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FULL-COVERAGE FILM COOLING HEAT TRANSFER STUDY - SUMMARY OF DATA FOR NORMAL-HOLE INJECTION AND 30° SLANT-HOLE INJECTION

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16. Abstract

Heat transfer to a full-coverage film-cooled turbulent boundary layer over a flat surface was studied. The surface consisted of a discrete hole test section containing 11 rows of holes spaced 5 diameters apart in a staggered array and an instrumented recovery region. Ten diameter spacing was also studied by plugging appropriate holes. Two test sections were used, one having holes normal to the surface and the other having holes angled 30° to the surface in the downstream direction. Stanton number data were obtained both in the full-coverage region and in the downstream recovery region for a range of blowing ratios, or mass flux ratios, from 0 to 1.3. Initial conditions at the upstream edge of the blowing region were varied from 500 to 5000 for momentum thickness Reynolds number and from 100 to 1800 for enthalpy thickness Reynolds number. The range of Reynolds numbers based on hole diameter and mainstream velocity was 6000 to 22 000. Initial boundary layer thicknesses ranged from 0.5 to 2.0 hole diameters. Air was used as the working fluid. The data were taken for the secondary injection temperature equal to the wall temperature and also equal to the mainstream temperature. Superposition was then used to obtain Stanton number as a continuous function of the injectant temperature. The heat transfer coefficient was defined on the basis of a mainstream-to-wall temperature difference. This definition permits direct comparison of performance between film cooling and transpiration cooling.

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by

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SUMMARY

Results are presented from a study of heat transfer to a full-coverage, film-cooled turbulent boundary layer over a flat surface. The surface used in the investigation consists of a discrete hole test section, containing eleven rows of holes, and an instrumented afterplate. Two test sections were used in the study, with the first containing an array of staggered holes, each 1.03 cm diameter, with all hole axes perpendicular to the surface, and the second test section similar in design but with all holes inclined 30° to the surface in the downstream direction. The center-to-center hole spacing for each test section is 5 diameters (and 10 diameters, achieved by modifying the 5-diameter array).

Stanton number data were obtained for a range of blowing ratios, or mass flux ratios, from 0 to 1.3. Initial conditions at the upstream edge of the blowing region were varied from 500 to 5000 for momentum thickness Reynolds number and from 100 to 1800 for enthalpy thickness Reynolds num-

ber. The range of Reynolds numbers based on hole diameter and mainstream velocity were 6000 to 22,000. Initial boundary layer thicknesses ranged from 0.5 to 2.0 hole diameters. Air was used as the working fluid with the mainstream velocity varied from 9 m/s to 33 m/s. The data were taken for secondary injection temperature equal to the wall temperature, and also equal to the mainstream temperature. By use of linear superposition theory, the data may be used to obtain Stanton number as a continuous function of the injectant temperature. The heat transfer coefficient is defined based upon a mainstream-to-wall temperature difference. This definition permits direct comparison of performance between film cooling and transpiration cooling.

The data show the effects on Stanton number of the turbulence level augmentation in the boundary layer due to jet-boundary layer interaction; the effective sink or source effect of gas injected at a temperature different from the wall temperature; and jet penetration into the boundary layer. Slant-hole injection is found to yield a considerably lower Stan-Stanton number than does normal-hole injection. For slant hole injection with injectant temperature equal to wall temperature, a blowing ratio of 0.4 produced a minimum in Stanton number throughout the blowing region. The wider hole spacing of 10 diameters causes a large reduction in the film-cooling effect for both normal-hole and slant-hole injection.

INTRODUCTION

High temperature gases passing over a surface may result in a large heat flux to the surface. One means of reducing the thermal loading, and thus surface temperature, is to employ film cooling over the surface by injecting coolant into the surface boundary layer through multiple rows of closely-spaced, discrete holes located in the surface. The holes form an array over the entire surface, and the cooling scheme is called full-coverage film cooling [1]. The method has direct application to gas turbine blade cooling where increasingly-higher turbine inlet gas temperatures will require film cooling over the whole blade surface.

Full-coverage film cooling is concerned with heat transfer between the holes in an array, where the heat transfer coefficient is strongly affected by upstream injection. The conventional film cooling rate equation, $\dot{q}'' = h_o(T_{aw} - T_o)$, is usually applied to full-coverage film cooling, with h^* , the heat transfer coefficient in the presence of blowing, replacing h_o (without blowing). T_{aw} is the adiabatic wall temperature, usually expressed in terms of a film effectiveness, $\eta = (T_{aw} - T_\infty)/(T_2 - T_\infty)$, where T_2 , T_o , and T_∞ refer to the injectant, surface, and mainstream temperatures respectively.

LeBrocq, Launder, and Pridden [2] studied the effects of hole pattern arrangement, injectant angle, coolant-mainstream density ratio, and blowing rate on η . Two major results of their study were that a staggered hole array yields a higher η than in-line rows of holes, and, likewise, downstream-angled injection yields a higher η than normal-hole injection. Launder and York [3] studied the effects of mainstream acceleration and high mainstream turbulence level on η . Metzger, Takeuchi, and Kuenstler [4] examined h^* and η over a discrete hole array with in-line and staggered patterns of normal-angle holes. Their results indicate that a staggered pattern yields a higher η ; beyond the initial part of the blowing region, η tends towards a constant value; and h^* can be 20 to 25 percent higher than h_o . Mayle and Camarata [5] examined the effects of hole spacing and blowing rate on h^* and η for a full-coverage, film-cooled surface with compound-angle injection. They found that for all spacings considered and for low to moderate blowing rates, η rises quite rapidly near the upstream end of the blowing region, but the rate of increase gradually diminishes with streamwise distance, as if approaching an equilibrium within the film cooling array. Also, their h^* data becomes a constant value downstream of the initial part of the blowing region.

Design of a full-coverage film-cooled turbine blade requires the ability to predict surface heat flux for a given set of mainstream, coolant, and surface temperatures, and predictions, either by integral or differential methods, require a broad, accurate data base to generate data correlations or confirm prediction methods. A major objective of the work presented here has been to provide such a data base. The facility used in the investigation has been designed and fabricated to simulate film-cooled turbine blades.

Four test surfaces were studied, using two discrete-hole test sections. The first test section, hereafter referred to as the normal-hole test section, contains 11 rows of holes forming a staggered hole array. The holes have center-to-center spacing of five hole diameters, with each hole axis normal to the surface. This test surface was reconfigured using plugs to provide a second surface with ten-diameter hole spacings. The second test section, hereafter referred to as the slant-hole test section, contains a similar array of staggered holes with each hole axis inclined 30° to the surface in the downstream direction. This test surface was likewise reconfigured to form the fourth surface with ten-diameter hole spacings. Downstream of the discrete-hole test section is an instrumented afterplate used to study the flow as it recovers from the effects of discrete hole injection.

In these studies, air was used as the working fluid, with low velocities, and small temperature differences. For each test surface, the mainstream-flow momentum thickness Reynolds number at the upstream edge of the blowing region was varied in two ways to study the effects of mainstream velocity and boundary layer thickness on surface heat transfer, and the enthalpy thickness Reynolds number was varied to single out the effect of the thermal boundary layer on surface heat transfer. Data were taken with two values of injectant temperature for each blowing rate. Local heat transfer coefficients, averaged over the surface area associated with one hole, are presented for the full coverage region, and local heat transfer coefficients for the downstream recovery region.

SYMBOLS

A	heat transfer area (see Fig. 1 and Fig. 2)
A_h	hole area (see Fig. 1 and Fig. 2)
C_f	skin friction, $\tau_o = C_f/2\ \rho_\infty U_\infty^2$
D	diameter of injection tube

F	blowing fraction, $\rho_2U_2/\rho_\infty U_\infty$, averaged over area A
h	heat transfer coefficient, $\dot{q}''/(T_\infty-T_o)$, with film cooling
h^*	heat transfer coefficient, $\dot{q}''/(T_{aw}-T_o)$, with film cooling
h_o	heat transfer coefficient, $\dot{q}''/(T_\infty-T_o)$, without film cooling
H	shape parameter, δ_1/δ_2
k	thermal conductivity
L	flow direction pitch (see Fig. 1)
M	blowing parameter, $\rho_2U_2/\rho_\infty U_\infty$, averaged over A_h
P	lateral pitch (see Fig. 1 and Fig. 2)
Pr	Prandtl number, $\mu c/k$
$\dot{q}''$	wall heat flux
Re_x	x-Reynolds number, $(x-x_{vo})U_\infty/\nu$
Re_{δ_2}	momentum thickness Reynolds number, δ_2U_∞/ν
Re_{Δ_2}	enthalpy thickness Reynolds number, Δ_2U_∞/ν
St	Stanton number, $h/(\rho_\infty U_\infty c)$
St_o	Stanton number at $M = 0$
T	temperature
T^+	non-dimensional temperature, $(T-T_\infty)\sqrt{C_f/2}\,/\{(T_o-T_\infty)St\}$
U	velocity
U_τ	friction velocity, $\sqrt{\tau_o/\rho}$
U^+	non-dimensional velocity, U/U_τ
x	distance along surface from nozzle exit
y	distance normal to surface
y^+	non-dimensional distance, $U_\tau y/\nu$
α	hole angle

δ	boundary layer thickness where $U/U_\infty = 0.99$
δ_1	displacement thickness, $\int_0^\infty (1 - \frac{\rho U}{\rho_\infty U_\infty})dy$
δ_2	momentum thickness, $\int_0^\infty \frac{\rho U}{\rho_\infty U_\infty} (1 - \frac{U}{U_\infty})dy$
Δ_2	enthalpy thickness, $\int_0^\infty \frac{\rho U}{\rho_\infty U_\infty} (\frac{T - T_\infty}{T_o - T_\infty})dy$
η	adiabatic wall effectiveness, $(T_{aw}-T_\infty)/(T_2-T_\infty)$
θ	temperature parameter, $(T_2-T_\infty)/(T_o-T_\infty)$
κ	von Karman constant, 0.41
μ	dynamic viscosity
ν	kinematic viscosity
ρ	density
τ_o	wall shear stress

Subscripts

2	injectant value
o	wall value (except with h_o or St_o)
∞	mainstream value (mainstream recovery value, if temperature)
aw	adiabatic wall value
vo	virtual origin

HEAT TRANSFER WITH FULL-COVERAGE FILM COOLING

Heat transfer between a surface and the fluid flowing over the surface in the presence of film cooling is affected by the hydrodynamic and thermal characteristics of the injectant and mainstream flow, the coolant hole pattern and injection angle, and thermal boundary conditions. Hydrodynamic characteristics are described by the injectant-to-mainstream mass flux ratio, averaged over the area of one hole,

$$M = \frac{\rho_2 U_2}{\rho_\infty U_\infty} , \tag{1a}$$

or averaged over the area associated with one hole,

$$F = M\frac{\pi D^2}{4P^2} . \tag{1b}$$

The thermal characteristics of the injectant and mainstream flow can be linked to the surface thermal boundary condition, as given by

$$\theta = \frac{T_2 - T_\infty}{T_o - T_\infty} \tag{2}$$

Other useful parameters are the ratios Δ_2/D , for heat transfer, and δ_2/D and $(\nu/U_\infty)/D$, for injectant-mainstream interaction. The cooling configuration is described by the hole spacing-to-hole diameter and hole axis angle, P/D and α . Other factors affecting the heat flux, but not presently considered, include surface rotation and curvature, high mainstream turbulence, high Mach number mainstream flow, and property variations due to large temperature differences.

There are two important regions on a film-cooled surface: the full-coverage region, and the downstream recovery region; but the major concern here is in the full-coverage region, i.e. the area around the holes. Geometrically, transpiration cooling differs from full-coverage film cooling in that with the latter the holes are usually large relative to the boundary layer thickness, and the injectant temperature can be different from the surface temperature. From a heat transfer standpoint, with full-coverage film cooling, as the blowing rate increases, the surface heat flux decreases to a minimum and then increases, while with transpiration the heat flux continuously decreases. It is nevertheless suggested that full-coverage film cooling be treated using the variables found useful in transpiration cooling since, physically, transpiration is a limiting case of discrete hole, full-coverage film cooling.

To approach full-coverage film cooling from the viewpoint of transpiration cooling, the concepts of h^* and T_{aw}, developed for the recovery region, downstream of a slot or row of holes, are abandoned, and the following heat transfer convective rate equation is employed,

$$\dot{q}'' = h(T_\infty - T_o) \tag{3}$$

where the heat flux is the local average over the area around the hole, as shown in Fig. 1 for the normal hole pattern and in Fig. 2 for the slant hole pattern. Thus, for the full-coverage film cooling study considered herein, the heat transfer coefficient, or Stanton number, may be described by

$$St = St\left(M,\ \theta\ ,\ \frac{\delta_2}{D}\ ,\ \frac{\Delta_2}{D}\ ,\ \frac{\nu/U_\infty}{D}\ ,\ \frac{P}{D}\ ,\ \alpha\ ,\ P_r\ ,\ \cdots\right) \tag{4}$$

Of particular interest to the film-cooling designer is the evaluation of heat flux with and without film cooling, $\dot{q}''/q''_o$ (at the same location), to assess the film-cooling performance. Mainstream gas temperature, coolant exit temperature, and a required surface temperature are given, thus fixing the θ parameter (θ is larger than unity, Colladay [6]). To optimize blade cooling design, computation of $\dot{q}''(\theta)/\dot{q}''_o$ as a function of all other parameters is required. By defining the convective rate equation for full-coverage film cooling using equation (3), the film cooling performance can be simplified to a comparison of h/h_o or St/St_o data, at the design point θ, as a function of the various parameters (because both heat fluxes are defined based on the <u>same</u> temperature driving potential).

To obtain Stanton number as a function of θ, experiments using two injectant temperatures are required to provide two fundamental data sets. Then, appealing to the linearity of the constant property thermal energy equation, superposition is applied, e.g. Metzger [4] or Choe [7,8], to determine h or St as a continuous function of θ,

$$St(\theta) = St(\theta = 0) - \theta\times[St(\theta = 0) - St(\theta = 1)] \quad (5)$$

EXPERIMENTAL HEAT-TRANSFER FACILITY

A closed-loop wind tunnel was designed and built specifically for the purpose of studying full-coverage film cooling over a flat surface. The tunnel floor consists of a preplate, a discrete-hole test section, and an instrumented afterplate, with all plates capable of being heated to a temperature of 10°C to 20°C above the main stream air temperature. A secondary air loop of the wind tunnel delivers air, capable of being heated or cooled, to the discrete-hole test section. The following sections describe the facility, hereafter referred to as the Discrete Hole

Rig, the discrete-hole test sections, the preplate and afterplate, and the qualification tests for the facility. Documentation of the facility is contained in [8].

Description of the Facility

Five main systems comprise the Discrete Hole Rig: the primary air-supply system, the secondary air-supply system, the test-plate electrical power system, the preplate and afterplate heating system, and the heat-exchanger cooling system. Figure 3 shows a flow schematic of the wind tunnel.

The main air loop of the wind tunnel is driven by a blower which delivers air through a duct to an oblique header that turns the flow into a heat exchanger. The flow passes through the exchanger, a screen pack, and a contraction nozzle, and enters the tunnel duct. Flow exits the tunnel duct into a plenum box that serves to supply both the secondary blower and the primary blower. The heat exchanger serves to keep the tunnel air temperature uniform at near-ambient temperature. The screen pack and contraction nozzle serve to reduce non-uniformities in the mean flow velocity and reduce the scale of the turbulence fluctuations. The flow is accelerated through the nozzle and exits with a velocity profile flat to within about 0.15 percent and a turbulence intensity of about 0.5 percent. Flow velocity can be varied in steps from 7 m/s to 35 m/s by changing pulleys and belts on the blower and drive. Constant flow velocity is maintained over the test section and afterplate by adjustment of the flexible tunnel top wall.

The secondary air loop of the wind tunnel is driven by a blower which delivers air through a flexible duct to an oblique header that turns the flow into a heat exchanger. The flow passes through the exchanger, a bank of finned heaters, a screen pack, and into a plenum box which contains an 11-pipe manifold, with each pipe containing a valve for flow-rate control. The flow is delivered via 11 individual ducts to alternating 8-pipe/9-pipe manifolds which deliver the flow to the test section. Pre-set valves located in each manifold distribute the flow equally among the delivery pipes. The heat exchanger serves to keep the secondary air at or near tunnel main stream temperature for $\theta \simeq 0$ test runs, and the heaters serve to elevate the air temperature to that of the discrete-hole test plates for the $\theta \simeq 1$ test runs. Secondary air flow rate is metered for each of the 11 channels, using hot-wire anemometers built into the individual delivery ducts and calibrated in place. Flow rate in each channel can be varied to yield a range of blowing ratios, M, from 0 to 1.5, over the range of main stream velocities given above.

The test-plate electrical power system delivers heater power to each of the 12 plates that comprise the discrete-hole test section. Power is supplied from a 120-volt AC, 1ϕ source that is passed through two voltage stabilizers and delivered to 12 step-down variable transformers. The power delivered to each plate is metered by inserting a wattmeter into the circuit, and the indicated reading is corrected for calibration and circuit-insertion losses in the data-reduction programs.

The preplate and afterplate heating system is a closed-loop hot-water heating system which operates with continuous water flow. Recirculated water passes through two water heaters in series and is delivered to an inlet manifold, where it passes through rectangular tubes that comprise the plates. From the exit manifold, the water is returned to the recirculation pump. Water temperature is held constant using a set-point proportional controller connected to one of the heaters. The rectangular tubes are coupled to the feeder manifolds with individual tubes, and this feature allows the preplate to be disconnected from the manifolds during unheated starting-length heat-transfer tests.

The heat exchanger cooling system is a semi-closed loop system which continuously circulates water from an insulated holding tank. Flow rate is maintained high enough to ensure uniform temperature of the main stream air being cooled. The secondary air heat exchanger is plumbed into the system with valves that allow cooling water to bypass the exchanger for $\theta \simeq 1$ test runs. Temperature control of the cooling water is achieved by dumping a portion of the recirculated water and resupplying the dumped water from a cold-water supply main.

Discrete-Hole Test Sections

The normal-hole injection test section and the slant-hole injection test section share the same basic design features. Each is primarily composed of a frame and 12 plates, with 94 tubes total attached to 11 of the plates. The frame is an aluminum structure 55 cm wide, 5 cm wider than the tunnel floor span, and is 61 cm long in the flow direction. Copper plates, 0.6 cm deep by 46 cm wide by 5 cm long in the flow direction, form the test surface, with the first plate blank and the 11 downstream plates containing alternating rows of 9 holes and 8 holes. Each hole is 1.03 cm diameter and spaced on 5 diameter centers, both spanwise and in the flow direction, to form a staggered hole array. Heater wires are glued into two grooves machined into the back side of each plate. The two resistance wires for each plate are bussed across one end with copper wire, and the wire leads are connected to the test-plate electrical power system. The plates are supported by phenolic stand-offs along their spans to minimize conduction heat loss from the plates. The stand-offs also serve to isolate the plates from each other. Four iron-constantan thermocouples are installed from the back side of each plate, with each thermocouple located midway between two adjacent holes.

The normal-hole test section utilizes a frame machined from an aluminum casting. The frame has two side rails, connected by alternating deep and shallow ribs with grooves machined into them to accept the plate stand-offs. The deep ribs contain water passages to heat the frame to minimize heat loss by conduction. Delivery tubes for the normal-hole test section plates are glued into recesses cut into the back side of each plate. The tubes are PVC pipe, each 45 cm long. Three of the delivery tubes attached to each plate contain iron-constant thermocouples installed 10 cm upstream of the tube exit to measure secondary air temperature. The test-section cavity is loosely packed with insulating material to reduce heat loss from the back sides of the plates. Figure 4 shows a cross-sectional view of the normal-hole test section.

The slant-hole test section utilizes a frame composed of aluminum side rails and linen phenolic cross ribs. The ribs have steps machined into them to support the plates, and they contain clearance holes for the angled tubes. The side rails contain water passages for heating to minimize conduction heat loss from the plates. Bottom plates with tube clearance holes close the frame cavity. Heating water tubes lie on the top sides of the bottom plates, parallel to the cross ribs, and serve to regulate the cavity temperature. Delivery tubes for the slant-hole test section are glued into recesses cut into the back side of each plate. The tubes, made of linen phenolic, extend back at a 30° angle to the plate surface for a distance of 35 cm and are turned in the downward direction by elbows. One tube in each plate contains an iron-constantan thermocouple located upstream of the point where the tube enters the frame cavity. The cavity is loosely packed with insulating material to minimize heat loss from the back sides of the plates. Figure 5 shows a cross-sectional view of the slant-hole test section.

Preplate and Afterplate

The preplate and afterplate of the test surface are identical in design and are formed by 48 cells. Each cell, nominally 2.6 cm long in the flow direction, is based on a rectangular copper tube, insulated on the back, through which hot water can be passed for plate temperature control. The cells are isolated from each other with thin spacers across the cell span. The plates are arranged such that the downstream 0.6 m of the preplate and the upstream 0.6 m of the afterplate are used for plate heating with the remaining tubes dry. Each tube is covered over with 3 lamina of thin bakelite and topped by a thin plate of copper. The center of the middle laminate has been removed and replaced by a 5 cm wide heat flux transducer. An iron-constantan thermocouple is installed in a groove in the back side of each thin copper plate and directly above the transducer. The preplate and afterplate are isolated from the test section with balsa wood, and the three surfaces are leveled to form a continuous, smooth surface. The heat flux transducers in the afterplate were calibrated and used to obtain Stanton number data for the flow over the afterplate as it recovers from the blowing region effect.

Qualification Tests

The Discrete Hole Rig was tested for reliability before being approved for use. The tests can be summarized as follows: tests of the main stream conditions, tests of the plate energy loss modes, and energy balance tests of the data-reduction program.

The two-dimensionality of the tunnel was examined by measuring the boundary layer momentum thickness at five locations across the span over the midpoint of the test section guard plate. The thicknesses were found to be uniform within $\pm 2\%$ for the case of $M = 0$ at 16.8 m/s tunnel velocity. For the low momentum thickness Reynolds number the flow was accelerated over the preplate and recovered to zero pressure gradient conditions over the test section and afterplate. For this case, with $M = 0$ and a tunnel velocity of 11.7 m/s, the thicknesses were uniform within $\pm 10\%$. The turbulence level of the main stream potential core over the guard plate was 0.4% for $M = 0$ and was found to increase to 0.6% at $M = 0.6$.

The Stanton number is determined by measuring plate power input, corrected for wattmeter calibration and insertion losses, and subtracting off all heat losses from the plate other than by convection. The energy loss modes were modeled in the data-reduction program as: radiation from the plate top surface, conduction between the plate and frame, conduction between adjacent plates (or end plates and preplate and afterplate), and convection between the plate hole area and the secondary air. Loss constants for conduction and plate-secondary air convection were determined experimentally for each plate. Constants were experimentally obtained for correction of the secondary air temperature to account for energy addition between the measurement point and tube exit.

Energy balance closure tests were conducted to evaluate the models used to calculate the energy loss modes. In these tests the tunnel was operated without main stream cooling, and the plate power was adjusted to bring each plate up to the main stream temperature. Cold water was used to cool the frame of the test section, resulting in a plate-to-frame temperature potential of about 10°C. Tests were conducted for $M = 0$, 0.45, and 0.70 for the normal-hole test section, and $M = 0.41$ and $M = 0.59$ for the slant-hole test section with $\theta \simeq 1$. The thermal boundary conditions of these tests were designed primarily to check the conduction loss constants. Similar tests with $\theta = 0$ were not possible due to the configuration of the heat exchanger cooling system. Analysis of these results, along with an uncertainty analysis, indicate error bands on the data should be ± 2.5 percent for $\theta = 1$ and ± 5 percent for $\theta = 0$. The much larger error band for $\theta = 0$ reflects uncertainty in the plate-secondary air loss constants.

EXPERIMENTAL DATA

Studies have been conducted using normal-hole injection and slant-hole injection into a turbulent boundary layer over a flat surface. Heat transfer data for both studies are presented for the blowing region and the downstream recovery region. Data are also presented for the case of transition occurring over the normal-hole injection test section.

Description of the Data

Data were acquired for both studies using a similar range of flow initial conditions and blowing ratios.

The primary investigation was a study of the effects of M on Stanton number. The investigation was carried out with $P/D = 5$ and $U_\infty = 16.8$ m/s, to give an initial condition of $Re_{\delta_2} \simeq 2800$ (in all data reported, <u>initial conditions</u> are those of the boundary layer over the mid-point of the upstream guard plate). To obtain the dependence of Stanton number on U_∞ for nominally the same boundary layer thickness, data were also taken at $Re_{\delta_2} \simeq 1900$ and 5000. In these tests an unheated starting length was used to give a well-defined initial thermal condition (recall only the downstream half of the preplate could be heated). Data with a heated starting length were taken to determine the influence on Stanton number of a developed thermal boundary layer. In all of the above mentioned data, the boundary layer was tripped near the nozzle exit, resulting in an initial $\delta/D \simeq 1.9$ to 2.4 for all Re_{δ_2}. To determine the influence of a thin boundary layer on Stanton number, data were taken with $Re_{\delta_2} \simeq 500$, obtained by accelerating the main stream flow over the heated preplate, tripping the boundary layer, and recovering it to flat plate conditions at the guard plate to produce $\delta/D \simeq 0.5$. The effects of hole spacing were examined by reconfiguring the hole array to $P/D = 10$ using plugs. Figures 6 and 7 show a summary of the experimental data for normal-hole injection and slant-hole injection, respectively.

All data were taken with $\theta \simeq 0$, 1 at each M and adjusted to $\theta = 0$, 1 using linear superposition, equation (5). To adjust the recovery region data, the average value of θ for rows 11 and 12 in the blowing region were used. Before all data were adjusted using superposition, a variable property correction was applied by multiplying the Stanton number by $(T_o/T_\infty)^{0.4}$. A tabular form of the unadjusted data may be found in [8] for the normal hole study and in [9] for the slant hole study.

Stanton number data are plotted versus x-Reynolds number and enthalpy thickness Reynolds number. The x-Reynolds number is a convenient nondimensional x coordinate that shows Stanton number as a function of M and θ for the same x location over the test surface. Virtual origins in the x-Reynolds number are computed from a relation between momentum thickness and distance, x , derived by integrating the momentum integral equation with a one-seventh power velocity profile assumption. Enthalpy thickness Reynolds number is computed using Δ_2 obtained from integration of the energy integral equation,

$$\frac{d\Delta_2}{dx} = St + F \times \theta \quad . \tag{6}$$

The interval of integration is from the midpoint of the upstream plate to the midpoint of its adjacent downstream plate to define the enthalpy thickness at that downstream plate. In all plots the first 12 points, left to right, are data taken on the test section plates, with the remaining data taken on the recovery region portion of the afterplate. Reference lines shown on x-Reynolds number and enthalpy thickness Reynolds number graphs are accepted correlations for two-dimensional equilibrium flow over a smooth plate with constant wall temperature and hydrodynamic and thermal boundary layers beginning at the same point. A tabular form of all plotted data are given in the APPENDIX.

Normal Injection Data

Effects of blowing ratio, M, on Stanton number for $p/d = 5$ were studied with $U_\infty = 16.8$ m/s and initial conditions of $Re_{\delta_2} \simeq 2800$ and $Re_{\delta_2} \simeq 100$ (unheated starting length). A velocity profile at the guard plate midpoint is shown in Fig. 8. At this point the hydrodynamic boundary layer is approximately two hole diameters. The profile exhibits log region and wake characteristics of a turbulent boundary layer velocity profile.

Figure 9 shows Stanton number versus x-Reynolds number for upstream initial conditions of $Re_{\delta_2} \simeq 2800$ and unheated starting length. Solid symbols represent $\theta = 1$, $(T_2 = T_o)$ and open symbols represent $\theta = 0$, $(T_2 = T_\infty)$. For the $\theta = 1$ graph, several points may be observed. The lowest blowing ratio, $M = 0.1$, causes the largest reduction in Stanton number in the initial part of the blowing region. Increasing M causes the Stanton number to rise in the initial region, with data for $M \geq 0.52$ lying above the no-blowing data. In the downstream blowing region (after plate 8), high values of M cause the Stanton number to go below the low-blowing data. This effect continues into the recovery region with Stanton number reaching a minimum about 8 hole diameters downstream of the last blowing plate. It is noted that the decrease in Stanton number in the blowing region is far less than what is obtainable with transpiration cooling for similar blowing conditions.

Data for $\theta = 0$ are also shown in Fig. 9. Addition of low enthalpy fluid into the boundary layer, along with increased turbulent mixing, cause the Stanton number data to rise above the $M = 0$ data, with the highest value of M causing the greatest increase. In the recovery region the Stanton number immediately drops with the highest blowing rate causing the largest reduction in Stanton number throughout the recovery region. Figure 10 shows the data plotted versus enthalpy thickness Reynolds number for $\theta = 0$. All blowing data are shown to lie above the no-blowing reference line, and appear to decrease with similar slopes over the last several plates in the blown region. Figure 11 shows the data for $\theta = 1$. The $M = 0.1$ Stanton number data lie below the $M = 0$ data in a manner characteristic of transpiration-blown surfaces. For $M = 0.2$, the data coincide with the reference line, and all Stanton number data for larger M lie above the reference line. In the downstream recovery region, for both graphs, the data appear to be returning to the equilibrium line, indicating recovery to a two-dimensional flow.

Effects of hole spacing-to-hole diameter on Stanton number were studied for $U_\infty \simeq 16.8$ m/s and initial conditions of $Re_{\delta_2} \simeq 2800$ and $Re_{\Delta_2} \simeq 100$, and $p/d = 10$. The surface was obtained by plugging alternate holes and alternate rows of the 5-diameter surface with cork. The plugs were trimmed to be flush with the plate, forming a smooth surface. Figure 12 shows turbulent velocity profiles at the beginning and end of the test section for $M = 0$. Both curves plot together in the log region with different wakes because of boundary layer growth in the downstream direction.

Stanton number data for initial conditions of $Re_{\delta_2} \simeq 2800$ and unheated starting length are shown in Fig. 13. The results are similar to those for $p/d = 5$ but with a diminshed effect. The x-Reynolds plot shows $M = 0.17$ produces a minimum over the entire blowing range for $\theta = 1$, and $M = 0.98$ blowing cause Stanton numbers to lie above the $M = 0$ values over the entire blowing range. In the recovery region, for the enthalpy thickness Reynolds number plot, the Stanton number immediately begins recovering towards the two-dimensional equilibrium line. Fluctuation in the Stanton number is a result of alternate rows of holes being plugged.

Effects of momentum thickness (or boundary layer thickness) change on Stanton number were studied for a main stream velocity of about 11.7 m/s and initial conditions of $Re_{\delta_2} \simeq 550$ and $Re_{\Delta_2} \simeq 590$, and $p/d =$ 5, 10. Typical velocity and temperature profiles at guard plate midpoint are shown in Figs. 14 and 15. Hydrodynamic and thermal boundary layer thicknesses at this point are each about 0.5 hole diameters.

Figures 16 and 17 show Stanton number data for initial conditions of $Re_{\delta_2} \simeq 550$ and $Re_{\Delta_2} \simeq 590$, and $p/d = 5, 10$. Influence of the holes in the plates is seen in the $M = 0$ curve for $p/d = 5$ lying above the two-dimensional equilibrium line. Behavior of the Stanton number data for $p/d = 5, 10$ is similar to the data for high momentum thickness, both in the blowing region and in the recovery region.

Enthalpy thickness effects on Stanton number for $p/d = 5$ were studied with a main stream velocity of $U_\infty = 16.8$ m/s and initial conditions of $Re_{\delta_2} \simeq 2800$ and $Re_{\Delta_2} \simeq 1820$. A velocity and temperature profile at the guard plate midpoint is shown in Figs. 18 and 19, and Stanton number data are shown in Fig. 20.

Main stream velocity effects on Stanton number for $p/d = 5$ were studied with velocities of about 9.8 m/s and 35 m/s. For the low velocity the initial conditions were $Re_{\delta_2} \simeq 1700$ and $Re_{\Delta_2} \simeq 70$. Figure 21 shows a velocity profile at the midpoint of the guard plate, and Figs. 22 through 24 show the data. For the high velocity, the initial conditions were $Re_{\delta_2} \simeq 5300$ and $Re_{\Delta_2} \simeq 170$. Figure 25 shows a velocity profile at the guard plate midpoint, and Fig. 26 shows Stanton number data. A blowing ratio of nominally 0.2 was used in the main stream velocity and enthalpy thickness studies. These data can be used along with the previously discussed data to formulate integral correlations to the data and to provide a data base for testing differential prediction schemes.

Figure 27 shows Stanton number versus x-Reynolds number and enthalpy thickness Reynolds number for $M = 0$, 0.2 and $p/d = 5$. The boundary layer is not tripped and has a momentum thickness Reynolds number of approximately 500 . The effects of natural transition over the test section due to the jets are seen in the x-Reynolds number plot. By plate 4 (the third blown plate), the Stanton number has risen to a maximum and begins to decrease, indicating transition to turbulent flow. For the $M = 0$ curve, the sharp dip downward in the Stanton number commencing with plate 13 (the afterplate) is due to the strong three-dimensionality of the natural transition for no blowing, coupled with the fact that the afterplate heat flux transducers only respond to flow near the tunnel centerline (indicating the centerline flow is still in the transition regime).

Slant-Hole Injection Data

The effects of blowing ratio, M , on Stanton number were studied with $U_\infty = 16.8$ m/s . Two velocity profiles at the guard plate midpoint are shown in Fig. 28 for initial conditions of $Re_{\delta_2} \simeq 2600$, $Re_{\Delta_2} \simeq 100$ ($p/d = 5$) and $Re_{\delta_2} \simeq 2900$, $Re_{\Delta_2} \simeq 100$ ($p/d = 10$). The hydrodynamic boundary layer at this point is approximately two hole diameters. Both profiles are similar and exhibit log region and wake characteristics of turbulent boundary layer velocity profiles.

Figure 29 shows Stanton number for initial conditions of $Re_{\delta_2} \simeq 2700$, $Re_{\Delta_2} \simeq 100$, and $p/d = 5$. The data form a comprehensive set with M varying from 0 to ~ 1.2 in increments of ~ 0.2. For the $\theta = 1$ graph, several points may be observed. In the blowing region the $M = 0.18$ data are a minimum over the first three plates with $M = 0.37$ producing the minimum Stanton number over the rest of the blowing region. Increased values of M in the blowing region cause the Stanton number to rise, with $M = 1.21$ causing the Stanton number to rise above the $M = 0$ curve over most of the blowing region. In the downstream recovery region the Stanton number data appear to immediately rise for $M = 0.18$ and to remain unchanged for $M = 0.37$. For all larger M the Stanton number continues to decrease throughout the recovery region. The decrease in Stanton number in the blowing region is far less than what is obtainable with transpiration cooling for similar blowing conditions.

The $\theta = 0$ data are also shown in Fig. 29. In the blowing region the $M = 0.2$ and 0.4 data have a pattern that is different from the higher blowing ratio data. The $M = 0.20$ curve follows the $M = 0$ curve over the first eight blowing rows before departing, and the $M = 0.40$ curve follows the $M = 0$ curve over the first four blowing plates before departing. All higher values of M cause a departure after data point 2. The unique behavior of the data on plate 2, the first blowing plate, is related to the holes being located near the plate downstream edge. In the downstream blowing region the curves exhibit an asymptotic behavior, indicating a local equilibrium has been established between the surface and the fluid in the near-wall region. In the recovery region the data for $M = 0.2$ and 0.4 immediately dip below the $M = 0$ curve. For $M \geq 0.58$ the Stanton number data decrease much more slowly in the recovery region, and $M \geq 0.93$ cause the data to be above the $M = 0$ curve over the entire recovery region (the last recovery region data taken is ~ 0.6 m downstream of the blowing region).

The same data are also plotted versus enthalpy thickness Reynolds number. Data for $\theta = 0$ are shown in Fig. 30. Most of the data lie above the two-dimensional equilibrium line in the blowing region. For $M \leq 0.4$ the data dip below the reference line in the initial recovery region, and then appear to return toward it. Trends in the data are uncertain for higher blowing ratios. Figure 31 shows the data for $\theta = 1$. The $M = 0$ data approach the reference line and pass slightly above it near the downstream edge of the test section, and the data in the recovery region drop down to follow the reference line. This behavior suggests the discrete holes produce a roughness effect on the Stanton number. The $M = 0.18$ and 0.37 data lie below the two-dimensional equilibrium line in a manner characteristic of transpiration-blown surfaces. Data for $M = 0.52$ lie near the reference line, with all larger values of M lying above the reference line. In the recovery region the data for $M \leq 0.4$ appear to be returning to the reference line. For higher blowing, the data trend is uncertain.

Effects of hole spacing-to-hole diameter in Stanton number were studied for $U_\infty \simeq 16.8$ m/s and initial conditions of $Re_{\delta_2} \simeq 2900$ and $Re_{\Delta_2} \simeq 100$, and $p/d = 10$. The surface was obtained by plugging alternate holes and alternate rows of the 5-diameter surface with plastic putty.

The plugs were trimmed to be flush with the plate, forming a smooth surface.

Stanton number data for initial conditions of $Re_{\delta_2} \simeq 2900$ and unheated starting length are shown in Fig. 32. The results are similar to those for $p/d = 5$ but with a diminished effect. The x-Reynolds plot shows $M = 0.36$ produces a minimum over the entire blowing range for $\theta = 1$, and $M = 0.75$ data lying above the low blowing ratio data. An enthalpy thickness Reynolds number plot of the data is given in Fig. 33. For $\theta = 1$ the $M = 0.36$ data appear to return to the equilibrium line, with the data trend for $M = 0.75$ uncertain. For $\theta = 0$ the data for all M lie above the no-blowing data throughout the recovery region. Fluctuations in the Stanton number are a result of alternate rows of holes being plugged.

Effects of momentum thickness (or boundary layer thickness) change on Stanton number were studied for a main stream velocity of about 11.7 m/s . Typical velocity and temperature profiles at the midpoint of the guard plate are shown in Fig. 34 for initial conditions of $Re_{\delta_2} \simeq 520$, $Re_{\Delta_2} \simeq 490$, and $p/d = 5, 10$. The profiles exhibit outer region similarity, but the inner region differences, plus the shape factor information, indicate the flow is probably still transitional on the guard plate. Hydrodynamic and thermal boundary layer thicknesses at this point are approximately 0.5 hole diameters.

Figures 36 and 37 show Stanton number versus x-Reynolds number and enthalpy thickness Reynolds number for initial conditions of $Re_{\delta_2} \simeq 520$, $Re_{\Delta_2} \simeq 490$, and $p/d = 5$. Data for initial conditions of $Re_{\delta_2} \simeq 520$ and $Re_{\Delta_2} \simeq 490$, and $p/d = 10$ are shown in Figs. 38 and 39. The effect of increased hole spacing is to reduce the Stanton number spread between $\theta = 0$ and $\theta = 1$. $M = 0.4$ produces a minimum in Stanton number in the blowing region. Influence of the holes in the plates is seen in the $M = 0$ data curve for $p/d = 5$ lying above the two-dimensional equilibrium line. The data trend is similar to the high momentum thickness data for $p/d = 5$ and 10 respectively.

The effects of enthalpy thickness on Stanton number for $p/d = 5$ were studied with a main stream velocity of $U_\infty = 16.8$ m/s and initial conditions of $Re_{\delta_2} \simeq 2700$ and $Re_{\Delta_2} \simeq 1800$. Velocity and temperature profiles at the guard plate midpoint are shown in Figs. 40 and 41. Stanton number data are shown in Figs. 42 and 43.

Main stream velocity effects on Stanton number for $p/d = 5$ were studied with velocities of about 9.8 m/s and 34.2 m/s . For the low velocity the initial conditions were $Re_{\delta_2} \simeq 1900$ and $Re_{\Delta_2} \simeq 70$. Figure 44 shows a velocity profile at the midpoint of the guard plate, and Figs. 45 and 46 show the data. For the high velocity the initial conditions were $Re_{\delta_2} \simeq 4800$ and $Re_{\Delta_2} \simeq 160$. Figure 47 shows a velocity profile at the guard plate midpoint, and Figs. 48 and 49 show the Stanton number data. A blowing ratio of nominally 0.4 was used in the main stream velocity and enthalpy thickness studies. These data can be used along with the previously discussed data to formulate integral correlations to the data and to provide a data base for testing differential prediction schemes.

DISCUSSION AND CONCLUSIONS

Linear superposition has been applied to heat transfer with full-coverage film cooling to obtain Stanton number, or surface heat flux, as a continuous function of secondary injection temperature. The superposition requires two fundamental data sets, experimentally obtained for two different injection temperatures. These data sets have been obtained for normal-hole injection and 30° slant-hole injection and are presented in both graphical and tabular form in this report.

For both studies, the primary investigation has been to obtain the variation of Stanton number with blowing ratio for hole spacings of five diameters and ten diameters. A smaller amount of data were also obtained with systematic variation of the initial conditions, upstream of the blowing section. The data should provide a satisfactory base for developing and confirming differential methods for predicting surface temperature and heat flux variation on a full-coverage film-cooled surface.

The conclusions are as follows:

1. 30° slant-hole injection yields a considerably lower Stanton number than does normal injection for similar boundary and initial conditions. This is due primarily to the small degree of penetration of the angled injectant, causing less dilution of the coolant by the main flow and less turbulent mixing due to mainstream-jet interaction.

2. For normal hole injection with injectant temperature equal to wall temperature, low blowing ratios produce a minimum in Stanton number in the initial blowing region. Past the first few rows of holes, however, the lowest Stanton number is achieved with higher blowing ratios. This

effect carries over into the downstream recovery region with the Stanton number continuing to decrease for high values of the blowing ratio.

3. For 30° slant-angle injection with injectant temperature equal to wall temperature, a blowing ratio of 0.4 produces a minimum in Stanton number throughout the blowing region. Higher values of blowing cause the Stanton number to rise in the blowing region, with a blowing ratio greater than 1.0 causing the data to lie above the no-blowing Stanton number in the initial blowing region. In the downstream recovery region, for low blowing ratios the Stanton number immediately begins to rise, and for high blowing ratios the Stanton number continues to decrease.

4. For the geometry considered, a hole spacing of 10 diameters reduces the film-cooling effect for both normal injection and 30° slant-angle injection.

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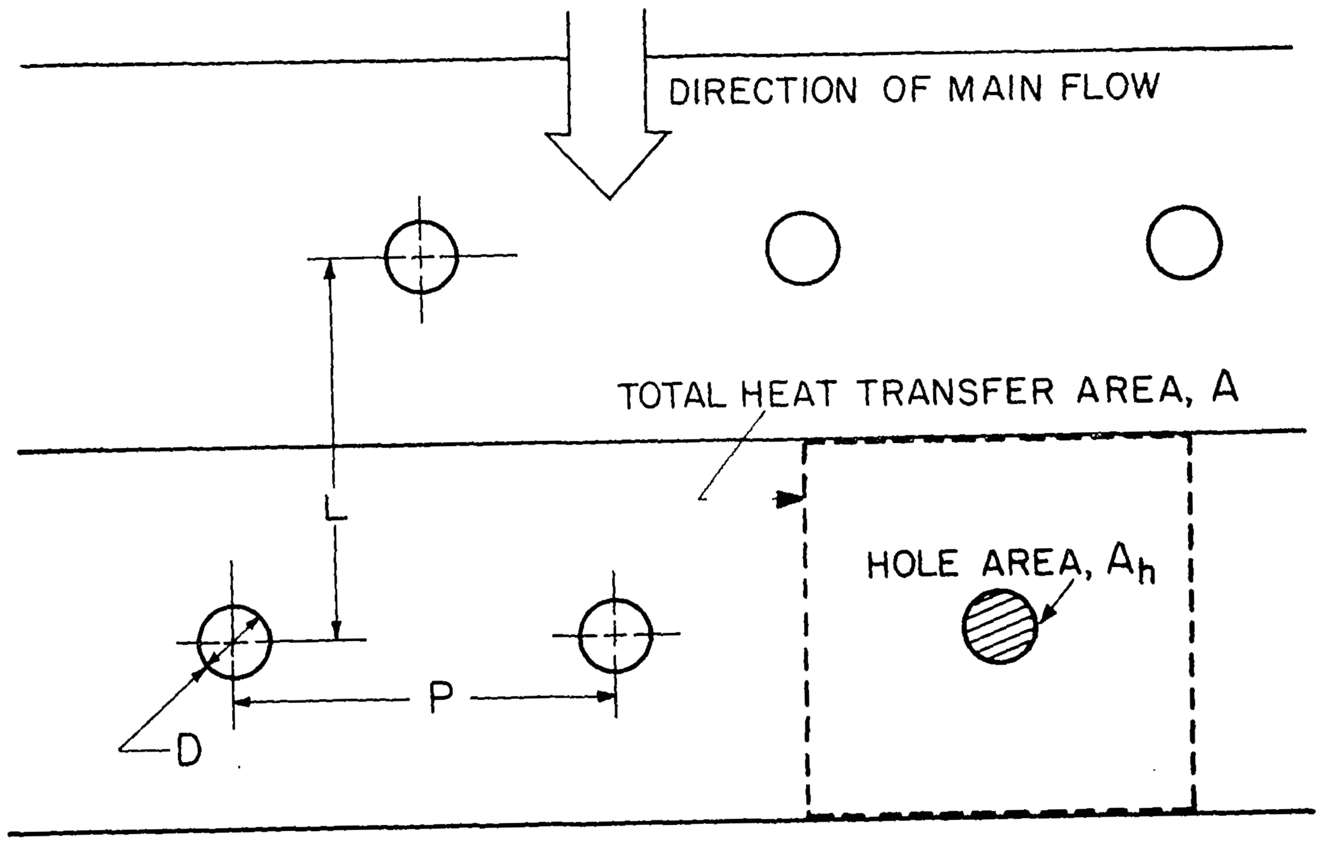

Fig. 1. Hole pattern and heat transfer area for the normal-hole injection study.

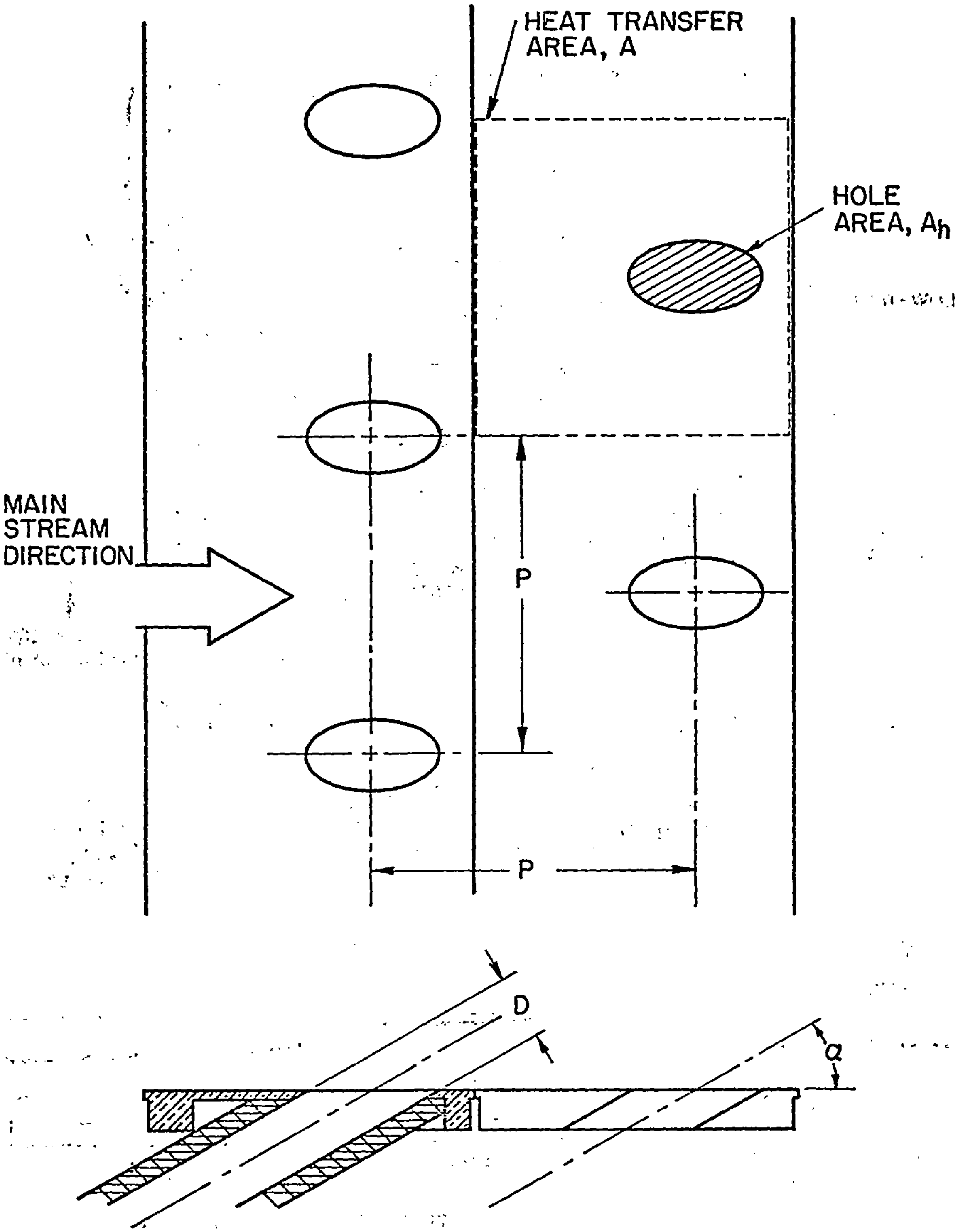

Fig. 2. Hole pattern and heat transfer area for the slant-hole injection study.

