0.7636	26.051	14.807	1.7593	1.2155
S/LINNER	0.9208	10.032	8.098	1.2389	1.0279
S/LOUTER	0.9648	3.694	2.984	1.2382	1.0159
HEAD INNER	0.8055	7.105	4.965	1.4311	1.0951
HEAD OUTER	0.7082	16.961	8.988	1.8871	1.3047

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7645	0.7725	12.785	10.598	6.888	6.326	1.856	1.675	1.247	1.187
S/LINNER	0.9463	0.9175	0.780	6.033	0.671	4.842	1.162	1.165	1.015	1.029
S/LOUTER	0.9733	0.9440	1.990	1.547	1.708	1.158	1.165	1.336	1.009	1.032
HEAD INNER	0.7734	0.9957	7.085	0.017	4.945	0.017	1.433	1.014	1.088	1.000
HEAD OUTER	0.9866	0.6655	0.108	15.664	0.103	8.258	1.041	1.897	1.001	1.315
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8725	0.8726	5.369	7.227	4.526	5.305	1.186	1.362	1.022	1.062
OUTLET	0.7306	0.7945	12.417	10.918	6.867	6.338	1.808	1.723	1.249	1.190

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO1. DUMP GAP 2.0 FLOW SPLIT 1.979

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7733	25.526	14.401	1.7725	1.2164
S/LINNER	0.8501	18.987	13.753	1.3805	1.0686
S/LOUTER	0.9293	7.431	6.122	1.2139	1.0225
HEAD INNER	0.7402	10.708	6.748	1.5869	1.1571
HEAD OUTER	0.7865	11.493	7.077	1.6240	1.1695

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7520	0.7965	14.583	8.741	7.453	5.549	1.956	1.575	1.286	1.146
S/LINNER	0.9664	0.8375	0.416	12.110	0.378	8.722	1.100	1.176	1.006	1.071
S/LOUTER	0.9365	0.9276	1.283	5.580	1.091	4.566	1.176	1.222	1.018	1.024
HEAD INNER	0.7261	0.9746	10.649	0.051	6.692	0.048	1.591	1.053	1.154	1.002
HEAD OUTER	0.9760	0.7532	0.193	10.556	0.184	6.439	1.053	1.639	1.002	1.182

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

INLET	0.8431	0.8886	5.860	6.766	4.439	5.384	1.320	1.257	1.050	1.040
OUTLET	0.6803	0.8318	13.998	9.248	7.314	5.656	1.914	1.635	1.307	1.144

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.5 FLOW SPLIT 0.581

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7492	28.734	13.553	2.1202	1.3364
S/LINNER	0.8572	18.089	14.066	1.2860	1.0457
S/LOUTER	0.9184	8.571	6.784	1.2635	1.0322
HEAD INNER	0.8629	4.692	3.619	1.2965	1.0492
HEAD OUTER	0.6972	13.719	8.241	1.6647	1.1846

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.9640	0.7021	0.741	21.683	0.690	9.963	1.073	2.176	1.004	1.410
S/LINNER	0.8387	0.9372	16.590	0.977	12.792	0.830	1.297	1.186	1.046	1.018
S/LOUTER	0.9181	0.9196	6.468	1.908	5.453	1.208	1.186	1.580	1.020	1.069
HEAD INNER	0.8539	0.9391	4.667	0.022	3.595	0.021	1.298	1.022	1.049	1.000
HEAD OUTER	0.9804	0.6341	0.039	12.910	0.038	7.742	1.041	1.668	1.001	1.176
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9147	0.8077	5.636	6.991	4.849	5.031	1.162	1.390	1.021	1.066
OUTLET	0.9674	0.5416	1.820	20.854	1.802	9.100	1.010	2.292	1.000	1.484

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.5 FLOW SPLIT 0.771

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.8045	22.399	13.141	1.7045	1.1773
S/LINNER	0.8279	21.800	16.191	1.3464	1.0634
S/LOUTER	0.9556	4.669	4.148	1.1256	1.0092
HEAD INNER	0.8364	5.597	4.027	1.3901	1.0793
HEAD OUTER	0.7281	12.321	7.562	1.6293	1.1768