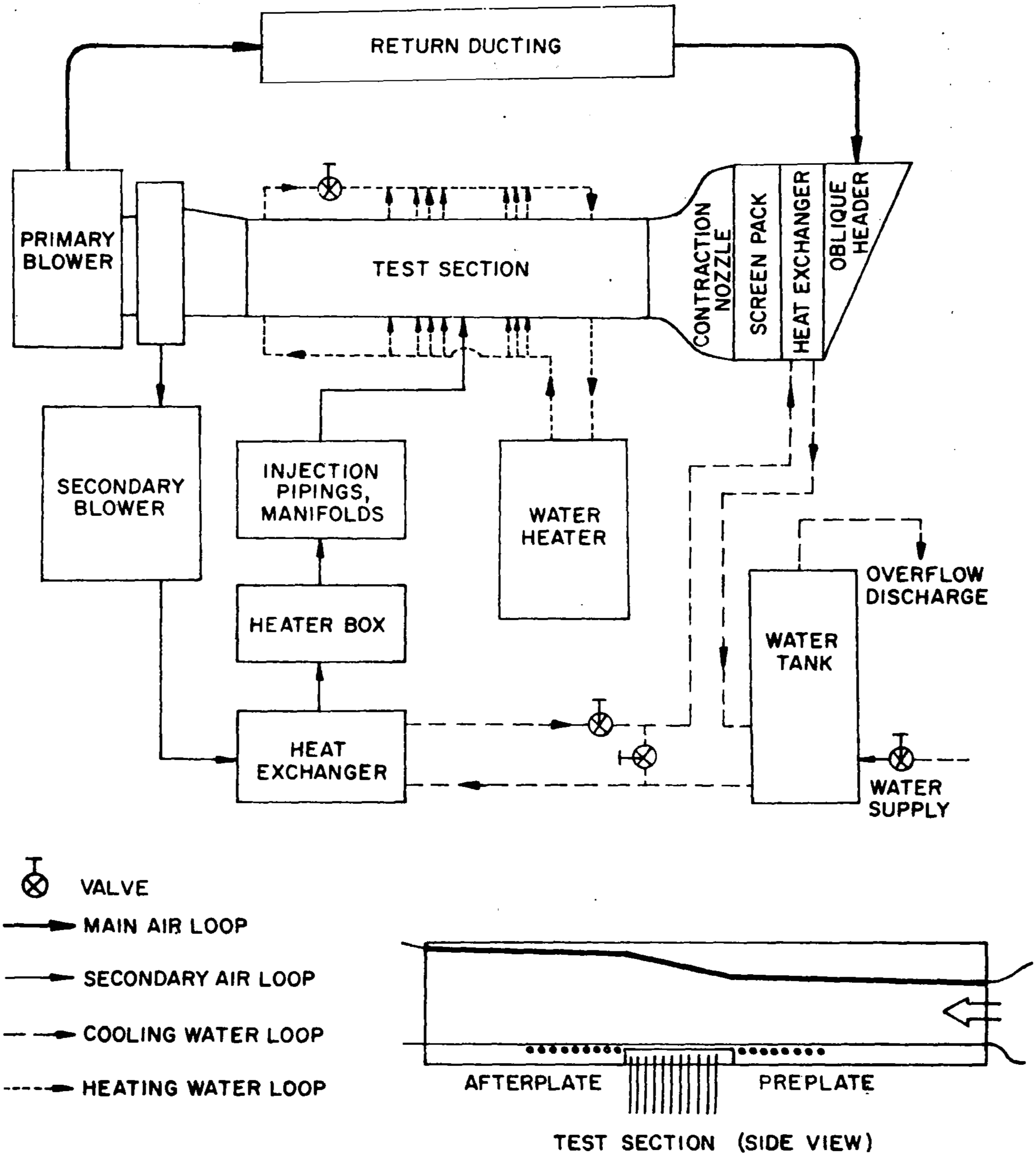

Fig. 3. Flow schematic of the full-coverage film cooling heat transfer facility.

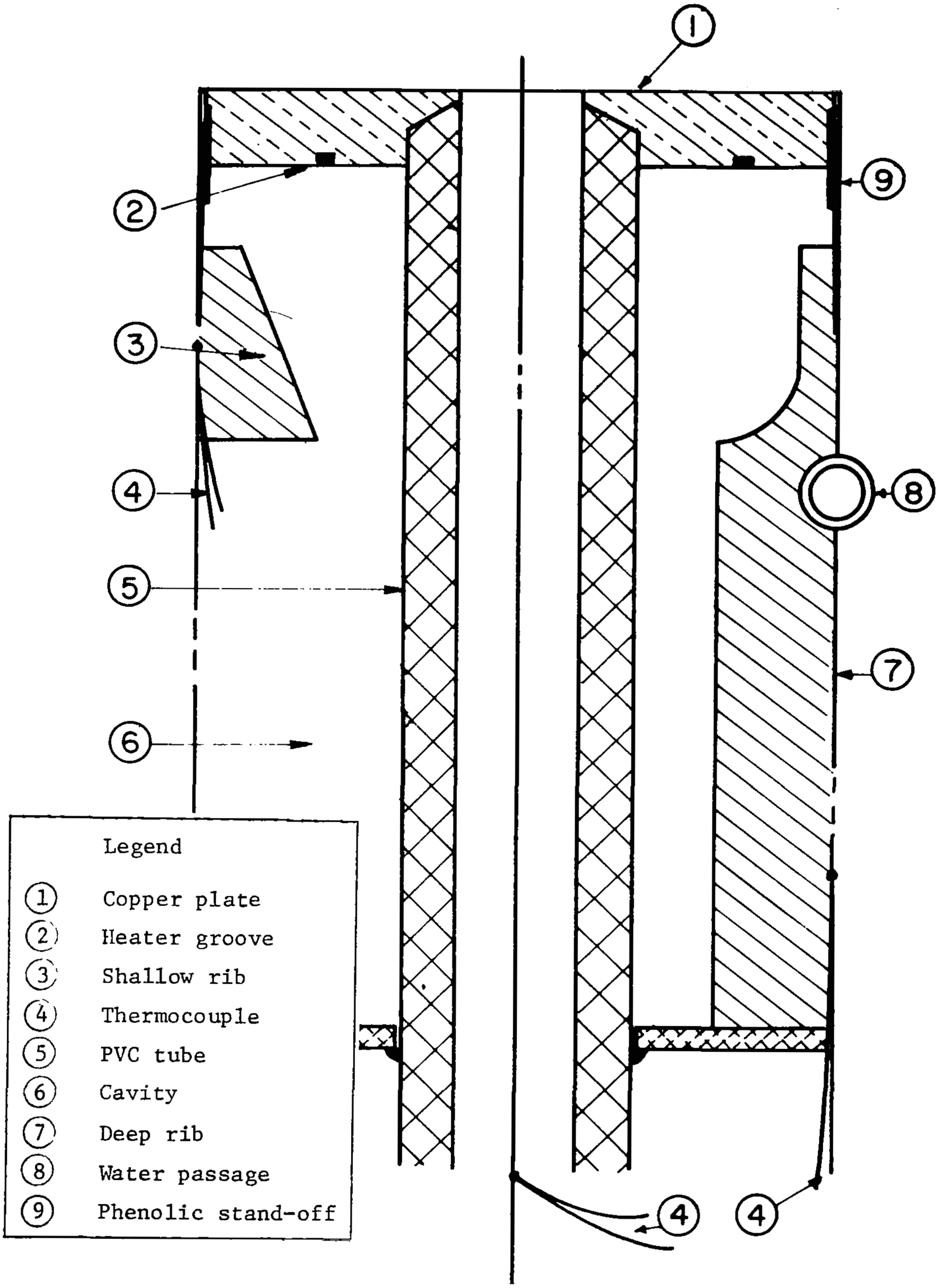

Fig. 4. Cross-sectional view of normal-hole test plate with tube.

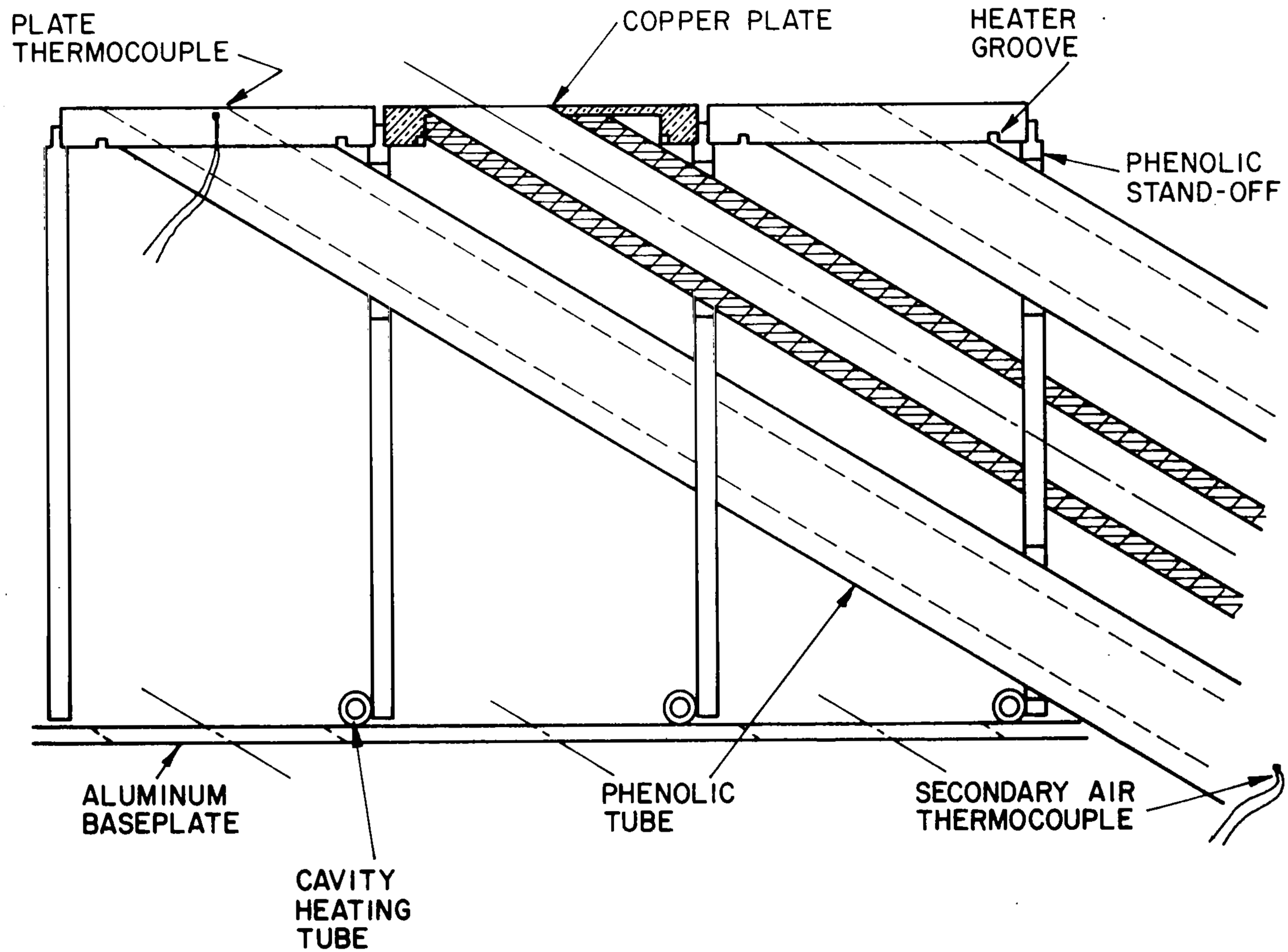

Fig. 5. Cross-sectional view of slant-hole test plates with tubes.

NORMAL INJECTION												
	Unheated Preplate						Partly Heated		Heated Preplate			
									Tripped		Not Tripped	
U_∞, m/s	9.8		16.8		33.6		16.5		11.6		11.6	
Re_{δ_2}	1730		2800		5320		2790		550		516	
Re_{Δ_2}	70		100		170		1820		590		555	
p/d	5	10	5	10	5	10	5	10	5	10	5	10
M = 0.0	X		X	X	X		X		X	X		X
M = 0.1			X									
M = 0.2	X		X	X	X		X		X	X	X	
M = 0.3			X									
M = 0.4			X									
M = 0.5			X	X					X	X		
M = 0.65			X									
M = 0.8	X			X								
M = 1.0	X			X								

Fig. 6. Summary of normal-hole injection data (Re_{δ_2}, Re_{Δ_2} are initial conditions at guard plate midpoint).

30° SLANT-ANGLE INJECTION										
	Unheated Preplate						Partly Heated Preplate		Heated Preplate	
U_∞(m/s)	9.8		16.8		34.2		16.8		11.8	
Re_{δ_2}	1900		2700		4800		2700		515	
Re_{Δ_2}	70		100		160		1800		490	
p/d	5	10	5	10	5	10	5	10	5	10
M = 0	X		X	X	X		X		X	X
M = 0.2			X							
M = 0.4	X		X	X	X		X		X	X
M = 0.6			X							
M = 0.75			X	X					X	X
M = 0.95			X							
M = 1.30			X							

Fig. 7. Summary of slant-hole injection data (Re_{δ_2}, Re_{Δ_2} are initial conditions at guard plate midpoint).

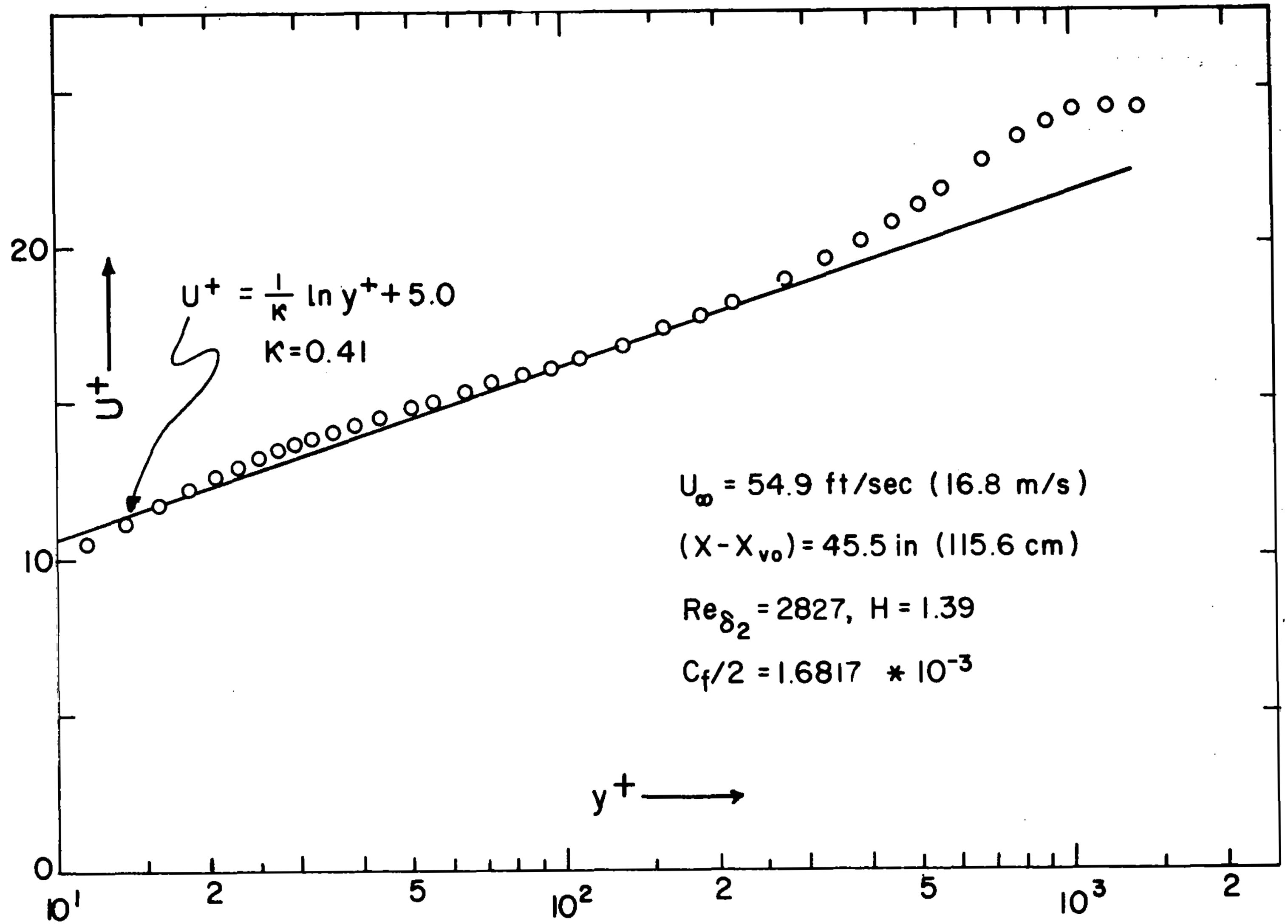

Fig. 8. Velocity profile at guard plate midpoint for Figs. 9 to 11.

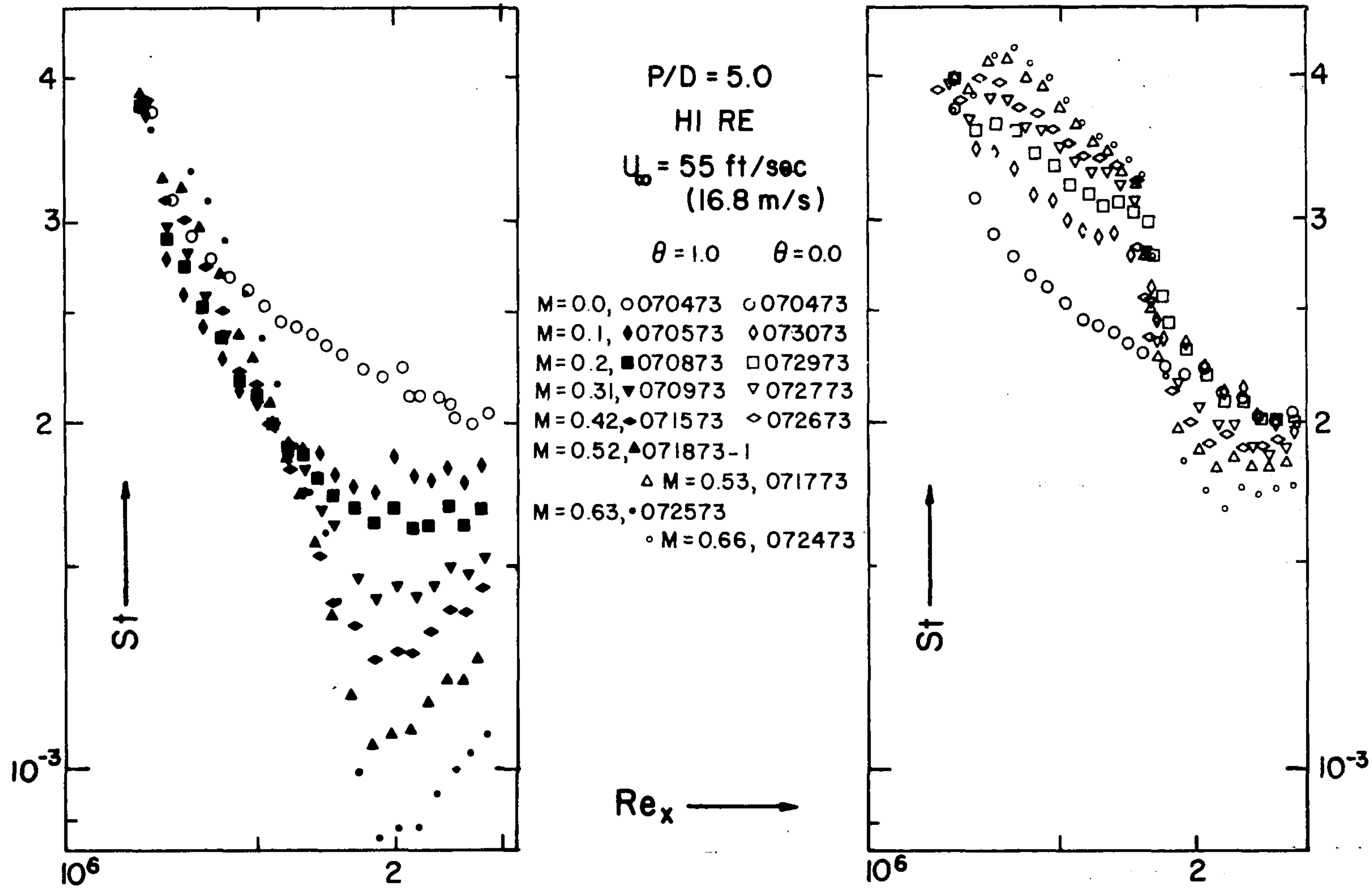

Fig. 9. St vs. Re_x with unheated starting length, high initial $Re_{\delta 2}$ and normal injection (P/D = 5) .

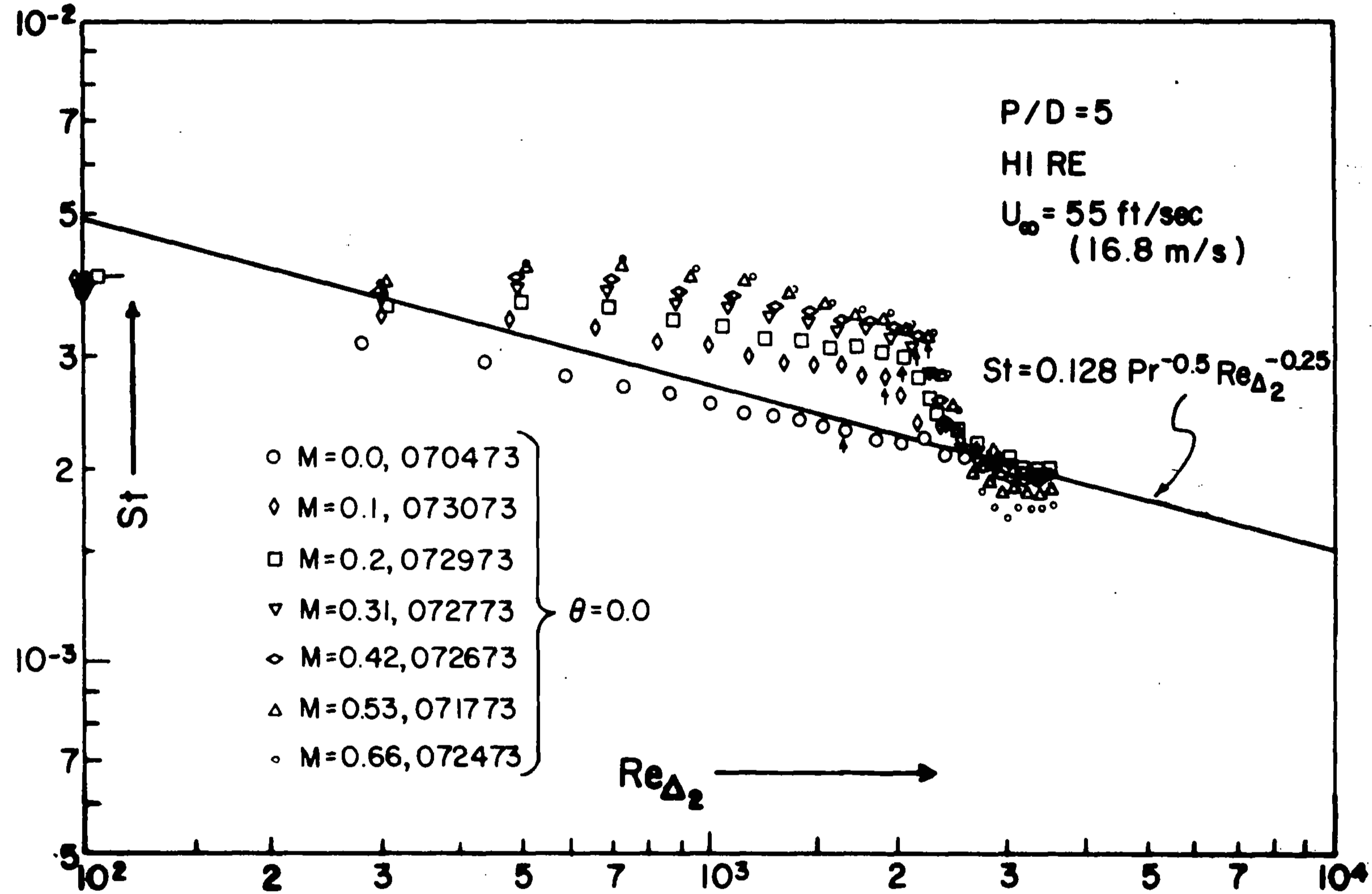

Fig. 10. θ = 0 Stanton number data from Fig. 9, replotted vs. Re_{Δ_2} .

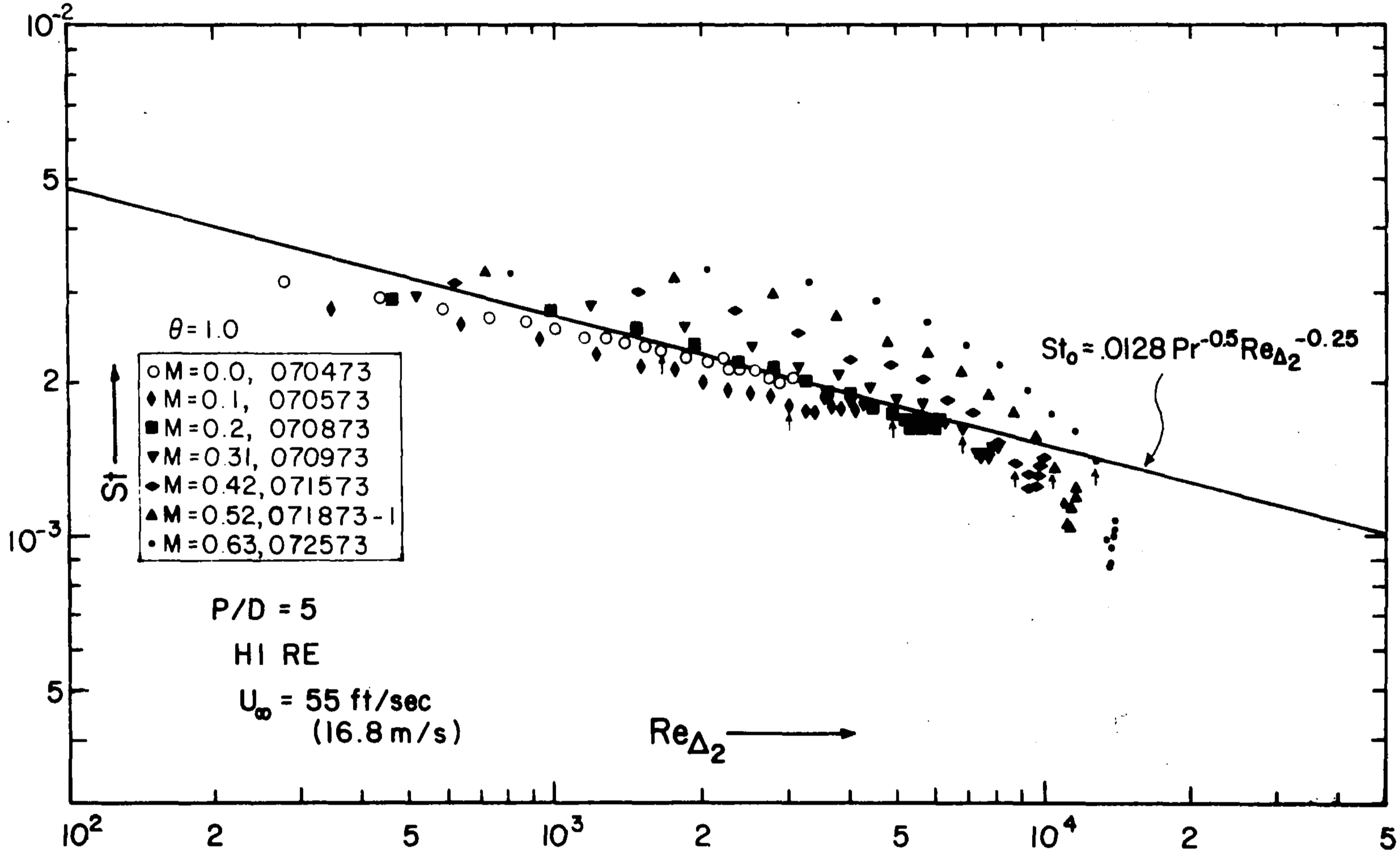

Fig. 11. $\theta = 1$ Stanton number data from Fig. 9, replotted vs. Re_{Δ_2} .

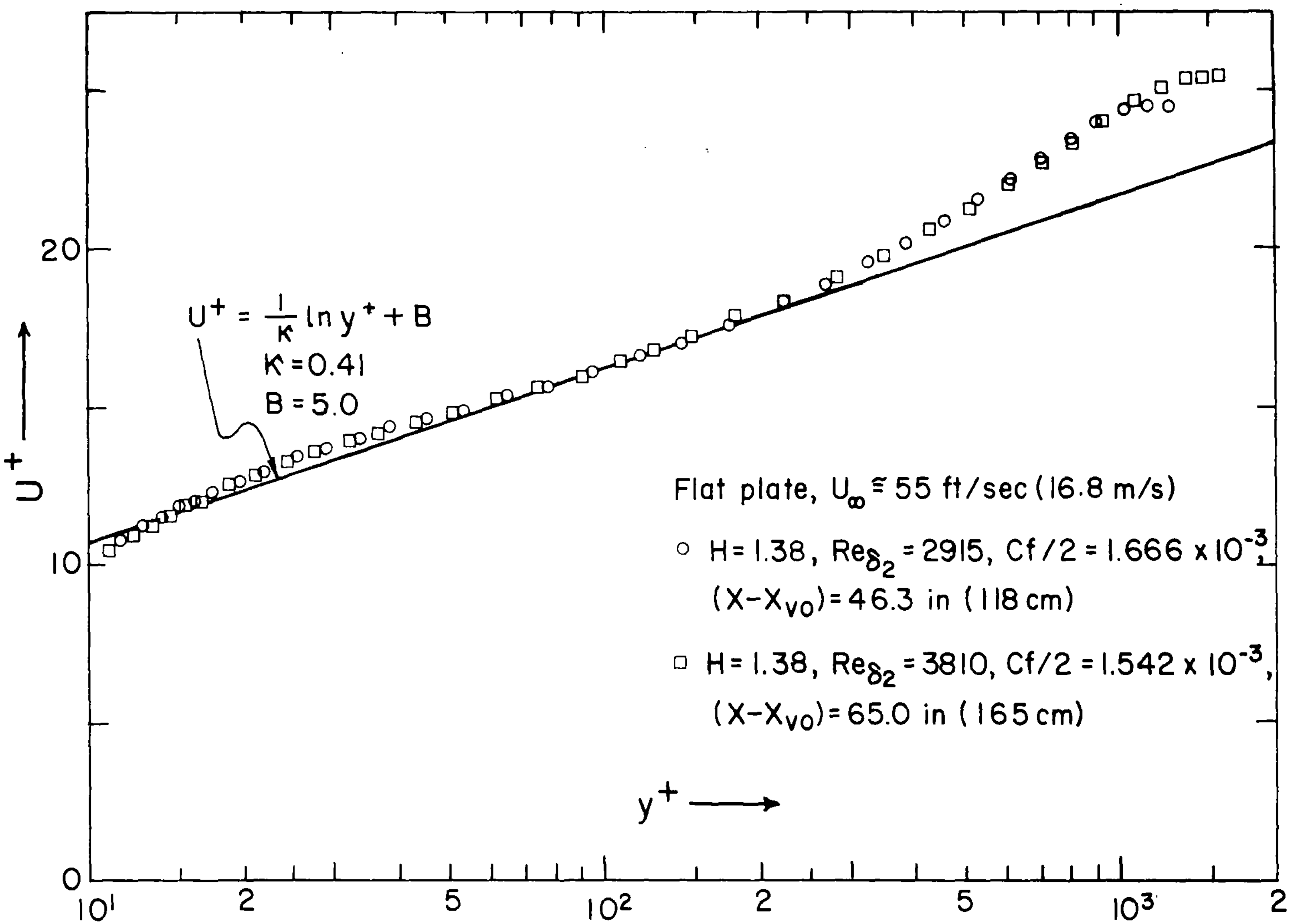

Fig. 12. Velocity profiles at guard plate midpoint and downstream edge of test section for Fig. 13.

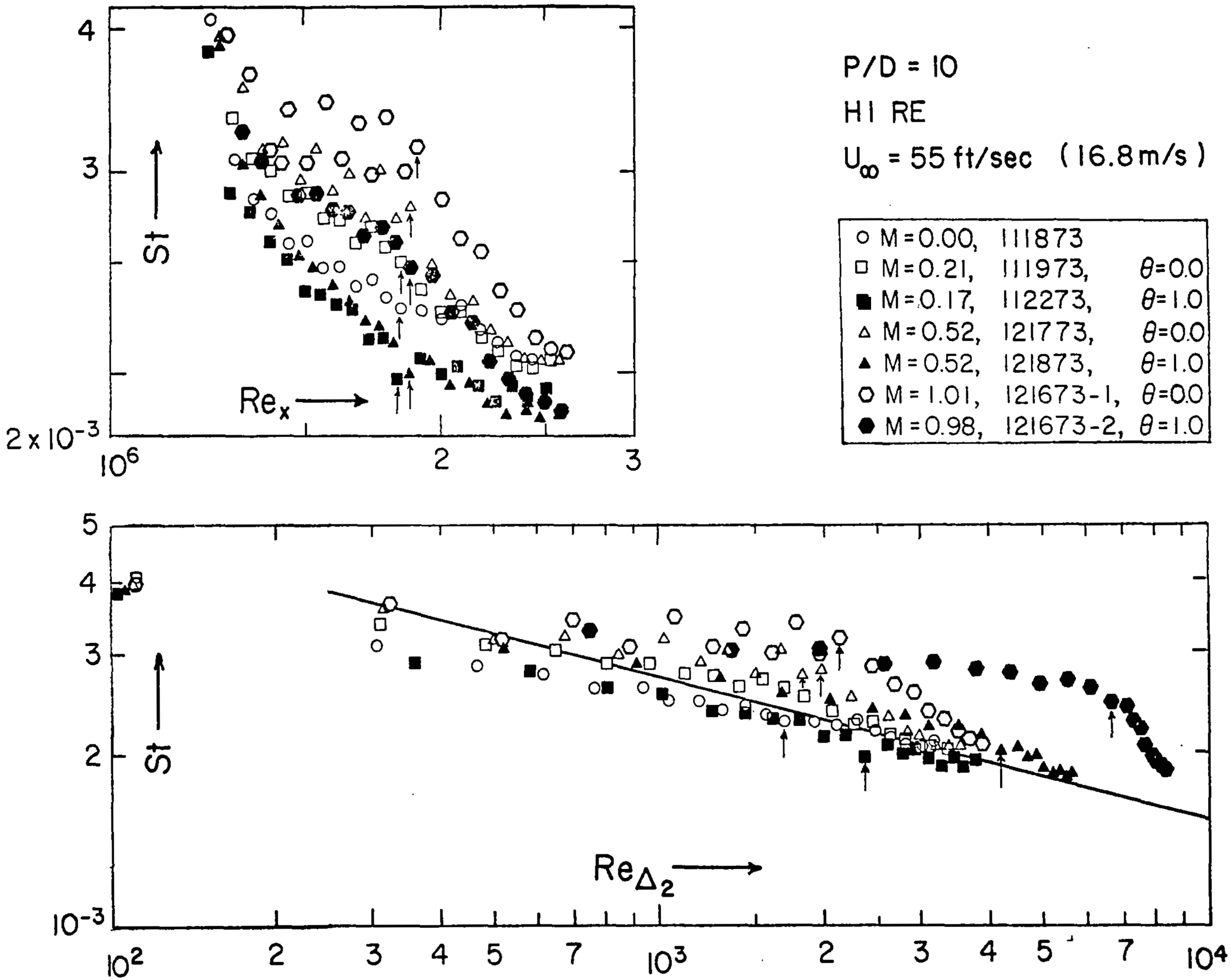

Fig. 13. St vs. Re_x and Re_{Δ_2} with unheated starting length, high initial Re_{δ_2}, and normal injection (P/D = 10).

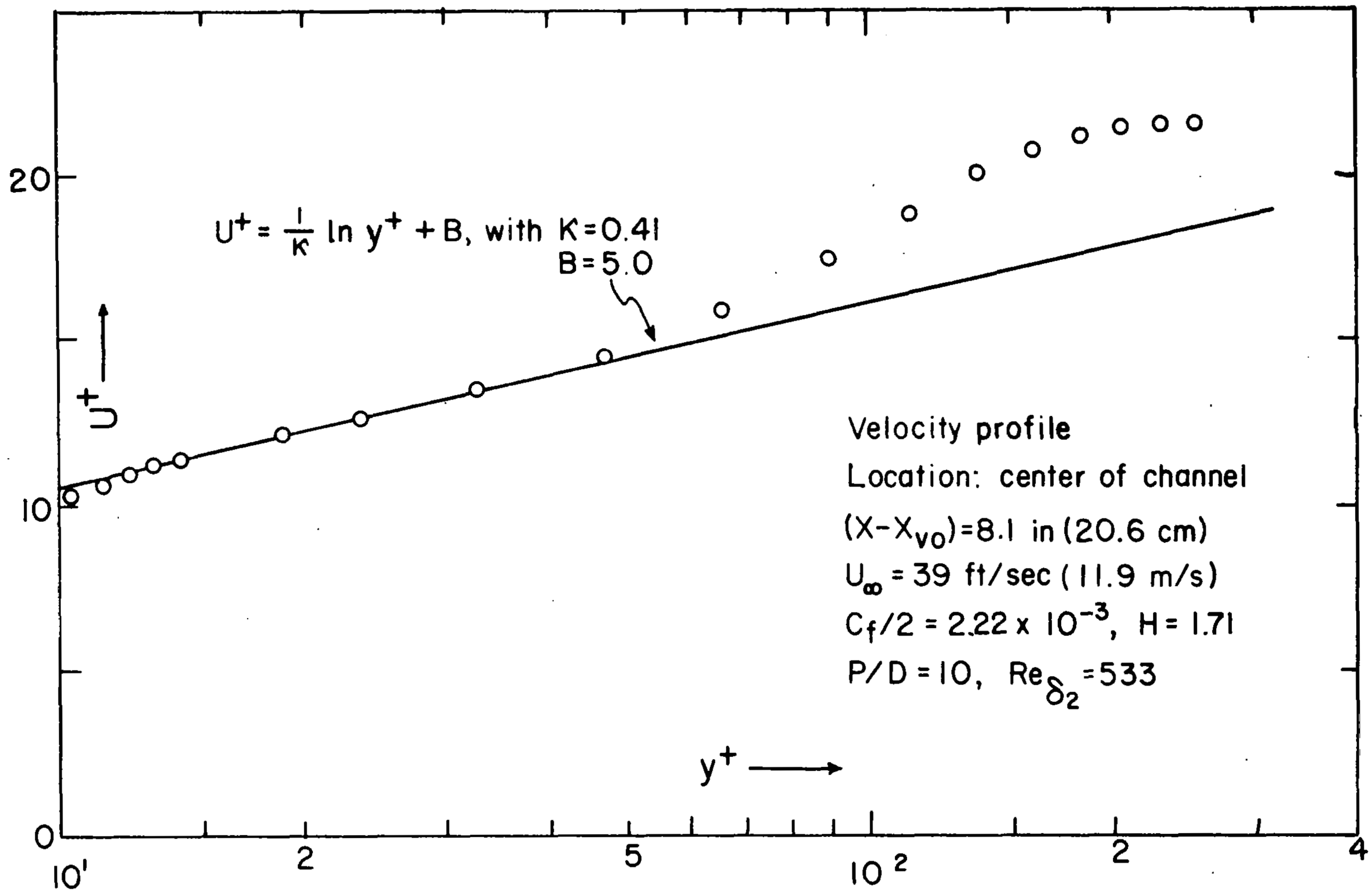

Fig. 14. Velocity profile at guard plate midpoint for Fig. 16.

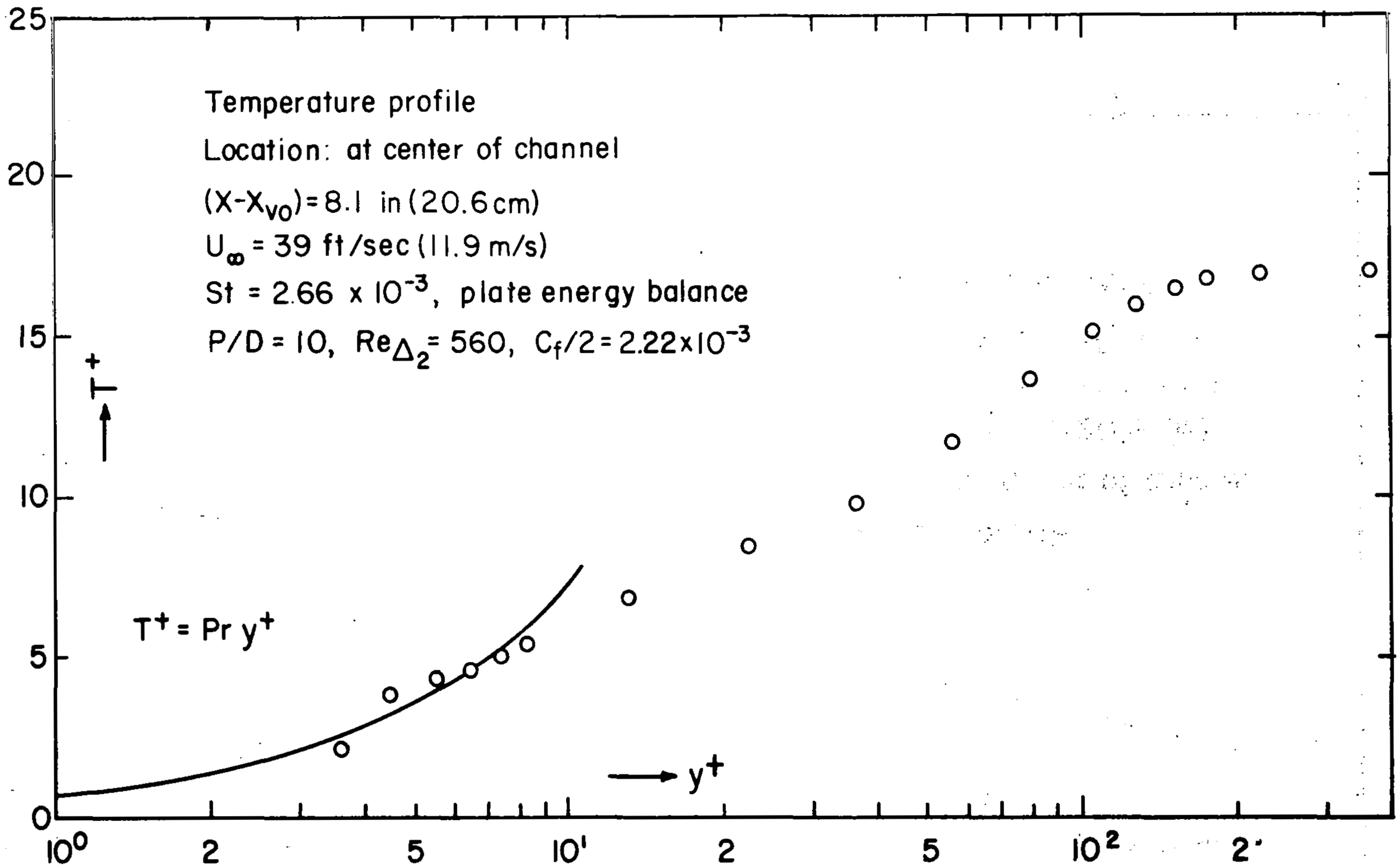

Fig. 15. Temperature profile at guard plate midpoint for Fig. 16.

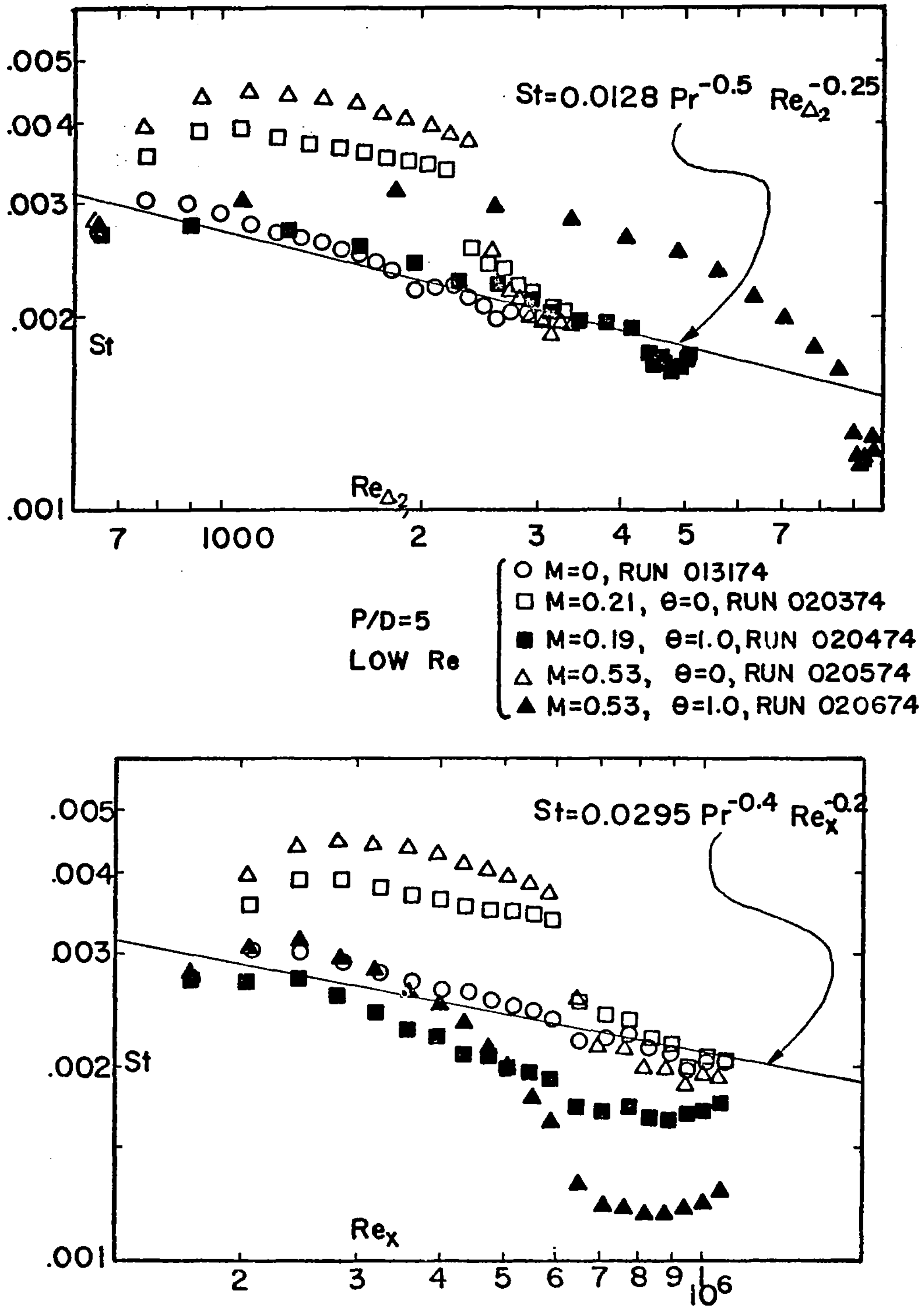

Fig. 16. St vs. Re_{Δ_2} and Re_x with heated starting length, low initial Re_{δ_2}, and normal injection (P/D = 5).