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.9301	0.7424	2.649	15.298	2.277	8.415	1.163	1.818	1.016	1.251
S/LINNER	0.8007	0.9451	20.491	0.854	15.030	0.757	1.363	1.129	1.063	1.011
S/LOUTER	0.9473	0.9871	4.387	0.256	3.886	0.238	1.129	1.073	1.010	1.002
HEAD INNER	0.8260	0.9840	5.561	0.032	3.991	0.031	1.393	1.033	1.080	1.001
HEAD OUTER	0.9815	0.7164	0.037	11.593	0.036	7.103	1.039	1.632	1.001	1.174
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9060	0.8323	5.602	7.013	4.627	5.221	1.211	1.343	1.030	1.057
OUTLET	0.9389	0.6799	3.372	14.709	2.554	8.208	1.320	1.792	1.029	1.243

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.5 FLOW SPLIT 1.218

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.8377	18.591	12.883	1.4431	1.0948
S/LINNER	0.9167	10.549	9.014	1.1703	1.0180
S/LOUTER	0.9335	6.991	5.939	1.1771	1.0181
HEAD INNER	0.8009	7.272	4.890	1.4870	1.1170
HEAD OUTER	0.7862	8.783	5.934	1.4800	1.1129

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8324	0.8428	9.374	7.139	6.403	5.019	1.464	1.422	1.102	1.088
S/LINNER	0.9108	0.9389	8.916	1.065	7.617	0.911	1.171	1.147	1.018	1.017
S/LOUTER	0.9384	0.9122	5.265	1.567	4.589	1.226	1.147	1.278	1.013	1.038
HEAD INNER	0.7890	0.9787	7.223	0.043	4.844	0.041	1.491	1.044	1.119	1.001
HEAD OUTER	0.9800	0.7763	0.040	8.293	0.039	5.592	1.042	1.483	1.001	1.112

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8829	0.8645	5.726	6.898	4.539	5.297	1.261	1.302	1.040	1.050
OUTLET	0.8222	0.8508	9.328	7.179	6.401	5.020	1.457	1.430	1.102	1.088

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.5 FLOW SPLIT 1.818

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.8095	21.826	12.718	1.7162	1.1755
S/LINNER	0.9309	8.759	7.319	1.1968	1.0205
S/LOUTER	0.9502	5.234	4.551	1.1499	1.0126
HEAD INNER	0.7748	8.226	5.422	1.5171	1.1290
HEAD OUTER	0.8267	7.120	5.059	1.4073	1.0859

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7575	0.9027	17.835	3.092	9.492	2.498	1.879	1.237	1.260	1.032
S/LINNER	0.9500	0.9284	0.726	5.239	0.656	4.345	1.106	1.120	1.007	1.022
S/LOUTER	0.9517	0.9465	3.603	1.480	3.217	1.211	1.120	1.222	1.009	1.021
HEAD INNER	0.7606	0.9376	8.198	0.025	5.395	0.024	1.520	1.025	1.127	1.000
HEAD OUTER	0.9925	0.8088	0.030	6.726	0.029	4.771	1.029	1.410	1.000	1.085
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8546	0.8331	5.709	6.910	4.485	5.343	1.273	1.293	1.040	1.047
OUTLET	0.6506	0.9364	17.703	3.149	8.931	2.936	1.982	1.073	1.335	1.007

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.5 FLOW SPLIT 2.557

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7614	27.328	12.527	2.1816	1.3205
S/LINNER	0.8804	15.145	12.229	1.2384	1.0320
S/LOUTER	0.9642	3.766	3.238	1.1632	1.0113
HEAD INNER	0.7770	7.631	4.881	1.5632	1.1478
HEAD OUTER	0.8253	7.548	5.378	1.4036	1.0840

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6651	0.9421	25.023	1.786	10.510	1.562	2.381	1.143	1.503	1.013
S/LINNER	0.9505	0.8714	0.719	9.407	0.602	7.582	1.193	1.208	1.017	1.031
S/LOUTER	0.9427	0.9714	1.511	2.047	1.251	1.804	1.208	1.135	1.021	1.008
HEAD INNER	0.7634	0.9686	7.559	0.063	4.815	0.059	1.570	1.067	1.151	1.003
HEAD OUTER	0.9888	0.8173	0.022	7.120	0.022	5.067	1.023	1.405	1.000	1.084

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

INLET	0.8301	0.8904	5.401	7.177	4.249	5.544	1.271	1.295	1.033	1.046
OUTLET	0.5065	0.9490	23.894	2.612	9.066	2.683	2.635	0.973	1.688	0.994

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.8 FLOW SPLIT 0.707

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7412	29.648	15.367	1.9294	1.2846
S/LINNER	0.8447	19.671	15.109	1.3019	1.0496
S/LOUTER	0.9527	4.975	4.383	1.1351	1.0104
HEAD INNER	0.8074	8.397	5.763	1.4572	1.1047
HEAD OUTER	0.7378	11.325	7.047	1.6072	1.1682

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8439	0.6784	6.782	17.712	4.839	8.154	1.401	2.172	1.082	1.426
S/LINNER	0.8227	0.9269	17.716	1.274	13.461	1.075	1.316	1.093	1.050	1.021
S/LOUTER	0.9559	0.9416	3.573	1.273	3.268	1.012	1.093	1.258	1.006	1.026
HEAD INNER	0.7974	0.9819	8.355	0.036	5.722	0.035	1.460	1.037	1.105	1.001
HEAD OUTER	0.9663	0.7267	0.068	10.651	0.063	6.608	1.072	1.612	1.004	1.167
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9110	0.8225	5.487	7.118	4.682	5.173	1.172	1.376	1.023	1.065
OUTLET	0.8822	0.6022	6.686	17.804	5.060	7.978	1.321	2.232	1.058	1.480

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.8 FLOW SPLIT 0.968

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7425	29.498	16.117	1.8302	1.2552
S/LINNER	0.8688	16.621	13.171	1.2619	1.0394
S/LOUTER	0.9383	6.483	5.750	1.1275	1.0104
HEAD INNER	0.7700	10.026	6.392	1.5685	1.1507
HEAD OUTER	0.7440	11.600	7.445	1.5581	1.1417

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7902	0.7067	10.296	14.873	6.460	7.480	1.594	1.988	1.155	1.337
S/LINNER	0.8495	0.9409	15.041	1.030	11.851	0.861	1.269	1.118	1.038	1.020
S/LOUTER	0.9372	0.9432	5.366	1.014	4.798	0.863	1.118	1.174	1.009	1.017
HEAD INNER	0.7572	0.9944	10.013	0.011	6.379	0.011	1.570	1.011	1.150	1.000
HEAD OUTER	0.9868	0.7328	0.026	10.922	0.026	7.001	1.027	1.560	1.001	1.137

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.9017	0.8440	5.301	7.284	4.554	5.281	1.164	1.379	1.022	1.068
OUTLET	0.8101	0.6330	10.155	14.993	6.471	7.469	1.569	2.007	1.142	1.355

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.8 FLOW SPLIT 1.003

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7474	28.935	16.080	1.7994	1.2428
S/LINNER	0.8813	15.036	12.291	1.2233	1.0289
S/LOUTER	0.9561	6.721	5.828	1.1532	1.0142
HEAD INNER	0.7517	11.421	7.021	1.6266	1.1758
HEAD OUTER	0.7488	11.381	7.324	1.5539	1.1411

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7874	0.7162	10.678	14.142	6.577	7.361	1.624	1.921	1.166	1.305
S/LINNER	0.8641	0.9456	13.582	0.948	11.035	0.819	1.231	1.149	1.028	1.014
S/LOUTER	0.9335	0.9458	5.538	1.073	4.818	0.916	1.149	1.171	1.014	1.016
HEAD INNER	0.7386	0.9933	11.405	0.013	7.006	0.013	1.628	1.014	1.175	1.000
HEAD OUTER	0.9852	0.7379	0.030	10.712	0.029	6.885	1.031	1.556	1.001	1.138

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8912	0.8552	5.802	6.829	4.548	5.290	1.276	1.291	1.042	1.047
OUTLET	0.8052	0.6966	10.390	14.385	6.582	7.353	1.579	1.956	1.149	1.326

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.8 FLOW SPLIT 1.786

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7466	29.022	14.614	1.9859	1.2905
S/LINNER	0.9598	7.625	6.251	1.2198	1.0217
S/LOUTER	0.9583	4.377	3.809	1.1491	1.0112
HEAD INNER	0.7656	9.110	5.974	1.5250	1.1312
HEAD OUTER	0.7884	10.486	6.940	1.5110	1.1258

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6842	0.8166	19.124	7.667	7.985	5.135	2.395	1.493	1.482	1.115
S/LINNER	0.9591	0.9373	0.594	4.585	0.541	3.723	1.097	1.125	1.006	1.024
S/LOUTER	0.9604	0.9528	3.042	1.212	2.703	1.004	1.125	1.208	1.009	1.018
HEAD INNER	0.7509	0.9974	9.105	0.005	5.968	0.005	1.526	1.005	1.126	1.000
HEAD OUTER	0.9896	0.7300	0.021	9.826	0.020	6.497	1.021	1.512	1.000	1.126
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8660	0.8763	5.355	7.239	4.503	5.326	1.189	1.359	1.021	1.060
OUTLET	0.6107	0.8498	19.193	7.593	7.839	5.250	2.448	1.446	1.577	1.095