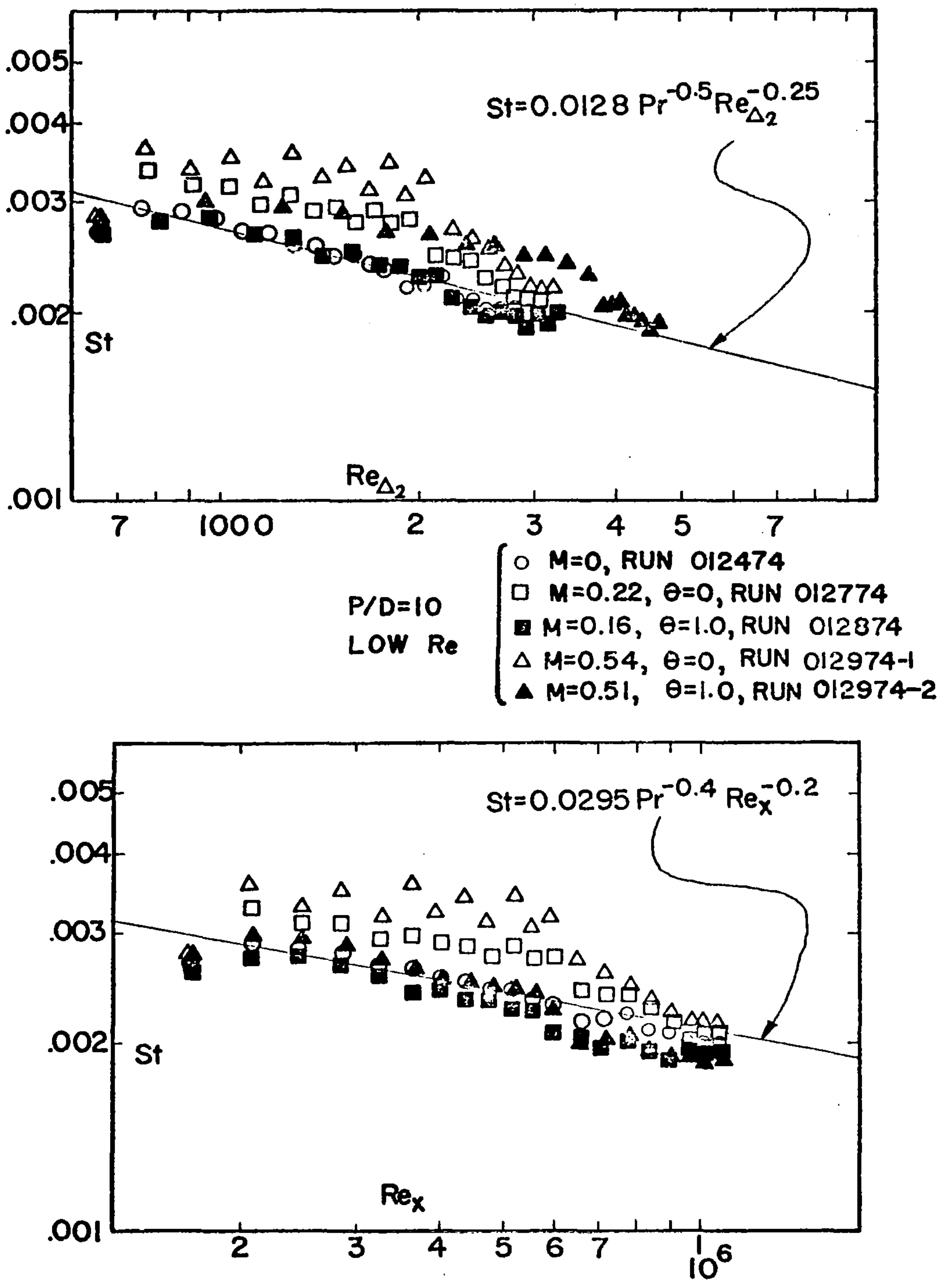

Fig. 17. St vs. Re_{Δ_2} and Re_x with heated starting length, low initial Re_{δ_2}, and normal injection (P/D = 10).

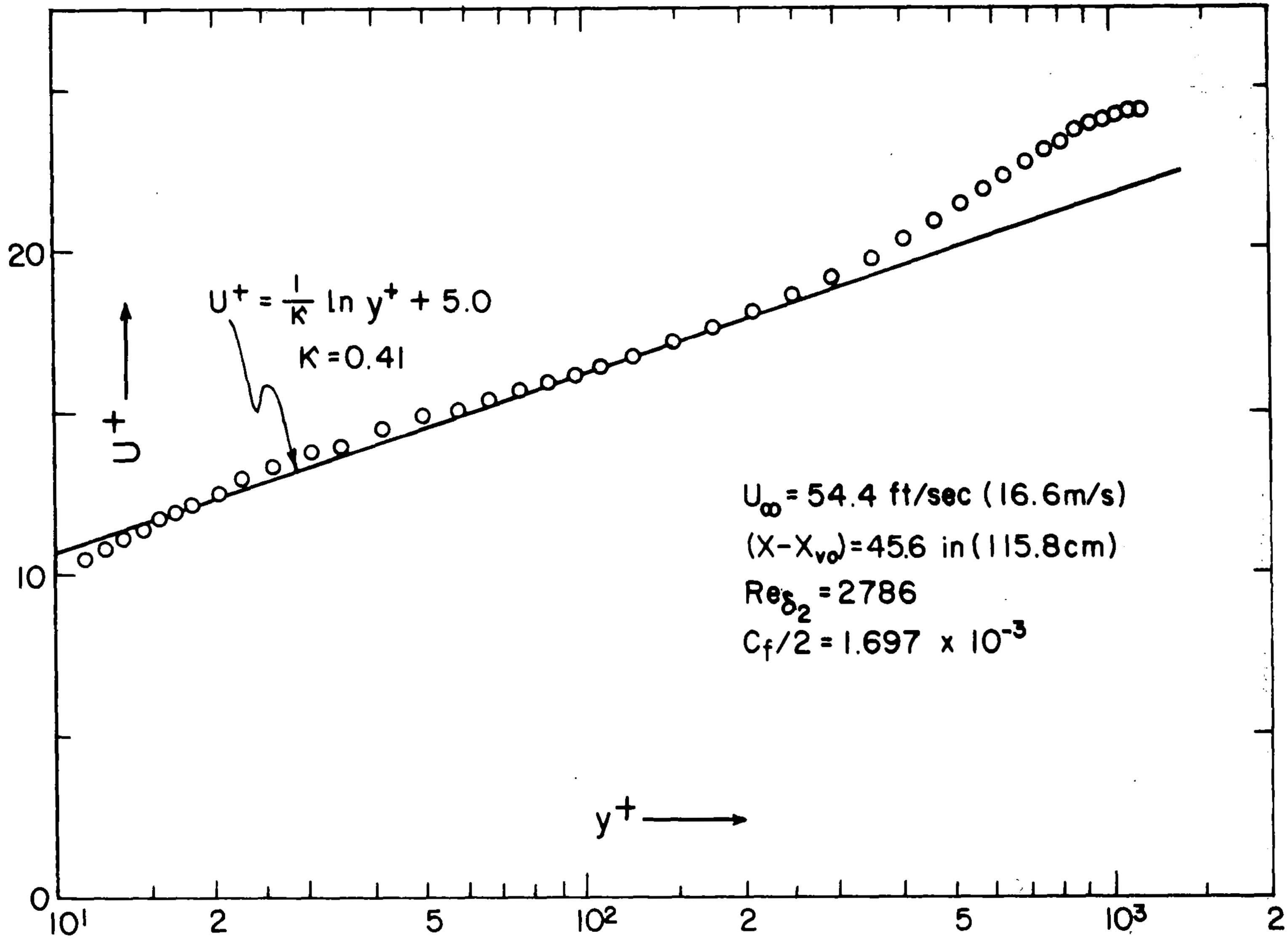

Fig. 18. Velocity profile at guard plate midpoint for Fig. 20.

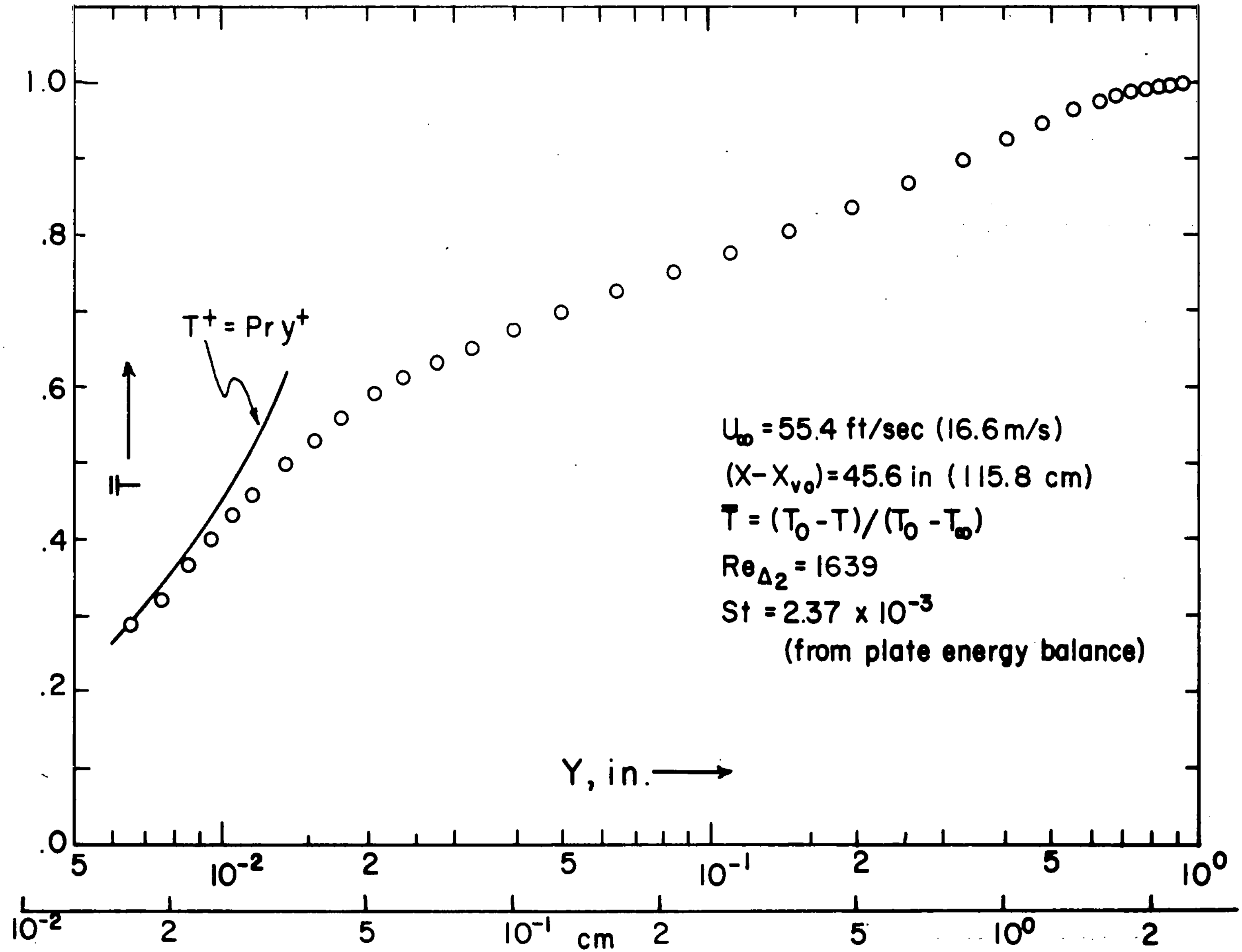

Fig. 19. Temperature profile at guard plate midpoint for Fig. 20.

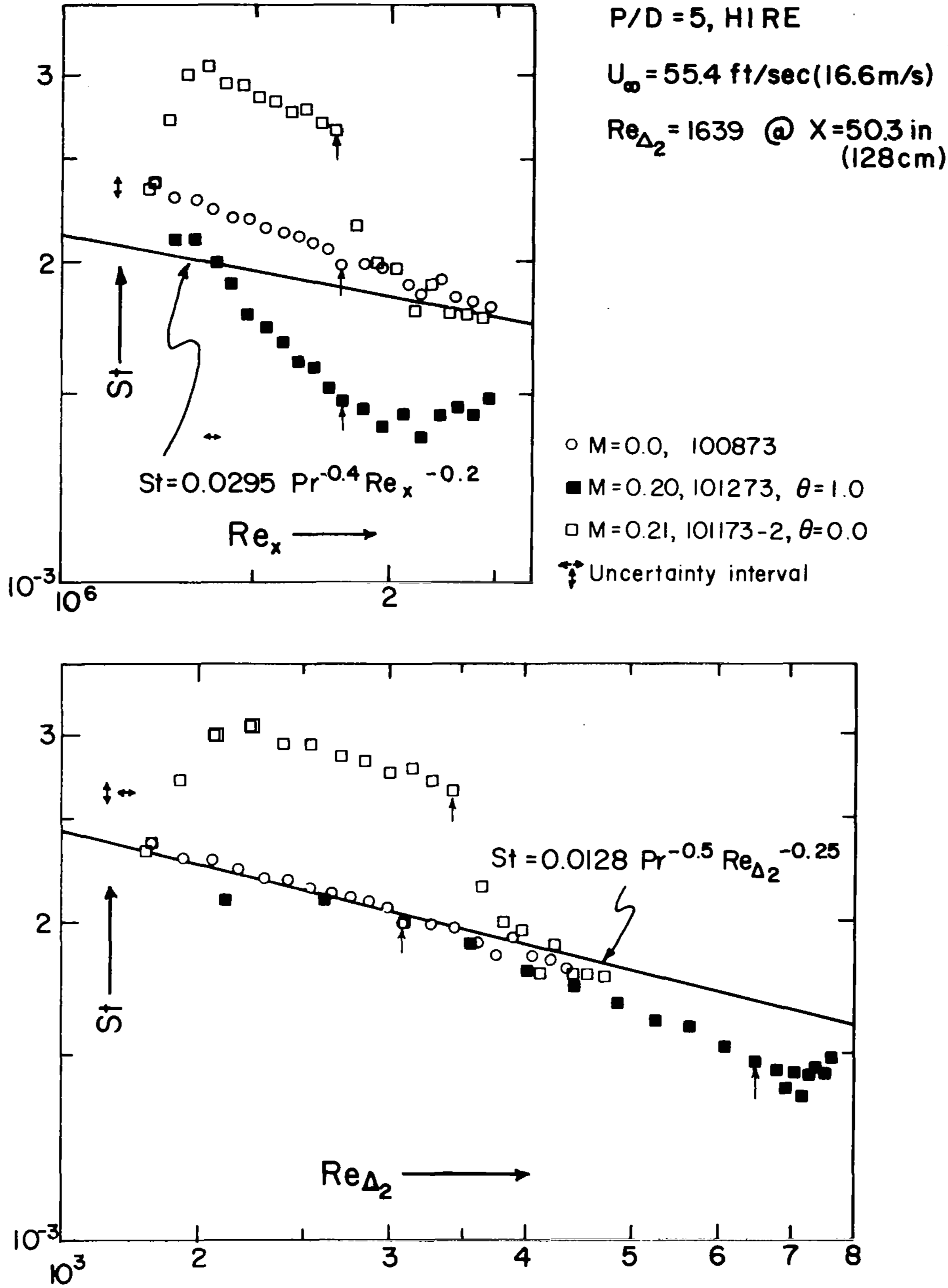

Fig. 20. St vs. Re_x and Re_{Δ_2} with heated starting length, high initial Re_{δ_2}, and normal injection (P/D = 5).

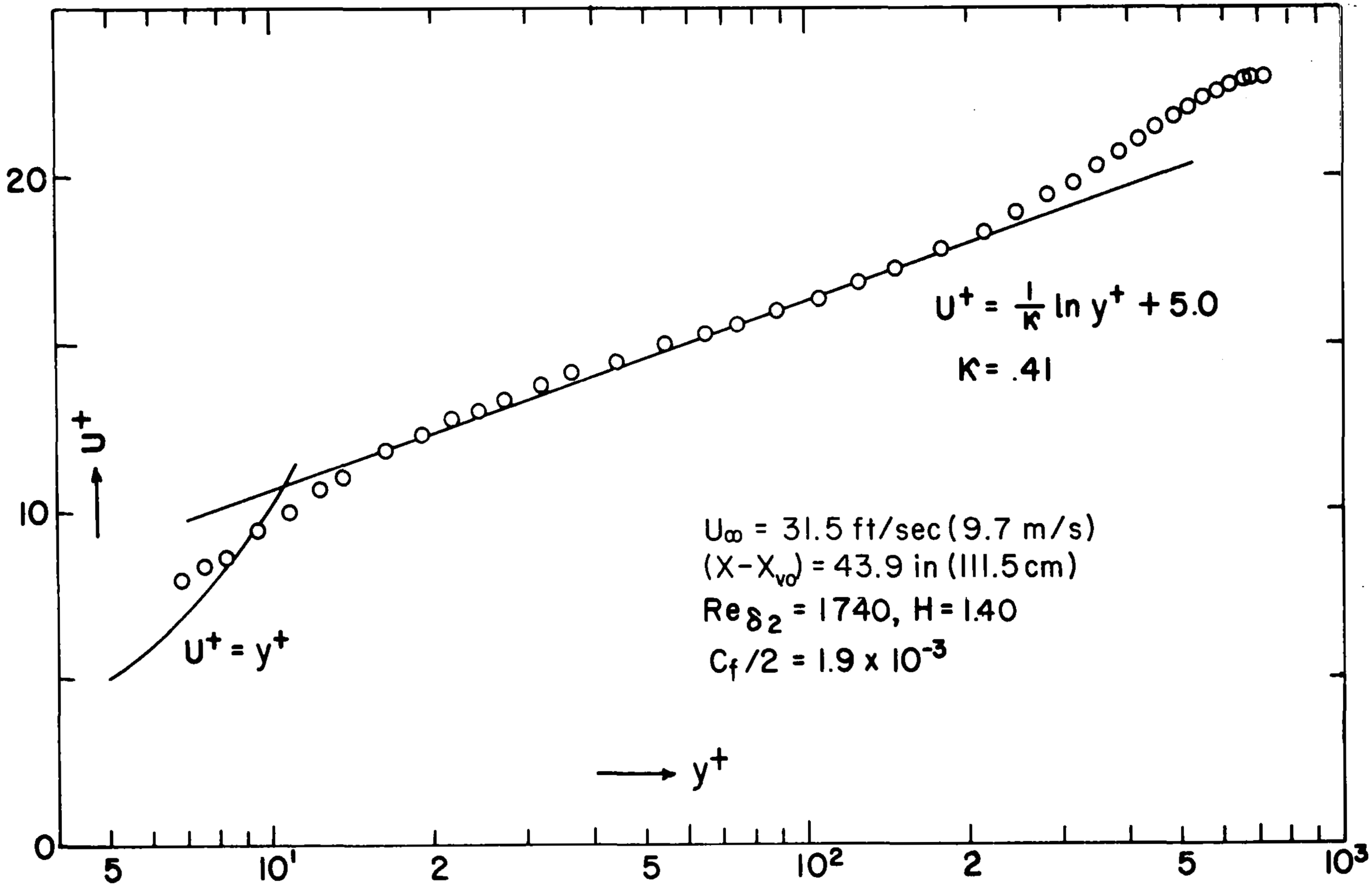

Fig. 21. Velocity profile at guard plate midpoint for Figs. 22 to 24.

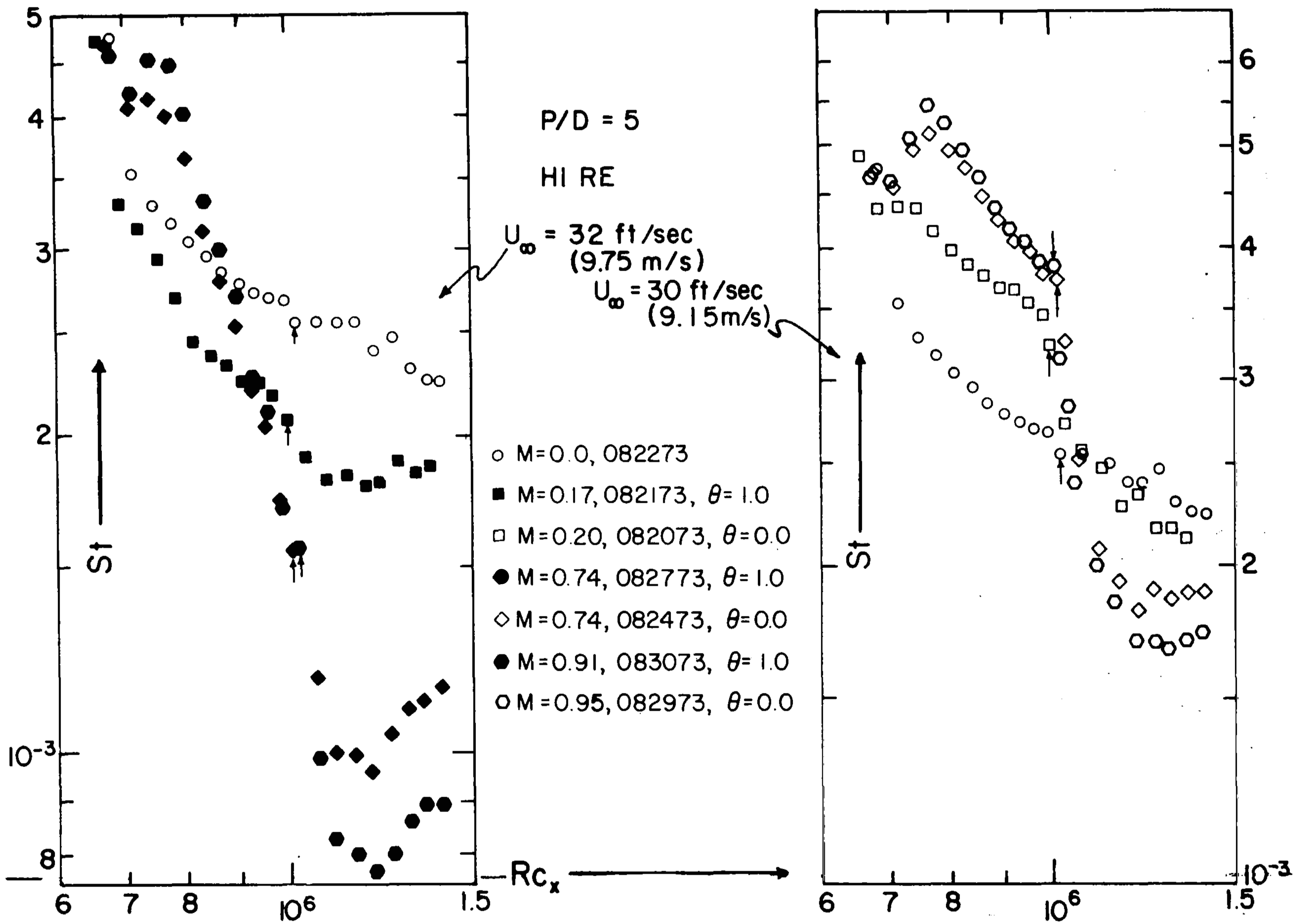

Fig. 22. St vs. Re_x with unheated starting length, high initial Re_{δ_2}, and normal injection (P/D = 5).

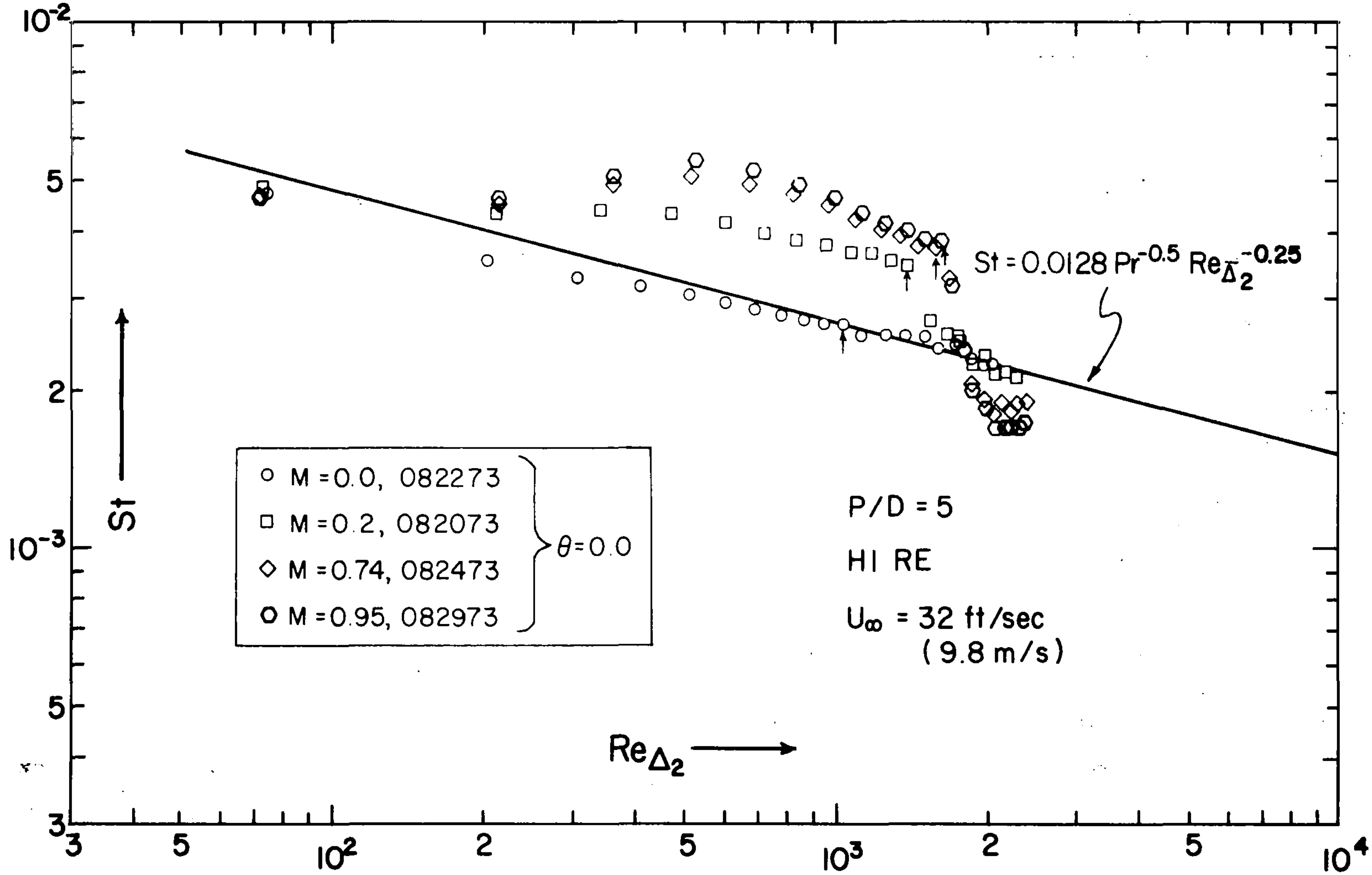

Fig. 23. θ = 0 Stanton number data from Fig. 22, replotted vs. Re_{Δ_2} .

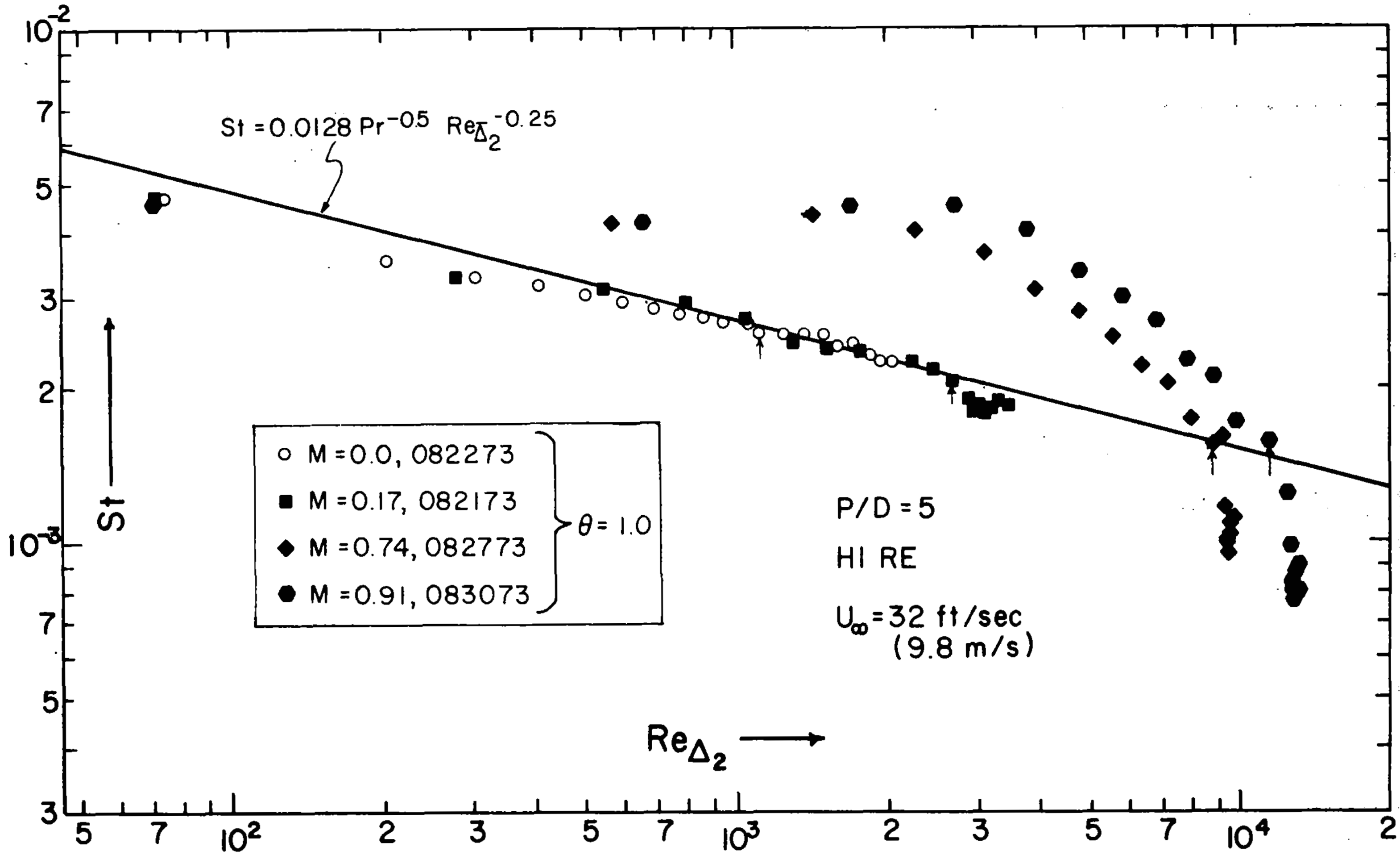

Fig. 24. $\theta = 1$ Stanton number data from Fig. 22, replotted vs. Re_{Δ_2} .

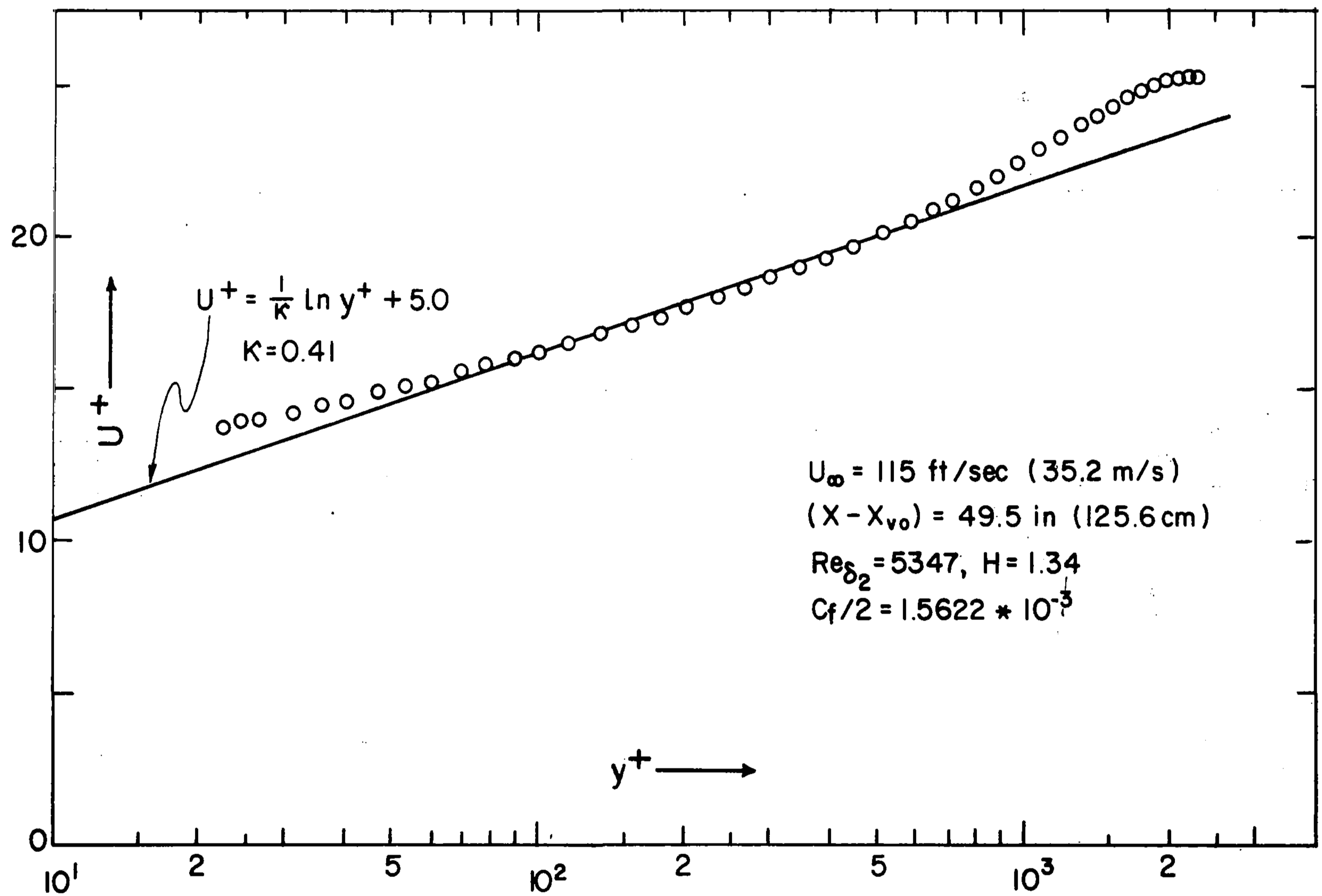

Fig. 25. Velocity profile at guard plate midpoint for Fig. 26.

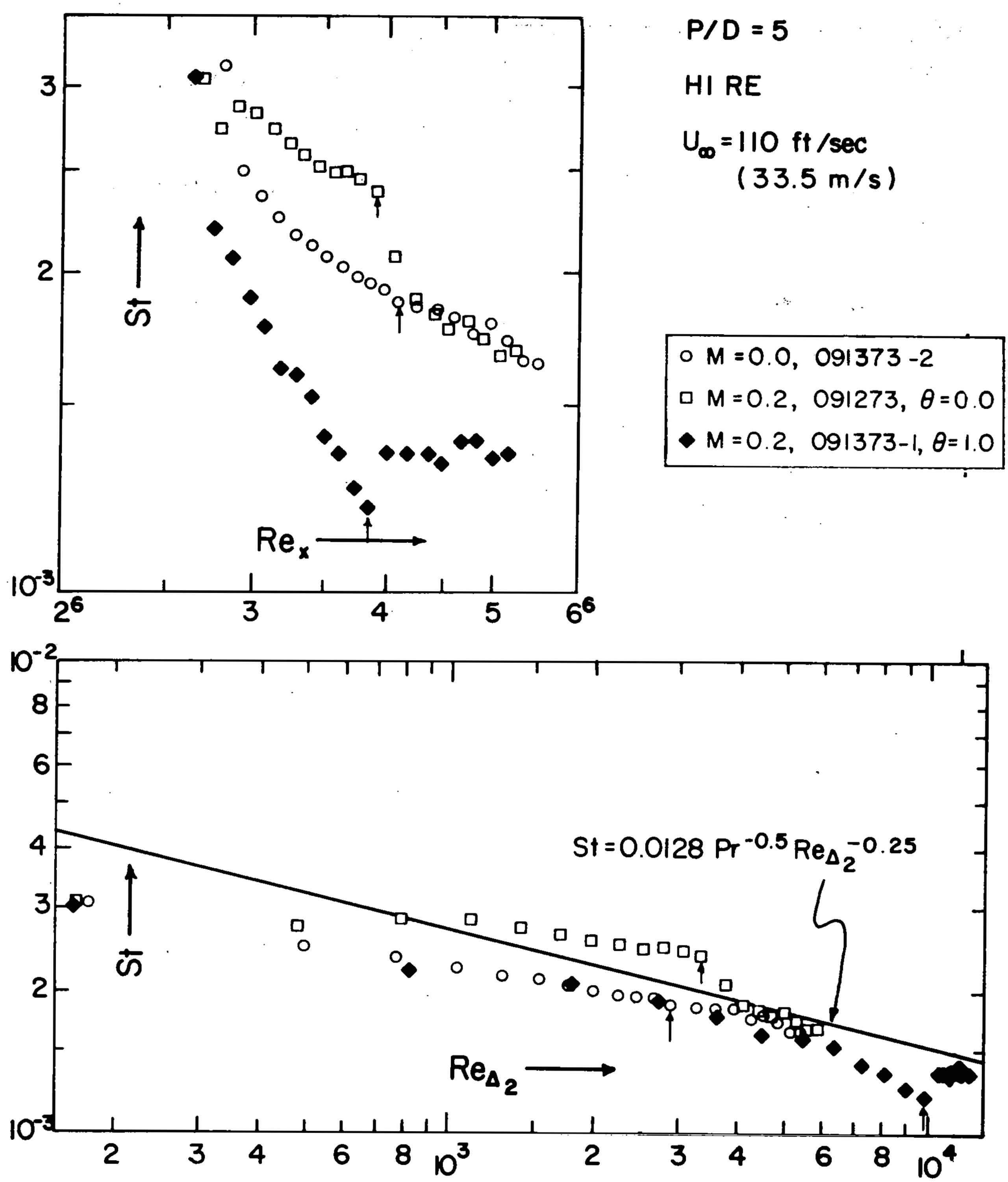

Fig. 26. St vs. Re_x and Re_{Δ_2} with unheated starting length, high Re_{δ_2}, and normal injection (P/D = 5).

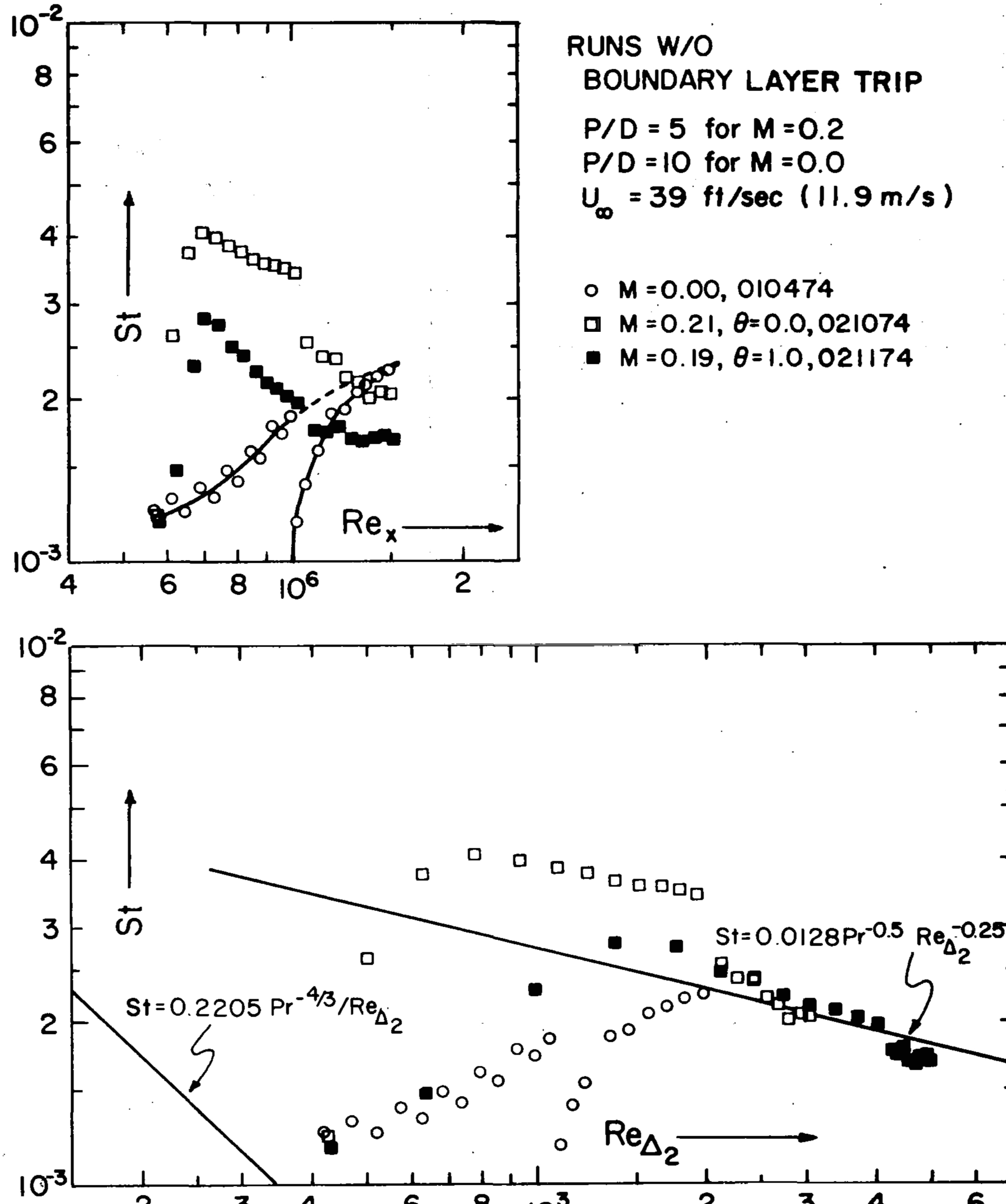

Fig. 27. St vs. Re_x and $Re_{\Delta 2}$ with heated starting length and low initial $Re_{\delta 2}$, and with laminar - turbulent transition over normal injection test section (P/D = 5).

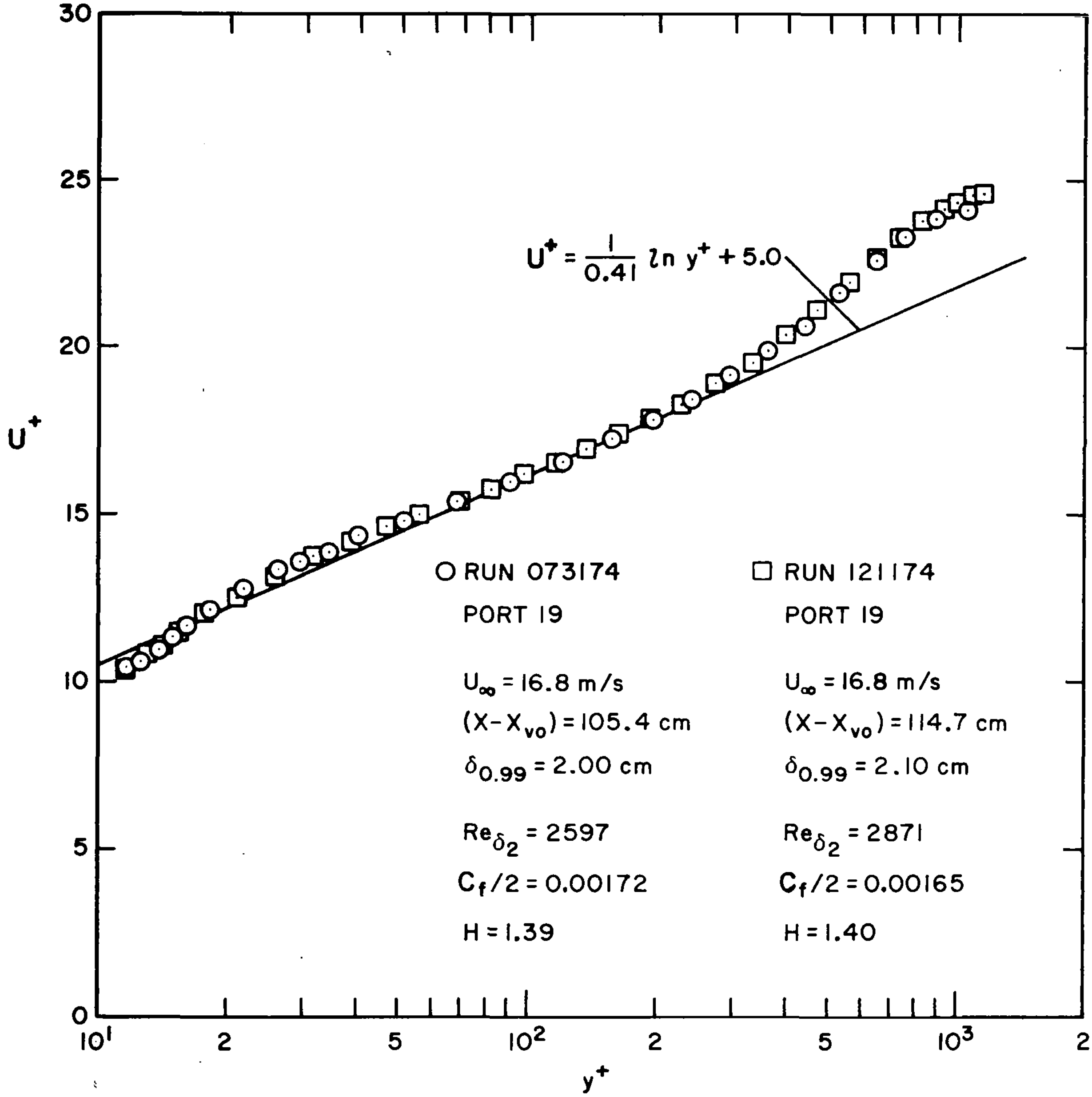

Fig. 28. Velocity profiles at guard plate midpoint for Figs. 29 to 31 (P/D = 5) and Figs. 32 and 33 (P/D = 10).

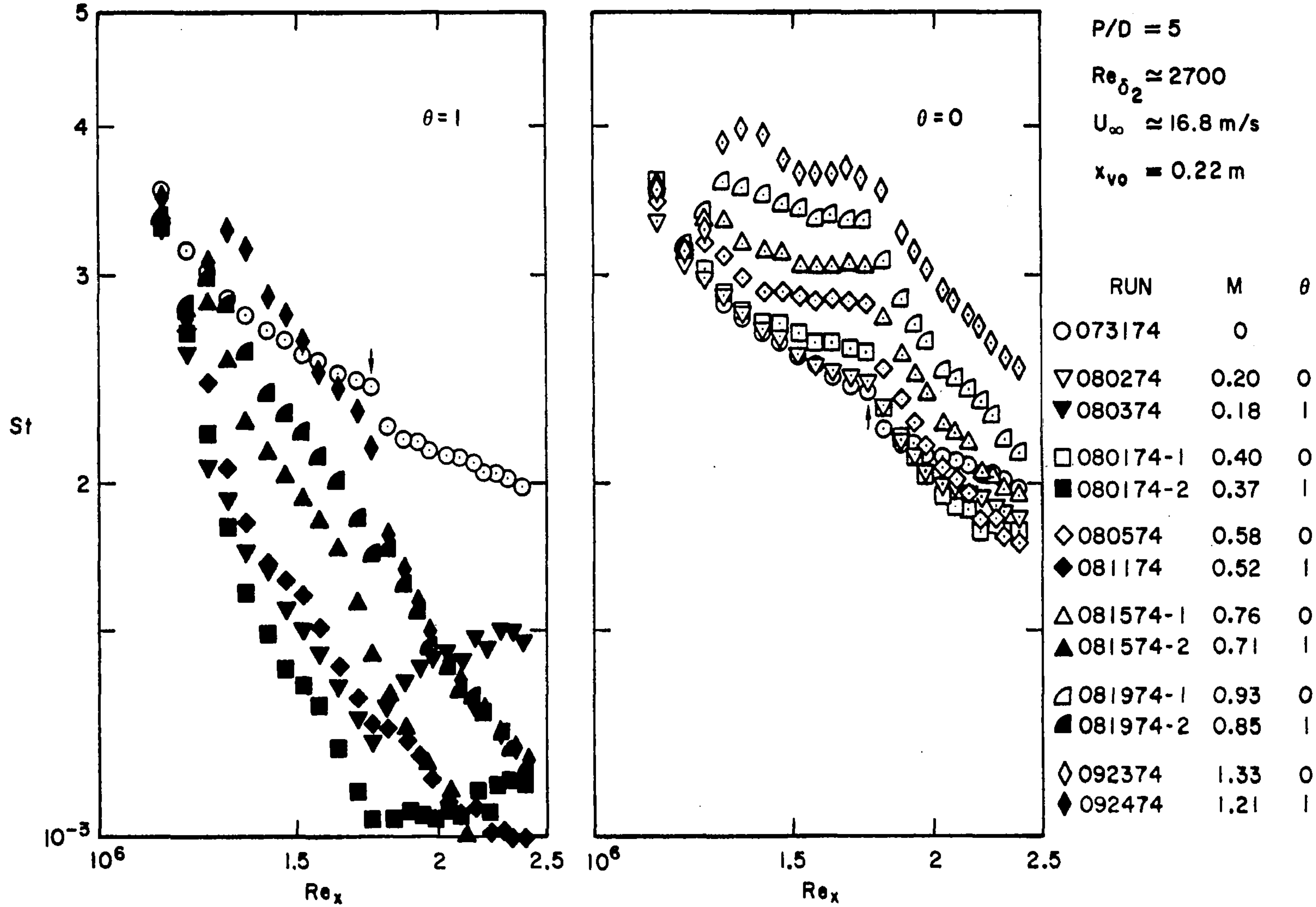

Fig. 29. St vs. Re_x with unheated starting length, high initial Re_{δ_2}, and slant angle injection (P/D = 5).