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 0.8 FLOW SPLIT 2.197

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7370	30.124	14.265	2.1117	1.3330
S/LINNER	0.8740	15.961	12.829	1.2442	1.0334
S/LOUTER	0.9728	2.859	2.451	1.1662	1.0092
HEAD INNER	0.7763	8.171	5.573	1.4661	1.1049
HEAD OUTER	0.7967	10.076	6.838	1.4628	1.1060

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6609	0.8377	22.121	6.199	8.640	4.357	2.560	1.423	1.570	1.089
S/LINNER	0.9144	0.8669	1.614	9.355	1.237	7.559	1.305	1.130	1.042	1.030
S/LOUTER	0.9534	0.9307	1.418	1.307	1.255	1.086	1.130	1.204	1.010	1.008
HEAD INNER	0.7621	0.9388	8.146	0.022	5.548	0.022	1.468	1.023	1.100	1.000
HEAD OUTER	0.9878	0.7386	0.024	9.438	0.024	6.445	1.025	1.464	1.000	1.105
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8387	0.8891	5.658	6.949	4.377	5.436	1.293	1.278	1.042	1.044
OUTLET	0.5443	0.8782	22.008	6.254	8.203	4.699	2.683	1.331	1.745	1.060

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 1.5 FLOW SPLIT 0.664

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7209	31.970	16.230	1.9697	1.3166
S/LINNER	0.8328	21.174	15.804	1.3398	1.0621
S/LOUTER	0.9468	5.592	4.862	1.1501	1.0126
HEAD INNER	0.7404	14.505	8.494	1.7077	1.2116
HEAD OUTER	0.7139	12.356	7.565	1.6333	1.1726

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7951	0.6696	9.592	17.333	6.082	7.861	1.577	2.205	1.148	1.450
S/LINNER	0.8068	0.9183	18.756	1.577	13.806	1.303	1.359	1.108	1.063	1.026
S/LOUTER	0.9477	0.9427	4.464	1.024	4.028	0.757	1.108	1.352	1.007	1.035
HEAD INNER	0.7289	0.9908	14.482	0.018	8.471	0.018	1.710	1.019	1.213	1.000
HEAD OUTER	0.9738	0.7013	0.052	11.641	0.050	7.111	1.055	1.637	1.002	1.167
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9090	0.8230	5.732	6.900	4.717	5.145	1.215	1.341	1.030	1.054
OUTLET	0.8401	0.5939	9.436	17.475	6.319	7.671	1.493	2.278	1.112	1.512

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 1.5 FLOW SPLIT 1.065

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7288	31.069	16.294	1.9068	1.2929
S/LINNER	0.9090	11.527	9.739	1.1836	1.0206
S/LOUTER	0.9277	7.596	6.479	1.1724	1.0175
HEAD INNER	0.7113	14.691	8.240	1.7829	1.2512
HEAD OUTER	0.7558	11.067	7.140	1.5500	1.1407

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7389	0.7209	13.111	13.910	7.113	7.111	1.843	1.956	1.263	1.317
S/LINNER	0.9001	0.9422	9.981	1.008	8.460	0.834	1.180	1.141	1.019	1.021
S/LOUTER	0.9276	0.9283	6.185	1.280	5.423	0.959	1.141	1.336	1.012	1.040
HEAD INNER	0.6973	0.9914	14.671	0.017	8.220	0.017	1.785	1.018	1.251	1.000
HEAD OUTER	0.9878	0.7450	0.024	10.420	0.024	6.715	1.025	1.552	1.000	1.138
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8980	0.8494	5.272	7.311	4.544	5.290	1.160	1.382	1.021	1.068
OUTLET	0.7573	0.7036	12.987	14.016	7.116	7.107	1.825	1.972	1.247	1.332

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 1.5 FLOW SPLIT 1.751

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7206	32.008	16.033	1.9963	1.3254
S/LINNER	0.8989	12.802	10.431	1.2274	1.0297
S/LOUTER	0.9585	4.360	3.653	1.1938	1.0151
HEAD INNER	0.7229	12.079	7.218	1.6735	1.1982
HEAD OUTER	0.7467	13.638	8.279	1.6473	1.1845

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6937	0.7484	17.841	10.974	7.946	6.265	2.245	1.752	1.433	1.226
S/LINNER	0.9529	0.8931	0.584	7.967	0.527	6.458	1.108	1.175	1.008	1.031
S/LOUTER	0.9618	0.9530	2.526	1.665	2.150	1.363	1.175	1.221	1.013	1.019
HEAD INNER	0.7074	0.9962	12.070	0.008	7.209	0.007	1.674	1.008	1.193	1.000
HEAD OUTER	0.9893	0.7375	0.021	12.719	0.021	7.714	1.022	1.649	1.000	1.184
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8495	0.8373	6.134	6.518	4.503	5.332	1.362	1.223	1.061	1.034
OUTLET	0.6272	0.7386	17.946	10.875	7.866	6.329	2.281	1.718	1.500	1.198

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO2. DUMP GAP 1.5 FLOW SPLIT 2.283

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7219	31.862	15.691	2.0306	1.3333
S/LINNER	0.8438	19.782	14.822	1.3346	1.0584
S/LOUTER	0.9472	5.549	4.667	1.1890	1.0172
HEAD INNER	0.7517	10.232	6.760	1.5136	1.1200
HEAD OUTER	0.7688	12.942	8.076	1.6024	1.1627

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6691	0.7310	20.039	9.158	8.466	5.596	2.367	1.636	1.503	1.173
S/LINNER	0.9200	0.8371	0.821	12.364	0.665	9.231	1.235	1.174	1.030	1.059
S/LOUTER	0.9457	0.9477	1.432	3.737	1.220	3.129	1.174	1.194	1.016	1.017
HEAD INNER	0.7384	0.9744	10.172	0.051	6.703	0.048	1.517	1.054	1.115	1.002
HEAD OUTER	0.9942	0.7514	0.023	12.037	0.023	7.504	1.021	1.604	1.000	1.163
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8466	0.8848	5.330	7.254	4.377	5.433	1.218	1.335	1.023	1.054
OUTLET	0.5537	0.8321	20.136	9.029	8.039	5.934	2.505	1.522	1.640	1.125

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.4 FLOW SPLIT 0.694

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.7558	28.598	14.087	2.0300	1.3040
S/LINNER	0.8445	19.692	15.031	2.0300	1.0530
S/LOUTER	0.9413	6.166	5.445	1.1325	1.0107
HEAD INNER	0.8696	4.463	3.496	1.2765	1.0436
HEAD OUTER	0.5335	29.130	10.346	2.8155	1.9087

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.9589	0.6772	1.342	20.313	1.216	9.595	1.104	2.118	1.007	1.408
S/LINNER	0.8241	0.9209	17.577	1.379	13.263	1.153	1.325	1.132	1.055	1.023
S/LOUTER	0.9414	0.9408	5.259	0.823	4.647	0.723	1.132	1.138	1.010	1.012
HEAD INNER	0.8623	0.9719	4.399	0.056	3.436	0.053	1.280	1.059	1.044	1.002
HEAD OUTER	0.9649	0.5039	0.141	26.808	0.127	9.450	1.110	2.837	1.007	1.955
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9075	0.8269	5.726	6.904	4.682	5.175	1.223	1.334	1.031	1.053
OUTLET	0.9646	0.5756	1.919	19.888	1.819	9.142	1.055	2.175	1.003	1.427

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.4 FLOW SPLIT 0.964

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.8074	22.555	14.344	1.5724	1.1403
S/LINNER	0.8598	17.755	13.719	1.5724	1.0488
S/LOUTER	0.9546	6.870	6.056	1.1343	1.0114
HEAD INNER	0.7915	7.617	5.030	1.5145	1.1268
HEAD OUTER	0.8135	7.661	5.343	1.4336	1.0962

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8818	0.7627	5.184	12.946	4.104	7.632	1.263	1.696	1.040	1.200
S/LINNER	0.8339	0.9352	15.655	1.371	11.958	1.148	1.309	1.115	1.050	1.021
S/LOUTER	0.9379	0.9116	5.707	1.055	5.117	0.852	1.115	1.238	1.008	1.032
HEAD INNER	0.7792	0.9753	7.561	0.049	4.976	0.047	1.519	1.052	1.129	1.002
HEAD OUTER	0.9804	0.7955	0.079	7.192	0.074	4.998	1.058	1.439	1.002	1.096

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8976	0.8480	5.542	7.065	4.554	5.283	1.217	1.337	1.031	1.058
OUTLET	0.8976	0.7324	5.457	12.729	4.207	7.558	1.297	1.684	1.044	1.200