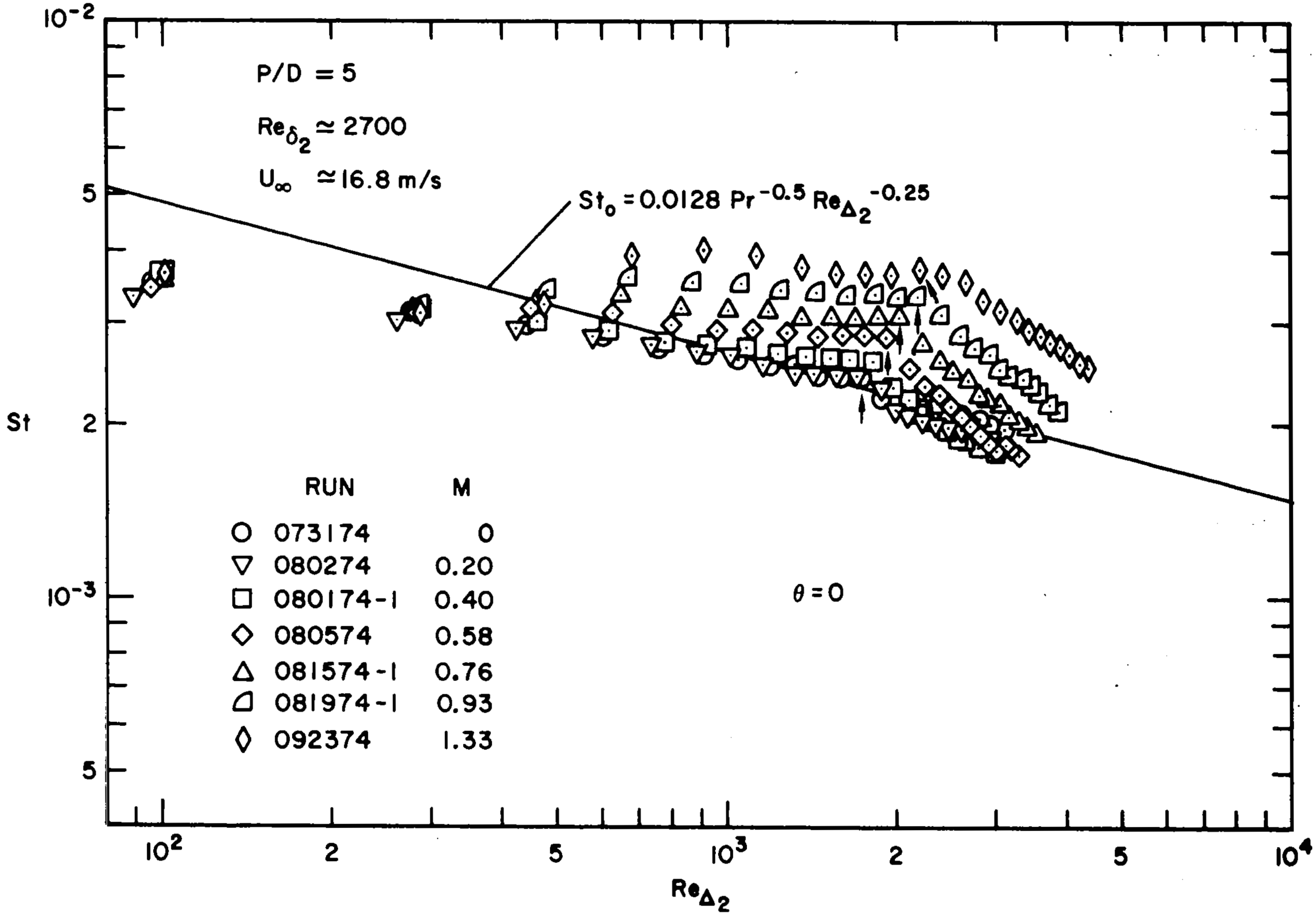

Fig. 30. θ = 0 Stanton number data from Fig. 29, replotted vs. Re_{Δ_2} .

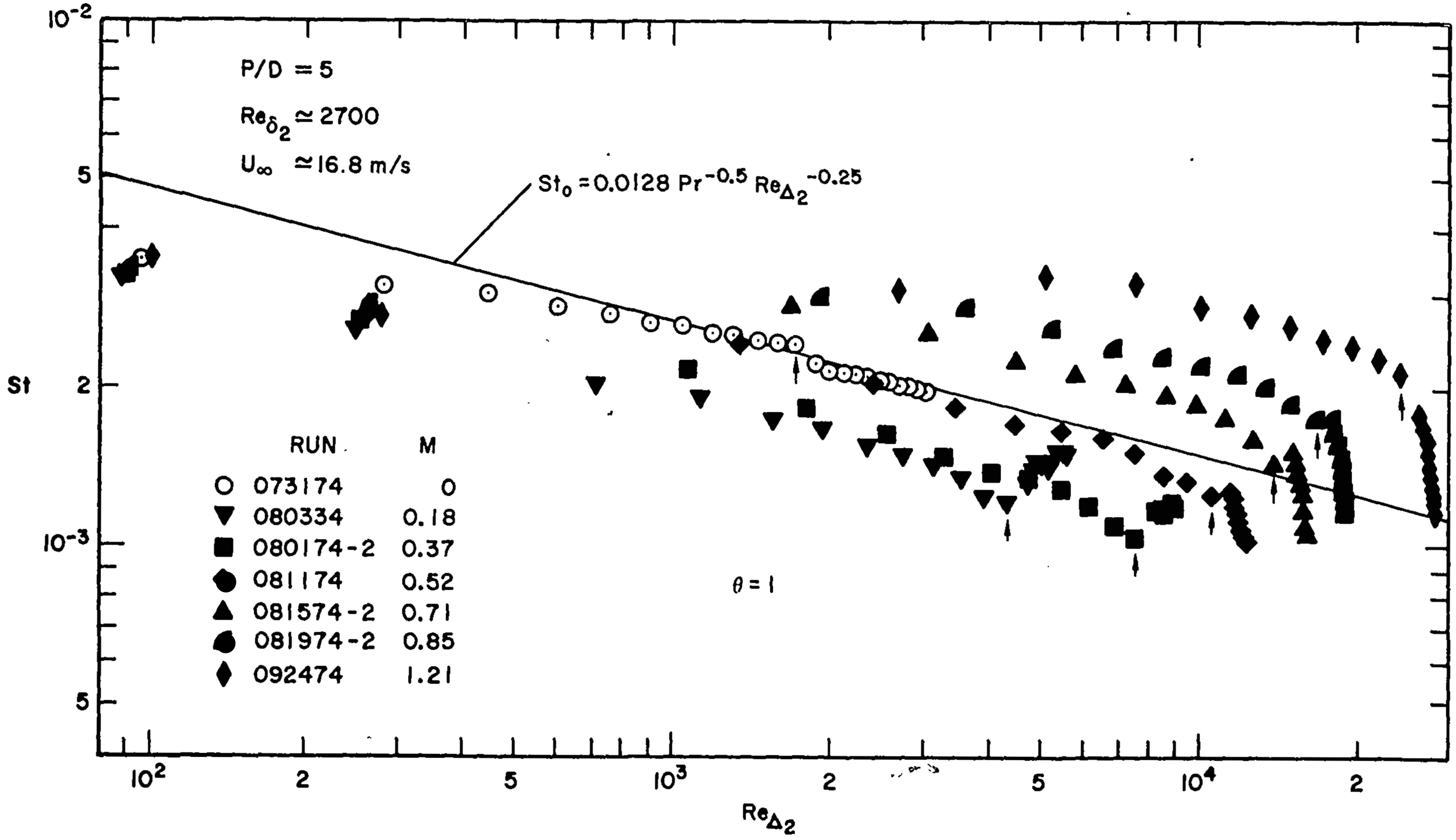

Fig. 31. θ = 1 Stanton number data from Fig. 29, replotted vs. Re_{Δ_2} .

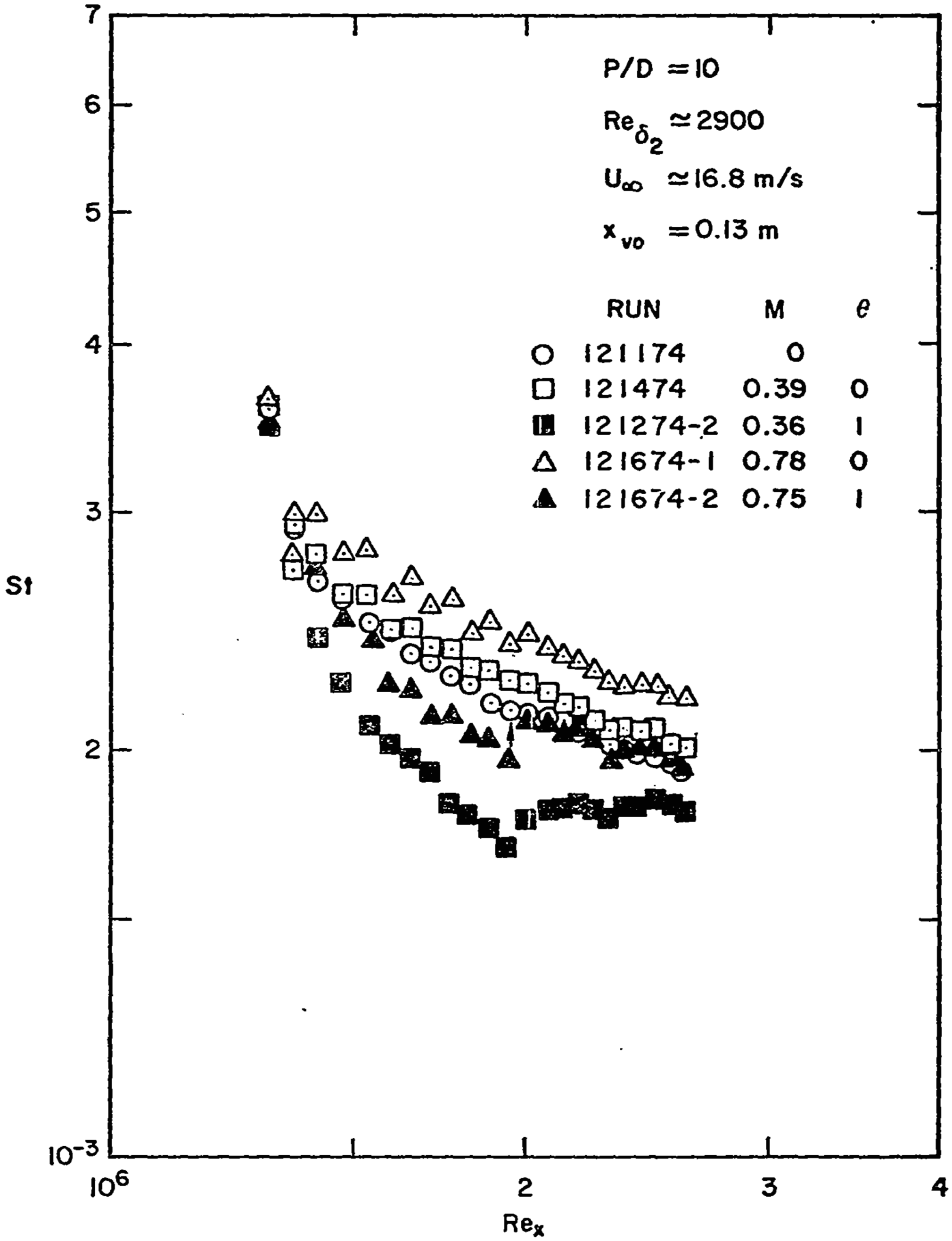

Fig. 32. St vs. Re_x with unheated starting length, high Re_{δ_2}, and slant angle injection (P/D = 10).

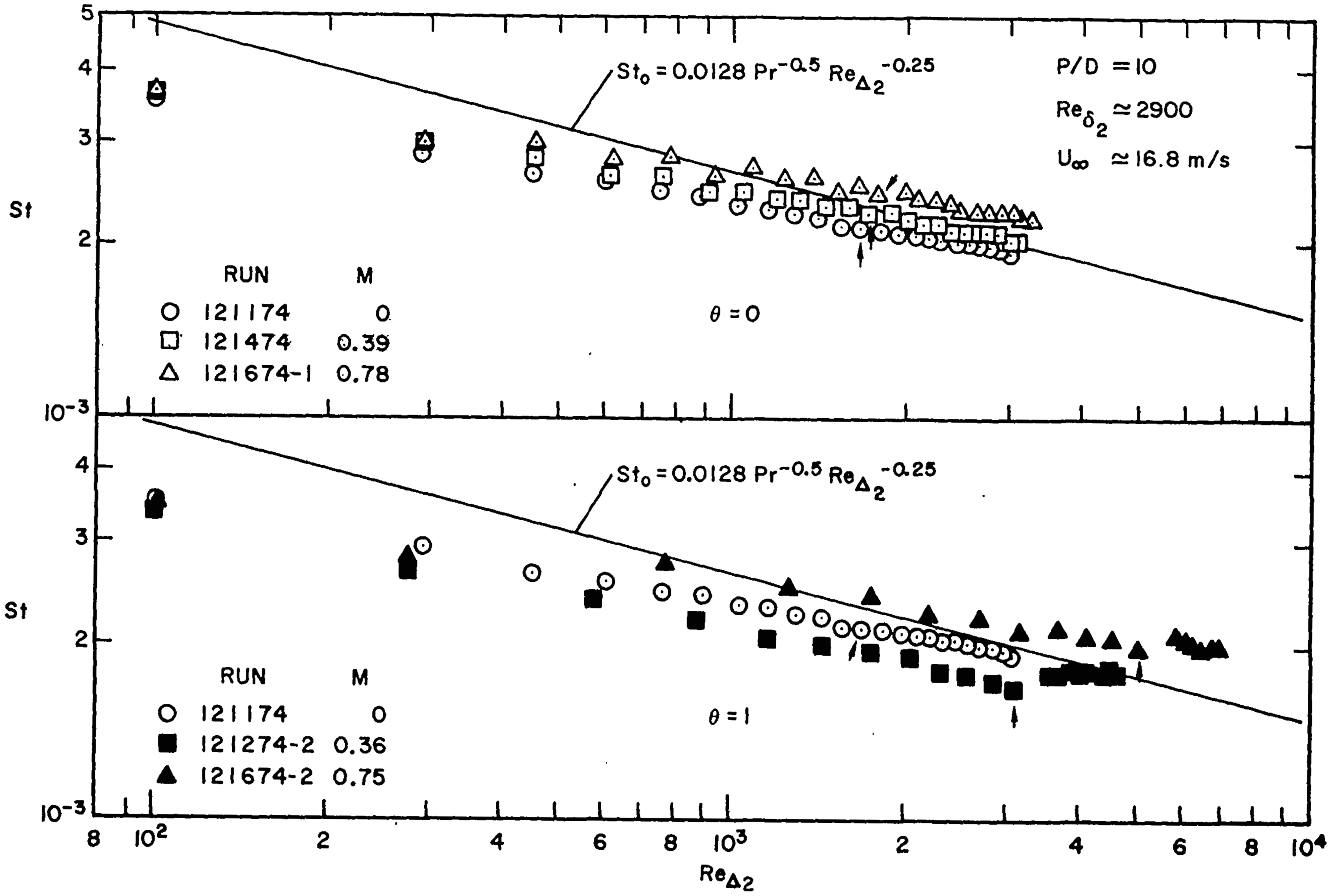

Fig. 33. Stanton number data from Fig. 32, replotted vs. Re_{Δ_2} .

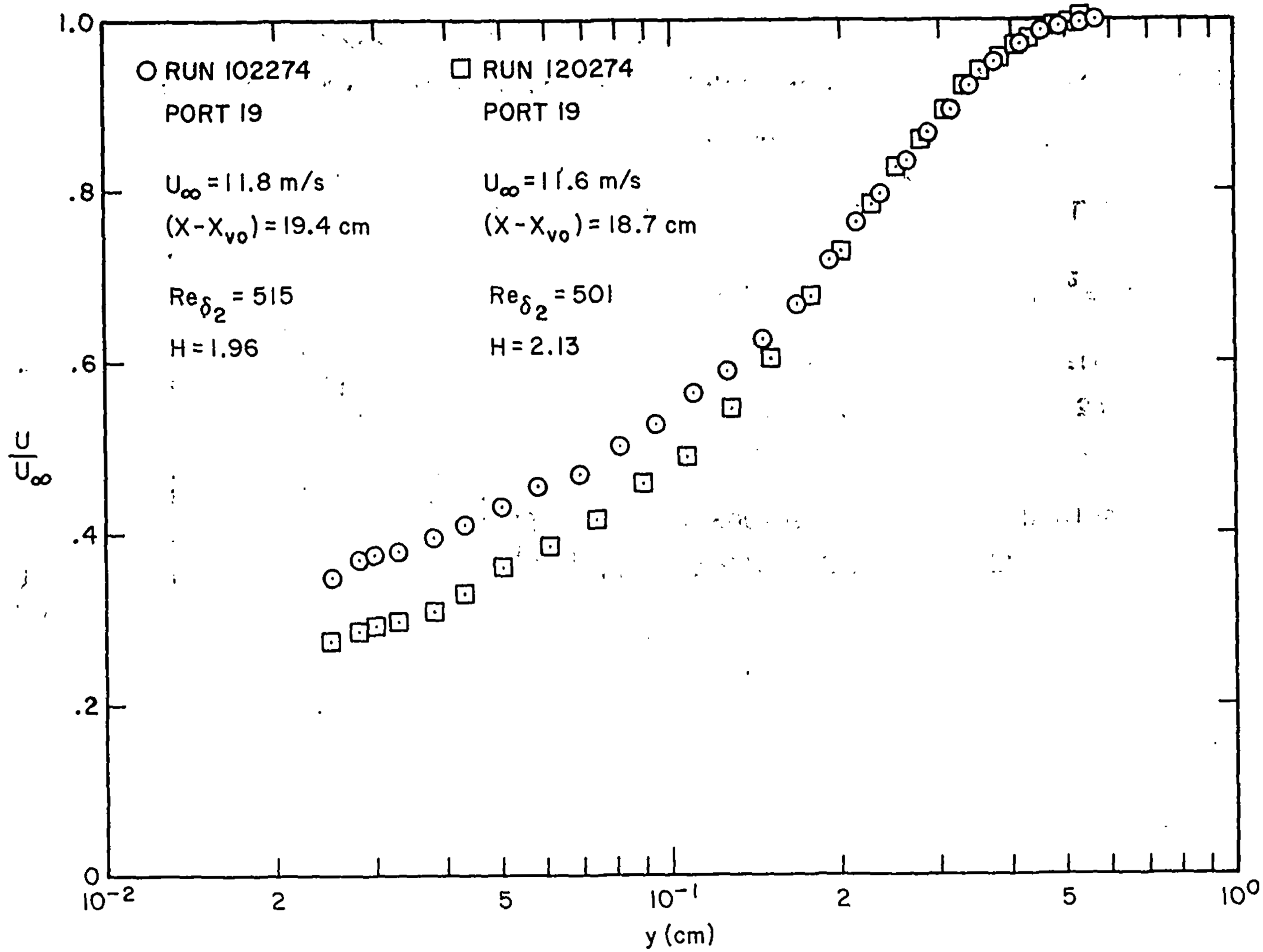

Fig. 34. Velocity profiles at guard plate midpoint for Figs. 36 and 37 (P/D = 5) and Figs. 38 and 39 (P/D = 10).

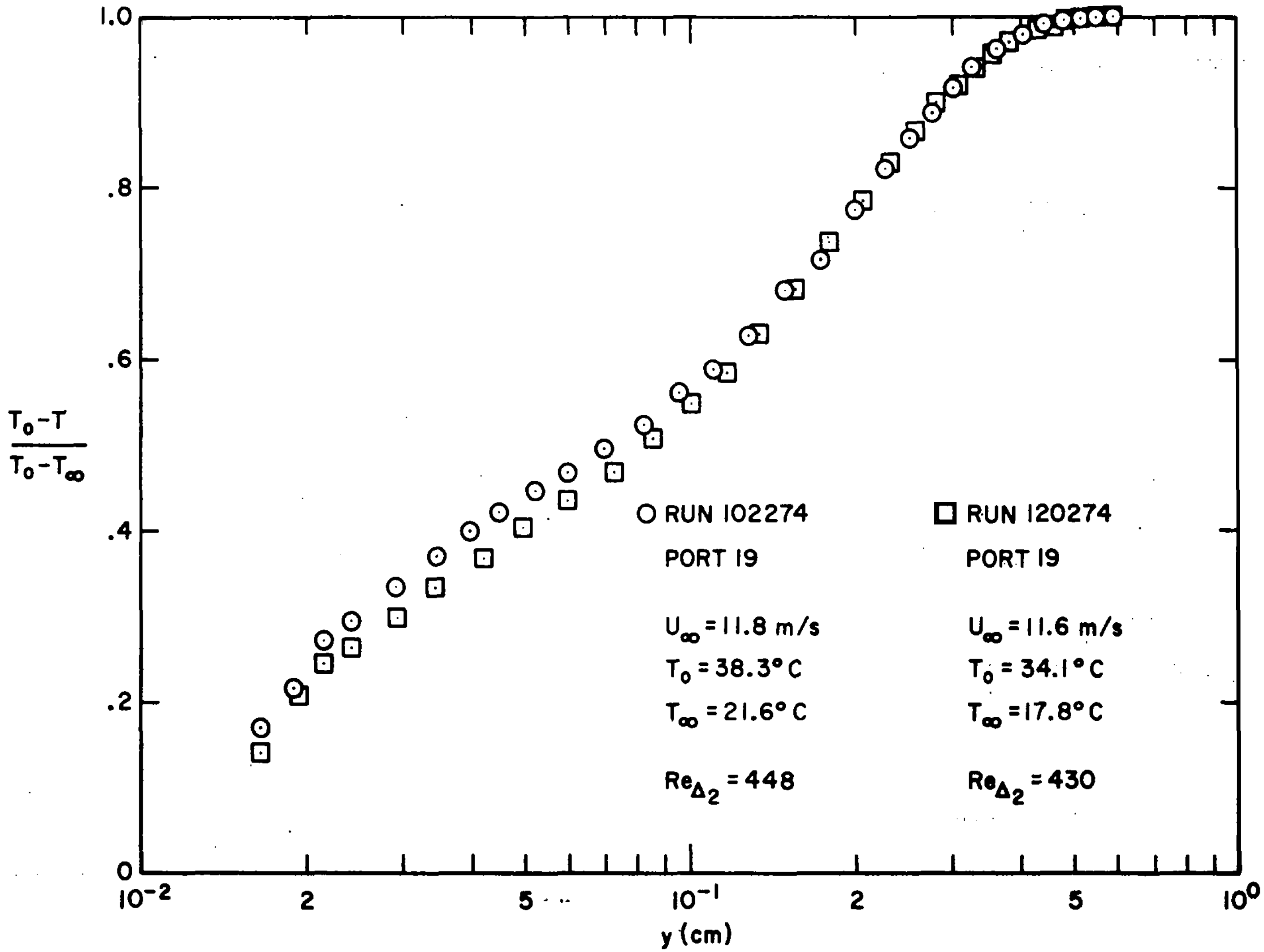

Fig. 35. Temperature profiles at guard plate midpoint for Figs. 36 and 37 (P/D = 5) and Figs. 38 and 39 (P/D = 10).

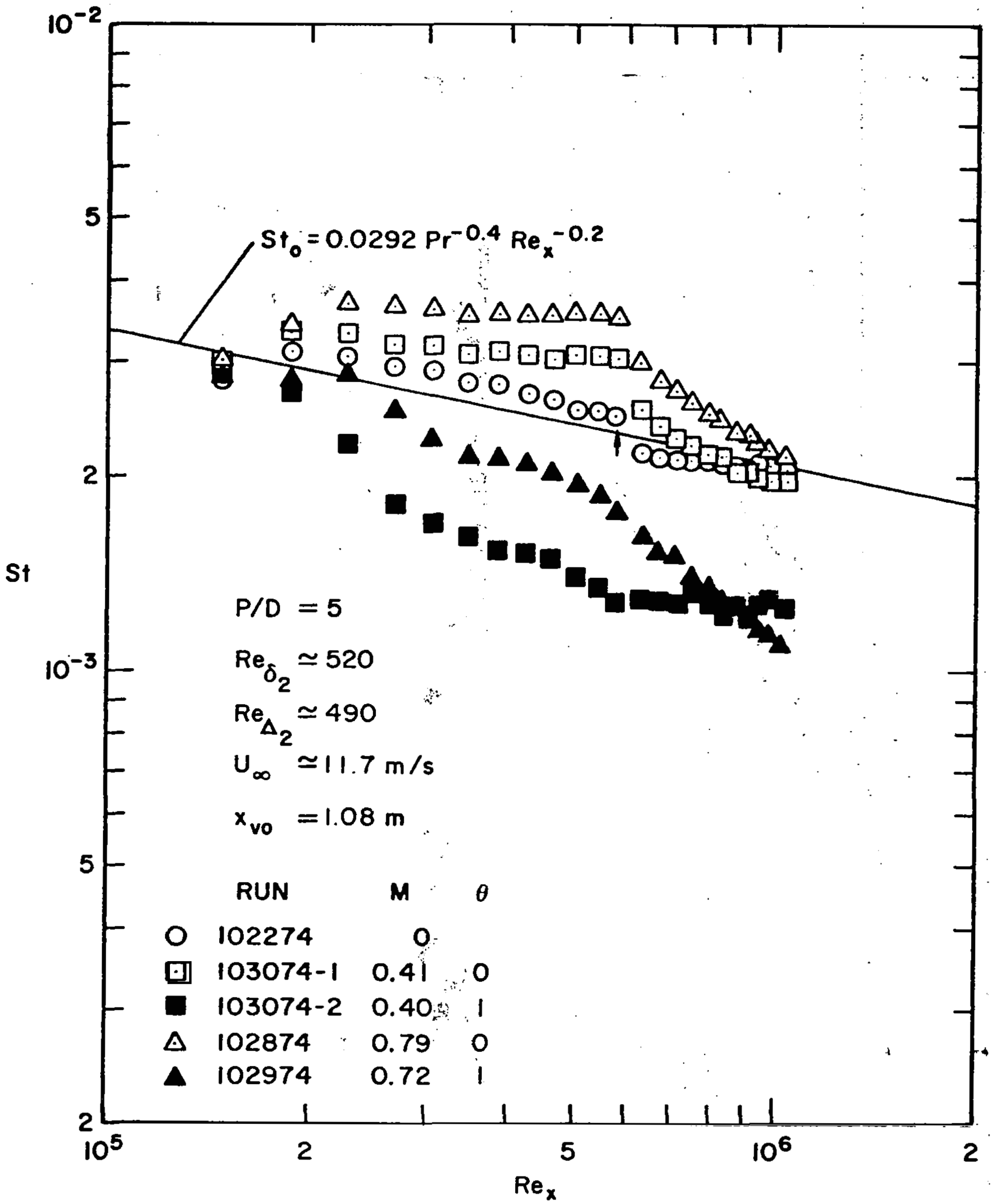

Fig. 36. St vs. Re_x with heated starting length, low initial Re_{δ_2}, and slant angle injection (P/D = 5).

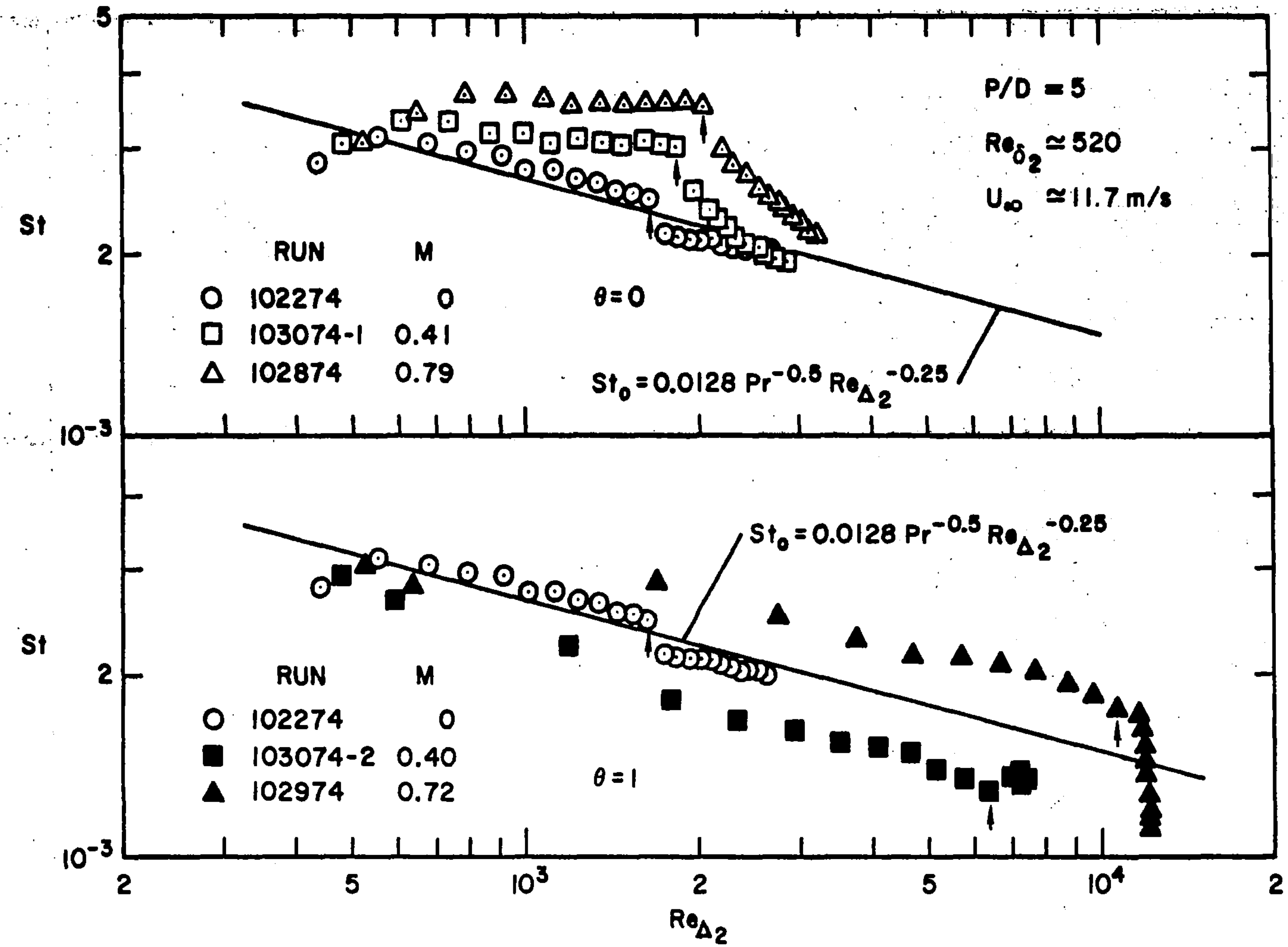

Fig. 37. Stanton number data from Fig. 36, replotted vs. Re_{Δ_2} .

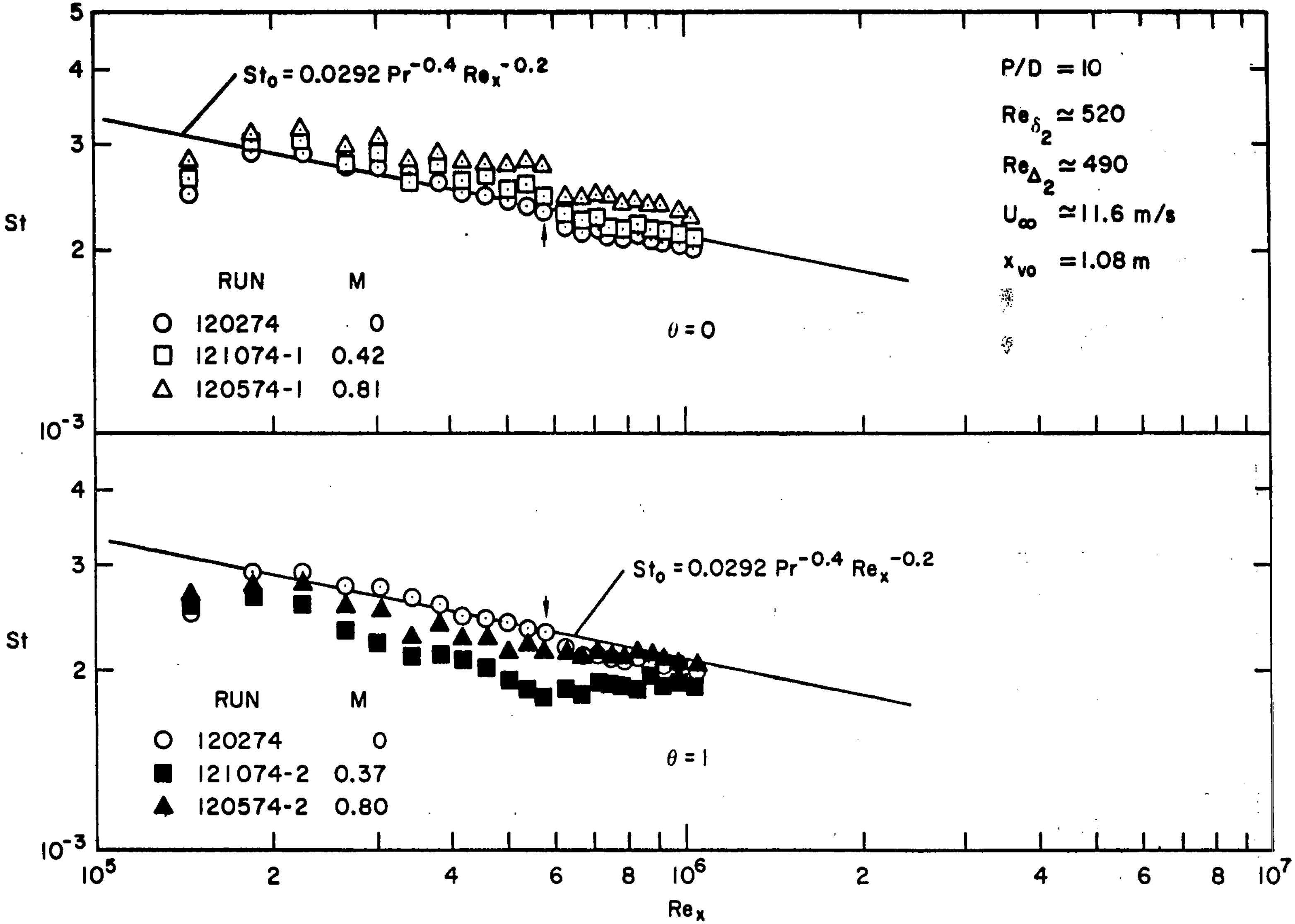

Fig. 38. St vs. Re_x with heated starting length, low initial Re_{δ_2}, and slant angle injection (P/D = 10).

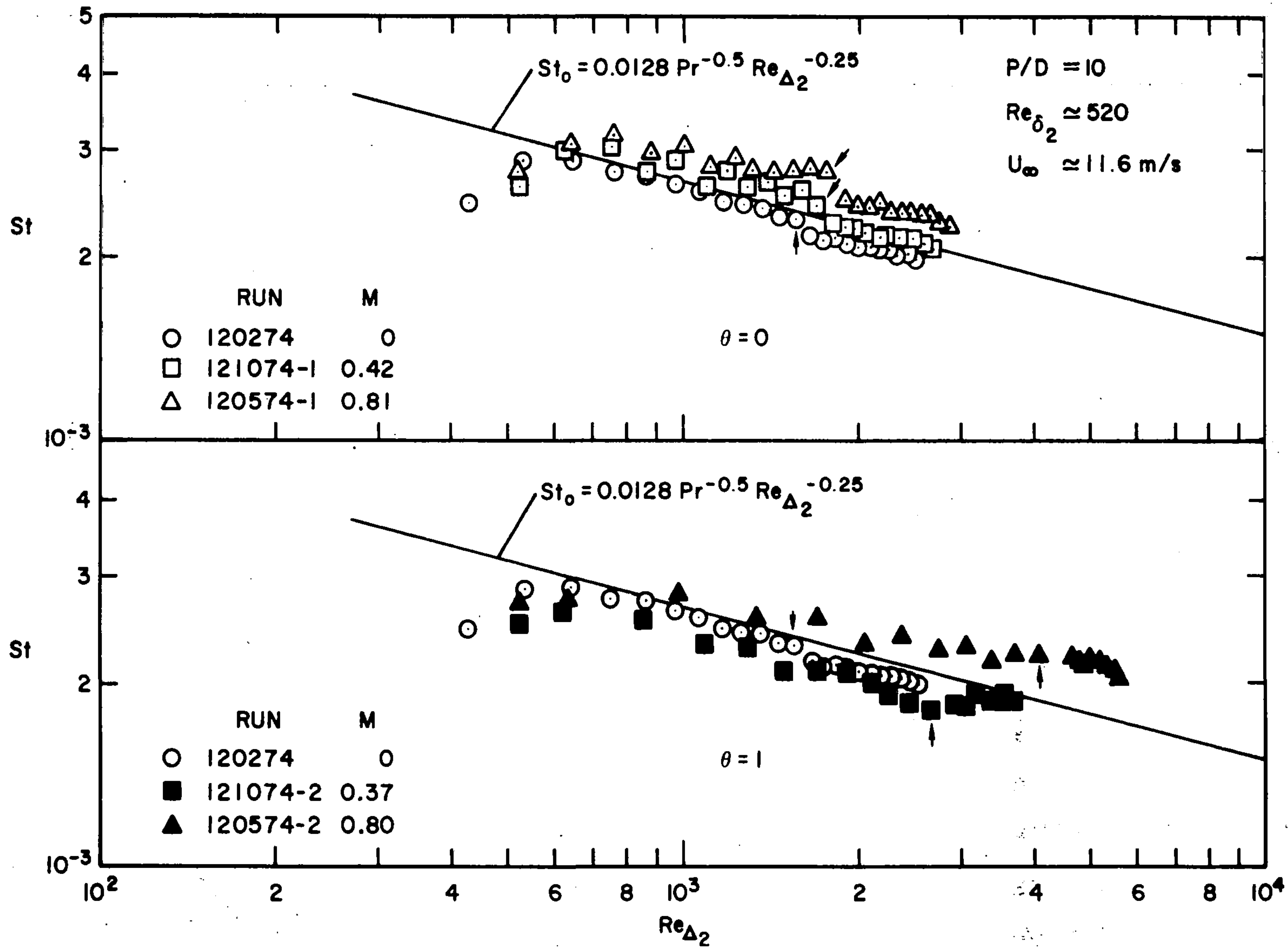

Fig. 39. Stanton number data from Fig. 38, replotted vs. Re_{Δ_2}.

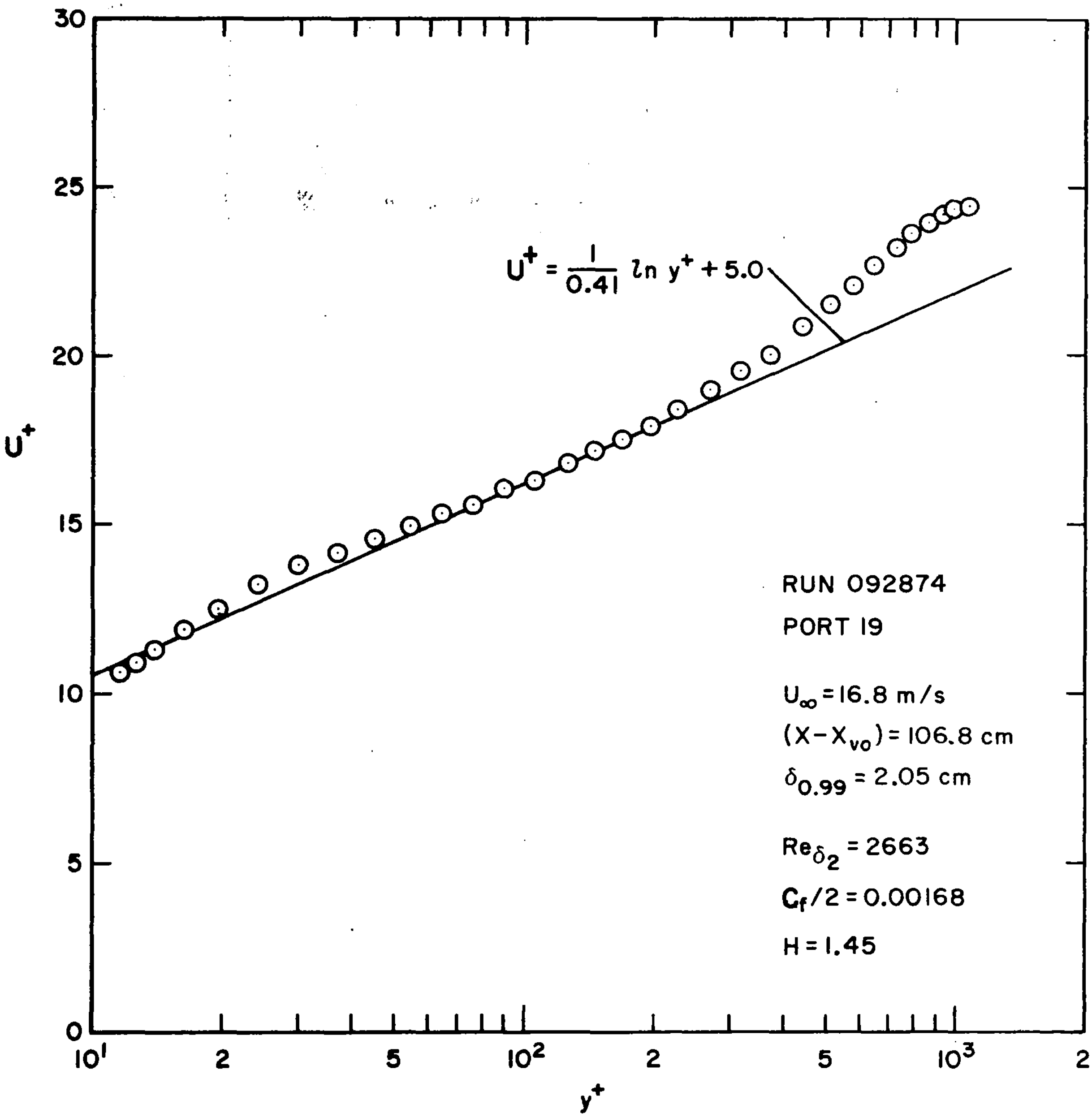

Fig. 40. Velocity profile at guard plate midpoint for Figs. 42 and 43.

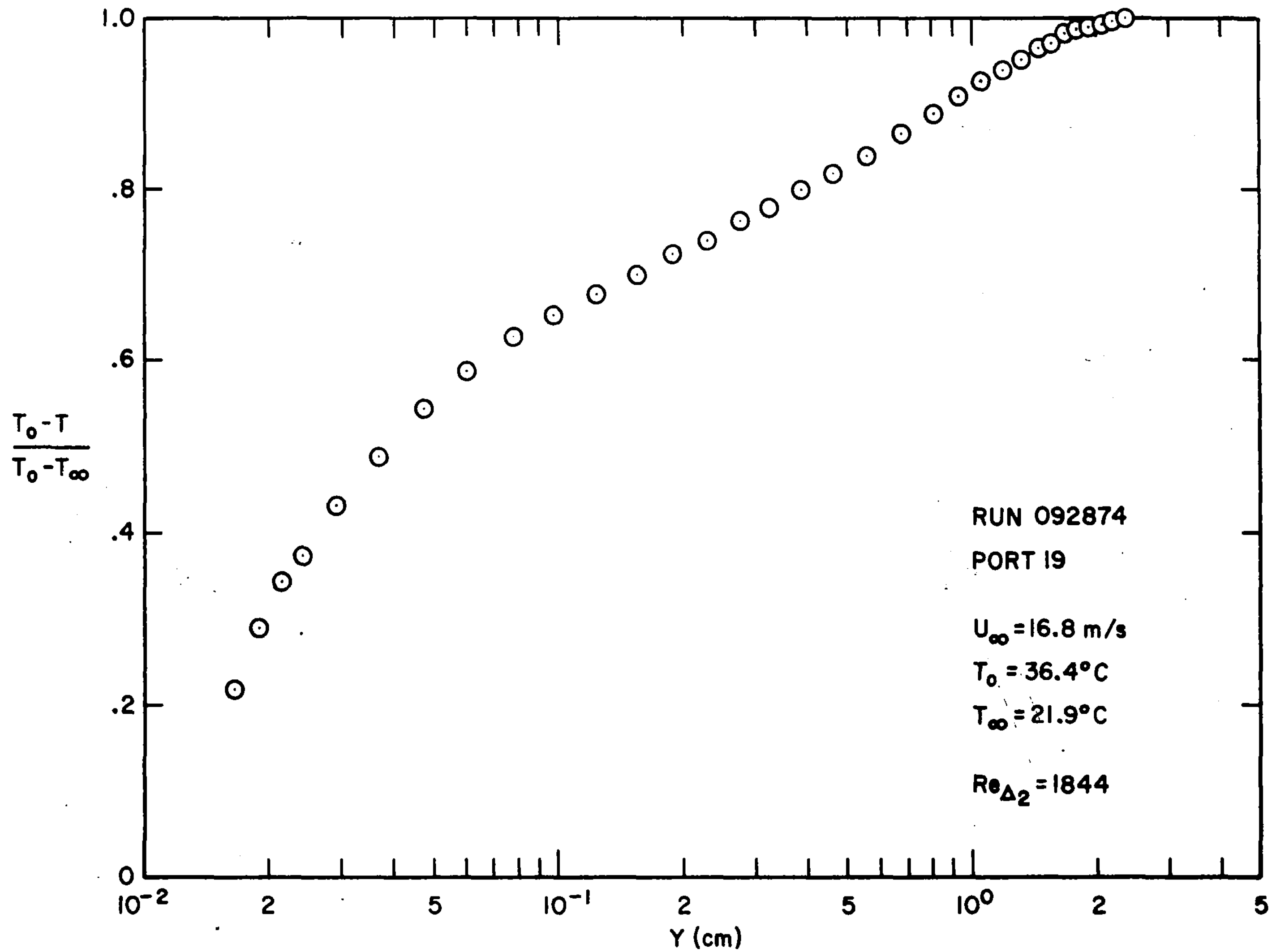

Fig. 41. Temperature profile at guard plate midpoint for Figs. 42 and 43.

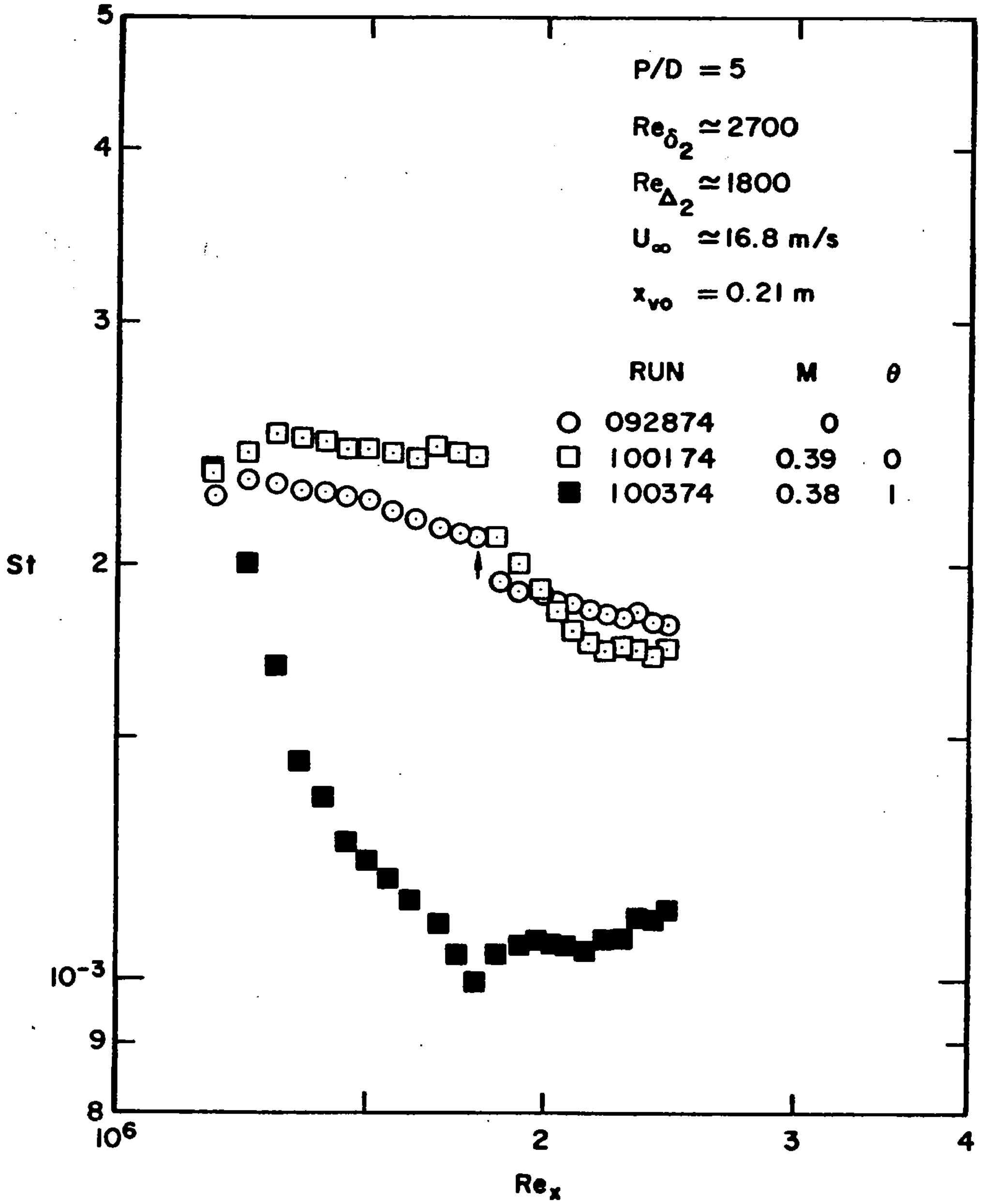

Fig. 42. St vs. Re_x with heated starting length, high initial Re_{δ_2}, and slant angle injection (P/D = 5).

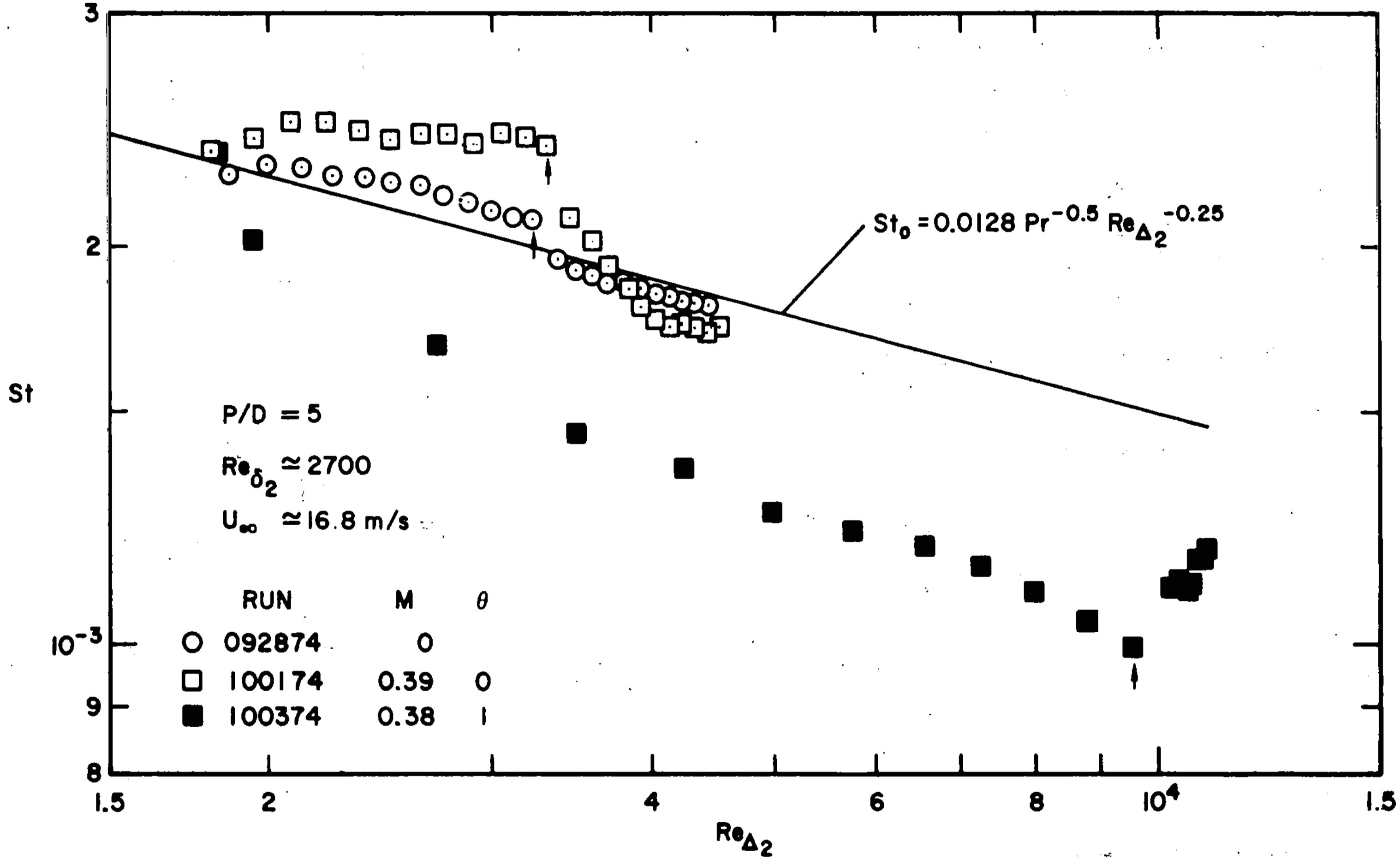

Fig. 43. Stanton number data from Fig. 42, replotted vs. Re_{Δ_2} .

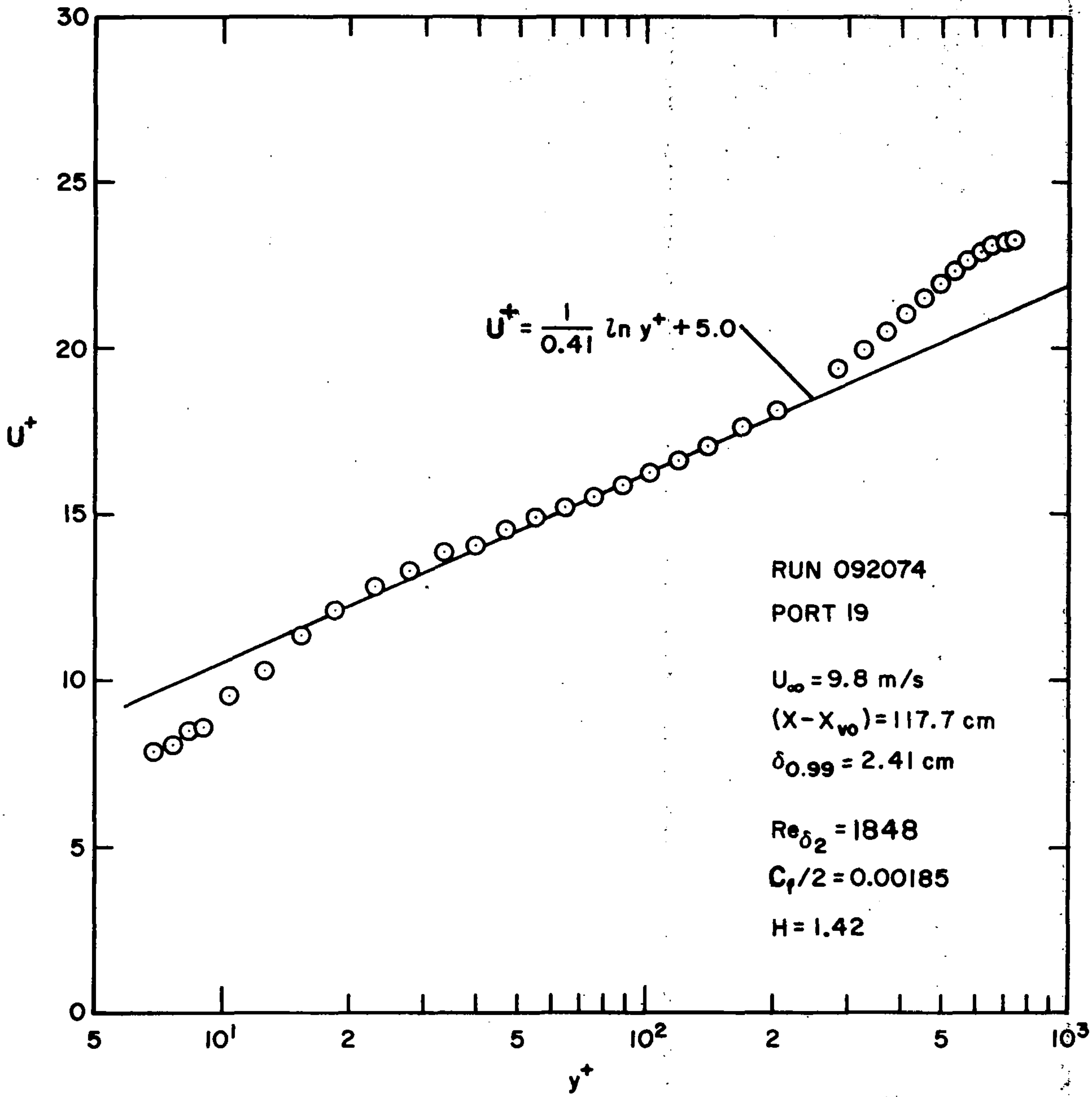

Fig. 44. Velocity profile at guard plate midpoint for Figs. 45 and 46.

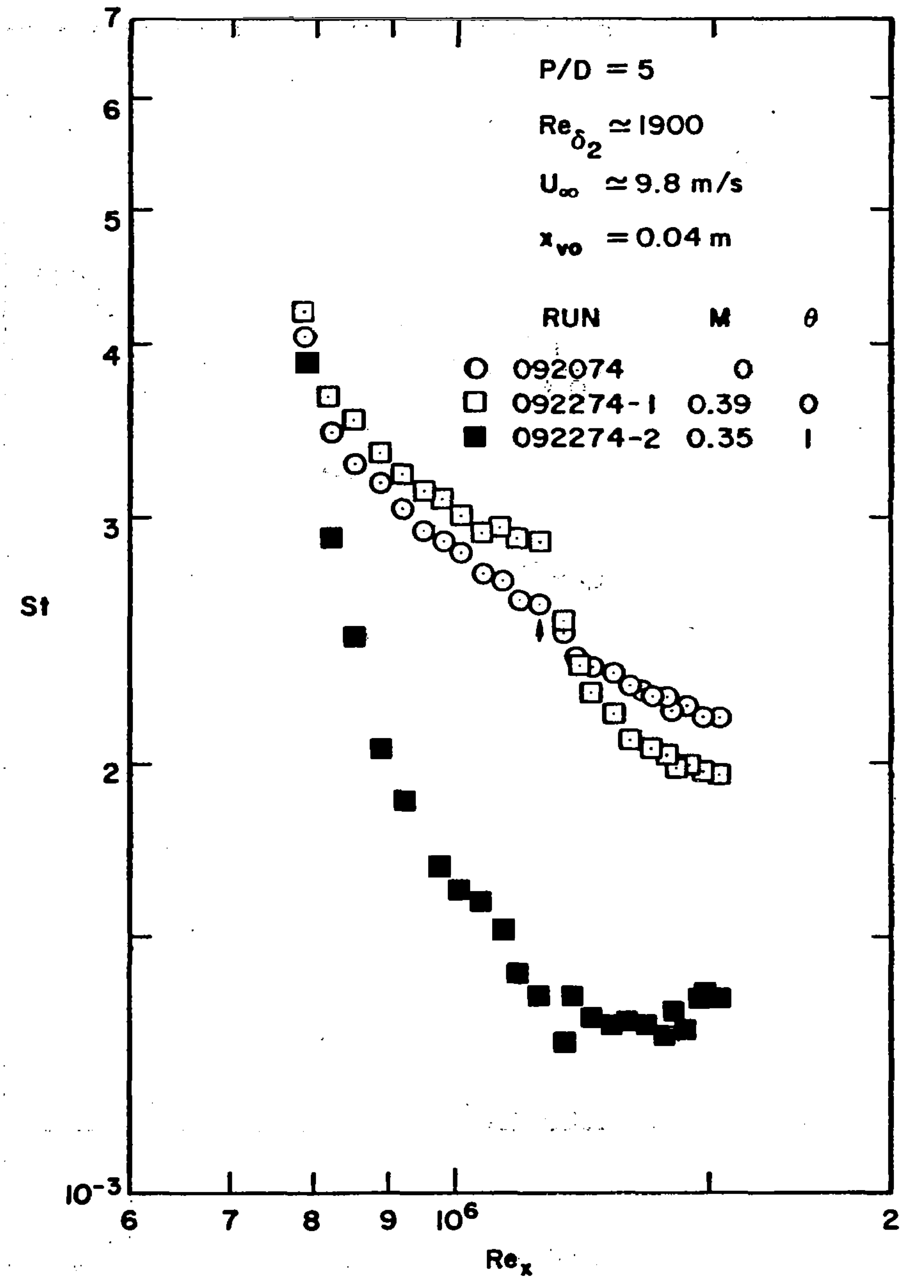

Fig. 45. St vs. Re_x with unheated starting length, high initial Re_{δ_2}, and slant angle injection (P/D = 5).

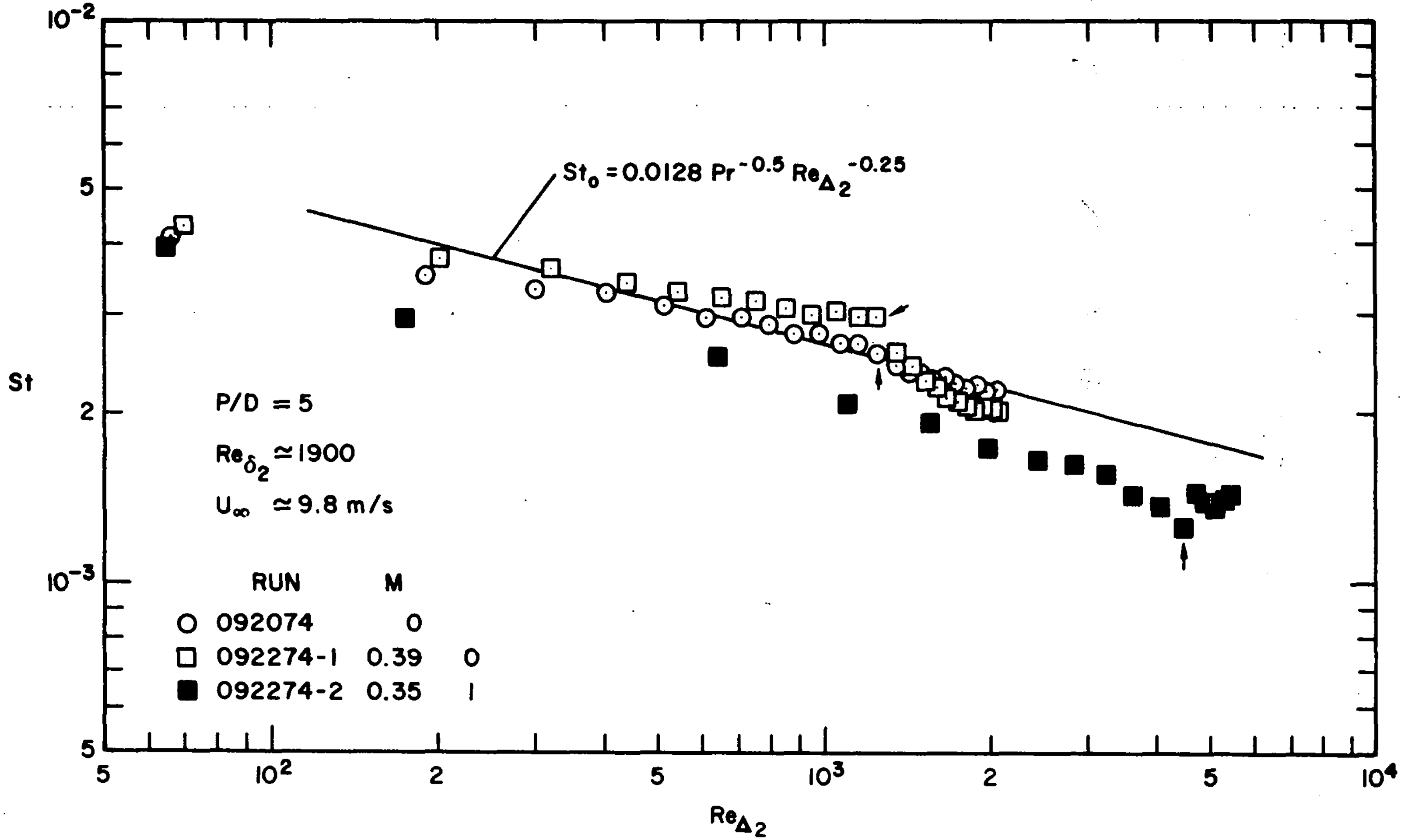

Fig. 46. Stanton number data from Fig. 45, replotted vs. Re_{Δ_2} .

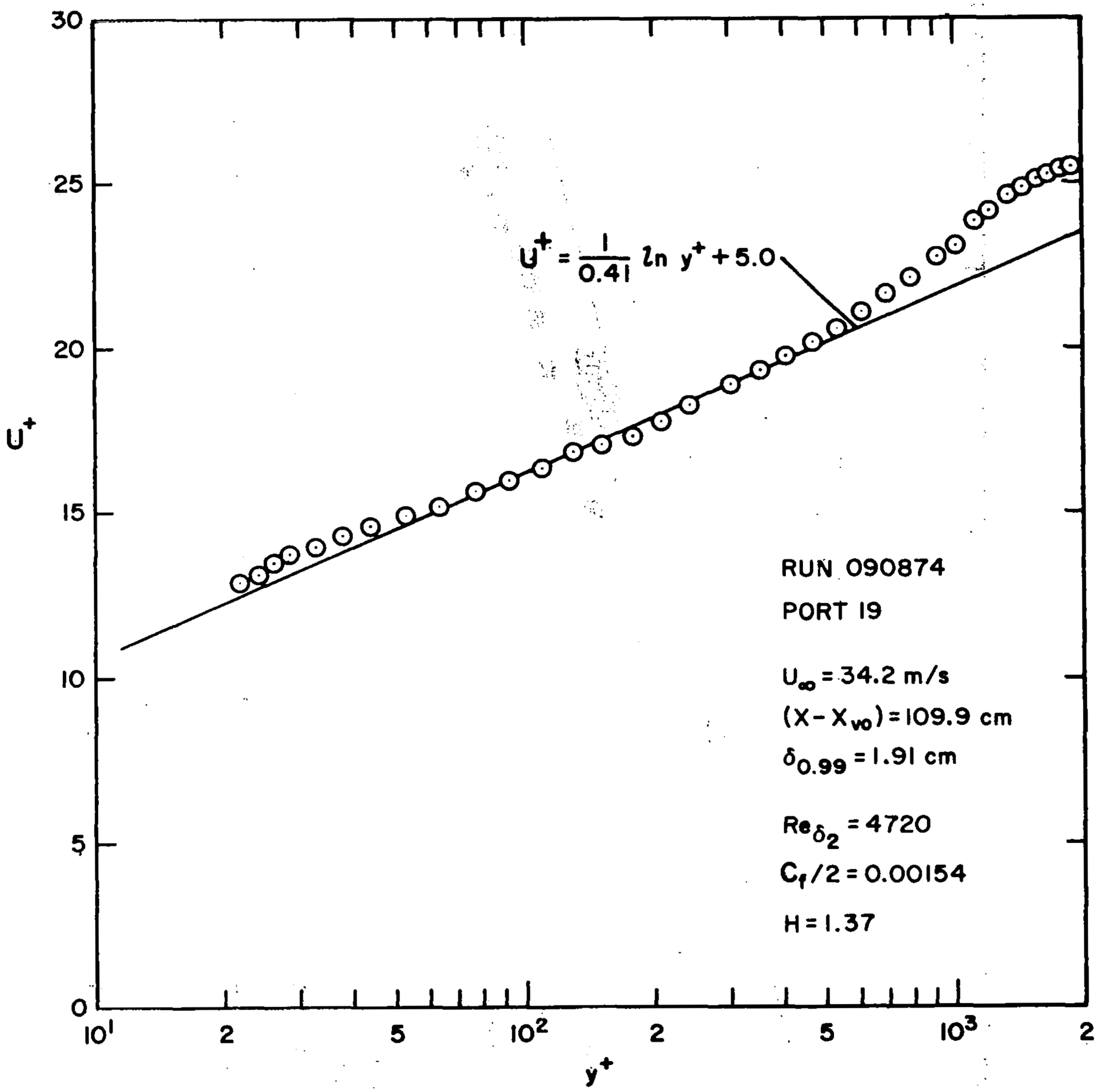

Fig. 47. Velocity profile at midpoint of guard plate for Figs. 48 and 49.

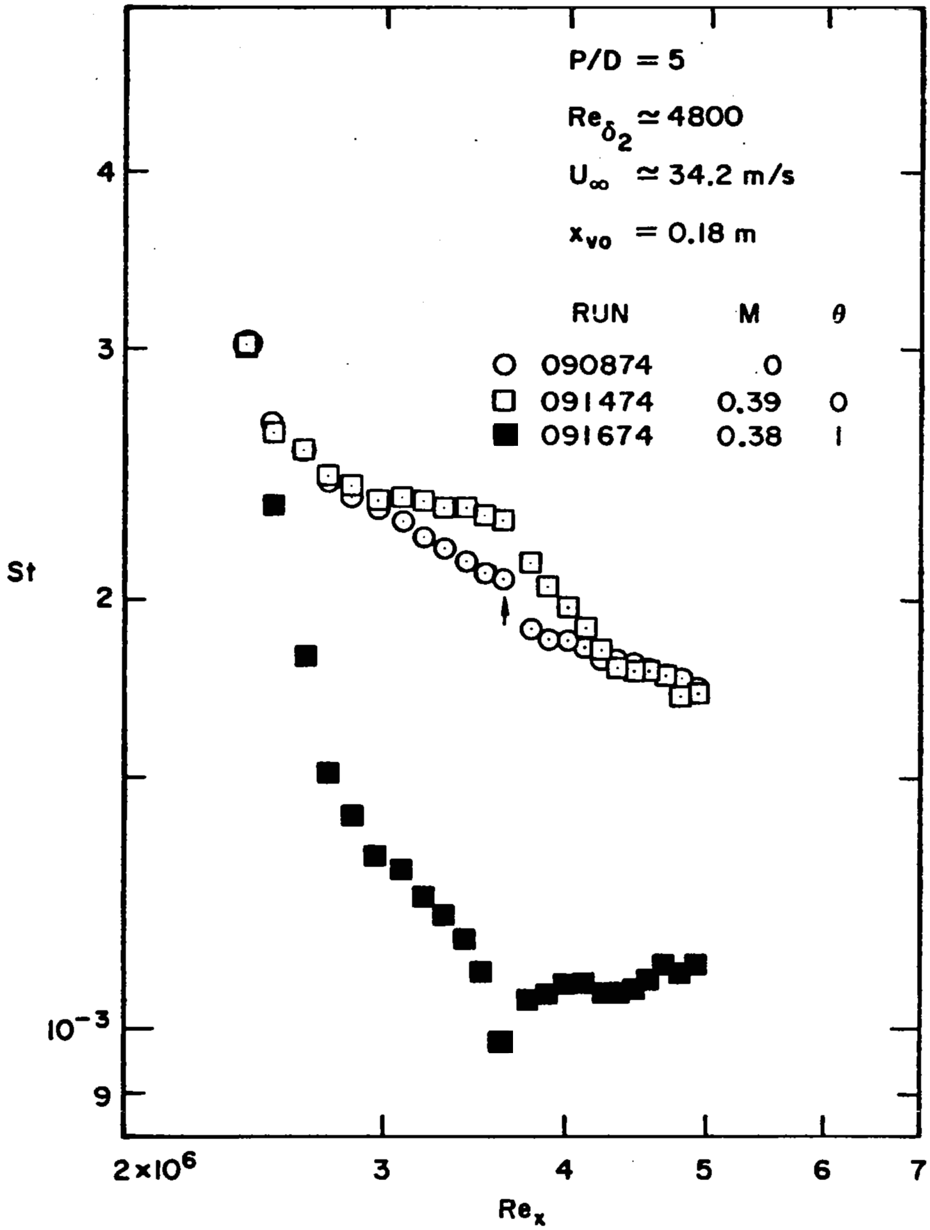

Fig. 48. St vs. Re_x with unheated starting length, high initial Re_{δ_2}, and slant angle injection (P/D = 5).

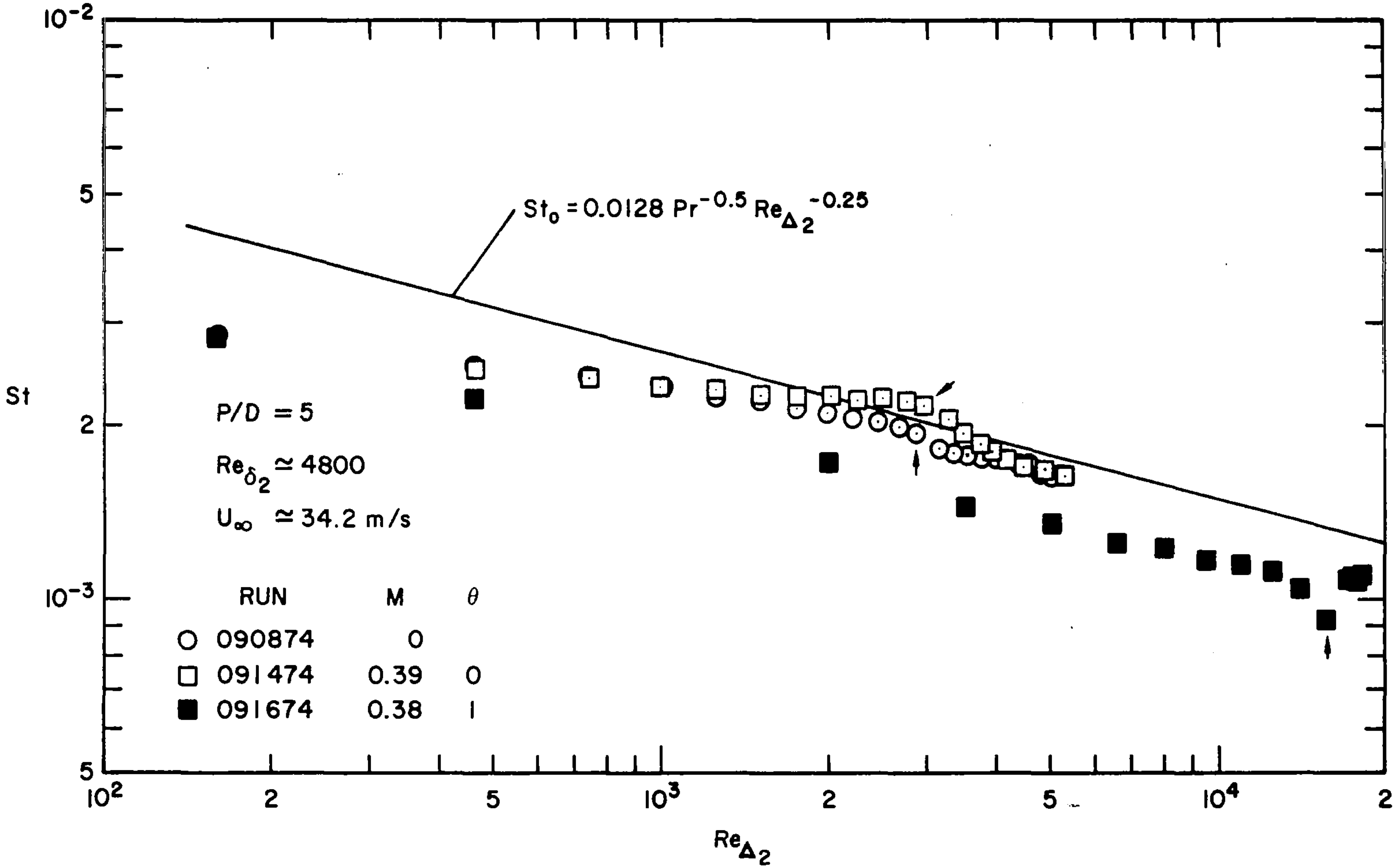

Fig. 49. Stanton number data from Fig. 48, replotted vs. Re_{Δ_2} .

APPENDIX - TABULAR FORM OF THE DATA

The data used in Figs. 8 through 49 are listed in the following pages.

Special Nomenclature

CP	c , specific heat
CF2	$C_f/2$
DEL1	δ_1
DEL2	δ_2
DEH2	Δ_2
DEL99	δ_{99}
DELT99	Δ_{99} (similar definition to δ_{99})
DREEN	Uncertainty in Re_{Δ_2}
DST	Uncertainty in St
ETA	$1 - St(\theta = 1)/St(\theta = 0)$
F-COL	F for $\theta = 0$
F-HOT	F for $\theta = 1$
LOGB	$\frac{St(\theta = 1)}{St_o} \ln\left[\frac{1 + F/St(\theta = 1)}{F/St(\theta = 1)}\right]$
PORT	Location for profile
PR	Pr
REENTH, REH, REDEL2	Re_{Δ_2}
REM	Re_{δ_2}
REX	Re_x
REXCOL	Re_x for $\theta = 0$
REXHOT	Re_x for $\theta = 1$
RHO	ρ
STCR	$St(\theta = 0)/St_o$
STHR	$St(\theta = 1)/St_o$
TADB	T_∞ , recovery

TBAR	$\begin{cases} (T - T_\infty)/(T_o - T_\infty) \\ 1 - (T - T_\infty)/(T_o - T_\infty) \end{cases}$
TINF	T_∞
TPLATE	T_o
UINF	U_∞
VISC	ν
XI	X location, temperature step
XLOC	X
XVO	X_{vo}

Note (1). The headings [e.g. 2800 STEP20 or 540HSLFP], are interpreted as follows: The first digits are the nominal initial Re_{δ_2} ; STEP implies unheated starting length; HSL implies heated starting length; the last digits are nominal blowing ratio, M , times 100; and FP is M = 0 , or "flat plate" conditions.

Note (2). Listed on the Stanton number data sheet is the definition for St_o used in formulating STHR, STCR and LOGB.

VELOCITY PROFILE FOR FIG. 8

REX = 0.12701E 07 REM = 2827.

XVO = 12.01 CM. DEL2 = 0.258 CM.
UINF = 16.81 M/S DEL99= 2.175 CM.
VISC = 0.15316E-04 M2/S DEL1 = 0.357 CM.
PORT = 19 H = 1.387
XLOC = 127.76 CM. CF/2 = 0.16817E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.012	7.23	0.430	11.4	10.49
0.030	0.014	7.65	0.455	13.7	11.09
0.036	0.016	8.07	0.480	16.0	11.70
0.041	0.019	8.41	0.500	18.3	12.20
0.046	0.021	8.69	0.517	20.6	12.60
0.051	0.023	8.89	0.529	22.9	12.91
0.056	0.026	9.11	0.542	25.1	13.21
0.061	0.028	9.26	0.551	27.4	13.43
0.066	0.030	9.40	0.559	29.7	13.64
0.071	0.033	9.52	0.566	32.0	13.81
0.079	0.036	9.67	0.576	35.4	14.04
0.086	0.040	9.83	0.585	38.9	14.26
0.097	0.044	10.02	0.596	43.4	14.54
0.112	0.051	10.23	0.608	50.3	14.84
0.124	0.057	10.35	0.616	56.0	15.01
0.142	0.065	10.55	0.628	64.0	15.31
0.160	0.074	10.75	0.640	72.0	15.59
0.185	0.085	10.90	0.649	83.4	15.82
0.211	0.097	11.11	0.661	94.9	16.12
0.239	0.110	11.28	0.671	107.4	16.36
0.290	0.133	11.55	0.687	130.3	16.76
0.353	0.162	11.96	0.712	158.9	17.35
0.417	0.192	12.25	0.729	187.4	17.78
0.480	0.221	12.51	0.744	216.0	18.15
0.607	0.279	13.00	0.773	273.2	18.86
0.734	0.338	13.47	0.802	330.3	19.55
0.861	0.396	13.88	0.826	387.5	20.13
0.988	0.454	14.26	0.849	444.6	20.70
1.115	0.513	14.64	0.871	501.7	21.25
1.242	0.571	15.01	0.893	558.9	21.78
1.496	0.688	15.60	0.928	673.2	22.64
1.750	0.805	16.14	0.960	787.5	23.42
2.004	0.921	16.48	0.981	901.8	23.91
2.258	1.038	16.70	0.994	1016.1	24.23
2.639	1.213	16.81	1.001	1187.5	24.40
3.020	1.389	16.91	1.000	1359.0	24.39

RUN 092074 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 1900STEPFP SLANT HOLE INJECTION P/D=5 ***

TADB= 23.61 DEG C UINF= 8.77 M/S TINF= 23.57 DEG C
RHO= 1.177 KG/M3 VISC= 0.15419E-04 M2/S XVO= 3.6 CM
CP= 1015. J/KGK PR= 0.717

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.78737E 06	0.65659E 02	0.40778E-02	0.118E-03	2.
2	132.8	0.81958E 06	0.18724E 03	0.34731E-02	0.109E-03	3.
3	137.9	0.85178E 06	0.29626E 03	0.32976E-02	0.107E-03	4.
4	143.0	0.88398E 06	0.40081E 03	0.31954E-02	0.106E-03	5.
5	148.1	0.91619E 06	0.50159E 03	0.30636E-02	0.104E-03	5.
6	153.2	0.94839E 06	0.59833E 03	0.29447E-02	0.102E-03	6.
7	158.2	0.98059E 06	0.69291E 03	0.29288E-02	0.102E-03	6.
8	163.3	0.10128E 07	0.78585E 03	0.28434E-02	0.101E-03	7.
9	168.4	0.10450E 07	0.87605E 03	0.27586E-02	0.100E-03	7.
10	173.5	0.10732E 07	0.96433E 03	0.27241E-02	0.999E-04	7.
11	178.6	0.11094E 07	0.10507E 04	0.26399E-02	0.989E-04	8.
12	183.6	0.11416E 07	0.11354E 04	0.26182E-02	0.985E-04	8.
13	187.5	0.11661E 07	0.11987E 04	0.25477E-02	0.102E-03	8.
14	190.1	0.11827E 07	0.12406E 04	0.25045E-02	0.103E-03	8.
15	192.7	0.11993E 07	0.12814E 04	0.24022E-02	0.100E-03	9.
16	195.4	0.12159E 07	0.13211E 04	0.23899E-02	0.983E-04	9.
17	198.0	0.12326E 07	0.13609E 04	0.23935E-02	0.985E-04	9.
18	200.6	0.12492E 07	0.14004E 04	0.23647E-02	0.978E-04	9.
19	203.2	0.12658E 07	0.14393E 04	0.23299E-02	0.951E-04	9.
20	205.8	0.12323E 07	0.14781E 04	0.23410E-02	0.964E-04	9.
21	208.5	0.12989E 07	0.15167E 04	0.23024E-02	0.943E-04	9.
22	211.1	0.13155E 07	0.15547E 04	0.22817E-02	0.956E-04	9.
23	213.7	0.13321E 07	0.15924E 04	0.22546E-02	0.935E-04	9.
24	216.3	0.13488E 07	0.16301E 04	0.22834E-02	0.962E-04	9.
25	218.9	0.13654E 07	0.16678E 04	0.22599E-02	0.946E-04	9.
26	221.6	0.13820E 07	0.17051E 04	0.22380E-02	0.983E-04	9.
27	224.2	0.13986E 07	0.17432E 04	0.23425E-02	0.913E-04	9.
28	226.8	0.14152E 07	0.17809E 04	0.22071E-02	0.982E-04	9.
29	229.4	0.14318E 07	0.18179E 04	0.22524E-02	0.919E-04	10.
30	232.0	0.14483E 07	0.18551E 04	0.22182E-02	0.949E-04	10.
31	234.6	0.14649E 07	0.18917E 04	0.21888E-02	0.922E-04	10.
32	237.3	0.14816E 07	0.19278E 04	0.21700E-02	0.915E-04	10.
33	239.9	0.14983E 07	0.19640E 04	0.21873E-02	0.922E-04	10.
34	242.5	0.15148E 07	0.20002E 04	0.21705E-02	0.891E-04	10.
35	245.1	0.15314E 07	0.20359E 04	0.21338E-02	0.937E-04	10.
36	247.8	0.15480E 07	0.20712E 04	0.21110E-02	0.102E-03	10.