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.4 FLOW SPLIT 1.389

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	15.839	10.771	1.2848	1.0456
OUTLET	0.8061	22.698	14.921	1.5212	1.1269
S/LINNER	0.9[illegible]82	10.365	8.289	1.5212	1.0306
S/LOUTER	0.9303	7.326	6.198	1.1819	1.0191
HEAD INNER	0.7953	7.477	5.054	1.4796	1.1142
HEAD OUTER	0.7955	8.835	6.035	1.4639	1.1072

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7717	0.8398	13.198	7.080	8.273	4.955	1.595	1.429	1.160	1.091
S/LINNER	0.9393	0.8963	3.905	4.213	3.350	3.221	1.166	1.151	1.015	1.045
S/LOUTER	0.9341	0.9159	5.490	1.666	4.771	1.295	1.151	1.286	1.014	1.039
HEAD INNER	0.7826	0.9857	7.445	0.028	5.022	0.028	1.482	1.029	1.114	1.001
HEAD OUTER	0.9795	0.7865	0.041	8.320	0.039	5.673	1.043	1.467	1.001	1.107
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8756	0.8707	5.676	6.944	4.539	5.297	1.251	1.311	1.037	1.052
OUTLET	0.7500	0.8535	13.312	6.982	8.250	4.973	1.614	1.404	1.166	1.085

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.4 FLOW SPLIT 2.049

	UBAR/UMAX		DELTASTAR %		THETA %		SHAPE FACTOR		ALPHA	
	MEAN		MEAN		MEAN		MEAN		MEAN	
INLET	0.8728		13.839		10.771		1.2848		1.0456	
OUTLET	0.7751		26.336		13.789		1.9100		1.2505	
S/LINNER	0.9059		11.918		9.283		1.9100		1.0388	
S/LOUTER	0.9595		4.252		3.455		1.2307		1.0177	
HEAD INNER	0.7924		7.583		5.231		1.4496		1.1003	
HEAD OUTER	0.8520		7.258		5.171		1.4038		1.0844	
	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6911	0.9102	22.307	3.003	10.503	2.449	2.124	1.226	1.398	1.050
S/LINNER	0.8676	0.9093	1.360	6.885	0.702	5.595	1.937	1.224	1.152	1.050
S/LOUTER	0.9637	0.9511	2.555	1.543	2.086	1.242	1.224	1.242	1.015	1.022
HEAD INNER	0.7801	0.9775	7.531	0.045	5.182	0.043	1.453	1.047	1.099	1.002
HEAD OUTER	0.9679	0.8181	0.129	6.745	0.117	4.781	1.098	1.411	1.006	1.087
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8543	0.8820	5.370	7.221	4.439	5.380	1.210	1.342	1.023	1.056
OUTLET	0.5833	0.9266	21.564	3.576	9.971	2.844	2.163	1.257	1.426	1.050

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.7 FLOW SPLIT 0.596

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6697	38.675	15.843	2.4411	1.5166
S/LINNER	0.8566	18.166	13.795	2.4411	1.0544
S/LOUTER	0.9534	4.899	4.277	1.1455	1.0115
HEAD INNER	0.8765	8.000	5.723	1.3980	1.0814
HEAD OUTER	0.7064	13.929	8.300	1.6782	1.1975

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.8460	0.5805	6.057	24.309	4.435	8.505	1.366	2.859	1.071	1.829
S/LINNER	0.8555	0.9578	15.499	1.739	11.694	1.370	1.325	1.111	1.055	1.036
S/LOUTER	0.9588	0.9300	3.522	1.250	3.171	1.004	1.111	1.245	1.007	1.029
HEAD INNER	0.8072	0.9795	7.952	0.041	5.676	0.039	1.401	1.043	1.081	1.001
HEAD OUTER	0.9580	0.6955	0.084	13.032	0.077	7.740	1.092	1.684	1.006	1.195

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

INLET	0.9105	0.8563	5.834	6.813	4.800	5.074	1.215	1.343	1.030	1.053
OUTLET	0.8827	0.4791	6.486	23.999	4.999	8.079	1.297	2.971	1.050	1.972

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.7 FLOW SPLIT 1.017

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6964	35.552	16.990	2.0925	1.3824
S/LINNER	0.8835	14.764	11.677	2.0925	1.0390
S/LOUTER	0.9434	5.948	5.243	1.1345	1.0111
HEAD INNER	0.7660	10.201	6.522	1.5643	1.1481
HEAD OUTER	0.7637	11.207	7.198	1.5569	1.1449