STANTON NUMBER DATA RUN 073073 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP10 M=0.1 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 070573 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP10 M=0.1 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 073073 AND 070573 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1203454.0	104.8	0.003980	1179530.0	95.9	0.003716	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1256122.0	300.7	0.003460	1231151.0	346.9	0.002772	0.199	0.899	0.0033	0.987	0.0032	1.489
3	1308789.0	482.7	0.003449	1282771.0	640.3	0.002596	0.247	1.003	0.0029	0.982	0.0028	1.442
4	1361457.0	660.6	0.003310	1334392.0	923.8	0.002423	0.268	1.037	0.0033	0.955	0.0032	1.497
5	1414124.0	831.7	0.003185	1386013.0	1207.7	0.002267	0.288	1.055	0.0030	0.922	0.0031	1.464
6	1466792.0	997.5	0.003111	1437633.0	1488.4	0.002125	0.317	1.077	0.0033	0.886	0.0034	1.481
7	1519459.0	1159.2	0.003030	1489254.0	1751.2	0.002116	0.302	1.088	0.0028	0.902	0.0026	1.378
8	1572127.0	1316.1	0.002930	1540874.0	2003.2	0.001977	0.325	1.086	0.0031	0.860	0.0031	1.429
9	1624795.0	1470.5	0.002932	1592495.0	2254.9	0.001908	0.349	1.117	0.0030	0.843	0.0028	1.365
10	1677462.0	1624.5	0.002918	1644116.0	2504.6	0.001886	0.354	1.139	0.0033	0.847	0.0031	1.434
11	1730130.0	1775.7	0.002821	1695736.0	2752.8	0.001871	0.337	1.125	0.0030	0.852	0.0027	1.384
12	1782797.0	1922.8	0.002768	1747357.0	2998.5	0.001781	0.357	1.126	0.0033	0.822	0.0031	1.422
13	1822825.0	2031.1	0.002604	1786589.0	3150.0	0.001876	0.280	1.074		0.873		
14	1849949.0	2099.7	0.002446	1813173.0	3198.5	0.001767	0.278	1.018		0.827		
15	1877073.0	2164.9	0.002354	1839758.0	3245.2	0.001745	0.259	0.988		0.822		
16	1904328.0	2227.3	0.002244	1866471.0	3292.6	0.001812	0.192	0.950		0.858		
17	1931583.0	2286.8	0.002140	1893185.0	3340.6	0.001801	0.158	0.913		0.858		
18	1958707.0	2347.5	0.002332	1919769.0	3387.7	0.001733	0.257	1.003		0.829		
19	1985831.0	2408.4	0.002154	1946354.0	3434.7	0.001803	0.163	0.933		0.868		
20	2012955.0	2466.0	0.002084	1972939.0	3482.3	0.001773	0.149	0.910		0.857		
21	2040079.0	2524.4	0.002216	1999524.0	3530.7	0.001859	0.161	0.974		0.903		
22	2067203.0	2582.9	0.002093	2026108.0	3579.5	0.001811	0.135	0.926		0.884		
23	2094326.0	2639.3	0.002058	2052693.0	3626.7	0.001735	0.157	0.916		0.851		
24	2121582.0	2695.9	0.002113	2079406.0	3673.5	0.001781	0.157	0.947		0.877		
25	2148837.0	2750.9	0.001935	2106120.0	3720.4	0.001746	0.098	0.873		0.864		
26	2175961.0	2806.5	0.002158	2132704.0	3768.4	0.001861	0.138	0.979		0.924		
27	2203085.0	2864.8	0.002141	2159289.0	3816.8	0.001774	0.172	0.977		0.885		
28	2230208.0	2921.9	0.002059	2185874.0	3863.8	0.001757	0.147	0.945		0.880		
29	2257333.0	2980.4	0.002248	2212459.0	3910.4	0.001743	0.225	1.037		0.877		
30	2284456.0	3038.1	0.002003	2239043.0	3957.7	0.001817	0.093	0.929		0.917		
31	2311580.0	3093.3	0.002066	2265628.0	4006.1	0.001815	0.122	0.963		0.920		
32	2338835.0	3147.8	0.001942	2292341.0	4053.6	0.001758	0.095	0.910		0.894		
33	2366091.0	3200.9	0.001971	2319055.0	4100.5	0.001764	0.105	0.928		0.900		
34	2393215.0	3254.6	0.001985	2345639.0	4147.6	0.001775	0.105	0.939		0.910		
35	2420338.0	3308.8	0.002008	2372224.0	4195.3	0.001811	0.098	0.955		0.931		
36	2447462.0	3362.6	0.001950	2398809.0	4243.7	0.001824	0.065	0.932		0.941		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 072973 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 070873 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 072973 AND 070873 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1208742.0	105.5	0.003990	1177937.0	97.7	0.003792	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1261641.0	307.8	0.003658	1229488.0	461.0	0.002899	0.207	0.951	0.0066	1.031	0.0074	2.077
3	1314540.0	503.4	0.003737	1281039.0	976.7	0.002739	0.267	1.088	0.0067	1.035	0.0070	2.081
4	1367439.0	698.9	0.003654	1332590.0	1463.4	0.002521	0.310	1.146	0.0065	0.993	0.0067	2.030
5	1420338.0	888.2	0.003502	1384141.0	1915.1	0.002367	0.324	1.161	0.0067	0.962	0.0060	1.929
6	1473237.0	1071.0	0.003411	1435692.0	2363.6	0.002164	0.366	1.182	0.0065	0.902	0.0069	2.008
7	1526136.0	1248.4	0.003295	1487243.0	2801.5	0.002122	0.356	1.184	0.0067	0.905	0.0058	1.879
8	1579036.0	1421.0	0.003230	1538794.0	3212.7	0.002002	0.380	1.198	0.0066	0.870	0.0060	1.885
9	1631935.0	1590.6	0.003183	1590345.0	3621.5	0.001900	0.403	1.213	0.0066	0.840	0.0059	1.852
10	1684834.0	1758.8	0.003177	1641896.0	4039.0	0.001871	0.411	1.241	0.0066	0.840	0.0065	1.946
11	1737733.0	1926.1	0.003146	1693446.0	4452.5	0.001781	0.434	1.256	0.0066	0.811	0.0059	1.837
12	1790632.0	2090.2	0.003060	1744997.0	4857.5	0.001729	0.435	1.246	0.0066	0.797	0.0063	1.893
13	1830835.0	2209.2	0.002793	1784176.0	5088.8	0.001827	0.346	1.153		0.850		
14	1858078.0	2282.5	0.002582	1810725.0	5136.2	0.001735	0.328	1.076		0.812		
15	1885321.0	2351.0	0.002436	1837273.0	5181.6	0.001679	0.311	1.024		0.790		
16	1912696.0	2415.6	0.002302	1863951.0	5226.2	0.001683	0.269	0.975		0.797		
17	1940071.0	2476.8	0.002188	1890628.0	5270.3	0.001630	0.255	0.934		0.776		
18	1967314.0	2538.3	0.002318	1917177.0	5313.6	0.001627	0.298	0.998		0.779		
19	1994557.0	2599.2	0.002149	1943726.0	5357.0	0.001645	0.235	0.932		0.791		
20	2021800.0	2656.8	0.002072	1970275.0	5400.2	0.001605	0.225	0.905		0.776		
21	2049044.0	2714.8	0.002186	1996824.0	5443.8	0.001673	0.235	0.961		0.813		
22	2076286.0	2772.9	0.002076	2023372.0	5487.8	0.001641	0.210	0.919		0.801		
23	2103529.0	2828.8	0.002023	2049921.0	5530.7	0.001587	0.216	0.902		0.778		
24	2130904.0	2884.7	0.002073	2076598.0	5573.3	0.001613	0.222	0.930		0.794		
25	2158280.0	2939.9	0.001973	2103276.0	5615.5	0.001562	0.209	0.890		0.772		
26	2185523.0	2996.5	0.002175	2129825.0	5657.7	0.001620	0.255	0.987		0.805		
27	2212766.0	3054.5	0.002083	2156373.0	5700.8	0.001622	0.221	0.951		0.809		
28	2240009.0	3110.7	0.002035	2182922.0	5744.0	0.001629	0.199	0.934		0.816		
29	2267252.0	3168.5	0.002203	2209471.0	5788.0	0.001678	0.238	1.017		0.844		
30	2294495.0	3225.9	0.002009	2236020.0	5832.6	0.001681	0.164	0.933		0.848		
31	2321738.0	3281.2	0.002045	2262568.0	5876.8	0.001647	0.195	0.954		0.834		
32	2349113.0	3335.5	0.001940	2289246.0	5920.4	0.001633	0.158	0.910		0.830		
33	2376488.0	3389.1	0.001988	2315923.0	5963.7	0.001624	0.183	0.937		0.829		
34	2403731.0	3443.2	0.001980	2342472.0	6006.9	0.001622	0.181	0.938		0.831		
35	2430974.0	3497.5	0.001999	2369021.0	6050.6	0.001666	0.167	0.951		0.856		
36	2458217.0	3551.8	0.001981	2395569.0	6094.9	0.001668	0.158	0.947		0.860		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 072773 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP30 M=0.3 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 070973 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP30 M=0.3 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 072773 AND 070973 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1183569.0	101.2	0.003909	1186933.0	97.8	0.003767	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUJJ
2	1235366.0	299.4	0.003744	1238878.0	520.2	0.002969	0.207	0.970	0.0102	1.059	0.0095	2.364
3	1287164.0	498.4	0.003940	1290822.0	1185.6	0.002806	0.288	1.143	0.0101	1.063	0.0103	2.534
4	1338961.0	701.2	0.003889	1342767.0	1853.2	0.002573	0.338	1.216	0.0102	1.016	0.0100	2.489
5	1390759.0	898.1	0.003715	1394711.0	2508.6	0.002364	0.364	1.227	0.0101	0.963	0.0103	2.499
6	1442556.0	1089.2	0.003664	1446656.0	3160.4	0.002150	0.413	1.265	0.0101	0.899	0.0103	2.451
7	1494353.0	1276.6	0.003570	1498600.0	3788.3	0.002075	0.419	1.279	0.0100	0.887	0.0097	2.382
8	1546151.0	1458.7	0.003461	1550545.0	4392.7	0.001975	0.430	1.279	0.0100	0.860	0.0096	2.360
9	1597948.0	1636.4	0.003401	1602490.0	4986.1	0.001858	0.453	1.292	0.0100	0.823	0.0094	2.318
10	1649745.0	1812.1	0.003384	1654434.0	5606.1	0.001815	0.464	1.317	0.0100	0.817	0.0108	2.500
11	1701543.0	1985.6	0.003314	1706379.0	6244.2	0.001672	0.495	1.318	0.0100	0.763	0.0103	2.392
12	1753340.0	2154.3	0.003201	1758323.0	6861.0	0.001623	0.493	1.299	0.0100	0.750	0.0101	2.363
13	1792706.0	2274.8	0.002814	1797801.0	7187.2	0.001594	0.434	1.158		0.743		
14	1819382.0	2346.3	0.002539	1824553.0	7228.9	0.001520	0.401	1.054		0.713		
15	1846057.0	2411.6	0.002352	1851304.0	7268.7	0.001451	0.383	0.985		0.685		
16	1872862.0	2472.8	0.002230	1878185.0	7307.5	0.001440	0.354	0.942		0.683		
17	1899667.0	2530.7	0.002107	1905067.0	7345.5	0.001402	0.334	0.897		0.669		
18	1926343.0	2587.8	0.002166	1931818.0	7383.0	0.001398	0.355	0.929		0.671		
19	1953019.0	2644.1	0.002053	1958570.0	7420.5	0.001398	0.319	0.887		0.674		
20	1979694.0	2697.7	0.001959	1985321.0	7457.4	0.001363	0.304	0.853		0.660		
21	2006370.0	2751.5	0.002073	2012073.0	7494.9	0.001432	0.309	0.908		0.697		
22	2033046.0	2805.1	0.001937	2038824.0	7533.0	0.001411	0.272	0.855		0.690		
23	2059721.0	2856.2	0.001894	2065576.0	7570.1	0.001365	0.279	0.841		0.671		
24	2086526.0	2908.0	0.001983	2092457.0	7607.2	0.001401	0.294	0.886		0.691		
25	2113332.0	2959.4	0.001867	2119338.0	7644.1	0.001360	0.272	0.839		0.674		
26	2140007.0	3011.8	0.002056	2146089.0	7681.3	0.001413	0.313	0.930		0.703		
27	2166683.0	3065.6	0.001975	2172841.0	7719.3	0.001426	0.278	0.899		0.713		
28	2193358.0	3117.6	0.001913	2199592.0	7757.6	0.001437	0.249	0.875		0.721		
29	2220034.0	3170.7	0.002067	2226344.0	7797.0	0.001506	0.271	0.951		0.759		
30	2246710.0	3223.6	0.001893	2253096.0	7837.1	0.001488	0.214	0.875		0.753		
31	2273386.0	3274.9	0.001949	2279847.0	7876.8	0.001475	0.243	0.906		0.749		
32	2300190.0	3325.5	0.001839	2306728.0	7916.3	0.001473	0.199	0.859		0.751		
33	2326996.0	3374.9	0.001865	2333609.0	7955.7	0.001467	0.213	0.876		0.750		
34	2353671.0	3425.2	0.001897	2360361.0	7995.1	0.001477	0.222	0.896		0.758		
35	2380347.0	3475.9	0.001904	2387112.0	8035.3	0.001523	0.200	0.903		0.785		
36	2407022.0	3526.7	0.001899	2413864.0	8076.0	0.001521	0.199	0.905		0.786		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 072673 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP40 M=0.4 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 071573 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP40 M=0.4 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 072673 AND 071573 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1167423.0	99.4	0.003890	1182215.0	98.6	0.003811	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1218514.0	297.4	0.003864	1233953.0	626.4	0.003112	0.195	0.998	0.0136	1.109	0.0135	2.869
3	1269605.0	500.2	0.004073	1285691.0	1488.1	0.002999	0.264	1.178	0.0137	1.135	0.0137	3.022
4	1320696.0	707.1	0.004027	1337429.0	2334.2	0.002739	0.320	1.255	0.0134	1.080	0.0132	2.961
5	1371786.0	908.5	0.003857	1389167.0	3159.1	0.002501	0.351	1.270	0.0136	1.018	0.0134	2.948
6	1422877.0	1104.0	0.003795	1440905.0	3997.7	0.002204	0.419	1.306	0.0135	0.920	0.0143	2.968
7	1473968.0	1294.9	0.003681	1492643.0	4840.0	0.002157	0.414	1.314	0.0138	0.921	0.0139	2.953
8	1525059.0	1480.2	0.003572	1544381.0	5636.8	0.002007	0.438	1.316	0.0135	0.873	0.0128	2.781
9	1576150.0	1661.2	0.003514	1596119.0	6398.9	0.001816	0.483	1.331	0.0137	0.804	0.0129	2.727
10	1627240.0	1839.7	0.003473	1647857.0	7181.7	0.001724	0.504	1.348	0.0135	0.775	0.0138	2.826
11	1678331.0	2016.3	0.003441	1699595.0	7980.8	0.001516	0.559	1.365	0.0136	0.691	0.0138	2.721
12	1729422.0	2188.5	0.003297	1751333.0	8759.1	0.001380	0.582	1.334	0.0134	0.637	0.0134	2.606
13	1768251.0	2310.0	0.002837	1790654.0	9162.0	0.001588	0.440	1.164		0.740		
14	1794563.0	2381.2	0.002566	1817299.0	9202.5	0.001445	0.437	1.062		0.677		
15	1820874.0	2446.1	0.002361	1843945.0	9239.3	0.001314	0.443	0.986		0.620		
16	1847314.0	2506.2	0.002204	1870719.0	9274.2	0.001302	0.409	0.928		0.617		
17	1873753.0	2562.3	0.002055	1897493.0	9308.1	0.001239	0.397	0.872		0.591		
18	1900065.0	2617.5	0.002136	1924138.0	9341.0	0.001230	0.424	0.913		0.589		
19	1926377.0	2671.4	0.001955	1950783.0	9374.2	0.001258	0.356	0.842		0.606		
20	1952688.0	2722.5	0.001921	1977429.0	9407.1	0.001209	0.371	0.833		0.585		
21	1979000.0	2774.1	0.002002	2004074.0	9440.0	0.001255	0.373	0.875		0.610		
22	2005312.0	2825.4	0.001892	2030719.0	9473.5	0.001263	0.332	0.832		0.617		
23	2031624.0	2874.9	0.001863	2057364.0	9506.7	0.001223	0.344	0.825		0.600		
24	2058063.0	2924.7	0.001920	2084138.0	9539.6	0.001243	0.353	0.855		0.613		
25	2084503.0	2974.5	0.001860	2110913.0	9572.1	0.001196	0.357	0.834		0.592		
26	2110814.0	3025.5	0.002013	2137558.0	9605.7	0.001322	0.343	0.908		0.657		
27	2137126.0	3077.7	0.001951	2164203.0	9640.7	0.001303	0.332	0.885		0.651		
28	2163438.0	3128.5	0.001903	2190848.0	9675.4	0.001294	0.320	0.868		0.649		
29	2189750.0	3180.8	0.002066	2217494.0	9711.5	0.001418	0.314	0.948		0.713		
30	2216061.0	3233.0	0.001896	2244139.0	9748.6	0.001363	0.281	0.874		0.689		
31	2242373.0	3283.6	0.001946	2270784.0	9784.8	0.001351	0.306	0.902		0.685		
32	2268812.0	3333.8	0.001864	2297558.0	9821.0	0.001357	0.272	0.868		0.691		
33	2295252.0	3383.3	0.001900	2324332.0	9857.1	0.001353	0.288	0.890		0.691		
34	2321564.0	3433.4	0.001900	2350978.0	9893.5	0.001376	0.276	0.894		0.705		
35	2347875.0	3483.8	0.001932	2377623.0	9930.6	0.001406	0.272	0.913		0.724		
36	2374187.0	3534.7	0.001928	2404268.0	9968.3	0.001422	0.263	0.916		0.734		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 071773 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP50 M=0.5 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 071873-1 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP50 M=0.5 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 071773 AND 071873-1 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1182168.0	101.8	0.003934	1172349.0	99.2	0.003868	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1233904.0	305.7	0.003951	1223655.0	712.8	0.003266	0.173	1.023	0.0174	1.161	0.0168	3.289
3	1285640.0	516.5	0.004199	1274961.0	1746.7	0.003199	0.238	1.218	0.0168	1.208	0.0171	3.491
4	1337376.0	734.1	0.004211	1326268.0	2774.3	0.002951	0.299	1.315	0.0172	1.162	0.0169	3.485
5	1389112.0	947.9	0.004053	1377574.0	3782.0	0.002694	0.335	1.338	0.0170	1.095	0.0168	3.447
6	1440849.0	1156.1	0.003995	1428880.0	4779.8	0.002384	0.403	1.378	0.0171	0.994	0.0170	3.385
7	1492585.0	1358.7	0.003840	1480187.0	5770.2	0.002271	0.409	1.374	0.0170	0.967	0.0169	3.377
8	1544321.0	1553.3	0.003683	1531493.0	6738.8	0.002080	0.435	1.360	0.0173	0.903	0.0165	3.271
9	1596057.0	1740.8	0.003562	1582799.0	7688.3	0.001852	0.480	1.352	0.0173	0.818	0.0166	3.188
10	1647793.0	1923.8	0.003514	1634106.0	8635.7	0.001731	0.508	1.367	0.0170	0.776	0.0168	3.173
11	1699529.0	2101.9	0.003371	1685412.0	9573.8	0.001555	0.539	1.340	0.0170	0.707	0.0165	3.064
12	1751265.0	2275.0	0.003319	1736718.0	10493.6	0.001348	0.594	1.346	0.0170	0.621	0.0164	2.935
13	1790584.0	2398.4	0.002818	1775711.0	10967.9	0.001383	0.509	1.159		0.643		
14	1817228.0	2469.7	0.002527	1802134.0	11002.8	0.001258	0.502	1.048		0.589		
15	1843872.0	2534.0	0.002292	1828557.0	11034.7	0.001147	0.500	0.959		0.540		
16	1870646.0	2592.8	0.002118	1855107.0	11064.4	0.001101	0.480	0.894		0.521		
17	1897419.0	2647.5	0.001984	1881659.0	11092.9	0.001057	0.467	0.844		0.503		
18	1924063.0	2700.4	0.001978	1908081.0	11120.6	0.001037	0.476	0.848		0.496		
19	1950707.0	2751.9	0.001887	1934504.0	11148.2	0.001051	0.443	0.815		0.505		
20	1977351.0	2801.3	0.001816	1960927.0	11175.7	0.001026	0.435	0.790		0.496		
21	2003996.0	2850.8	0.001894	1987350.0	11203.3	0.001058	0.441	0.830		0.514		
22	2030640.0	2900.1	0.001802	2013773.0	11231.4	0.001067	0.408	0.795		0.520		
23	2057284.0	2947.6	0.001762	2040195.0	11259.1	0.001026	0.418	0.782		0.503		
24	2084057.0	2995.4	0.001822	2066746.0	11286.8	0.001068	0.414	0.814		0.526		
25	2110830.0	3042.9	0.001737	2093297.0	11314.3	0.001010	0.419	0.781		0.499		
26	2137474.0	3090.3	0.001819	2119720.0	11342.2	0.001102	0.394	0.822		0.547		
27	2164118.0	3139.5	0.001868	2146143.0	11371.7	0.001130	0.395	0.849		0.563		
28	2190762.0	3188.8	0.001827	2172565.0	11401.5	0.001120	0.387	0.835		0.561		
29	2217407.0	3239.5	0.001975	2198988.0	11432.6	0.001234	0.375	0.908		0.620		
30	2244051.0	3290.3	0.001828	2225411.0	11464.6	0.001180	0.354	0.845		0.595		
31	2270695.0	3339.5	0.001860	2251834.0	11495.8	0.001184	0.363	0.864		0.600		
32	2297468.0	3387.9	0.001776	2278385.0	11527.1	0.001176	0.338	0.829		0.597		
33	2324242.0	3435.9	0.001823	2304936.0	11558.4	0.001190	0.347	0.855		0.607		
34	2350886.0	3484.5	0.001816	2331358.0	11589.9	0.001196	0.342	0.856		0.612		
35	2377530.0	3533.5	0.001864	2357781.0	11622.1	0.001235	0.337	0.884		0.634		
36	2404174.0	3583.0	0.001845	2384204.0	11654.7	0.001229	0.334	0.879		0.634		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 072473 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP65 M=0.65 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 072573 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP65 M=0.65 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 072473 AND 072573 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1202553.0	98.7	0.003752	1195304.0	94.5	0.003612	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1255181.0	299.9	0.003895	1247615.0	811.4	0.003265	0.162	1.012	0.0215	1.166	0.0205	3.691
3	1307809.0	513.7	0.004230	1299925.0	2055.3	0.003310	0.218	1.231	0.0214	1.256	0.0204	3.936
4	1360437.0	737.9	0.004289	1352236.0	3293.0	0.003119	0.273	1.345	0.0213	1.233	0.0204	3.996
5	1413066.0	960.6	0.004173	1404547.0	4527.9	0.002873	0.312	1.383	0.0212	1.172	0.0208	4.020
6	1465694.0	1176.3	0.004022	1456858.0	5746.9	0.002594	0.355	1.393	0.0212	1.086	0.0204	3.909
7	1518322.0	1384.5	0.003889	1509169.0	6928.0	0.002371	0.390	1.397	0.0210	1.014	0.0198	3.792
8	1570950.0	1584.0	0.003694	1561480.0	8097.0	0.002159	0.416	1.369	0.0216	0.941	0.0203	3.784
9	1623578.0	1776.6	0.003626	1613791.0	9264.3	0.001903	0.475	1.381	0.0214	0.844	0.0202	3.656
10	1676206.0	1965.1	0.003536	1666102.0	10426.1	0.001739	0.508	1.380	0.0213	0.783	0.0206	3.628
11	1728835.0	2148.9	0.003449	1718413.0	11579.3	0.001597	0.537	1.376	0.0212	0.729	0.0202	3.530
12	1781463.0	2327.4	0.003335	1770724.0	12732.1	0.001380	0.586	1.357	0.0216	0.638	0.0209	3.476
13	1821460.0	2452.9	0.002783	1810480.0	13331.3	0.001231	0.558	1.149		0.575		
14	1848564.0	2524.2	0.002474	1837420.0	13362.3	0.001067	0.569	1.030		0.501		
15	1875667.0	2587.8	0.002212	1864360.0	13389.8	0.000974	0.560	0.929		0.460		
16	1902902.0	2645.2	0.002022	1891431.0	13415.3	0.000921	0.544	0.856		0.438		
17	1930137.0	2697.9	0.001861	1918502.0	13440.0	0.000906	0.513	0.794		0.433		
18	1957241.0	2748.4	0.001857	1945442.0	13463.7	0.000856	0.539	0.799		0.411		
19	1984344.0	2797.3	0.001747	1972382.0	13487.0	0.000868	0.503	0.757		0.419		
20	2011448.0	2843.7	0.001676	1999322.0	13510.1	0.000848	0.494	0.732		0.411		
21	2038551.0	2890.2	0.001746	2026262.0	13533.4	0.000874	0.499	0.767		0.426		
22	2065655.0	2936.4	0.001660	2053203.0	13557.0	0.000875	0.473	0.734		0.429		
23	2092758.0	2980.9	0.001625	2080143.0	13580.2	0.000845	0.480	0.724		0.416		
24	2119993.0	3025.8	0.001679	2107213.0	13603.4	0.000875	0.479	0.753		0.432		
25	2147228.0	3070.4	0.001613	2134284.0	13626.4	0.000835	0.482	0.727		0.414		
26	2174332.0	3114.9	0.001666	2161224.0	13649.8	0.000902	0.458	0.756		0.450		
27	2201435.0	3161.4	0.001758	2188164.0	13674.7	0.000940	0.465	0.802		0.470		
28	2228539.0	3208.1	0.001689	2215104.0	13700.1	0.000946	0.440	0.775		0.475		
29	2255643.0	3256.2	0.001856	2242045.0	13726.9	0.001041	0.439	0.856		0.525		
30	2282746.0	3305.0	0.001737	2268985.0	13754.2	0.000985	0.433	0.806		0.499		
31	2309850.0	3352.5	0.001766	2295925.0	13781.1	0.001008	0.429	0.823		0.513		
32	2337084.0	3399.3	0.001682	2322996.0	13808.1	0.000996	0.408	0.788		0.508		
33	2364320.0	3445.9	0.001754	2350067.0	13835.3	0.001019	0.419	0.826		0.522		
34	2391423.0	3493.2	0.001736	2377007.0	13862.9	0.001032	0.406	0.822		0.530		
35	2418526.0	3540.7	0.001764	2403947.0	13891.1	0.001054	0.403	0.839		0.544		
36	2445630.0	3588.6	0.001762	2430887.0	13919.6	0.001059	0.399	0.842		0.548		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

VELOCITY PROFILE FOR FIG. 12

REX = 0.13197E 07 REM = 2915.

XVO = 10.07 CM. DEL2 = 0.260 CM.
UINF = 16.71 M/S DEL99= 2.185 CM.
VISC = 0.14905E-04 M2/S DEL1 = 0.360 CM.
PORT = 19 H = 1.384
XLOC = 127.76 CM. CF/2 = 0.16661E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.012	7.33	0.439	11.6	10.74
0.028	0.013	7.63	0.457	12.8	11.19
0.030	0.014	7.84	0.469	14.0	11.49
0.033	0.015	8.09	0.484	15.1	11.87
0.036	0.016	8.22	0.492	16.3	12.05
0.038	0.017	8.40	0.503	17.4	12.32
0.043	0.020	8.62	0.516	19.8	12.63
0.048	0.022	8.82	0.528	22.1	12.93
0.056	0.026	9.14	0.547	25.6	13.39
0.064	0.029	9.34	0.559	29.1	13.69
0.074	0.034	9.57	0.573	33.7	14.03
0.084	0.038	9.77	0.585	38.4	14.33
0.099	0.045	10.01	0.599	45.3	14.67
0.117	0.053	10.18	0.609	53.5	14.92
0.142	0.065	10.48	0.627	65.1	15.36
0.170	0.078	10.69	0.640	77.9	15.67
0.208	0.095	10.98	0.657	95.3	16.10
0.259	0.119	11.33	0.678	118.6	16.61
0.310	0.142	11.59	0.693	141.8	16.99
0.386	0.177	11.99	0.717	176.7	17.58
0.488	0.223	12.50	0.748	223.2	18.32
0.589	0.270	12.85	0.769	269.7	18.83
0.716	0.328	13.34	0.798	327.8	19.55
0.843	0.386	13.75	0.823	386.0	20.15
1.001	0.458	14.23	0.852	458.1	20.86
1.161	0.531	14.69	0.879	531.3	21.54
1.351	0.618	15.13	0.905	618.5	22.18
1.542	0.706	15.59	0.933	705.7	22.85
1.763	0.807	15.99	0.957	806.8	23.44
1.986	0.909	16.35	0.978	909.1	23.97
2.240	1.025	16.59	0.993	1025.4	24.32
2.494	1.142	16.70	0.999	1141.6	24.48
2.748	1.258	16.71	1.000	1257.9	24.50

VELOCITY PROFILE FOR FIG. 12

REX = 0.18446E 07 REM = 3810.

XVO = 13.36 CM. DEL2 = 0.341 CM.
UINF = 16.66 M/S DEL99= 2.889 CM.
VISC = 0.14924E-04 M2/S DEL1 = 0.469 CM.
PORT = 33 H = 1.375
XLOC = 178.56 CM. CF/2 = 0.15422E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.009	6.86	0.412	11.1	10.48
0.028	0.010	7.09	0.425	12.3	10.83
0.030	0.011	7.36	0.442	13.4	11.25
0.033	0.011	7.54	0.452	14.5	11.52
0.036	0.012	7.80	0.468	15.6	11.91
0.038	0.013	7.88	0.473	16.7	12.05
0.043	0.015	8.23	0.494	18.9	12.58
0.048	0.017	8.40	0.504	21.2	12.83
0.056	0.019	8.66	0.520	24.5	13.24
0.064	0.022	8.89	0.533	27.8	13.58
0.074	0.025	9.12	0.547	32.3	13.93
0.084	0.029	9.25	0.555	36.8	14.14
0.099	0.034	9.49	0.569	43.4	14.50
0.117	0.040	9.69	0.582	51.2	14.81
0.142	0.049	9.99	0.599	62.4	15.26
0.170	0.059	10.21	0.613	74.6	15.60
0.208	0.072	10.45	0.627	91.3	15.97
0.246	0.085	10.77	0.647	108.0	16.46
0.287	0.099	11.01	0.661	125.9	16.82
0.338	0.117	11.28	0.677	148.1	17.23
0.414	0.143	11.69	0.702	181.5	17.86
0.516	0.178	12.04	0.722	226.1	18.39
0.643	0.222	12.50	0.750	281.8	19.10
0.795	0.275	12.92	0.775	348.6	19.74
0.986	0.341	13.46	0.808	432.2	20.56
1.176	0.407	13.91	0.835	515.7	21.25
1.397	0.483	14.38	0.863	612.6	21.97
1.621	0.561	14.84	0.891	710.6	22.68
1.875	0.649	15.28	0.917	822.0	23.35
2.129	0.737	15.71	0.943	933.4	24.01
2.446	0.847	16.12	0.967	1072.6	24.63
2.764	0.956	16.41	0.985	1211.8	25.07
3.081	1.066	16.61	0.997	1351.0	25.38
3.335	1.154	16.64	0.999	1462.4	25.43
3.589	1.242	16.66	1.000	1573.8	25.46

STANTON NUMBER DATA RUN 111873 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEPFP NORMAL HOLE INJECTION P/D=10 ***

TADB= 22.86 DEG C UINF= 16.27 M/S TINF= 22.74 DEG C
RHO= 1.195 KG/M3 VISC= 0.15224E-04 M2/S XVO= 11.7 CM
CP= 1010. J/KGK PR= 0.714

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.12399E 07	0.11124E 03	0.40992E-02	0.587E-04	2.
2	132.8	0.12942E 07	0.30619E 03	0.30844E-02	0.525E-04	3.
3	137.9	0.13485E 07	0.46687E 03	0.28367E-02	0.513E-04	3.
4	143.0	0.14027E 07	0.61866E 03	0.27567E-02	0.510E-04	4.
5	148.1	0.14570E 07	0.76393E 03	0.25961E-02	0.501E-04	5.
6	153.2	0.15113E 07	0.90543E 03	0.26183E-02	0.500E-04	5.
7	158.2	0.15656E 07	0.10437E 04	0.24776E-02	0.495E-04	5.
8	163.3	0.16198E 07	0.11784E 04	0.24839E-02	0.496E-04	6.
9	168.4	0.16741E 07	0.13105E 04	0.23867E-02	0.491E-04	6.
10	173.5	0.17284E 07	0.14410E 04	0.24197E-02	0.492E-04	6.
11	178.6	0.17827E 07	0.15698E 04	0.23287E-02	0.489E-04	7.
12	183.6	0.18369E 07	0.16948E 04	0.22746E-02	0.485E-04	7.
13	187.5	0.18782E 07	0.17896E 04	0.23701E-02	0.375E-04	7.
14	190.1	0.19061E 07	0.18543E 04	0.22526E-02	0.384E-04	7.
15	192.7	0.19341E 07	0.19177E 04	0.22752E-02	0.389E-04	7.
16	195.4	0.19622E 07	0.19810E 04	0.22473E-02	0.382E-04	7.
17	198.0	0.19903E 07	0.20435E 04	0.22189E-02	0.380E-04	7.
18	200.6	0.20182E 07	0.21058E 04	0.22369E-02	0.383E-04	7.
19	203.2	0.20462E 07	0.21683E 04	0.22298E-02	0.375E-04	7.
20	205.8	0.20741E 07	0.22294E 04	0.21375E-02	0.363E-04	7.
21	208.5	0.21021E 07	0.22915E 04	0.22970E-02	0.386E-04	7.
22	211.1	0.21300E 07	0.23543E 04	0.21913E-02	0.380E-04	7.
23	213.7	0.21580E 07	0.24147E 04	0.21241E-02	0.372E-04	8.
24	216.3	0.21861E 07	0.24749E 04	0.21837E-02	0.383E-04	8.
25	218.9	0.22141E 07	0.25348E 04	0.20979E-02	0.370E-04	8.
26	221.6	0.22421E 07	0.25956E 04	0.22465E-02	0.387E-04	8.
27	224.2	0.22701E 07	0.26569E 04	0.21312E-02	0.373E-04	8.
28	226.8	0.22980E 07	0.27159E 04	0.20861E-02	0.368E-04	8.
29	229.4	0.23260E 07	0.27749E 04	0.21290E-02	0.369E-04	8.
30	232.0	0.23539E 07	0.28336E 04	0.20668E-02	0.370E-04	8.
31	234.6	0.23819E 07	0.28925E 04	0.21461E-02	0.373E-04	8.
32	237.3	0.24099E 07	0.29505E 04	0.19934E-02	0.358E-04	8.
33	239.9	0.24380E 07	0.30071E 04	0.20574E-02	0.364E-04	8.
34	242.5	0.24660E 07	0.30657E 04	0.21258E-02	0.369E-04	8.
35	245.1	0.24939E 07	0.31247E 04	0.20948E-02	0.384E-04	8.
36	247.8	0.25219E 07	0.31834E 04	0.21013E-02	0.426E-04	8.

STANTON NUMBER DATA RUN 111973 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=10 ***

STANTON NUMBER DATA RUN 112273 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 111973 AND 112273 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1237635.0	110.8	0.004089	1231693.0	102.8	0.003812	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1291810.0	313.3	0.003387	1285609.0	358.0	0.002870	0.153	0.885	0.0017	1.030	0.0014	1.254
3	1345986.0	488.8	0.003094	1339524.0	585.2	0.002769	0.105	0.905	0.0017	1.057	0.0014	1.304
4	1400161.0	654.8	0.003033	1393439.0	804.7	0.002612	0.139	0.956	0.0018	1.038	0.0014	1.293
5	1454336.0	814.3	0.002855	1447354.0	1017.5	0.002522	0.116	0.951	0.0018	1.035	0.0014	1.297
6	1508512.0	970.5	0.002910	1501269.0	1226.5	0.002357	0.190	1.013	0.0017	0.992	0.0014	1.271
7	1562687.0	1123.5	0.002740	1555185.0	1430.8	0.002350	0.142	0.989	0.0017	1.011	0.0014	1.295
8	1616862.0	1272.2	0.002750	1609100.0	1619.4	0.002308	0.161	1.025	0.0017	1.012	0.0012	1.251
9	1671038.0	1417.3	0.002608	1663015.0	1805.9	0.002278	0.127	0.999	0.0017	1.016	0.0012	1.259
10	1725213.0	1561.9	0.002730	1716930.0	2001.2	0.002149	0.213	1.071	0.0017	0.973	0.0014	1.265
11	1779388.0	1705.8	0.002581	1770846.0	2193.1	0.002157	0.164	1.035	0.0017	0.991	0.0014	1.287
12	1833564.0	1844.6	0.002545	1824761.0	2369.8	0.001985	0.220	1.041	0.0017	0.924	0.0012	1.182
13	1874737.0	1949.8	0.002597	1865737.0	2503.7	0.002238	0.138	1.077		1.051		
14	1902637.0	2019.7	0.002407	1893503.0	2564.1	0.002105	0.125	1.008		0.994		
15	1930538.0	2086.4	0.002370	1921269.0	2605.3	0.002067	0.128	1.001		0.982		
16	1958573.0	2151.8	0.002310	1949170.0	2662.7	0.002065	0.106	0.984		0.987		
17	1986609.0	2215.4	0.002248	1977071.0	2719.7	0.002035	0.095	0.965		0.977		
18	2014509.0	2278.4	0.002262	2004838.0	2775.8	0.002000	0.116	0.978		0.966		
19	2042409.0	2341.2	0.002231	2032604.0	2831.8	0.002032	0.089	0.972		0.986		
20	2070310.0	2402.0	0.002126	2060370.0	2887.5	0.001973	0.072	0.933		0.962		
21	2098210.0	2463.5	0.002279	2088137.0	2943.1	0.002031	0.109	1.007		0.995		
22	2126111.0	2525.6	0.002165	2115903.0	2999.7	0.002037	0.059	0.963		1.003		
23	2154011.0	2585.3	0.002106	2143670.0	3054.9	0.001935	0.081	0.943		0.957		
24	2182046.0	2644.8	0.002154	2171570.0	3108.9	0.001953	0.093	0.971		0.970		
25	2210082.0	2703.9	0.002081	2199472.0	3163.2	0.001951	0.062	0.943		0.974		
26	2237982.0	2764.0	0.002223	2227238.0	3219.3	0.002082	0.064	1.014		1.043		
27	2265883.0	2824.6	0.002114	2255004.0	3274.5	0.001894	0.104	0.970		0.953		
28	2293783.0	2882.7	0.002043	2282771.0	3327.6	0.001925	0.058	0.943		0.972		
29	2321684.0	2940.8	0.002116	2310537.0	3380.8	0.001900	0.102	0.982		0.964		
30	2349584.0	2998.5	0.002019	2338304.0	3434.4	0.001959	0.029	0.942		0.998		
31	2377484.0	3056.4	0.002123	2366070.0	3488.8	0.001955	0.079	0.995		0.999		
32	2405520.0	3113.4	0.001962	2393971.0	3542.6	0.001916	0.023	0.924		0.983		
33	2433555.0	3169.0	0.002022	2421872.0	3595.6	0.001893	0.063	0.957		0.975		
34	2461456.0	3226.4	0.002088	2449638.0	3649.2	0.001967	0.058	0.994		1.016		
35	2489356.0	3284.6	0.002077	2477405.0	3703.8	0.001960	0.057	0.993		1.016		
36	2517256.0	3342.2	0.002048	2505171.0	3758.1	0.001947	0.050	0.984		1.013		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 121773 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP50 M=0.5 TH=0 NORMAL HOLE INJECTION P/D=10 ***

STANTON NUMBER DATA RUN 121873 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP50 M=0.5 TH=1 NORMAL HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 121773 AND 121873 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1263828.0	109.4	0.003956	1260649.0	106.0	0.003841	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1319150.0	315.2	0.003483	1315831.0	523.0	0.003037	0.128	0.915	0.0043	1.096	0.0041	1.734
3	1374472.0	498.6	0.003148	1371014.0	912.9	0.002855	0.093	0.925	0.0043	1.095	0.0041	1.768
4	1429794.0	673.0	0.003155	1426197.0	1295.7	0.002689	0.148	0.999	0.0042	1.074	0.0042	1.779
5	1485116.0	842.5	0.002972	1481380.0	1669.7	0.002534	0.147	0.995	0.0042	1.045	0.0042	1.767
6	1540437.0	1010.3	0.003095	1536562.0	2056.9	0.002475	0.200	1.083	0.0041	1.047	0.0045	1.840
7	1595759.0	1176.3	0.002907	1591745.0	2440.1	0.002387	0.179	1.055	0.0041	1.032	0.0045	1.838
8	1651081.0	1338.4	0.002953	1646928.0	2784.6	0.002319	0.214	1.106	0.0043	1.022	0.0039	1.741
9	1706403.0	1496.6	0.002765	1702111.0	3124.7	0.002228	0.194	1.064	0.0043	0.999	0.0039	1.727
10	1761725.0	1655.0	0.002962	1757293.0	3490.1	0.002213	0.253	1.168	0.0042	1.007	0.0044	1.830
11	1817047.0	1813.3	0.002759	1812476.0	3852.9	0.002134	0.227	1.112	0.0042	0.985	0.0044	1.816
12	1872369.0	1966.2	0.002768	1867659.0	4198.1	0.002017	0.271	1.138	0.0041	0.943	0.0042	1.742
13	1914413.0	2083.4	0.002850	1909598.0	4461.1	0.002288	0.197	1.188		1.080		
14	1942904.0	2161.1	0.002600	1938017.0	4523.6	0.002106	0.190	1.094		1.000		
15	1971395.0	2234.1	0.002518	1966436.0	4523.4	0.002057	0.183	1.068		0.982		
16	2000024.0	2304.7	0.002430	1994993.0	4581.3	0.002019	0.169	1.040		0.970		
17	2028653.0	2373.0	0.002358	2023550.0	4638.1	0.001974	0.163	1.017		0.953		
18	2057144.0	2440.2	0.002357	2051969.0	4694.0	0.001954	0.171	1.024		0.948		
19	2085634.0	2506.7	0.002303	2080388.0	4749.8	0.001966	0.146	1.008		0.959		
20	2114125.0	2571.2	0.002218	2108807.0	4804.6	0.001887	0.149	0.978		0.925		
21	2142616.0	2636.2	0.002339	2137226.0	4859.5	0.001971	0.157	1.038		0.971		
22	2171107.0	2701.1	0.002214	2165645.0	4915.0	0.001932	0.128	0.990		0.956		
23	2199598.0	2763.1	0.002132	2194065.0	4968.6	0.001835	0.139	0.959		0.912		
24	2228226.0	2824.8	0.002194	2222621.0	5021.5	0.001881	0.143	0.993		0.939		
25	2256856.0	2886.8	0.002153	2251178.0	5074.7	0.001863	0.135	0.981		0.934		
26	2285346.0	2949.7	0.002257	2279597.0	5129.4	0.001983	0.121	1.034		0.999		
27	2313837.0	3012.5	0.002149	2308017.0	5183.9	0.001844	0.142	0.990		0.933		
28	2342328.0	3072.9	0.002084	2336436.0	5236.1	0.001825	0.125	0.966		0.927		
29	2370819.0	3133.4	0.002155	2364855.0	5288.7	0.001874	0.131	1.005		0.955		
30	2399310.0	3193.6	0.002066	2393274.0	5341.8	0.001855	0.102	0.968		0.950		
31	2427800.0	3253.9	0.002162	2421693.0	5394.9	0.001879	0.131	1.018		0.965		
32	2456429.0	3313.5	0.002020	2450250.0	5447.3	0.001808	0.105	0.956		0.932		
33	2485058.0	3371.8	0.002065	2478807.0	5499.0	0.001826	0.116	0.983		0.945		
34	2513549.0	3431.6	0.002128	2507226.0	5551.8	0.001886	0.114	1.018		0.979		
35	2542040.0	3491.9	0.002104	2535645.0	5605.1	0.001859	0.116	1.011		0.969		
36	2570531.0	3551.4	0.002068	2564064.0	5657.8	0.001843	0.109	0.998		0.964		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 121673-1 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP100 M=1.0 TH=0 NORMAL HOLE INJECTION P/D=10 ***

STANTON NUMBER DATA RUN 121673-2 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEP100 M=1.0 TH=1 NORMAL HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 121673-1 AND 121673-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1287139.0	111.1	0.003942	1265195.0	107.5	0.003884	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	1343481.0	319.4	0.003452	1320577.0	748.6	0.003262	0.055	0.910	0.0083	1.178	0.0080	2.332
3	1399823.0	504.9	0.003136	1375959.0	1366.1	0.003037	0.031	0.925	0.0083	1.166	0.0080	2.380
4	1456165.0	685.3	0.003266	1431340.0	1982.8	0.003037	0.070	1.038	0.0082	1.214	0.0081	2.492
5	1512508.0	863.8	0.003070	1486722.0	2594.6	0.002861	0.068	1.031	0.0082	1.181	0.0081	2.488
6	1568850.0	1042.8	0.003285	1542104.0	3195.4	0.002881	0.123	1.153	0.0083	1.220	0.0080	2.545
7	1625192.0	1222.4	0.003091	1597486.0	3794.2	0.002794	0.096	1.126	0.0083	1.209	0.0080	2.558
8	1681534.0	1398.9	0.003173	1652867.0	4383.4	0.002767	0.128	1.192	0.0083	1.220	0.0079	2.576
9	1737877.0	1572.6	0.002993	1708249.0	4968.2	0.002637	0.119	1.156	0.0083	1.183	0.0079	2.552
10	1794219.0	1747.3	0.003210	1763631.0	5546.7	0.002705	0.157	1.270	0.0082	1.233	0.0078	2.616
11	1850561.0	1922.4	0.003006	1819013.0	6124.3	0.002604	0.134	1.216	0.0082	1.203	0.0078	2.598
12	1906904.0	2092.8	0.003040	1874394.0	6697.2	0.002484	0.183	1.255	0.0079	1.163	0.0078	2.570
13	1949724.0	2224.0	0.003142	1916485.0	7131.8	0.002696	0.142	1.315		1.273		
14	1978740.0	2312.0	0.002910	1945006.0	7206.2	0.002514	0.136	1.229		1.195		
15	2007756.0	2395.6	0.002848	1973528.0	7165.6	0.002441	0.143	1.213		1.167		
16	2036913.0	2476.8	0.002745	2002187.0	7234.4	0.002376	0.134	1.178		1.142		
17	2066070.0	2555.1	0.002648	2030848.0	7301.4	0.002319	0.124	1.146		1.121		
18	2095087.0	2632.0	0.002640	2059369.0	7366.9	0.002269	0.141	1.152		1.102		
19	2124103.0	2707.7	0.002576	2087891.0	7431.5	0.002254	0.125	1.132		1.100		
20	2153119.0	2780.8	0.002456	2116412.0	7494.4	0.002149	0.125	1.087		1.055		
21	2182136.0	2853.8	0.002569	2144934.0	7556.8	0.002221	0.135	1.145		1.095		
22	2211152.0	2926.2	0.002417	2173456.0	7619.4	0.002161	0.106	1.084		1.071		
23	2240168.0	2994.8	0.002302	2201977.0	7679.0	0.002013	0.125	1.039		1.002		
24	2269325.0	3062.8	0.002381	2230637.0	7737.1	0.002057	0.136	1.082		1.028		
25	2298482.0	3131.0	0.002313	2259297.0	7795.3	0.002019	0.127	1.058		1.014		
26	2327498.0	3199.1	0.002378	2287819.0	7854.7	0.002145	0.098	1.094		1.081		
27	2356515.0	3266.9	0.002291	2316340.0	7913.6	0.001983	0.134	1.060		1.004		
28	2385531.0	3332.2	0.002205	2344862.0	7969.6	0.001939	0.121	1.026		0.986		
29	2414547.0	3397.1	0.002262	2373384.0	8025.6	0.001978	0.125	1.058		1.009		
30	2443564.0	3461.3	0.002159	2401905.0	8081.3	0.001925	0.108	1.015		0.986		
31	2472580.0	3525.3	0.002249	2430427.0	8136.8	0.001965	0.126	1.063		1.010		
32	2501737.0	3588.3	0.002088	2459087.0	8191.4	0.001861	0.109	0.992		0.960		
33	2530894.0	3649.4	0.002115	2487747.0	8245.0	0.001889	0.107	1.010		0.978		
34	2559910.0	3711.9	0.002190	2516268.0	8299.5	0.001931	0.118	1.051		1.004		
35	2588926.0	3774.6	0.002128	2544790.0	8354.2	0.001895	0.109	1.026		0.989		
36	2617943.0	3836.0	0.002098	2573312.0	8407.7	0.001857	0.115	1.017		0.972		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

VELOCITY AND TEMPERATURE PROFILES FOR FIGS. 14 AND 15

REX = 0.15784E 06 REM = 533. REH = 560.

XVO =	107.92 CM.	DEL2 =	0.067 CM.	DEH2 =	0.071 CM.
UINF =	11.87 M/S	DEL99=	0.537 CM.	DELT99 =	0.495 CM.
VISC =	0.14916E-04 M2/S	DEL1 =	0.114 CM.	UINF =	11.91 M/S
PORT =	19	H =	1.708	VISC =	0.15126E-04 M2/S
XLOC =	127.76 CM.	CF/2 =	0.22191E-02	TINF =	21.53 DEG C
				TPLATE =	38.04 DEG C

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+	Y(CM.)	T(DEG C)	TBAR	TBAR
0.025	0.047	5.64	0.475	9.5	10.08	0.0165	35.96	0.126	0.874
0.028	0.052	5.81	0.490	10.5	10.39	0.0190	34.38	0.222	0.778
0.030	0.057	5.97	0.503	11.4	10.67	0.0216	33.91	0.251	0.749
0.033	0.061	6.13	0.517	12.4	10.97	0.0241	33.55	0.273	0.727
0.036	0.066	6.30	0.531	13.3	11.27	0.0267	33.15	0.297	0.703
0.038	0.071	6.38	0.537	14.3	11.41	0.0292	32.83	0.317	0.683
0.051	0.095	6.81	0.574	19.0	12.19	0.0419	31.46	0.400	0.600
0.064	0.118	7.07	0.596	23.8	12.65	0.0673	29.86	0.497	0.503
0.089	0.166	7.56	0.637	33.3	13.52	0.1054	28.59	0.575	0.425
0.127	0.236	8.13	0.685	47.6	14.54	0.1562	26.75	0.687	0.313
0.178	0.331	8.84	0.745	66.6	15.81	0.2197	24.84	0.803	0.197
0.241	0.449	9.70	0.817	90.4	17.35	0.2832	23.43	0.888	0.112
0.305	0.568	10.47	0.882	114.2	18.73	0.3467	22.56	0.941	0.059
0.368	0.686	11.07	0.933	138.0	19.80	0.4102	22.07	0.971	0.029
0.432	0.804	11.48	0.967	161.8	20.53	0.4737	21.82	0.986	0.014
0.495	0.922	11.70	0.985	185.6	20.92	0.6007	21.64	0.997	0.003
0.559	1.040	11.85	0.998	209.4	21.19	0.9817	21.59	1.000	0.000
0.622	1.159	11.90	1.003	233.2	21.28				
0.686	1.277	11.92	1.005	257.0	21.32				

STANTON NUMBER DATA RUN 013174 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSLFP NORMAL HOLE INJECTION P/D=5 ***

TADB= 20.62 DEG C   UINF= 11.52 M/S   TINF= 20.56 DEG C
RHO= 1.200 KG/M3   VISC= 0.15056E-04 M2/S   XVO= 105.5 CM
CP= 1011. J/KGK   PR= 0.715

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.17004E 06	0.65685E 03	0.26975E-02	0.661E-04	58.
2	132.8	0.20891E 06	0.76801E 03	0.30224E-02	0.679E-04	58.
3	137.9	0.24778E 06	0.88510E 03	0.30026E-02	0.679E-04	58.
4	143.0	0.28665E 06	0.99983E 03	0.29011E-02	0.672E-04	58.
5	148.1	0.32551E 06	0.11106E 04	0.27993E-02	0.667E-04	58.
6	153.2	0.36438E 06	0.12175E 04	0.27032E-02	0.662E-04	58.
7	158.2	0.40325E 06	0.13218E 04	0.26594E-02	0.660E-04	58.
8	163.3	0.44211E 06	0.14241E 04	0.26073E-02	0.658E-04	59.
9	168.4	0.48098E 06	0.15237E 04	0.25178E-02	0.652E-04	59.
10	173.5	0.51985E 06	0.16210E 04	0.24891E-02	0.650E-04	59.
11	178.6	0.55872E 06	0.17168E 04	0.24410E-02	0.647E-04	59.
12	183.6	0.59758E 06	0.18100E 04	0.23522E-02	0.643E-04	59.
13	187.5	0.62712E 06	0.18773E 04	0.21584E-02	0.407E-04	59.
14	190.1	0.64714E 06	0.19204E 04	0.21438E-02	0.458E-04	59.
15	192.7	0.66715E 06	0.19638E 04	0.21819E-02	0.468E-04	59.
16	195.4	0.68727E 06	0.20073E 04	0.21631E-02	0.461E-04	59.
17	198.0	0.70738E 06	0.20506E 04	0.21584E-02	0.461E-04	59.
18	200.6	0.72740E 06	0.20945E 04	0.22259E-02	0.472E-04	59.
19	203.2	0.74742E 06	0.21389E 04	0.21979E-02	0.457E-04	59.
20	205.8	0.76743E 06	0.21820E 04	0.21101E-02	0.443E-04	59.
21	208.5	0.78745E 06	0.22258E 04	0.22543E-02	0.468E-04	59.
22	211.1	0.80747E 06	0.22698E 04	0.21385E-02	0.466E-04	59.
23	213.7	0.82748E 06	0.23119E 04	0.20676E-02	0.459E-04	59.
24	216.3	0.84760E 06	0.23541E 04	0.21445E-02	0.474E-04	59.
25	218.9	0.86771E 06	0.23962E 04	0.20563E-02	0.464E-04	59.
26	221.6	0.88773E 06	0.24379E 04	0.21058E-02	0.473E-04	59.
27	224.2	0.90774E 06	0.24801E 04	0.21054E-02	0.472E-04	59.
28	226.8	0.92776E 06	0.25217E 04	0.20391E-02	0.459E-04	59.
29	229.4	0.94778E 06	0.25632E 04	0.21063E-02	0.465E-04	59.
30	232.0	0.96779E 06	0.26042E 04	0.19824E-02	0.463E-04	59.
31	234.6	0.98781E 06	0.26455E 04	0.21477E-02	0.474E-04	59.
32	237.3	0.10079E 07	0.26871E 04	0.19998E-02	0.454E-04	59.
33	239.9	0.10280E 07	0.27275E 04	0.20293E-02	0.451E-04	59.
34	242.5	0.10481E 07	0.27692E 04	0.21325E-02	0.459E-04	59.
35	245.1	0.10681E 07	0.28111E 04	0.20480E-02	0.478E-04	59.
36	247.8	0.10881E 07	0.28518E 04	0.20135E-02	0.521E-04	59.

STANTON NUMBER DATA RUN 020374 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 020474 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 020374 AND 020474 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	169188.9	653.6	0.002721	167142.7	645.6	0.002695	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUJU
2	207860.6	775.1	0.003566	205346.8	888.2	0.002749	0.229	1.223	0.0068	0.941	0.0073	1.922
3	246532.4	919.4	0.003894	243550.8	1258.4	0.002746	0.295	1.382	0.0068	0.973	0.0066	1.912
4	285204.1	1070.4	0.003915	281754.9	1613.0	0.002575	0.342	1.431	0.0069	0.939	0.0066	1.896
5	323875.9	1219.6	0.003814	319958.9	1953.5	0.002453	0.357	1.430	0.0069	0.917	0.0062	1.837
6	362547.6	1365.5	0.003722	358163.0	2279.9	0.002290	0.385	1.427	0.0068	0.876	0.0062	1.806
7	401219.4	1508.8	0.003688	396367.1	2585.3	0.002224	0.397	1.443	0.0068	0.868	0.0053	1.698
8	439891.1	1649.2	0.003574	434571.1	2877.2	0.002107	0.411	1.424	0.0070	0.838	0.0057	1.723
9	478562.9	1786.5	0.003523	472775.1	3173.6	0.002065	0.414	1.428	0.0069	0.835	0.0057	1.739
10	517234.6	1922.6	0.003515	510979.2	3480.3	0.001987	0.435	1.447	0.0069	0.816	0.0063	1.813
11	555906.4	2057.3	0.003453	549183.3	3788.3	0.001987	0.425	1.442	0.0069	0.828	0.0058	1.775
12	594578.1	2189.9	0.003403	587387.3	4083.2	0.001913	0.438	1.440	0.0071	0.808	0.0057	1.742
13	623968.8	2283.5	0.002789	616422.5	4247.1	0.001884	0.325	1.192		0.803		
14	643884.7	2337.2	0.002602	636097.6	4283.6	0.001826	0.298	1.119		0.783		
15	663800.6	2388.5	0.002541	655772.6	4318.8	0.001750	0.311	1.100		0.756		
16	683813.0	2438.2	0.002440	675543.0	4353.8	0.001801	0.262	1.062		0.782		
17	703825.7	2485.8	0.002337	695313.6	4388.9	0.001765	0.245	1.023		0.771		
18	723741.6	2533.1	0.002411	714988.7	4423.2	0.001710	0.291	1.061		0.751		
19	743657.6	2580.4	0.002330	734663.8	4457.7	0.001796	0.229	1.031		0.793		
20	763573.5	2625.6	0.002203	754338.8	4492.3	0.001718	0.220	0.980		0.763		
21	783489.7	2671.3	0.002386	774014.2	4526.3	0.001735	0.273	1.067		0.774		
22	803405.6	2717.1	0.002209	793689.3	4561.0	0.001782	0.193	0.993		0.799		
23	823321.6	2760.5	0.002142	813364.3	4595.0	0.001677	0.217	0.968		0.756		
24	843333.9	2804.1	0.002226	833134.7	4628.1	0.001679	0.246	1.010		0.760		
25	863346.7	2847.5	0.002133	852905.4	4661.2	0.001679	0.213	0.973		0.764		
26	883262.6	2890.1	0.002139	872580.4	4695.4	0.001794	0.161	0.980		0.820		
27	903178.5	2933.1	0.002176	892255.5	4729.3	0.001655	0.239	1.001		0.760		
28	923094.4	2975.9	0.002118	911930.6	4762.2	0.001684	0.205	0.979		0.776		
29	943010.7	3018.8	0.002183	931605.9	4795.7	0.001719	0.213	1.014		0.796		
30	962926.6	3060.4	0.001985	951281.0	4829.3	0.001688	0.150	0.925		0.785		
31	982842.5	3102.5	0.002241	970956.1	4863.0	0.001736	0.225	1.049		0.811		
32	1002854.0	3145.0	0.002022	990726.4	4897.2	0.001740	0.140	0.950		0.816		
33	1022867.0	3186.0	0.002088	1010497.0	4931.1	0.001703	0.184	0.985		0.802		
34	1042783.0	3228.4	0.002171	1030172.0	4965.7	0.001805	0.168	1.028		0.853		
35	1062699.0	3270.8	0.002081	1049847.0	5000.7	0.001746	0.161	0.989		0.828		
36	1082615.0	3312.0	0.002047	1069522.0	5035.0	0.001738	0.151	0.977		0.827		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 020574 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL55 M=0.55 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 020674 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL55 M=0.55 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 020574 AND 020674 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	166337.5	642.5	0.002824	167362.6	646.5	0.002793	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	204357.5	772.7	0.004023	205617.0	1070.6	0.003067	0.237	1.374	0.0172	1.049	0.0163	3.027
3	242377.5	934.1	0.004471	243871.3	1828.6	0.003153	0.295	1.580	0.0178	1.116	0.0171	3.254
4	280397.5	1106.1	0.004575	282125.6	2587.3	0.002954	0.354	1.665	0.0167	1.076	0.0165	3.186
5	318417.6	1278.6	0.004502	320379.9	3333.0	0.002812	0.375	1.681	0.0174	1.051	0.0168	3.229
6	356437.6	1448.7	0.004441	358634.3	4098.1	0.002624	0.409	1.696	0.0174	1.003	0.0178	3.317
7	394457.6	1615.9	0.004358	396888.6	4873.1	0.002508	0.425	1.698	0.0176	0.978	0.0176	3.296
8	432477.6	1779.2	0.004228	435142.9	5608.7	0.002340	0.447	1.678	0.0171	0.930	0.0160	3.091
9	470497.6	1937.9	0.004121	473397.3	6316.7	0.002127	0.484	1.663	0.0177	0.859	0.0165	3.075
10	508517.6	2093.1	0.004047	511651.6	7047.8	0.001975	0.512	1.659	0.0171	0.811	0.0176	3.149
11	546537.6	2244.7	0.003926	549905.9	7799.5	0.001782	0.546	1.633	0.0176	0.742	0.0179	3.108
12	584557.6	2392.2	0.003832	588160.3	8542.4	0.001641	0.572	1.616	0.0169	0.693	0.0175	3.004
13	613452.9	2494.9	0.003048	617233.6	8923.5	0.001584	0.480	1.297		0.675		
14	633033.2	2552.0	0.002776	636934.6	8953.2	0.001431	0.485	1.189		0.614		
15	652613.4	2604.2	0.002545	656635.6	8980.4	0.001321	0.481	1.097		0.570		
16	672288.6	2652.5	0.002380	676431.9	9006.0	0.001282	0.461	1.032		0.557		
17	691964.0	2697.5	0.002217	696228.6	9030.8	0.001230	0.445	0.967		0.537		
18	711544.3	2740.8	0.002199	715929.6	9054.9	0.001212	0.449	0.964		0.532		
19	731124.6	2783.0	0.002107	735630.6	9078.8	0.001211	0.425	0.929		0.534		
20	750704.8	2823.1	0.001989	755331.5	9102.2	0.001157	0.418	0.881		0.514		
21	770285.4	2863.4	0.002122	775032.8	9125.5	0.001204	0.433	0.945		0.537		
22	789865.7	2903.8	0.001992	794733.7	9149.0	0.001185	0.405	0.892		0.531		
23	809446.0	2942.2	0.001927	814434.6	9172.0	0.001143	0.407	0.867		0.515		
24	829121.1	2980.6	0.001995	834231.1	9194.7	0.001164	0.416	0.902		0.527		
25	848796.5	3018.8	0.001901	854027.8	9217.5	0.001142	0.399	0.863		0.519		
26	868376.8	3057.0	0.001999	873728.7	9241.0	0.001239	0.380	0.912		0.566		
27	887957.1	3096.1	0.001984	893429.6	9264.7	0.001170	0.410	0.909		0.537		
28	907537.4	3134.3	0.001913	913130.6	9288.0	0.001189	0.378	0.881		0.548		
29	927117.9	3173.1	0.002049	932831.8	9312.1	0.001251	0.389	0.947		0.579		
30	946698.3	3211.6	0.001881	952532.8	9336.3	0.001204	0.360	0.873		0.560		
31	966278.5	3250.3	0.002066	972233.8	9360.8	0.001281	0.380	0.963		0.598		
32	985953.6	3289.4	0.001919	992030.1	9385.9	0.001264	0.341	0.898		0.592		
33	1005629.0	3327.5	0.001977	1011826.0	9410.8	0.001267	0.359	0.929		0.596		
34	1025209.0	3367.3	0.002082	1031527.0	9436.7	0.001354	0.350	0.982		0.639		
35	1044789.0	3407.3	0.001993	1051228.0	9463.0	0.001319	0.338	0.944		0.625		
36	1064369.0	3446.1	0.001968	1070929.0	9488.7	0.001287	0.346	0.935		0.612		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 012474 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSLFP NORMAL HOLE INJECTION P/D=10 ***

TADB= 21.99 DEG C UINF= 11.53 M/S TINF= 21.93 DEG C
RHO= 1.197 KG/M3 VISC= 0.15162E-04 M2/S XVO= 105.5 CM
CP= 1009. J/KGK PR= 0.714

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.16906E 06	0.65306E 03	0.26657E-02	0.669E-04	58.
2	132.8	0.20770E 06	0.76115E 03	0.29284E-02	0.684E-04	58.
3	137.9	0.24635E 06	0.87308E 03	0.28649E-02	0.679E-04	58.
4	143.0	0.28499E 06	0.98272E 03	0.28095E-02	0.675E-04	58.
5	148.1	0.32363E 06	0.10885E 04	0.26668E-02	0.669E-04	58.
6	153.2	0.36228E 06	0.11913E 04	0.26539E-02	0.666E-04	58.
7	158.2	0.40092E 06	0.12920E 04	0.25583E-02	0.662E-04	58.
8	163.3	0.43956E 06	0.13904E 04	0.25346E-02	0.662E-04	58.
9	168.4	0.47820E 06	0.14865E 04	0.24391E-02	0.656E-04	58.
10	173.5	0.51685E 06	0.15813E 04	0.24650E-02	0.658E-04	58.
11	178.6	0.55549E 06	0.16745E 04	0.23618E-02	0.653E-04	58.
12	183.6	0.59413E 06	0.17652E 04	0.23277E-02	0.651E-04	58.
13	187.5	0.62350E 06	0.18314E 04	0.21349E-02	0.407E-04	58.
14	190.1	0.64340E 06	0.18737E 04	0.21074E-02	0.458E-04	58.
15	192.7	0.66330E 06	0.19164E 04	0.21791E-02	0.473E-04	58.
16	195.4	0.68330E 06	0.19597E 04	0.21674E-02	0.468E-04	58.
17	198.0	0.70330E 06	0.20025E 04	0.21341E-02	0.465E-04	58.
18	200.6	0.72320E 06	0.20457E 04	0.22013E-02	0.476E-04	58.
19	203.2	0.74310E 06	0.20894E 04	0.21838E-02	0.461E-04	58.
20	205.8	0.76300E 06	0.21321E 04	0.21028E-02	0.447E-04	58.
21	208.5	0.78290E 06	0.21757E 04	0.22683E-02	0.475E-04	58.
22	211.1	0.80280E 06	0.22195E 04	0.21294E-02	0.471E-04	58.
23	213.7	0.82270E 06	0.22615E 04	0.20900E-02	0.467E-04	58.
24	216.3	0.84270E 06	0.23033E 04	0.21038E-02	0.475E-04	58.
25	218.9	0.86270E 06	0.23448E 04	0.20631E-02	0.466E-04	58.
26	221.6	0.88260E 06	0.23870E 04	0.21735E-02	0.479E-04	58.
27	224.2	0.90250E 06	0.24294E 04	0.20849E-02	0.470E-04	58.
28	226.8	0.92240E 06	0.24702E 04	0.20104E-02	0.459E-04	58.
29	229.4	0.94230E 06	0.25109E 04	0.20746E-02	0.463E-04	58.
30	232.0	0.96220E 06	0.25516E 04	0.20123E-02	0.466E-04	58.
31	234.6	0.98210E 06	0.25930E 04	0.21358E-02	0.473E-04	58.
32	237.3	0.10021E 07	0.26340E 04	0.19791E-02	0.457E-04	58.
33	239.9	0.10221E 07	0.26739E 04	0.20298E-02	0.457E-04	58.
34	242.5	0.10420E 07	0.27149E 04	0.20876E-02	0.459E-04	58.
35	245.1	0.10619E 07	0.27560E 04	0.20391E-02	0.482E-04	58.
36	247.8	0.10818E 07	0.27965E 04	0.20287E-02	0.526E-04	58.

STANTON NUMBER DATA RUN 012774 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=10 ***

STANTON NUMBER DATA RUN 012874 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 012774 AND 012874 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	170450.9	658.4	0.002774	169105.9	653.2	0.002696	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UJUUUUJU
2	209411.2	777.3	0.003327	207758.7	811.9	0.002782	0.164	1.143	0.0017	0.954	0.0014	1.173
3	248371.4	903.8	0.003168	246411.4	973.3	0.002835	0.105	1.126	0.0017	1.006	0.0014	1.233
4	287331.6	1026.9	0.003150	285064.3	1128.7	0.002638	0.162	1.153	0.0018	0.964	0.0013	1.183
5	326291.9	1146.2	0.002975	323717.0	1280.2	0.002629	0.116	1.117	0.0018	0.986	0.0013	1.210
6	365252.1	1263.6	0.003053	362369.8	1433.3	0.002450	0.197	1.172	0.0018	0.940	0.0014	1.191
7	404212.3	1379.6	0.002904	401022.6	1583.7	0.002486	0.144	1.138	0.0018	0.973	0.0014	1.230
8	443172.6	1493.4	0.002935	439675.4	1723.1	0.002378	0.190	1.172	0.0016	0.948	0.0012	1.167
9	482132.8	1604.9	0.002788	478328.1	1860.0	0.002351	0.157	1.132	0.0016	0.953	0.0012	1.175
10	521093.0	1715.8	0.002907	516980.9	1999.3	0.002277	0.217	1.198	0.0017	0.937	0.0013	1.183
11	560053.3	1826.5	0.002772	555633.7	2137.4	0.002284	0.176	1.160	0.0017	0.954	0.0013	1.203
12	599013.4	1935.0	0.002800	594286.5	2270.5	0.002090	0.253	1.187	0.0018	0.885	0.0013	1.130
13	628623.3	2014.7	0.002504	623662.7	2369.2	0.002157	0.139	1.072		0.922		
14	648687.8	2064.0	0.002405	643568.8	2411.7	0.002105	0.125	1.036		0.905		
15	668752.3	2112.7	0.002447	663475.0	2440.5	0.002045	0.164	1.061		0.885		
16	688914.0	2161.1	0.002368	683477.6	2481.9	0.002106	0.111	1.032		0.917		
17	709076.0	2207.7	0.002271	703480.5	2523.7	0.002089	0.080	0.996		0.915		
18	729140.4	2254.9	0.002435	723386.6	2564.3	0.001993	0.181	1.074		0.878		
19	749204.9	2302.6	0.002314	743292.8	2605.0	0.002087	0.098	1.026		0.924		
20	769269.4	2347.7	0.002171	763198.9	2646.0	0.002024	0.068	0.968		0.901		
21	789334.3	2393.8	0.002422	783105.4	2686.4	0.002030	0.162	1.085		0.908		
22	809398.8	2440.3	0.002207	803011.6	2727.6	0.002107	0.045	0.994		0.947		
23	829463.3	2484.4	0.002178	822917.7	2768.5	0.001999	0.082	0.986		0.903		
24	849624.9	2528.9	0.002259	842920.3	2807.9	0.001950	0.137	1.027		0.885		
25	869786.9	2573.4	0.002169	862923.2	2847.0	0.001972	0.091	0.991		0.899		
26	889851.4	2618.0	0.002267	882829.4	2887.5	0.002095	0.076	1.040		0.960		
27	909915.9	2662.8	0.002196	902735.5	2927.3	0.001900	0.135	1.012		0.874		
28	929980.4	2705.9	0.002097	922641.7	2965.9	0.001972	0.060	0.971		0.911		
29	950045.2	2749.0	0.002194	942548.1	3004.8	0.001931	0.120	1.020		0.896		
30	970109.7	2791.5	0.002036	962454.3	3044.1	0.002020	0.008	0.950		0.942		
31	990174.2	2834.5	0.002243	982360.4	3083.9	0.001973	0.120	1.052		0.923		
32	1010335.0	2877.8	0.002070	1002363.0	3123.4	0.001986	0.040	0.974		0.933		
33	1030497.0	2919.6	0.002093	1022365.0	3162.5	0.001934	0.076	0.989		0.913		
34	1050562.0	2962.6	0.002181	1042272.0	3201.8	0.002015	0.076	1.035		0.954		
35	1070626.0	3005.7	0.002119	1062178.0	3241.8	0.001995	0.058	1.009		0.949		
36	1090691.0	3048.2	0.002111	1082084.0	3281.6	0.001995	0.055	1.009		0.952		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 012974-1 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL55 M=0.55 TH=0 NORMAL HOLE INJECTION P/D=10 ***

STANTON NUMBER DATA RUN 012974-2 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL55 M=0.55 TH=1 NORMAL HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 012974-1 AND 012974-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	167196.6	645.9	0.002773	170660.9	659.2	0.002754	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	205413.0	766.2	0.003523	209669.2	944.9	0.003006	0.147	1.206	0.0045	1.033	0.0044	1.682
3	243629.4	897.6	0.003354	248677.4	1234.3	0.002948	0.121	1.188	0.0045	1.048	0.0044	1.719
4	281845.8	1028.0	0.003471	287685.6	1518.8	0.002834	0.183	1.265	0.0044	1.038	0.0044	1.719
5	320062.2	1156.3	0.003247	326693.9	1798.6	0.002709	0.166	1.214	0.0044	1.017	0.0044	1.713
6	358278.6	1285.3	0.003501	365702.1	2074.5	0.002633	0.248	1.339	0.0044	1.011	0.0044	1.721
7	396494.9	1415.0	0.003288	404710.3	2347.4	0.002557	0.222	1.284	0.0044	1.002	0.0044	1.723
8	434711.3	1542.6	0.003389	443718.6	2596.9	0.002517	0.257	1.348	0.0043	1.005	0.0039	1.657
9	472927.7	1667.6	0.003152	482726.8	2844.2	0.002450	0.222	1.274	0.0043	0.995	0.0039	1.656
10	511144.1	1792.6	0.003392	521735.0	3098.3	0.002437	0.282	1.393	0.0044	1.005	0.0041	1.709
11	549360.5	1916.7	0.003104	560743.3	3351.3	0.002390	0.230	1.293	0.0044	1.000	0.0041	1.713
12	587576.9	2036.8	0.003180	599751.4	3594.5	0.002274	0.285	1.343	0.0043	0.964	0.0039	1.656
13	616621.4	2126.4	0.002928	629397.8	3776.2	0.002186	0.253	1.248		0.936		
14	636302.8	2182.5	0.002761	649487.0	3819.7	0.002143	0.224	1.185		0.924		
15	655984.2	2236.7	0.002743	669576.2	3822.4	0.002025	0.262	1.184		0.878		
16	675761.0	2290.0	0.002671	689762.8	3864.0	0.002110	0.210	1.160		0.920		
17	695538.0	2341.5	0.002551	709949.6	3906.0	0.002069	0.189	1.114		0.907		
18	715219.4	2392.5	0.002625	730038.8	3947.4	0.002041	0.222	1.153		0.900		
19	734900.9	2443.4	0.002544	750128.0	3988.8	0.002082	0.182	1.123		0.923		
20	754582.3	2492.2	0.002408	770217.2	4030.0	0.002010	0.166	1.069		0.896		
21	774263.9	2541.4	0.002584	790306.8	4070.8	0.002054	0.205	1.153		0.921		
22	793945.4	2590.6	0.002406	810395.9	4112.2	0.002059	0.144	1.079		0.927		
23	813626.8	2637.2	0.002333	830485.1	4152.4	0.001934	0.171	1.052		0.875		
24	833403.6	2683.5	0.002366	850671.7	4191.5	0.001955	0.174	1.072		0.889		
25	853180.6	2729.3	0.002276	870858.5	4230.4	0.001919	0.157	1.036		0.877		
26	872862.0	2774.3	0.002295	890947.8	4270.0	0.002017	0.121	1.049		0.926		
27	892543.4	2819.6	0.002303	911036.9	4309.7	0.001923	0.165	1.058		0.886		
28	912224.8	2864.2	0.002225	931126.1	4348.3	0.001920	0.137	1.026		0.889		
29	931906.6	2908.7	0.002291	951215.7	4387.1	0.001943	0.152	1.061		0.904		
30	951587.9	2952.9	0.002194	971304.9	4426.0	0.001918	0.126	1.020		0.895		
31	971269.4	2997.6	0.002340	991394.1	4465.0	0.001959	0.163	1.093		0.918		
32	991046.1	3042.0	0.002168	1011580.0	4503.8	0.001900	0.123	1.016		0.894		
33	1010823.0	3085.0	0.002194	1031767.0	4541.8	0.001880	0.143	1.033		0.888		
34	1030504.0	3129.1	0.002286	1051856.0	4580.4	0.001958	0.143	1.080		0.929		
35	1050186.0	3173.5	0.002215	1071945.0	4619.3	0.001915	0.135	1.050		0.912		
36	1069867.0	3216.8	0.002184	1092035.0	4657.5	0.001886	0.136	1.040		0.901		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

VELOCITY AND TEMPERATURE PROFILES FOR FIGS. 18 AND 19

REX	= 0.12471E 07	REM	=	2786.	REH	=	1639.	
XVO	= 12.06 CM.	DEL2	=	0.258 CM.	DEH2	=	0.156 CM.	
UINF	= 16.58 M/S	DEL99	=	2.164 CM.	DELT99	=	1.899 CM.	
VISC	= 0.15381E-04 M2/S	DEL1	=	0.358 CM.	UINF	=	16.21 M/S	
PORT	= 19	H	=	1.384	VISC	=	0.15419E-04 M2/S	
XLOC	= 127.76 CM.	CF/2	=	0.16973E-02	TINF	=	23.59 DEG C	
					TPLATE	=	38.04 DEG C	

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+	Y(CM.)	T(DEG C)	TBAR	TBAR
0.025	0.012	7.19	0.434	11.3	10.52	0.0165	33.93	0.287	0.713
0.028	0.013	7.38	0.445	12.4	10.80	0.0191	33.46	0.320	0.680
0.030	0.014	7.59	0.458	13.5	11.11	0.0216	32.81	0.365	0.635
0.033	0.015	7.76	0.468	14.7	11.36	0.0241	32.31	0.400	0.600
0.036	0.016	7.97	0.481	15.8	11.68	0.0267	31.85	0.432	0.568
0.038	0.018	8.13	0.490	16.9	11.91	0.0292	31.46	0.459	0.541
0.041	0.019	8.28	0.499	18.0	12.12	0.0343	30.88	0.499	0.501
0.046	0.021	8.55	0.516	20.3	12.52	0.0394	30.43	0.531	0.469
0.051	0.023	8.84	0.533	22.6	12.94	0.0445	30.04	0.558	0.442
0.058	0.027	9.08	0.548	25.9	13.30	0.0521	29.60	0.589	0.411
0.069	0.032	9.41	0.568	30.5	13.78	0.0597	29.27	0.612	0.388
0.079	0.036	9.58	0.578	35.0	14.03	0.0699	28.98	0.632	0.368
0.094	0.043	9.87	0.595	41.7	14.45	0.0826	28.70	0.651	0.349
0.112	0.052	10.12	0.610	49.6	14.82	0.1003	28.38	0.674	0.326
0.130	0.060	10.28	0.620	57.5	15.05	0.1257	28.02	0.699	0.301
0.150	0.069	10.48	0.632	66.5	15.35	0.1638	27.66	0.724	0.276
0.170	0.079	10.67	0.644	75.6	15.63	0.2146	27.28	0.750	0.250
0.193	0.089	10.85	0.654	85.7	15.88	0.2781	26.91	0.777	0.223
0.218	0.101	11.02	0.665	97.0	16.13	0.3670	26.52	0.804	0.196
0.244	0.113	11.21	0.676	108.3	16.41	0.4940	26.06	0.836	0.164
0.282	0.130	11.41	0.688	125.2	16.71	0.6464	25.60	0.868	0.132
0.333	0.154	11.67	0.704	147.8	17.09	0.8369	25.15	0.900	0.100
0.396	0.183	11.99	0.723	175.9	17.55	1.0274	24.77	0.926	0.074
0.472	0.218	12.32	0.743	209.8	18.04	1.2179	24.46	0.947	0.053
0.561	0.259	12.66	0.764	249.3	18.54	1.4084	24.23	0.963	0.037
0.663	0.306	13.07	0.788	294.4	19.14	1.5989	24.05	0.976	0.024
0.790	0.365	13.45	0.811	350.8	19.69	1.7259	23.95	0.983	0.017
0.917	0.424	13.86	0.836	407.2	20.30	1.8529	23.87	0.989	0.011
1.044	0.482	14.23	0.858	463.6	20.83	1.9799	23.82	0.992	0.008
1.171	0.541	14.62	0.882	519.9	21.40	2.1069	23.79	0.994	0.006
1.298	0.600	14.91	0.899	576.3	21.83	2.2339	23.74	0.998	0.002
1.425	0.658	15.19	0.916	632.7	22.24	2.3609	23.71	1.000	0.000
1.552	0.717	15.49	0.935	689.1	22.68				
1.679	0.776	15.75	0.950	745.5	23.06				
1.806	0.834	15.96	0.963	801.9	23.37				
1.933	0.893	16.15	0.974	858.3	23.64				
2.060	0.952	16.31	0.984	914.7	23.88				
2.187	1.010	16.42	0.990	971.1	24.04				
2.314	1.069	16.50	0.995	1027.5	24.15				
2.441	1.128	16.56	0.999	1083.9	24.25				
2.568	1.187	16.58	1.000	1140.3	24.27				

STANTON NUMBER DATA RUN 100873 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800HSLFP NORMAL HOLE INJECTION P/D=5 ***

TADB= 23.74 DEG C UINF= 16.21 M/S TINF= 23.63 DEG C
RHO= 1.178 KG/M3 VISC= 0.15420E-04 M2/S XVO= 12.1 CM
CP= 1014. J/KGK PR= 0.717

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.12162E 07	0.18156E 04	0.24279E-02	0.542E-04	80.
2	132.8	0.12696E 07	0.19432E 04	0.23509E-02	0.540E-04	80.
3	137.9	0.13230E 07	0.20684E 04	0.23399E-02	0.539E-04	80.
4	143.0	0.13764E 07	0.21922E 04	0.22961E-02	0.539E-04	80.
5	148.1	0.14298E 07	0.23136E 04	0.22522E-02	0.539E-04	80.
6	153.2	0.14832E 07	0.24337E 04	0.22457E-02	0.537E-04	80.
7	158.2	0.15366E 07	0.25527E 04	0.22099E-02	0.534E-04	80.
8	163.3	0.15900E 07	0.26699E 04	0.21825E-02	0.533E-04	80.
9	168.4	0.16434E 07	0.27860E 04	0.21627E-02	0.532E-04	80.
10	173.5	0.16968E 07	0.29009E 04	0.21413E-02	0.535E-04	80.
11	178.6	0.17502E 07	0.30144E 04	0.21102E-02	0.534E-04	80.
12	183.6	0.18036E 07	0.31251E 04	0.20360E-02	0.530E-04	80.
13	187.5	0.18441E 07	0.32089E 04	0.21389E-02	0.364E-04	80.
14	190.1	0.18716E 07	0.32664E 04	0.20384E-02	0.376E-04	80.
15	192.7	0.18991E 07	0.33225E 04	0.20347E-02	0.378E-04	80.
16	195.4	0.19268E 07	0.33780E 04	0.19989E-02	0.370E-04	80.
17	198.0	0.19544E 07	0.34327E 04	0.19709E-02	0.368E-04	80.
18	200.6	0.19819E 07	0.34878E 04	0.20318E-02	0.377E-04	80.
19	203.2	0.20094E 07	0.35432E 04	0.19974E-02	0.364E-04	80.
20	205.8	0.20369E 07	0.35971E 04	0.19187E-02	0.353E-04	80.
21	208.5	0.20644E 07	0.36518E 04	0.20522E-02	0.373E-04	80.
22	211.1	0.20919E 07	0.37070E 04	0.19550E-02	0.370E-04	80.
23	213.7	0.21194E 07	0.37597E 04	0.18773E-02	0.362E-04	80.
24	216.3	0.21470E 07	0.38119E 04	0.19133E-02	0.388E-04	80.
25	218.9	0.21747E 07	0.38607E 04	0.16323E-02	0.364E-04	80.
26	221.6	0.22022E 07	0.39091E 04	0.18846E-02	0.388E-04	80.
27	224.2	0.22297E 07	0.39624E 04	0.19858E-02	0.389E-04	80.
28	226.8	0.22572E 07	0.40164E 04	0.19343E-02	0.371E-04	80.
29	229.4	0.22847E 07	0.40702E 04	0.19759E-02	0.369E-04	80.
30	232.0	0.23122E 07	0.41238E 04	0.19124E-02	0.370E-04	80.
31	234.6	0.23397E 07	0.41769E 04	0.19468E-02	0.368E-04	80.
32	237.3	0.23673E 07	0.42289E 04	0.18299E-02	0.358E-04	80.
33	239.9	0.23950E 07	0.42800E 04	0.18835E-02	0.362E-04	80.
34	242.5	0.24225E 07	0.43321E 04	0.19002E-02	0.361E-04	80.
35	245.1	0.24500E 07	0.43842E 04	0.18834E-02	0.378E-04	80.
36	247.8	0.24775E 07	0.44357E 04	0.18629E-02	0.414E-04	81.

STANTON NUMBER DATA RUN 101173-2 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800HSL20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 101273 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800HSL20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 101173-2 AND 101273 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1198825.0	1789.7	0.002388	1218038.0	1818.4	0.002431	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUUU
2	1251463.0	1927.3	0.002840	1271519.0	2125.1	0.002152	0.242	1.208	0.0070	0.916	0.0069	2.042
3	1304101.0	2084.8	0.003145	1325001.0	2621.8	0.002157	0.314	1.344	0.0069	0.922	0.0074	2.121
4	1356739.0	2251.4	0.003185	1378482.0	3114.2	0.002059	0.353	1.387	0.0068	0.897	0.0068	2.034
5	1409377.0	2416.5	0.003086	1431964.0	3579.7	0.001960	0.365	1.370	0.0068	0.870	0.0066	1.982
6	1462014.0	2578.4	0.003065	1485445.0	4034.9	0.001843	0.399	1.365	0.0068	0.821	0.0067	1.940
7	1514652.0	2738.0	0.003000	1538926.0	4464.0	0.001788	0.404	1.358	0.0068	0.809	0.0057	1.808
8	1567290.0	2894.7	0.002954	1592408.0	4876.1	0.001729	0.415	1.353	0.0069	0.792	0.0061	1.857
9	1619928.0	3048.9	0.002908	1645889.0	5290.9	0.001659	0.430	1.345	0.0069	0.767	0.0060	1.811
10	1672566.0	3202.2	0.002916	1699371.0	5710.0	0.001638	0.438	1.362	0.0069	0.765	0.0064	1.878
11	1725203.0	3354.0	0.002851	1752852.0	6127.8	0.001569	0.450	1.351	0.0069	0.744	0.0060	1.811
12	1777841.0	3502.3	0.002784	1806333.0	6539.6	0.001534	0.449	1.368	0.0068	0.753	0.0063	1.893
13	1817846.0	3610.4	0.002564	1846979.0	6770.7	0.001624	0.367	1.199		0.759		
14	1844954.0	3676.4	0.002304	1874522.0	6814.5	0.001553	0.326	1.130		0.762		
15	1872063.0	3737.8	0.002216	1902065.0	6856.6	0.001500	0.323	1.089		0.737		
16	1899303.0	3796.4	0.002104	1929741.0	6897.9	0.001490	0.292	1.053		0.746		
17	1926543.0	3852.3	0.002014	1957418.0	6938.7	0.001469	0.270	1.022		0.746		
18	1953651.0	3907.5	0.002054	1984961.0	6978.8	0.001444	0.297	1.011		0.711		
19	1980760.0	3962.1	0.001966	2012504.0	7019.1	0.001473	0.251	0.984		0.737		
20	2007868.0	4014.5	0.001899	2040047.0	7059.1	0.001428	0.248	0.990		0.744		
21	2034977.0	4067.7	0.002025	2067590.0	7099.3	0.001487	0.265	0.987		0.725		
22	2062085.0	4120.8	0.001882	2095133.0	7140.0	0.001470	0.219	0.963		0.752		
23	2089194.0	4171.2	0.001832	2122676.0	7179.9	0.001418	0.226	0.976		0.755		
24	2116434.0	4221.1	0.001845	2150352.0	7219.0	0.001420	0.231	0.964		0.742		
25	2143674.0	4268.0	0.001616	2178029.0	7256.3	0.001289	0.202	0.990		0.790		
26	2170782.0	4315.1	0.001854	2205572.0	7295.2	0.001528	0.176	0.984		0.811		
27	2197891.0	4366.9	0.001963	2233114.0	7336.7	0.001485	0.244	0.989		0.748		
28	2224999.0	4419.0	0.001877	2260657.0	7377.7	0.001483	0.210	0.970		0.767		
29	2252108.0	4471.0	0.001952	2288201.0	7418.9	0.001509	0.227	0.988		0.764		
30	2279216.0	4522.5	0.001843	2315744.0	7460.6	0.001511	0.180	0.964		0.790		
31	2306325.0	4573.5	0.001913	2343286.0	7502.4	0.001522	0.204	0.983		0.782		
32	2333564.0	4623.7	0.001785	2370963.0	7543.9	0.001490	0.165	0.975		0.814		
33	2360805.0	4672.9	0.001839	2398639.0	7584.9	0.001487	0.192	0.977		0.789		
34	2387913.0	4723.3	0.001880	2426182.0	7626.6	0.001536	0.183	0.990		0.809		
35	2415021.0	4774.2	0.001868	2453725.0	7669.1	0.001541	0.175	0.992		0.818		
36	2442130.0	4824.4	0.001834	2481268.0	7711.5	0.001534	0.164	0.985		0.824		

STANTON NUMBER RATIO BASED ON EXPERIMENTAL FLAT PLATE VALUE AT SAME X LOCATION

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

VELOCITY PROFILE FOR FIG. 21

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REX   = 0.69241E 06        REM   =        1740.

XVO   =        16.04 CM.   DEL2  =        0.281 CM.
UINF  =         9.66 M/S   DEL99=         2.388 CM.
VISC  = 0.15581E-04 M2/S   DEL1  =        0.393 CM.
PORT  =           19       H     =        1.399
XLOC  =       127.76 CM.   CF/2  = 0.18972E-02
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Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.011	3.32	0.344	6.9	7.90
0.028	0.012	3.49	0.362	7.5	8.30
0.030	0.013	3.63	0.376	8.2	8.63
0.036	0.015	3.97	0.411	9.6	9.43
0.041	0.017	4.23	0.438	11.0	10.05
0.046	0.019	4.49	0.465	12.3	10.67
0.051	0.021	4.63	0.479	13.7	11.00
0.061	0.026	4.97	0.514	16.5	11.81
0.071	0.030	5.19	0.537	19.2	12.34
0.081	0.034	5.38	0.557	21.9	12.78
0.091	0.038	5.48	0.568	24.7	13.03
0.102	0.043	5.62	0.582	27.4	13.37
0.119	0.050	5.80	0.600	32.2	13.78
0.137	0.057	5.94	0.615	37.0	14.12
0.165	0.069	6.09	0.631	44.6	14.49
0.203	0.085	6.31	0.654	54.9	15.00
0.241	0.101	6.43	0.666	65.1	15.29
0.279	0.117	6.55	0.679	75.4	15.58
0.330	0.138	6.72	0.696	89.1	15.99
0.394	0.165	6.86	0.710	106.3	16.31
0.470	0.197	7.07	0.732	126.9	16.82
0.546	0.229	7.22	0.748	147.4	17.17
0.673	0.282	7.49	0.776	181.7	17.81
0.800	0.335	7.73	0.801	216.0	18.39
0.927	0.388	7.96	0.824	250.3	18.92
1.054	0.441	8.18	0.847	284.6	19.45
1.181	0.495	8.33	0.863	318.8	19.81
1.308	0.548	8.54	0.884	353.1	20.29
1.435	0.601	8.72	0.903	387.4	20.72
1.562	0.654	8.86	0.918	421.7	21.07
1.689	0.707	9.01	0.933	456.0	21.42
1.816	0.760	9.17	0.949	490.3	21.80
1.943	0.814	9.28	0.961	524.5	22.07
2.070	0.867	9.39	0.972	558.8	22.32
2.197	0.920	9.48	0.982	593.1	22.54
2.324	0.973	9.56	0.990	627.4	22.73
2.451	1.026	9.64	0.998	661.7	22.91
2.578	1.080	9.64	0.998	696.0	22.92
2.705	1.133	9.66	1.000	730.3	22.96

STANTON NUMBER DATA RUN 082273 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEPFP NORMAL HOLE INJECTION P/D=5 ***

TADB= 25.00 DEG C   UINF= 9.45 M/S   TINF= 24.96 DEG C
RHO= 1.182 KG/M3   VISC= 0.15462E-04 M2/S   XVO= 16.2 CM
CP= 1011. J/KGK   PR= 0.714

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.68159E 06	0.73423E 02	0.47301E-02	0.107E-03	2.
2	132.8	0.71263E 06	0.20136E 03	0.35118E-02	0.950E-04	3.
3	137.9	0.74368E 06	0.30679E 03	0.32805E-02	0.932E-04	4.
4	143.0	0.77472E 06	0.40662E 03	0.31511E-02	0.920E-04	4.
5	148.1	0.80577E 06	0.50239E 03	0.30183E-02	0.910E-04	5.
6	153.2	0.83681E 06	0.59464E 03	0.29251E-02	0.905E-04	5.
7	158.2	0.86786E 06	0.68381E 03	0.28194E-02	0.899E-04	5.
8	163.3	0.89890E 06	0.77034E 03	0.27552E-02	0.896E-04	6.
9	168.4	0.92995E 06	0.85524E 03	0.27141E-02	0.892E-04	6.
10	173.5	0.96099E 06	0.93884E 03	0.26716E-02	0.891E-04	6.
11	178.6	0.99204E 06	0.10215E 04	0.26541E-02	0.888E-04	7.
12	183.6	0.10231E 07	0.11019E 04	0.25221E-02	0.878E-04	7.
13	187.5	0.10467E 07	0.11633E 04	0.27894E-02	0.588E-04	7.
14	190.1	0.10627E 07	0.12065E 04	0.26063E-02	0.605E-04	7.
15	192.7	0.10787E 07	0.12477E 04	0.25386E-02	0.600E-04	7.
16	195.4	0.10947E 07	0.12879E 04	0.24896E-02	0.588E-04	7.
17	198.0	0.11108E 07	0.13275E 04	0.24590E-02	0.585E-04	7.
18	200.6	0.11268E 07	0.13675E 04	0.25336E-02	0.598E-04	7.
19	203.2	0.11428E 07	0.14076E 04	0.24722E-02	0.575E-04	7.
20	205.8	0.11587E 07	0.14465E 04	0.23945E-02	0.560E-04	7.
21	208.5	0.11747E 07	0.14859E 04	0.25239E-02	0.586E-04	7.
22	211.1	0.11907E 07	0.15252E 04	0.23896E-02	0.582E-04	7.
23	213.7	0.12067E 07	0.15628E 04	0.23091E-02	0.571E-04	7.
24	216.3	0.12228E 07	0.16003E 04	0.23801E-02	0.605E-04	8.
25	218.9	0.12388E 07	0.16366E 04	0.21528E-02	0.577E-04	8.
26	221.6	0.12548E 07	0.16731E 04	0.24020E-02	0.607E-04	8.
27	224.2	0.12708E 07	0.17118E 04	0.24419E-02	0.603E-04	8.
28	226.8	0.12868E 07	0.17500E 04	0.23215E-02	0.574E-04	8.
29	229.4	0.13028E 07	0.17890E 04	0.25568E-02	0.599E-04	8.
30	232.0	0.13188E 07	0.18277E 04	0.22817E-02	0.575E-04	8.
31	234.6	0.13348E 07	0.18647E 04	0.23382E-02	0.572E-04	8.
32	237.3	0.13508E 07	0.19010E 04	0.21915E-02	0.559E-04	8.
33	239.9	0.13669E 07	0.19364E 04	0.22286E-02	0.558E-04	8.
34	242.5	0.13829E 07	0.19720E 04	0.22298E-02	0.553E-04	8.
35	245.1	0.13989E 07	0.20077E 04	0.22250E-02	0.586E-04	8.
36	247.8	0.14149E 07	0.20432E 04	0.22154E-02	0.647E-04	8.

STANTON NUMBER DATA RUN 082073 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEP20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 082173 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEP20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 082073 AND 082173 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	652621.4	72.5	0.004878	661801.9	70.9	0.004702	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUUU
2	682346.9	209.7	0.004354	691945.4	277.6	0.003274	0.248	1.010	0.0066	1.043	0.0057	1.805
3	712072.3	340.1	0.004418	722089.0	542.2	0.003115	0.295	1.147	0.0067	1.054	0.0054	1.820
4	741797.7	470.4	0.004348	752232.6	793.9	0.002902	0.333	1.216	0.0065	1.023	0.0053	1.793
5	771523.1	597.1	0.004175	782376.2	1041.6	0.002684	0.357	1.234	0.0066	0.977	0.0056	1.808
6	801248.6	718.2	0.003974	812519.8	1291.6	0.002419	0.391	1.228	0.0065	0.903	0.0059	1.782
7	830973.9	835.2	0.003899	842663.3	1531.3	0.002352	0.397	1.249	0.0069	0.898	0.0052	1.708
8	860699.4	949.1	0.003766	872806.9	1762.0	0.002300	0.389	1.245	0.0068	0.895	0.0054	1.740
9	890424.8	1060.1	0.003700	902950.4	1992.0	0.002232	0.397	1.257	0.0067	0.884	0.0053	1.728
10	920150.3	1169.1	0.003638	933094.0	2226.9	0.002219	0.390	1.267	0.0067	0.892	0.0058	1.817
11	949875.6	1276.2	0.003564	963237.6	2465.2	0.002151	0.396	1.269	0.0069	0.877	0.0056	1.786
12	979601.1	1380.6	0.003460	993381.1	2690.7	0.002027	0.414	1.256	0.0066	0.837	0.0052	1.683
13	1002192.0	1456.7	0.003223	1016290.0	2815.7	0.002159	0.330	1.186		0.900		
14	1017501.0	1503.4	0.002871	1031814.0	2848.3	0.002041	0.289	1.066		0.856		
15	1032809.0	1546.1	0.002704	1047338.0	2878.8	0.001875	0.307	1.013		0.791		
16	1048192.0	1586.5	0.002564	1062937.0	2908.0	0.001885	0.265	0.969		0.800		
17	1063575.0	1624.7	0.002419	1078536.0	2937.2	0.001873	0.225	0.921		0.799		
18	1078883.0	1662.9	0.002563	1094060.0	2965.6	0.001783	0.304	0.984		0.765		
19	1094192.0	1700.7	0.002378	1109584.0	2993.9	0.001863	0.216	0.919		0.803		
20	1109501.0	1736.4	0.002279	1125108.0	3022.4	0.001804	0.208	0.887		0.782		
21	1124809.0	1772.7	0.002449	1140632.0	3050.4	0.001795	0.267	0.960		0.781		
22	1140118.0	1808.5	0.002227	1156156.0	3078.9	0.001871	0.160	0.879		0.818		
23	1155427.0	1842.6	0.002219	1171680.0	3107.2	0.001767	0.204	0.881		0.776		
24	1170809.0	1876.8	0.002242	1187279.0	3134.5	0.001752	0.218	0.896		0.773		
25	1186192.0	1909.6	0.002044	1202878.0	3161.3	0.001691	0.173	0.822		0.749		
26	1201501.0	1942.3	0.002228	1218402.0	3189.2	0.001900	0.147	0.901		0.846		
27	1216809.0	1977.1	0.002309	1233926.0	3217.8	0.001778	0.230	0.940		0.795		
28	1232118.0	2011.7	0.002199	1249450.0	3245.5	0.001793	0.185	0.900		0.805		
29	1247427.0	2047.0	0.002408	1264974.0	3274.7	0.001955	0.188	0.991		0.881		
30	1262735.0	2081.9	0.002146	1280498.0	3304.3	0.001857	0.135	0.888		0.840		
31	1278044.0	2115.3	0.002220	1296022.0	3332.7	0.001805	0.187	0.923		0.820		
32	1293427.0	2148.3	0.002083	1311621.0	3361.1	0.001840	0.117	0.871		0.838		
33	1308810.0	2180.7	0.002142	1327221.0	3389.4	0.001804	0.158	0.900		0.825		
34	1324118.0	2213.4	0.002125	1342745.0	3417.4	0.001806	0.150	0.897		0.829		
35	1339427.0	2246.0	0.002139	1358268.0	3445.7	0.001835	0.142	0.907		0.845		
36	1354735.0	2278.5	0.002097	1373792.0	3474.0	0.001810	0.136	0.893		0.837		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 082473 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEP75 M=0.75 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 082773 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEP75 M=0.75 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 082473 AND 082773 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	674861.3	72.1	0.004694	675928.4	71.7	0.004658	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	705599.8	215.6	0.004639	706715.4	568.3	0.004070	0.123	1.083	0.0242	1.302	0.0235	3.933
3	736338.1	364.6	0.005058	737502.4	1423.8	0.004144	0.181	1.323	0.0237	1.409	0.0238	4.243
4	767076.5	522.3	0.005202	768289.4	2279.3	0.004001	0.231	1.465	0.0243	1.418	0.0236	4.329
5	797814.9	679.9	0.005051	799076.4	3121.1	0.003635	0.280	1.504	0.0239	1.329	0.0235	4.271
6	828553.3	832.2	0.004861	829863.4	3959.7	0.003089	0.365	1.512	0.0239	1.159	0.0243	4.178
7	859291.8	977.6	0.004601	860650.4	4798.4	0.002790	0.394	1.485	0.0237	1.070	0.0243	4.101
8	890030.1	1115.1	0.004342	891437.4	5615.0	0.002507	0.423	1.446	0.0243	0.981	0.0234	3.923
9	920768.5	1245.9	0.004171	922224.4	6404.5	0.002172	0.479	1.428	0.0241	0.864	0.0232	3.751
10	951506.9	1372.7	0.004078	953011.4	7203.2	0.002014	0.506	1.430	0.0244	0.813	0.0245	3.843
11	982245.3	1495.4	0.003906	983798.4	8025.6	0.001704	0.564	1.400	0.0240	0.698	0.0252	3.739
12	1012983.0	1614.3	0.003833	1014585.0	8837.7	0.001522	0.603	1.402	0.0243	0.632	0.0244	3.568
13	1036344.0	1699.3	0.003288	1037983.0	9248.9	0.001610	0.510	1.219		0.674		
14	1052175.0	1748.3	0.002898	1053838.0	9272.3	0.001351	0.534	1.084		0.569		
15	1068005.0	1791.3	0.002524	1069694.0	9292.2	0.001148	0.545	0.952		0.487		
16	1083912.0	1829.2	0.002267	1085626.0	9309.7	0.001063	0.531	0.863		0.453		
17	1099819.0	1863.7	0.002077	1101558.0	9326.1	0.001003	0.517	0.797		0.430		
18	1115649.0	1896.5	0.002068	1117413.0	9341.8	0.000976	0.528	0.799		0.420		
19	1131480.0	1928.1	0.001912	1133269.0	9357.2	0.000961	0.497	0.745		0.416		
20	1147310.0	1957.8	0.001839	1149124.0	9372.2	0.000925	0.497	0.721		0.402		
21	1163140.0	1987.6	0.001923	1164979.0	9387.1	0.000962	0.500	0.759		0.421		
22	1178971.0	2017.1	0.001794	1180835.0	9402.3	0.000953	0.469	0.713		0.419		
23	1194801.0	2045.3	0.001771	1196690.0	9417.3	0.000927	0.476	0.709		0.409		
24	1210708.0	2073.6	0.001801	1212622.0	9432.0	0.000927	0.485	0.725		0.411		
25	1226615.0	2101.4	0.001712	1228554.0	9446.3	0.000875	0.489	0.694		0.390		
26	1242445.0	2129.7	0.001857	1244410.0	9461.4	0.001024	0.449	0.757		0.458		
27	1258276.0	2159.4	0.001890	1260265.0	9477.5	0.001011	0.465	0.775		0.454		
28	1274106.0	2188.9	0.001833	1276120.0	9493.5	0.001000	0.454	0.755		0.451		
29	1289936.0	2220.0	0.002088	1291976.0	9510.7	0.001171	0.439	0.866		0.530		
30	1305767.0	2251.2	0.001844	1307831.0	9528.5	0.001067	0.421	0.768		0.485		
31	1321597.0	2280.8	0.001893	1323686.0	9545.4	0.001062	0.439	0.793		0.485		
32	1337504.0	2310.2	0.001818	1339619.0	9562.4	0.001084	0.404	0.765		0.496		
33	1353411.0	2339.4	0.001867	1355551.0	9579.6	0.001088	0.417	0.790		0.500		
34	1369241.0	2369.1	0.001884	1371406.0	9597.1	0.001117	0.407	0.801		0.515		
35	1385071.0	2398.9	0.001871	1387261.0	9615.0	0.001138	0.392	0.799		0.527		
36	1400902.0	2428.6	0.001879	1403117.0	9633.0	0.001124	0.402	0.807		0.522		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 082973 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEP95 M=0.95 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 083073 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 1700STEP95 M=0.95 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 082973 AND 083073 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	670788.0	70.8	0.004635	679792.8	70.5	0.004553	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	701340.9	213.0	0.004672	710755.8	662.2	0.004191	0.103	1.090	0.0306	1.342	0.0295	4.531
3	731893.8	363.2	0.005161	741718.8	1711.3	0.004507	0.127	1.348	0.0309	1.534	0.0296	4.977
4	762446.6	526.2	0.005508	772681.9	2761.5	0.004459	0.191	1.549	0.0309	1.581	0.0293	5.131
5	792999.4	691.6	0.005322	803644.9	3802.6	0.003992	0.250	1.582	0.0306	1.461	0.0295	5.079
6	823552.3	849.5	0.005011	834607.9	4828.8	0.003303	0.341	1.557	0.0307	1.241	0.0295	4.824
7	854105.2	998.7	0.004759	865570.9	5842.2	0.002960	0.378	1.534	0.0309	1.137	0.0297	4.752
8	884658.1	1139.3	0.004443	896533.9	6842.1	0.002674	0.398	1.478	0.0308	1.047	0.0292	4.615
9	915210.9	1272.2	0.004260	927496.9	7826.0	0.002243	0.474	1.456	0.0310	0.893	0.0294	4.423
10	945763.8	1400.2	0.004116	958459.9	8812.7	0.002078	0.495	1.441	0.0314	0.840	0.0300	4.434
11	976316.7	1524.0	0.003987	989422.9	9792.9	0.001681	0.578	1.427	0.0310	0.690	0.0295	4.146
12	1006869.0	1645.0	0.003935	1020386.0	10752.3	0.001530	0.611	1.437	0.0306	0.636	0.0292	4.047
13	1030089.0	1730.0	0.003156	1043917.0	11238.2	0.001214	0.615	1.169		0.509		
14	1045824.0	1777.2	0.002840	1059863.0	11256.9	0.001131	0.602	1.061		0.477		
15	1061559.0	1818.6	0.002408	1075809.0	11273.5	0.000946	0.607	0.907		0.401		
16	1077370.0	1854.5	0.002152	1091833.0	11288.0	0.000866	0.597	0.818		0.370		
17	1093181.0	1886.7	0.001940	1107856.0	11301.3	0.000799	0.588	0.743		0.343		
18	1108916.0	1917.7	0.001996	1123802.0	11314.0	0.000801	0.599	0.770		0.345		
19	1124650.0	1947.6	0.001808	1139748.0	11326.6	0.000772	0.573	0.703		0.335		
20	1140385.0	1975.6	0.001741	1155694.0	11338.8	0.000762	0.562	0.682		0.332		
21	1156120.0	2003.8	0.001833	1171640.0	11351.1	0.000778	0.575	0.723		0.341		
22	1171855.0	2031.6	0.001707	1187586.0	11363.4	0.000759	0.556	0.678		0.334		
23	1187589.0	2058.0	0.001645	1203532.0	11375.6	0.000767	0.534	0.657		0.339		
24	1203400.0	2084.3	0.001689	1219555.0	11387.6	0.000742	0.561	0.679		0.329		
25	1219211.0	2110.5	0.001635	1235578.0	11399.1	0.000695	0.575	0.661		0.310		
26	1234946.0	2136.9	0.001723	1251524.0	11411.2	0.000826	0.520	0.701		0.370		
27	1250681.0	2164.4	0.001765	1267470.0	11424.0	0.000770	0.564	0.723		0.346		
28	1266416.0	2191.6	0.001686	1283416.0	11436.4	0.000782	0.536	0.694		0.353		
29	1282150.0	2220.0	0.001917	1299362.0	11450.1	0.000939	0.510	0.793		0.425		
30	1297885.0	2248.1	0.001655	1315308.0	11464.2	0.000832	0.497	0.689		0.379		
31	1313620.0	2274.8	0.001739	1331254.0	11477.5	0.000825	0.525	0.727		0.377		
32	1329431.0	2301.5	0.001646	1347277.0	11490.8	0.000841	0.489	0.692		0.385		
33	1345242.0	2327.9	0.001704	1363301.0	11504.4	0.000862	0.494	0.720		0.397		
34	1360977.0	2354.9	0.001732	1379247.0	11518.2	0.000869	0.498	0.735		0.401		
35	1376711.0	2381.9	0.001689	1395193.0	11532.2	0.000888	0.474	0.721		0.412		
36	1392446.0	2408.8	0.001721	1411139.0	11546.2	0.000862	0.499	0.738		0.401		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

VELOCITY PROFILE FOR FIG. 25

REX = 0.28178E 07 REM = 5347.