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7557	0.6562	11.558	17.882	6.708	7.664	1.723	2.333	1.214	1.515
S/LINNER	0.8733	0.9129	11.959	1.842	9.648	1.325	1.238	1.134	1.031	1.054
S/LOUTER	0.9440	0.9402	5.051	0.852	4.437	0.732	1.134	1.138	1.011	1.012
HEAD INNER	0.7547	0.9648	10.119	0.070	6.445	0.065	1.570	1.075	1.149	1.004
HEAD OUTER	0.9652	0.7549	0.070	10.483	0.065	6.715	1.075	1.561	1.004	1.146
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8975	0.8490	5.425	7.172	4.548	5.287	1.193	1.356	1.027	1.062
OUTLET	0.7842	0.6267	11.105	18.254	6.720	7.646	1.653	2.387	1.183	1.565

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.7 FLOW SPLIT 1.611

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	15.839	10.771	1.2848	1.0456
OUTLET	0.6980	35.365	17.200	2.0560	1.3669
S/LINNER	0.9479	6.597	4.823	2.0560	1.0505
S/LOUTER	0.9488	5.378	4.508	1.1930	1.0173
HEAD INNER	0.7410	11.295	6.968	1.6207	1.1759
HEAD OUTER	0.7775	11.500	7.209	1.5951	1.1600

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6607	0.7373	20.413	11.142	8.796	6.265	2.321	1.779	1.502	1.242
S/LINNER	0.9689	0.9420	0.864	3.738	0.749	2.657	1.154	1.188	1.010	1.036
S/LOUTER	0.9512	0.9408	3.958	1.288	3.332	1.066	1.188	1.208	1.016	1.022
HEAD INNER	0.7276	0.9758	11.236	0.048	6.913	0.046	1.625	1.051	1.173	1.002
HEAD OUTER	0.9854	0.7601	0.059	10.715	0.056	6.699	1.048	1.599	1.001	1.165

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8664	0.8768	5.662	6.957	4.526	5.308	1.251	1.311	1.036	1.051
OUTLET	0.6099	0.7676	20.206	11.309	8.731	6.310	2.314	1.792	1.535	1.232

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 0.7 FLOW SPLIT 2.298

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6669	57.005	15.213	2.5638	1.5410
S/LINNER	0.8736	16.007	11.868	2.5638	1.0530
S/LOUTER	0.9629	5.900	3.366	1.1587	1.0113
HEAD INNER	0.7945	7.987	5.545	1.4404	1.0971
HEAD OUTER	0.7884	11.591	7.036	1.6189	1.1648

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8706	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.5884	0.7778	28.225	8.034	8.234	5.202	3.428	1.544	1.968	1.140
S/LINNER	0.9484	0.8655	0.659	10.021	0.540	7.386	1.183	1.215	1.017	1.055
S/LOUTER	0.9574	0.9714	1.649	2.045	1.358	1.822	1.215	1.121	1.023	1.007
HEAD INNER	0.7836	0.9667	7.910	0.066	5.473	0.062	1.445	1.071	1.097	1.004
HEAD OUTER	0.9872	0.7634	0.077	10.568	0.074	6.505	1.038	1.625	1.001	1.172

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8230	0.8059	5.899	6.720	4.339	5.470	1.360	1.228	1.059	1.055
OUTLET	0.4639	0.8205	27.281	8.792	7.874	5.465	3.465	1.609	2.253	1.144

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 1.2 FLOW SPLIT 0.691

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6536	40.555	16.779	2.4171	1.5393
S/LINNER	0.7940	26.099	16.882	2.4171	1.1582
S/LOUTER	0.9479	5.472	4.740	1.1544	1.0131
HEAD INNER	0.8175	8.396	5.972	1.4059	1.0846
HEAD OUTER	0.6886	17.429	9.729	1.7914	1.2597

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7876	0.5767	9.079	23.459	5.672	8.278	1.601	2.834	1.159	1.833
S/LINNER	0.7659	0.8755	22.059	2.634	14.330	1.664	1.539	1.118	1.137	1.103
S/LOUTER	0.9524	0.9220	4.276	1.085	3.824	0.831	1,118	1.306	1.008	1.041
HEAD INNER	0.8092	0.9701	8.325	0.060	5.906	0.056	1.410	1.063	1.085	1.003
HEAD OUTER	0.9699	0.6669	0.121	16.128	0.108	8.965	1.117	1.799	1.007	1.255
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.9028	0.8331	6.049	6.614	4.682	5.177	1.292	1.278	1.042	1.038
OUTLET	0.8220	0.5965	9.738	22.943	5.886	8.126	1.654	2.823	1.155	1.883

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 1.2 FLOW SPLIT 0.955

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6631	39.448	17.611	2.2400	1.4670
S/LINNER	0.8288	21.689	15.956	2.2400	1.0688
S/LOUTER	0.9412	6.184	5.523	1.1197	1.0091
HEAD INNER	0.7392	12.631	7.635	1.6543	1.1886
HEAD OUTER	0.7880	9.608	6.508	1.4765	1.1121

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.7378	0.6103	12.706	19.931	7.011	7.900	1.812	2.523	1.253	1.646
S/LINNER	0.8127	0.8889	18.718	1.937	13.826	1.389	1.354	1.116	1.064	1.066
S/LOUTER	0.9401	0.9475	5.380	0.730	4.820	0.639	1.116	1.143	1.009	1.012
HEAD INNER	0.7141	0.9689	12.482	0.123	7.504	0.109	1.664	1.129	1.187	1.008
HEAD OUTER	0.9786	0.7694	0.086	8.986	0.079	6.067	1.088	1.481	1.004	1.110
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8890	0.8569	6.069	6.588	4.554	5.287	1.333	1.246	1.052	1.036
OUTLET	0.7499	0.5936	13.085	19.623	7.019	7.901	1.864	2.484	1.263	1.643

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 1.2 FLOW SPLIT 1.703

	UBAR/UMAX	DELTASTAR %	THETA %	SHAPE FACTOR	ALPHA
	MEAN	MEAN	MEAN	MEAN	MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6715	38.460	17.343	2.2176	1.4525
S/LINNER	0.9445	7.032	6.063	2.2176	1.0143
S/LOUTER	0.9582	4.391	3.814	1.1513	1.0114
HEAD INNER	0.7530	10.178	6.728	1.5129	1.1209
HEAD OUTER	0.7517	15.017	8.749	1.7163	1.2172

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
INLET	0.8796	0.8675	5.765	6.865	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6446	0.6978	20.544	13.352	8.523	6.575	2.410	2.031	1.556	1.361
S/LINNER	0.9362	0.9454	9.790	4.070	0.636	3.539	1.242	1.140	1.027	1.015
S/LOUTER	0.9615	0.9439	3.287	1.002	2.883	0.844	1.140	1.186	1.010	1.018
HEAD INNER	0.7400	0.9712	10.111	0.057	6.664	0.054	1.517	1.061	1.116	1.005
HEAD OUTER	0.9712	0.7228	0.058	13.939	0.054	8.102	1.061	1.720	1.003	1.219

SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)

INLET	0.8668	0.8762	5.481	7.123	4.516	5.315	1.214	1.340	1.027	1.057
OUTLET	0.5823	0.7390	20.917	13.033	8.438	6.644	2.479	1.962	1.634	1.308

BOUNDARY LAYER PARAMETERS FOR DIFFUSER NO3. DUMP GAP 1.2 FLOW SPLIT 2.288

	UBAR/UMAX MEAN	DELTASTAR % MEAN	THETA % MEAN	SHAPE FACTOR MEAN	ALPHA MEAN
INLET	0.8728	13.839	10.771	1.2848	1.0456
OUTLET	0.6685	38.816	16.804	2.3099	1.4827
S/LINNER	0.8611	17.589	12.826	2.3099	1.0612
S/LOUTER	0.9467	5.597	4.712	1.1878	1.0170
HEAD INNER	0.7871	8.275	5.769	1.4344	1.0923
HEAD OUTER	0.7394	15.709	8.959	1.7535	1.2321

	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER	INNER	OUTER
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT MAX VEL)										
INLET	0.8796	0.8675	5.765	6.863	4.539	5.297	1.270	1.296	1.041	1.049
OUTLET	0.6098	0.7358	24.409	10.737	8.840	5.936	2.761	1.809	1.736	1.254
S/LINNER	0.9107	0.8561	0.835	10.925	0.618	7.961	1.351	1.344	1.047	1.061
S/LOUTER	0.9065	0.9552	1.699	3.538	1.264	3.129	1.344	1.131	1.050	1.010
HEAD INNER	0.7761	0.9613	8.185	0.077	5.686	0.071	1.440	1.084	1.091	1.005
HEAD OUTER	0.9838	0.7216	0.045	14.522	0.043	8.266	1.045	1.757	1.001	1.236
SPLIT BOUNDARY LAYER PARAMETERS (ABOUT S/S)										
INLET	0.8335	0.8909	5.673	6.931	4.339	5.469	1.308	1.267	1.045	1.042
OUTLET	0.4837	0.7939	24.477	10.631	8.372	6.293	2.924	1.689	1.929	1.188