XVO = 1.96 CM. DEL2 = 0.239 CM.
UINF = 35.18 M/S DEL99= 2.278 CM.
VISC = 0.15704E-04 M2/S DEL1 = 0.320 CM.
PORT = 19 H = 1.342
XLOC = 127.76 CM. CF/2 = 0.15604E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.011	19.04	0.541	22.5	13.70
0.028	0.012	19.32	0.549	24.7	13.90
0.030	0.013	19.43	0.552	27.0	13.98
0.036	0.016	19.74	0.561	31.5	14.21
0.041	0.018	20.07	0.571	36.0	14.44
0.046	0.020	20.29	0.577	40.5	14.60
0.053	0.023	20.68	0.588	47.2	14.88
0.061	0.027	20.96	0.596	53.9	15.08
0.069	0.030	21.22	0.603	60.7	15.27
0.079	0.035	21.66	0.616	69.7	15.59
0.089	0.039	21.96	0.624	78.7	15.80
0.102	0.045	22.21	0.631	89.9	15.98
0.114	0.050	22.54	0.641	101.1	16.22
0.132	0.058	22.90	0.651	116.9	16.48
0.152	0.067	23.34	0.663	134.8	16.79
0.178	0.078	23.79	0.676	157.3	17.12
0.203	0.089	24.16	0.687	179.8	17.39
0.229	0.100	24.54	0.698	202.3	17.66
0.267	0.117	25.06	0.712	236.0	18.04
0.305	0.134	25.47	0.724	269.7	18.33
0.343	0.151	25.91	0.737	303.4	18.65
0.394	0.173	26.46	0.752	348.3	19.05
0.445	0.195	26.85	0.763	393.3	19.32
0.508	0.223	27.34	0.777	449.5	19.68
0.584	0.256	27.94	0.794	516.9	20.11
0.660	0.290	28.50	0.810	584.3	20.51
0.737	0.323	29.04	0.826	651.7	20.90
0.813	0.357	29.45	0.837	719.2	21.20
0.914	0.401	30.05	0.854	809.1	21.63
1.003	0.440	30.56	0.869	887.7	21.99
1.105	0.485	31.16	0.886	977.6	22.43
1.232	0.541	31.77	0.903	1090.0	22.86
1.359	0.597	32.31	0.919	1202.3	23.25
1.486	0.652	32.94	0.937	1314.7	23.71
1.613	0.708	33.37	0.949	1427.1	24.01
1.740	0.764	33.81	0.961	1539.4	24.33
1.867	0.820	34.24	0.973	1651.8	24.64
1.994	0.875	34.45	0.979	1764.2	24.79
2.121	0.931	34.73	0.987	1876.6	25.00
2.248	0.987	34.98	0.994	1988.9	25.18
2.375	1.043	35.08	0.997	2101.3	25.25
2.502	1.098	35.16	1.000	2213.7	25.30
2.629	1.154	35.18	1.000	2326.0	25.32

STANTON NUMBER DATA RUN 091373-2 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 5300STEPFP NORMAL HOLE INJECTION P/D=5 ***

TADB= 27.22 DEG C   UINF= 35.37 M/S   TINF= 26.66 DEG C
RHO= 1.166 KG/M3   VISC= 0.15718E-04 M2/S   XVO= 2.1 CM
CP= 1013. J/KGK   PR= 0.715

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.28277E 07	0.18490E 03	0.32348E-02	0.444E-04	3.
2	132.8	0.29420E 07	0.52003E 03	0.26283E-02	0.391E-04	4.
3	137.9	0.30563E 07	0.81253E 03	0.24889E-02	0.378E-04	6.
4	143.0	0.31706E 07	0.10900E 04	0.23660E-02	0.368E-04	6.
5	148.1	0.32849E 07	0.13561E 04	0.22882E-02	0.364E-04	7.
6	153.2	0.33993E 07	0.16145E 04	0.22335E-02	0.359E-04	8.
7	158.2	0.35136E 07	0.18668E 04	0.21805E-02	0.356E-04	8.
8	163.3	0.36279E 07	0.21128E 04	0.21239E-02	0.351E-04	9.
9	168.4	0.37422E 07	0.23534E 04	0.20838E-02	0.348E-04	9.
10	173.5	0.38565E 07	0.25901E 04	0.20577E-02	0.347E-04	10.
11	178.6	0.39709E 07	0.28239E 04	0.20328E-02	0.346E-04	10.
12	183.6	0.40852E 07	0.30526E 04	0.19684E-02	0.337E-04	11.
13	187.5	0.41721E 07	0.32249E 04	0.20276E-02	0.322E-04	11.
14	190.1	0.42309E 07	0.33422E 04	0.19541E-02	0.321E-04	11.
15	192.7	0.42898E 07	0.34574E 04	0.19542E-02	0.320E-04	11.
16	195.4	0.43490E 07	0.35714E 04	0.19149E-02	0.311E-04	11.
17	198.0	0.44081E 07	0.36837E 04	0.18929E-02	0.309E-04	11.
18	200.6	0.44670E 07	0.37968E 04	0.19458E-02	0.317E-04	11.
19	203.2	0.45259E 07	0.39099E 04	0.18904E-02	0.306E-04	11.
20	205.8	0.45847E 07	0.40199E 04	0.18422E-02	0.299E-04	12.
21	208.5	0.46436E 07	0.41305E 04	0.19103E-02	0.310E-04	12.
22	211.1	0.47025E 07	0.42413E 04	0.18494E-02	0.304E-04	12.
23	213.7	0.47614E 07	0.43483E 04	0.17825E-02	0.296E-04	12.
24	216.3	0.48205E 07	0.44553E 04	0.18479E-02	0.314E-04	12.
25	218.9	0.48797E 07	0.45584E 04	0.16504E-02	0.296E-04	12.
26	221.6	0.49386E 07	0.46607E 04	0.18201E-02	0.318E-04	12.
27	224.2	0.49974E 07	0.47698E 04	0.18816E-02	0.316E-04	12.
28	226.8	0.50563E 07	0.48791E 04	0.18285E-02	0.303E-04	12.
29	229.4	0.51152E 07	0.49898E 04	0.19246E-02	0.314E-04	12.
30	232.0	0.51741E 07	0.50996E 04	0.18034E-02	0.298E-04	12.
31	234.6	0.52329E 07	0.52053E 04	0.17837E-02	0.293E-04	13.
32	237.3	0.52921E 07	0.53081E 04	0.17020E-02	0.285E-04	13.
33	239.9	0.53512E 07	0.54094E 04	0.17372E-02	0.291E-04	13.
34	242.5	0.54101E 07	0.55113E 04	0.17187E-02	0.290E-04	13.
35	245.1	0.54690E 07	0.56135E 04	0.17489E-02	0.300E-04	13.
36	247.8	0.55279E 07	0.57158E 04	0.17210E-02	0.313E-04	13.

STANTON NUMBER DATA RUN 091273 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 5300STEP20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=5 ***

STANTON NUMBER DATA RUN 091373-1 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 5300STEP20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 091273 AND 091373-1 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	2692300.0	174.8	0.003211	2654612.0	171.2	0.003191	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	2801146.0	508.5	0.002920	2761934.0	840.1	0.002308	0.210	0.876	0.0069	0.958	0.0070	2.078
3	2909992.0	835.1	0.003080	2869256.0	1826.1	0.002158	0.299	1.035	0.0068	0.951	0.0069	2.126
4	3018838.0	1166.8	0.003016	2976578.0	2768.2	0.001983	0.342	1.091	0.0065	0.910	0.0065	2.049
5	3127684.0	1490.7	0.002935	3083900.0	3685.1	0.001851	0.369	1.122	0.0067	0.877	0.0068	2.086
6	3236529.0	1804.2	0.002826	3191222.0	4609.3	0.001693	0.401	1.130	0.0067	0.823	0.0069	2.064
7	3345375.0	2109.4	0.002782	3298545.0	5526.3	0.001672	0.399	1.154	0.0067	0.830	0.0068	2.085
8	3454221.0	2407.5	0.002695	3405867.0	6426.7	0.001599	0.407	1.153	0.0068	0.809	0.0067	2.057
9	3563067.0	2699.8	0.002676	3513189.0	7303.6	0.001475	0.449	1.177	0.0067	0.759	0.0066	1.995
10	3671913.0	2990.9	0.002672	3620511.0	8182.9	0.001410	0.472	1.204	0.0069	0.737	0.0069	2.035
11	3780758.0	3280.0	0.002641	3727833.0	9067.2	0.001304	0.506	1.216	0.0067	0.691	0.0068	1.979
12	3889604.0	3562.9	0.002558	3835155.0	9932.5	0.001249	0.512	1.202	0.0067	0.670	0.0067	1.947
13	3972327.0	3774.7	0.002583	3916720.0	10402.2	0.001516	0.413	1.231		0.821		
14	4028383.0	3911.6	0.002298	3971991.0	10483.9	0.001436	0.375	1.105		0.782		
15	4084438.0	4037.3	0.002180	4027262.0	10562.9	0.001418	0.350	1.057		0.777		
16	4140765.0	4155.9	0.002047	4082800.0	10641.0	0.001408	0.312	1.001		0.776		
17	4197093.0	4268.9	0.001982	4138340.0	10718.3	0.001383	0.302	0.977		0.766		
18	4253149.0	4379.9	0.001973	4193611.0	10795.4	0.001405	0.288	0.980		0.782		
19	4309204.0	4489.2	0.001923	4248881.0	10873.1	0.001402	0.271	0.962		0.784		
20	4365260.0	4595.6	0.001868	4304152.0	10949.9	0.001373	0.265	0.941		0.772		
21	4421316.0	4701.9	0.001920	4359424.0	11026.9	0.001409	0.266	0.975		0.796		
22	4477372.0	4808.1	0.001864	4414695.0	11104.6	0.001398	0.250	0.953		0.793		
23	4533427.0	4909.7	0.001757	4469966.0	11180.2	0.001334	0.241	0.903		0.760		
24	4589754.0	5010.9	0.001851	4525504.0	11255.4	0.001386	0.252	0.958		0.793		
25	4646082.0	5109.5	0.001660	4581043.0	11328.7	0.001263	0.239	0.865		0.726		
26	4702138.0	5207.8	0.001845	4636314.0	11400.8	0.001343	0.272	0.966		0.776		
27	4758193.0	5312.8	0.001894	4691585.0	11477.9	0.001445	0.237	0.998		0.838		
28	4814249.0	5417.4	0.001835	4746856.0	11557.1	0.001418	0.227	0.972		0.826		
29	4870305.0	5523.3	0.001937	4802128.0	11638.1	0.001508	0.221	1.032		0.881		
30	4926360.0	5628.4	0.001811	4857398.0	11719.8	0.001444	0.203	0.970		0.847		
31	4982416.0	5729.8	0.001803	4912669.0	11798.8	0.001412	0.217	0.971		0.832		
32	5038743.0	5828.9	0.001726	4968208.0	11876.4	0.001392	0.193	0.934		0.823		
33	5095071.0	5926.4	0.001750	5023747.0	11953.5	0.001396	0.202	0.952		0.828		
34	5151127.0	6024.4	0.001742	5079018.0	12030.7	0.001393	0.201	0.952		0.829		
35	5207182.0	6122.9	0.001770	5134289.0	12108.5	0.001420	0.198	0.972		0.848		
36	5263238.0	6222.1	0.001764	5189560.0	12187.0	0.001415	0.198	0.973		0.848		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

STANTON NUMBER DATA RUN 010474 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSLFP NORMAL HOLE INJECTION P/D=5 NO B L TRIP ***

TADB= 18.51 DEG C UINF= 11.46 M/S TINF= 18.45 DEG C
RHO= 1.193 KG/M3 VISC= 0.15081E-04 M2/S XVO= 53.1 CM
CP= 1009. J/KGK PR= 0.714

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.56760E 06	0.42088E 03	0.12520E-02	0.612E-04	58.
2	132.8	0.60622E 06	0.47053E 03	0.13198E-02	0.622E-04	58.
3	137.9	0.64483E 06	0.52010E 03	0.12480E-02	0.615E-04	58.
4	143.0	0.68344E 06	0.57096E 03	0.13866E-02	0.627E-04	58.
5	148.1	0.72205E 06	0.62327E 03	0.13226E-02	0.619E-04	58.
6	153.2	0.76067E 06	0.67747E 03	0.14851E-02	0.629E-04	58.
7	158.2	0.79928E 06	0.73339E 03	0.14113E-02	0.625E-04	58.
8	163.3	0.83789E 06	0.79184E 03	0.16161E-02	0.635E-04	58.
9	168.4	0.87650E 06	0.85325E 03	0.15651E-02	0.630E-04	58.
10	173.5	0.91511E 06	0.91788E 03	0.17824E-02	0.638E-04	58.
11	178.6	0.95373E 06	0.98562E 03	0.17262E-02	0.634E-04	58.
12	183.6	0.99234E 06	0.10550E 04	0.18685E-02	0.646E-04	58.
13	187.5	0.10217E 07	0.11029E 04	0.11810E-02	0.297E-04	58.
14	190.1	0.10416E 07	0.11279E 04	0.13386E-02	0.371E-04	58.
15	192.7	0.10615E 07	0.11551E 04	0.13947E-02	0.383E-04	58.
16	195.4	0.10814E 07	0.11837E 04	0.14756E-02	0.389E-04	58.
17	198.0	0.11014E 07	0.12137E 04	0.15365E-02	0.397E-04	58.
18	200.6	0.11213E 07	0.12451E 04	0.16160E-02	0.410E-04	58.
19	203.2	0.11412E 07	0.12778E 04	0.16714E-02	0.402E-04	58.
20	205.8	0.11611E 07	0.13111E 04	0.16684E-02	0.399E-04	58.
21	208.5	0.11810E 07	0.13465E 04	0.18898E-02	0.434E-04	58.
22	211.1	0.12008E 07	0.13835E 04	0.18338E-02	0.442E-04	58.
23	213.7	0.12207E 07	0.14201E 04	0.18400E-02	0.445E-04	58.
24	216.3	0.12407E 07	0.14576E 04	0.19227E-02	0.462E-04	58.
25	218.9	0.12607E 07	0.14961E 04	0.19507E-02	0.461E-04	58.
26	221.6	0.12806E 07	0.15369E 04	0.21452E-02	0.485E-04	58.
27	224.2	0.13005E 07	0.15788E 04	0.20645E-02	0.477E-04	58.
28	226.8	0.13204E 07	0.16199E 04	0.20644E-02	0.476E-04	58.
29	229.4	0.13402E 07	0.16619E 04	0.21542E-02	0.483E-04	58.
30	232.0	0.13601E 07	0.17046E 04	0.21295E-02	0.493E-04	58.
31	234.6	0.13800E 07	0.17483E 04	0.22618E-02	0.501E-04	58.
32	237.3	0.14000E 07	0.17920E 04	0.21292E-02	0.488E-04	58.
33	239.9	0.14200E 07	0.18352E 04	0.22099E-02	0.492E-04	58.
34	242.5	0.14399E 07	0.18799E 04	0.22790E-02	0.496E-04	58.
35	245.1	0.14597E 07	0.19249E 04	0.22506E-02	0.522E-04	58.
36	247.8	0.14796E 07	0.19697E 04	0.22498E-02	0.569E-04	58.

STANTON NUMBER DATA RUN 021074 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL20 M=0.2 TH=0 NORMAL HOLE INJECTION P/D=5 NO B L TRIP ***

STANTON NUMBER DATA RUN 021174 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 540HSL20 M=0.2 TH=1 NORMAL HOLE INJECTION P/D=5 NO B L TRIP ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 021074 AND 021174 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	574640.9	426.1	0.001225	583200.5	432.4	0.001174	UUUUU	UUUUU	0.0000	UUUUUUU	0.0000	UUUUUUU
2	613732.2	501.6	0.002637	622874.0	630.6	0.001477	0.440	1.123	0.0069	0.631	0.0073	1.755
3	652823.4	626.2	0.003740	662547.5	988.5	0.002311	0.382	1.613	0.0068	1.000	0.0069	2.161
4	691914.6	779.3	0.004094	702220.9	1376.4	0.002802	0.316	1.787	0.0076	1.226	0.0075	2.525
5	731005.8	937.6	0.004003	741894.4	1760.6	0.002742	0.315	1.766	0.0069	1.213	0.0063	2.336
6	770097.0	1091.3	0.003862	781567.9	2116.9	0.002486	0.356	1.722	0.0070	1.112	0.0064	2.252
7	809188.2	1240.7	0.003780	821241.4	2447.7	0.002398	0.366	1.702	0.0068	1.083	0.0054	2.061
8	848279.4	1385.9	0.003647	860914.9	2755.6	0.002239	0.386	1.657	0.0068	1.021	0.0055	2.025
9	887370.6	1527.4	0.003593	900588.4	3067.4	0.002158	0.399	1.648	0.0069	0.993	0.0058	2.044
10	926461.9	1667.2	0.003561	940261.9	3395.4	0.002102	0.410	1.647	0.0071	0.975	0.0065	2.136
11	965553.1	1805.5	0.003517	979935.4	3722.5	0.002037	0.421	1.641	0.0070	0.953	0.0059	2.026
12	1004644.0	1941.4	0.003433	1019608.0	4029.5	0.001973	0.425	1.614	0.0070	0.930	0.0056	1.961
13	1034353.0	2036.8	0.002809	1049760.0	4198.0	0.001804	0.358	1.329		0.856		
14	1054485.0	2091.9	0.002662	1070192.0	4234.6	0.001780	0.331	1.264		0.847		
15	1074617.0	2144.5	0.002560	1090624.0	4270.9	0.001760	0.312	1.220		0.841		
16	1094847.0	2195.4	0.002482	1111155.0	4307.0	0.001770	0.287	1.187		0.849		
17	1115076.0	2244.4	0.002382	1131686.0	4343.1	0.001759	0.262	1.143		0.847		
18	1135208.0	2292.6	0.002408	1152118.0	4378.9	0.001746	0.275	1.160		0.844		
19	1155340.0	2340.5	0.002339	1172550.0	4414.9	0.001773	0.242	1.131		0.860		
20	1175472.0	2386.5	0.002231	1192981.0	4450.5	0.001711	0.233	1.082		0.833		
21	1195604.0	2433.0	0.002374	1213414.0	4486.2	0.001772	0.253	1.155		0.865		
22	1215736.0	2479.1	0.002203	1233845.0	4522.4	0.001767	0.198	1.076		0.866		
23	1235868.0	2523.1	0.002170	1254277.0	4557.6	0.001675	0.228	1.063		0.823		
24	1256098.0	2567.2	0.002203	1274808.0	4591.9	0.001687	0.234	1.083		0.832		
25	1276328.0	2610.9	0.002130	1295339.0	4626.7	0.001712	0.196	1.050		0.847		
26	1296460.0	2654.0	0.002146	1315771.0	4662.1	0.001751	0.184	1.062		0.869		
27	1316591.0	2697.4	0.002162	1336203.0	4697.2	0.001673	0.226	1.073		0.833		
28	1336723.0	2740.0	0.002070	1356635.0	4731.6	0.001694	0.182	1.030		0.846		
29	1356856.0	2782.9	0.002188	1377067.0	4766.6	0.001725	0.211	1.092		0.864		
30	1376988.0	2825.3	0.002014	1397499.0	4801.7	0.001706	0.153	1.008		0.857		
31	1397120.0	2867.2	0.002144	1417930.0	4837.0	0.001749	0.184	1.077		0.881		
32	1417349.0	2909.2	0.002026	1438461.0	4872.2	0.001693	0.164	1.020		0.855		
33	1437579.0	2950.4	0.002068	1458992.0	4907.1	0.001712	0.172	1.044		0.867		
34	1457711.0	2992.8	0.002139	1479424.0	4942.6	0.001763	0.175	1.083		0.896		
35	1477843.0	3035.2	0.002068	1499856.0	4978.2	0.001722	0.168	1.050		0.877		
36	1497975.0	3076.7	0.002046	1520288.0	5013.1	0.001683	0.177	1.042		0.860		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 073174 VELOCITY PROFILE FOR FIG. 28

REX = 0.11423E 07 REM = 2597.

XVO =	22.35 CM.	DEL2 =	0.240 CM.
UINF =	16.80 M/S	DEL99=	2.000 CM.
VISC =	0.15498E-04 M2/S	DEL1 =	0.334 CM.
PORT =	19	H =	1.392
XLOC =	127.76 CM.	CF/2 =	0.17156E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.013	7.25	0.431	11.4	10.42
0.028	0.014	7.41	0.441	12.5	10.65
0.030	0.015	7.63	0.454	13.7	10.97
0.033	0.017	7.84	0.467	14.8	11.26
0.036	0.018	8.16	0.486	16.0	11.72
0.041	0.020	8.50	0.506	18.2	12.22
0.048	0.024	8.90	0.530	21.7	12.79
0.051	0.025	8.96	0.534	22.8	12.88
0.058	0.029	9.31	0.555	26.2	13.39
0.066	0.033	9.45	0.563	29.6	13.59
0.076	0.038	9.70	0.578	34.2	13.94
0.089	0.044	9.96	0.593	39.9	14.31
0.114	0.057	10.31	0.614	51.3	14.83
0.152	0.076	10.69	0.637	68.4	15.37
0.203	0.102	11.15	0.664	91.2	16.03
0.267	0.133	11.58	0.689	119.7	16.64
0.343	0.171	12.01	0.715	153.9	17.26
0.432	0.216	12.40	0.738	193.8	17.82
0.533	0.267	12.84	0.764	239.4	18.45
0.648	0.324	13.34	0.795	290.7	19.18
0.800	0.400	13.85	0.825	359.1	19.91
0.978	0.489	14.45	0.860	438.9	20.77
1.181	0.590	15.06	0.897	530.1	21.66
1.440	0.720	15.71	0.936	646.4	22.59
1.664	0.832	16.19	0.964	746.8	23.28
1.981	0.990	16.61	0.989	889.3	23.88
2.362	1.181	16.80	1.000	1060.3	24.14
3.028	1.514	16.80	1.000	1359.0	24.14

RUN 121174 VELOCITY PROFILE FOR FIG. 28

REX =	0.12950E 07	REM =	2871.
XVO =	13.04 CM.	DEL2 =	0.254 CM.
UINF =	16.82 M/S	DEL99=	2.100 CM.
VISC =	0.14902E-04 M2/S	DEL1 =	0.355 CM.
PORT =	19	H =	1.396
XLOC =	127.76 CM.	CF/2 =	0.16496E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.012	7.26	0.432	11.6	10.63
0.028	0.013	7.39	0.440	12.8	10.82
0.030	0.015	7.63	0.454	14.0	11.17
0.033	0.016	7.84	0.466	15.1	11.48
0.038	0.018	8.22	0.489	17.5	12.03
0.046	0.022	8.56	0.509	21.0	12.53
0.056	0.027	8.99	0.534	25.6	13.15
0.069	0.033	9.38	0.558	31.4	13.73
0.084	0.040	9.72	0.578	38.4	14.23
0.102	0.048	10.00	0.594	46.6	14.63
0.122	0.058	10.25	0.609	55.9	15.00
0.147	0.070	10.49	0.624	67.5	15.36
0.178	0.085	10.76	0.640	81.5	15.75
0.213	0.102	11.06	0.658	97.8	16.19
0.254	0.121	11.33	0.673	116.4	16.58
0.300	0.143	11.59	0.689	137.4	16.97
0.351	0.167	11.88	0.706	160.7	17.38
0.414	0.197	12.18	0.724	189.8	17.83
0.490	0.233	12.51	0.743	224.7	18.30
0.592	0.282	12.93	0.768	271.3	18.92
0.719	0.342	13.42	0.798	329.5	19.64
0.871	0.415	13.94	0.828	399.4	20.40
1.024	0.487	14.43	0.858	469.3	21.12
1.214	0.578	14.97	0.890	556.6	21.91
1.405	0.669	15.46	0.919	644.0	22.63
1.595	0.759	15.89	0.945	731.3	23.26
1.786	0.850	16.25	0.966	818.6	23.79
1.976	0.941	16.56	0.984	906.0	24.24
2.167	1.032	16.69	0.992	993.3	24.43
2.357	1.122	16.79	0.998	1080.6	24.58
2.548	1.213	16.82	1.000	1168.0	24.62

FUN 073174 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEPFP SLANT HOLE INJECTION P/D=5 ***

TACB= 26.81 DEG C UINF= 16.80 M/S TINF= 26.68 DEG C
RHO= 1.171 KG/M3 VISC= 0.15622E-04 M2/S XVO= 22.4 CM
CP= 1015. J/KGK PR= 0.1717

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.11335E 07	0.95676E 02	0.35028E-02	0.683E-04	2.
2	132.8	0.11882E 07	0.27670E 03	0.31248E-02	0.652E-04	3.
3	137.9	0.12428E 07	0.44390E 03	0.29964E-02	0.642E-04	4.
4	143.0	0.12974E 07	0.60297E 03	0.28270E-02	0.634E-04	5.
5	148.1	0.13521E 07	0.75534E 03	0.27515E-02	0.626E-04	5.
6	153.2	0.14067E 07	0.90327E 03	0.26641E-02	0.617E-04	6.
7	158.2	0.14613E 07	0.10475E 04	0.26161E-02	0.616E-04	6.
8	163.3	0.15159E 07	0.11884E 04	0.25417E-02	0.610E-04	7.
9	168.4	0.15706E 07	0.13265E 04	0.25137E-02	0.608E-04	7.
10	173.5	0.16252E 07	0.14621E 04	0.24535E-02	0.603E-04	8.
11	178.6	0.16798E 07	0.15952E 04	0.24171E-02	0.600E-04	8.
12	183.6	0.17345E 07	0.17268E 04	0.24016E-02	0.595E-04	8.
13	187.5	0.17760E 07	0.18241E 04	0.22480E-02	0.795E-04	9.
14	190.1	0.18041E 07	0.18869E 04	0.22150E-02	0.791E-04	9.
15	192.7	0.18322E 07	0.19489E 04	0.21877E-02	0.792E-04	9.
16	195.4	0.18605E 07	0.20102E 04	0.21648E-02	0.774E-04	9.
17	198.0	0.18888E 07	0.20709E 04	0.21431E-02	0.770E-04	9.
18	200.6	0.19169E 07	0.21313E 04	0.21446E-02	0.769E-04	9.
19	203.2	0.19451E 07	0.21913E 04	0.21180E-02	0.751E-04	9.
20	205.8	0.19732E 07	0.22509E 04	0.21150E-02	0.759E-04	10.
21	208.5	0.20013E 07	0.23102E 04	0.20941E-02	0.748E-04	10.
22	211.1	0.20295E 07	0.23691E 04	0.20913E-02	0.756E-04	10.
23	213.7	0.20576E 07	0.24274E 04	0.20465E-02	0.733E-04	10.
24	216.3	0.20859E 07	0.24855E 04	0.20762E-02	0.754E-04	10.
25	218.9	0.21141E 07	0.25435E 04	0.20436E-02	0.739E-04	10.
26	221.6	0.21423E 07	0.26018E 04	0.20973E-02	0.766E-04	10.
27	224.2	0.21704E 07	0.26628E 04	0.22334E-02	0.778E-04	10.
28	226.8	0.21985E 07	0.27222E 04	0.19834E-02	0.738E-04	11.
29	229.4	0.22267E 07	0.27782E 04	0.19925E-02	0.702E-04	11.
30	232.0	0.22548E 07	0.28347E 04	0.20210E-02	0.746E-04	11.
31	234.6	0.22829E 07	0.28916E 04	0.20168E-02	0.730E-04	11.
32	237.3	0.23112E 07	0.29479E 04	0.19831E-02	0.720E-04	11.
33	239.9	0.23395E 07	0.30042E 04	0.20099E-02	0.731E-04	11.
34	242.5	0.23676E 07	0.30601E 04	0.19633E-02	0.697E-04	11.
35	245.1	0.23957E 07	0.31160E 04	0.20032E-02	0.748E-04	11.
36	247.8	0.24239E 07	0.31717E 04	0.19498E-02	0.796E-04	11.

RUN 080274 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP20 M=0.2 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 080374 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP20 M=0.2 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 080274 AND 080374 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1122526.0	89.7	0.003318	1127970.0	88.2	0.003246	UUUUU	0.947	0.0000	0.927	0.0000	0.927
2	1176624.0	262.1	0.003054	1182330.0	246.2	0.002566	0.160	0.800	0.0066	0.916	0.0062	1.797
3	1230722.0	424.4	0.002947	1236690.0	706.3	0.002030	0.311	0.864	0.0065	0.770	0.0060	1.650
4	1284819.0	582.1	0.002883	1291050.0	1136.9	0.001904	0.340	0.911	0.0064	0.753	0.0058	1.642
5	1338917.0	735.4	0.002783	1345410.0	1552.1	0.001757	0.369	0.929	0.0064	0.717	0.0058	1.623
6	1393015.0	883.4	0.002688	1399770.0	1960.5	0.001670	0.379	0.938	0.0064	0.700	0.0057	1.615
7	1447112.0	1027.7	0.002650	1454130.0	2360.7	0.001567	0.409	0.959	0.0064	0.671	0.0059	1.616
8	1501210.0	1168.8	0.002565	1508490.0	2765.3	0.001561	0.391	0.958	0.0065	0.682	0.0060	1.660
9	1555308.0	1305.8	0.002502	1562850.0	3173.5	0.001474	0.411	0.960	0.0065	0.655	0.0060	1.636
10	1609405.0	1440.6	0.002482	1617210.0	3574.6	0.001370	0.448	0.976	0.0063	0.618	0.0059	1.595
11	1663503.0	1574.1	0.002454	1671570.0	3967.1	0.001271	0.482	0.986	0.0065	0.582	0.0060	1.569
12	1717601.0	1703.6	0.002332	1725930.0	4359.8	0.001263	0.458	0.956	0.0064	0.586	0.0061	1.606
13	1758715.0	1798.8	0.002302	1767244.0	4741.9	0.001114	0.516	0.957		0.522		
14	1786575.0	1863.4	0.002330	1795239.0	4775.6	0.001288	0.447	0.977		0.607		
15	1814435.0	1927.1	0.002238	1823235.0	4812.3	0.001332	0.405	0.947		0.631		
16	1842431.0	1988.6	0.002172	1851366.0	4850.0	0.001359	0.375	0.927		0.647		
17	1870426.0	2048.5	0.002126	1879497.0	4888.6	0.001397	0.343	0.914		0.669		
18	1898287.0	2107.6	0.002112	1907493.0	4927.8	0.001399	0.338	0.915		0.674		
19	1926147.0	2165.8	0.002061	1935488.0	4967.0	0.001394	0.324	0.900		0.675		
20	1954007.0	2223.0	0.002039	1963483.0	5006.5	0.001431	0.298	0.897		0.696		
21	1981868.0	2279.7	0.002026	1991479.0	5046.1	0.001391	0.313	0.897		0.680		
22	2009728.0	2335.6	0.001977	2019474.0	5085.8	0.001444	0.270	0.881		0.709		
23	2037588.0	2390.4	0.001956	2047470.0	5125.9	0.001417	0.276	0.878		0.699		
24	2065584.0	2445.4	0.001983	2075601.0	5165.5	0.001410	0.289	0.895		0.699		
25	2093579.0	2500.1	0.001944	2103732.0	5205.6	0.001452	0.253	0.883		0.723		
26	2121440.0	2555.1	0.001997	2131728.0	5247.0	0.001496	0.251	0.912		0.748		
27	2149300.0	2612.5	0.002123	2159723.0	5290.2	0.001587	0.253	0.976		0.797		
28	2177160.0	2668.6	0.001898	2187718.0	5332.6	0.001441	0.240	0.877		0.727		
29	2205021.0	2721.9	0.001927	2215714.0	5372.6	0.001414	0.266	0.895		0.716		
30	2232881.0	2775.4	0.001908	2243710.0	5413.7	0.001516	0.205	0.892		0.771		
31	2260741.0	2828.6	0.001907	2271705.0	5455.5	0.001468	0.230	0.896		0.749		
32	2288736.0	2881.5	0.001884	2299836.0	5497.3	0.001513	0.197	0.890		0.775		
33	2316732.0	2934.5	0.001918	2327967.0	5539.5	0.001495	0.221	0.910		0.768		
34	2344592.0	2987.6	0.001890	2355963.0	5581.0	0.001471	0.221	0.901		0.759		
35	2372453.0	3040.5	0.001900	2383958.0	5623.0	0.001523	0.198	0.910		0.789		
36	2400313.0	3092.8	0.001849	2411953.0	5665.2	0.001489	0.195	0.890		0.774		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 080174-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 080174-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 080174-1 AND 080174-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1144127.0	99.3	0.003602	1130962.0	89.3	0.003277	UUUUU	1.028	0.0000	0.936	0.0000	0.936
2	1199266.0	285.1	0.003136	1185467.0	250.6	0.002640	0.158	0.825	0.0135	0.943	0.0124	2.548
3	1254405.0	454.2	0.002997	1239971.0	1057.3	0.002139	0.286	0.883	0.0129	0.812	0.0118	2.394
4	1309544.0	616.3	0.002885	1294475.0	1808.9	0.001790	0.380	0.915	0.0133	0.709	0.0121	2.334
5	1364682.0	772.2	0.002770	1348979.0	2559.3	0.001623	0.414	0.929	0.0129	0.663	0.0119	2.291
6	1419821.0	924.1	0.002740	1403484.0	3290.8	0.001475	0.462	0.960	0.0131	0.619	0.0122	2.293
7	1474960.0	1074.7	0.002722	1457988.0	4031.6	0.001392	0.489	0.989	0.0129	0.597	0.0120	2.277
8	1530098.0	1223.5	0.002675	1512492.0	4763.4	0.001384	0.483	1.004	0.0132	0.605	0.0118	2.284
9	1585237.0	1369.7	0.002626	1566996.0	5477.4	0.001309	0.501	1.012	0.0130	0.582	0.0118	2.283
10	1640376.0	1514.3	0.002623	1621500.0	6191.3	0.001206	0.540	1.036	0.0129	0.545	0.0117	2.231
11	1695514.0	1658.0	0.002588	1676005.0	6892.4	0.001101	0.575	1.045	0.0129	0.504	0.0123	2.258
12	1750653.0	1797.0	0.002453	1730509.0	7622.3	0.001039	0.576	1.010	0.0128	0.482	0.0119	2.193
13	1792559.0	1899.3	0.002445	1771932.0	8314.1	0.000984	0.598	1.021		0.461		
14	1820955.0	1966.9	0.002310	1800002.0	8342.4	0.001030	0.554	0.973		0.486		
15	1849351.0	2031.8	0.002252	1828072.0	8371.6	0.001045	0.536	0.957		0.496		
16	1877885.0	2095.0	0.002193	1856277.0	8401.1	0.001052	0.520	0.940		0.502		
17	1906420.0	2156.6	0.002145	1884483.0	8430.8	0.001061	0.505	0.927		0.509		
18	1934816.0	2217.2	0.002114	1912553.0	8460.5	0.001052	0.502	0.920		0.507		
19	1963213.0	2276.4	0.002053	1940623.0	8489.9	0.001041	0.493	0.900		0.504		
20	1991609.0	2334.6	0.002038	1968692.0	8519.1	0.001037	0.491	0.900		0.505		
21	2020006.0	2392.0	0.001998	1996762.0	8548.3	0.001045	0.477	0.889		0.511		
22	2048402.0	2448.0	0.001945	2024832.0	8577.8	0.001053	0.459	0.871		0.518		
23	2076799.0	2502.8	0.001906	2052902.0	8607.1	0.001032	0.459	0.859		0.510		
24	2105332.0	2557.1	0.001917	2081107.0	8636.3	0.001044	0.455	0.869		0.518		
25	2133867.0	2611.8	0.001929	2109313.0	8665.6	0.001044	0.459	0.880		0.520		
26	2162263.0	2666.3	0.001908	2137383.0	8695.7	0.001098	0.425	0.876		0.550		
27	2190660.0	2722.7	0.002058	2165452.0	8727.3	0.001151	0.441	0.950		0.578		
28	2219056.0	2777.9	0.001827	2193522.0	8758.1	0.001042	0.430	0.848		0.526		
29	2247453.0	2830.1	0.001845	2221592.0	8787.5	0.001046	0.433	0.861		0.530		
30	2275849.0	2882.7	0.001858	2249662.0	8817.8	0.001110	0.403	0.872		0.565		
31	2304246.0	2935.5	0.001850	2277732.0	8848.8	0.001098	0.406	0.873		0.561		
32	2332780.0	2987.8	0.001831	2305937.0	8880.0	0.001126	0.385	0.868		0.577		
33	2361314.0	3039.9	0.001840	2334143.0	8911.8	0.001135	0.383	0.877		0.584		
34	2389710.0	3092.1	0.001828	2362213.0	8943.4	0.001112	0.392	0.876		0.574		
35	2418107.0	3144.2	0.001837	2390282.0	8975.2	0.001157	0.370	0.884		0.599		
36	2446503.0	3195.8	0.001792	2418352.0	9007.5	0.001137	0.366	0.866		0.591		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 080574 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP60 M=0.6 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 081174-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP60 M=0.6 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 080574 AND 081174-1 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1149692.0	95.3	0.003440	1147284.0	92.5	0.003345	UUUUJ	0.982	0.0000	0.955	0.0000	0.955
2	1205099.0	278.3	0.003166	1202574.0	258.8	0.002671	0.156	0.834	0.0189	0.958	0.0173	3.079
3	1260506.0	454.5	0.003195	1257865.0	1353.1	0.002404	0.248	0.942	0.0188	0.916	0.0171	3.115
4	1315913.0	629.3	0.003112	1313156.0	2422.4	0.002024	0.350	0.989	0.0184	0.804	0.0171	3.027
5	1371320.0	798.1	0.002982	1368447.0	3476.0	0.001833	0.385	1.002	0.0181	0.751	0.0168	2.972
6	1426727.0	960.9	0.002896	1423738.0	4503.0	0.001691	0.416	1.016	0.0189	0.712	0.0170	2.975
7	1482134.0	1121.6	0.002904	1479028.0	5534.1	0.001654	0.431	1.057	0.0189	0.711	0.0172	3.037
8	1537540.0	1281.7	0.002877	1534319.0	6572.5	0.001580	0.451	1.081	0.0189	0.693	0.0172	3.043
9	1592947.0	1440.0	0.002837	1589610.0	7606.6	0.001506	0.469	1.095	0.0186	0.672	0.0166	2.978
10	1648354.0	1598.1	0.002867	1644901.0	8604.4	0.001399	0.512	1.134	0.0185	0.634	0.0164	2.923
11	1703761.0	1756.2	0.002842	1700192.0	9586.9	0.001323	0.534	1.149	0.0186	0.608	0.0168	2.947
12	1759168.0	1912.7	0.002805	1755482.0	10585.4	0.001261	0.550	1.157	0.0186	0.587	0.0169	2.950
13	1801277.0	2029.9	0.002764	1797503.0	11572.1	0.001274	0.539	1.156		0.599		
14	1829812.0	2105.6	0.002538	1825978.0	11608.0	0.001245	0.509	1.071		0.589		
15	1858346.0	2177.4	0.002487	1854453.0	11643.3	0.001230	0.505	1.058		0.585		
16	1887019.0	2247.1	0.002392	1883066.0	11678.1	0.001211	0.494	1.027		0.580		
17	1915692.0	2314.5	0.002326	1911679.0	11712.3	0.001186	0.490	1.006		0.571		
18	1944227.0	2380.2	0.002276	1940153.0	11745.9	0.001167	0.487	0.992		0.565		
19	1972761.0	2444.2	0.002202	1968628.0	11778.7	0.001137	0.484	0.967		0.553		
20	2001296.0	2506.7	0.002179	1997103.0	11810.9	0.001121	0.486	0.964		0.548		
21	2029831.0	2568.4	0.002135	2025578.0	11842.4	0.001087	0.491	0.951		0.534		
22	2058365.0	2628.6	0.002081	2054053.0	11873.1	0.001072	0.485	0.933		0.529		
23	2086900.0	2687.1	0.002014	2082527.0	11903.4	0.001051	0.478	0.909		0.521		
24	2115573.0	2744.7	0.002021	2111140.0	11933.3	0.001045	0.483	0.918		0.521		
25	2144246.0	2801.9	0.001982	2139753.0	11963.1	0.001045	0.473	0.906		0.522		
26	2172780.0	2858.6	0.001986	2168228.0	11993.0	0.001057	0.468	0.913		0.531		
27	2201315.0	2917.2	0.002121	2196703.0	12023.7	0.001093	0.485	0.981		0.551		
28	2229849.0	2974.4	0.001880	2225177.0	12053.6	0.001007	0.465	0.874		0.510		
29	2258384.0	3028.1	0.001876	2253652.0	12082.1	0.000989	0.473	0.877		0.503		
30	2286919.0	3081.7	0.001877	2282127.0	12110.6	0.001017	0.458	0.882		0.519		
31	2315453.0	3134.8	0.001844	2310602.0	12139.5	0.001008	0.453	0.871		0.517		
32	2344126.0	3187.3	0.001831	2339215.0	12168.2	0.001004	0.451	0.869		0.517		
33	2372799.0	3239.5	0.001824	2367828.0	12197.0	0.001016	0.443	0.870		0.525		
34	2401334.0	3291.4	0.001806	2396302.0	12225.7	0.000997	0.448	0.866		0.517		
35	2429868.0	3343.0	0.001808	2424777.0	12254.3	0.001013	0.440	0.871		0.527		
36	2458403.0	3393.9	0.001755	2453252.0	12282.7	0.000976	0.444	0.849		0.509		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 081574-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP75 M=0.75 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 081574-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP75 M=0.75 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 081574-1 AND 081574-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1150408.0	99.7	0.003598	1145315.0	92.8	0.003364	UUUUJ	1.027	0.0000	0.960	0.0000	0.960
2	1205849.0	287.4	0.003173	1200511.0	262.7	0.002792	0.120	0.836	0.0250	1.001	0.0231	3.718
3	1261291.0	468.0	0.003342	1255707.0	1693.2	0.002821	0.156	0.986	0.0245	1.075	0.0227	3.921
4	1316732.0	653.2	0.003339	1310903.0	3090.8	0.002509	0.248	1.061	0.0250	0.996	0.0228	3.914
5	1372173.0	834.5	0.003199	1366099.0	4479.4	0.002243	0.299	1.074	0.0246	0.919	0.0230	3.896
6	1427615.0	1010.3	0.003143	1421295.0	5870.6	0.002116	0.327	1.103	0.0247	0.890	0.0230	3.911
7	1483056.0	1184.2	0.003132	1476491.0	7254.3	0.002014	0.357	1.140	0.0246	0.866	0.0229	3.914
8	1538497.0	1355.7	0.003054	1531687.0	8628.2	0.001991	0.348	1.147	0.0251	0.873	0.0227	3.957
9	1593939.0	1525.5	0.003071	1586883.0	9990.0	0.001879	0.388	1.186	0.0246	0.838	0.0223	3.894
10	1649380.0	1695.3	0.003056	1642079.0	11322.0	0.001780	0.418	1.209	0.0247	0.806	0.0226	3.907
11	1704822.0	1865.3	0.003076	1697275.0	12659.8	0.001593	0.482	1.244	0.0244	0.732	0.0226	3.816
12	1760263.0	2032.5	0.002957	1752471.0	13990.5	0.001454	0.508	1.219	0.0251	0.677	0.0233	3.826
13	1802398.0	2156.9	0.002963	1794420.0	15334.8	0.001327	0.552	1.239		0.624		
14	1830951.0	2239.0	0.002783	1822846.0	15372.4	0.001315	0.527	1.174		0.622		
15	1859503.0	2317.1	0.002684	1851272.0	15409.2	0.001274	0.525	1.142		0.606		
16	1888194.0	2392.5	0.002590	1879835.0	15444.8	0.001230	0.525	1.111		0.588		
17	1916885.0	2465.7	0.002528	1908399.0	15479.4	0.001198	0.526	1.094		0.576		
18	1945437.0	2537.3	0.002484	1936825.0	15512.9	0.001156	0.534	1.083		0.559		
19	1973989.0	2607.0	0.002393	1965251.0	15545.2	0.001116	0.534	1.051		0.542		
20	2002541.0	2675.4	0.002392	1993677.0	15576.5	0.001084	0.547	1.058		0.529		
21	2031094.0	2742.7	0.002316	2022103.0	15606.8	0.001043	0.550	1.032		0.512		
22	2059646.0	2808.0	0.002251	2050529.0	15636.4	0.001040	0.538	1.009		0.513		
23	2088199.0	2871.9	0.002218	2078955.0	15665.4	0.000998	0.550	1.001		0.494		
24	2116889.0	2935.3	0.002220	2107518.0	15693.5	0.000972	0.562	1.008		0.484		
25	2145580.0	2998.3	0.002184	2136082.0	15720.8	0.000946	0.567	0.998		0.473		
26	2174133.0	3060.5	0.002169	2164508.0	15748.4	0.000998	0.540	0.997		0.501		
27	2202685.0	3124.4	0.002303	2192934.0	15776.4	0.000967	0.580	1.065		0.488		
28	2231237.0	3186.6	0.002050	2221360.0	15803.0	0.000905	0.558	0.953		0.458		
29	2259790.0	3245.0	0.002036	2249786.0	15829.0	0.000919	0.549	0.952		0.467		
30	2288342.0	3303.2	0.002035	2278212.0	15855.1	0.000913	0.551	0.957		0.466		
31	2316894.0	3360.6	0.001986	2306638.0	15880.8	0.000896	0.549	0.938		0.459		
32	2345585.0	3417.0	0.001957	2335202.0	15906.3	0.000892	0.544	0.929		0.458		
33	2374276.0	3472.8	0.001947	2363766.0	15931.7	0.000896	0.540	0.929		0.462		
34	2402828.0	3528.1	0.001918	2392192.0	15956.8	0.000866	0.548	0.920		0.449		
35	2431380.0	3582.6	0.001895	2420617.0	15981.5	0.000872	0.540	0.913		0.453		
36	2459933.0	3635.8	0.001830	2449043.0	16005.9	0.000840	0.541	0.886		0.438		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 081974-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP90 M=0.9 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 081974-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP90 M=0.9 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 081974-1 AND 081974-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1159394.0	100.1	0.003582	1144244.0	92.2	0.003342	UUUUU	1.023	0.0000	0.954	0.0000	0.954
2	1215269.0	289.5	0.003199	1199388.0	261.3	0.002793	0.127	0.843	0.0301	1.000	0.0275	4.125
3	1271143.0	473.5	0.003388	1254532.0	1934.2	0.002967	0.124	1.000	0.0301	1.129	0.0276	4.501
4	1327018.0	668.6	0.003595	1309677.0	3614.9	0.002816	0.217	1.143	0.0303	1.117	0.0273	4.571
5	1382892.0	868.3	0.003553	1364821.0	5270.6	0.002578	0.274	1.194	0.0300	1.055	0.0274	4.570
6	1438766.0	1062.2	0.003388	1419965.0	6916.3	0.002337	0.310	1.190	0.0302	0.982	0.0276	4.550
7	1494641.0	1253.0	0.003441	1475109.0	8567.9	0.002289	0.335	1.253	0.0303	0.983	0.0279	4.643
8	1550515.0	1444.4	0.003412	1530254.0	10228.7	0.002199	0.355	1.283	0.0303	0.963	0.0272	4.599
9	1606390.0	1633.1	0.003340	1585398.0	11849.8	0.002099	0.372	1.290	0.0299	0.935	0.0276	4.637
10	1662264.0	1820.4	0.003365	1640542.0	13483.2	0.002007	0.404	1.332	0.0295	0.908	0.0271	4.586
11	1718139.0	2007.2	0.003323	1695687.0	15084.9	0.001875	0.436	1.344	0.0298	0.861	0.0275	4.589
12	1774013.0	2190.4	0.003235	1750831.0	16702.5	0.001764	0.455	1.335	0.0298	0.820	0.0275	4.555
13	1816478.0	2328.1	0.003282	1792741.0	18292.0	0.001662	0.494	1.373		0.780		
14	1845253.0	2420.3	0.003118	1821140.0	18338.6	0.001619	0.481	1.316		0.764		
15	1874028.0	2508.0	0.002975	1849539.0	18384.0	0.001574	0.471	1.267		0.748		
16	1902943.0	2592.3	0.002872	1878076.0	18427.9	0.001511	0.474	1.233		0.722		
17	1931858.0	2673.7	0.002779	1906613.0	18470.3	0.001468	0.472	1.203		0.705		
18	1960634.0	2753.1	0.002735	1935013.0	18511.4	0.001425	0.479	1.193		0.688		
19	1989409.0	2830.4	0.002633	1963412.0	18551.0	0.001364	0.482	1.157		0.662		
20	2018184.0	2906.5	0.002652	1991811.0	18589.4	0.001337	0.496	1.174		0.652		
21	2046960.0	2981.4	0.002545	2020211.0	18626.8	0.001292	0.492	1.134		0.633		
22	2075735.0	3054.1	0.002501	2048610.0	18663.1	0.001260	0.496	1.122		0.621		
23	2104511.0	3125.0	0.002421	2077009.0	18698.4	0.001222	0.495	1.093		0.605		
24	2133425.0	3195.3	0.002460	2105546.0	18733.0	0.001216	0.506	1.118		0.604		
25	2162340.0	3265.8	0.002435	2134084.0	18766.9	0.001169	0.520	1.113		0.584		
26	2191116.0	3335.6	0.002409	2162483.0	18800.7	0.001205	0.500	1.108		0.604		
27	2219891.0	3407.0	0.002551	2190882.0	18835.1	0.001214	0.524	1.180		0.611		
28	2248666.0	3476.7	0.002288	2219281.0	18868.2	0.001114	0.513	1.064		0.563		
29	2277442.0	3542.3	0.002261	2247681.0	18898.6	0.001096	0.515	1.057		0.556		
30	2306217.0	3607.8	0.002286	2276080.0	18930.8	0.001102	0.518	1.075		0.562		
31	2334993.0	3672.7	0.002223	2304480.0	18961.9	0.001085	0.512	1.051		0.555		
32	2363907.0	3736.2	0.002182	2333017.0	18992.5	0.001065	0.512	1.037		0.547		
33	2392822.0	3799.0	0.002181	2361554.0	19022.7	0.001057	0.515	1.041		0.545		
34	2421598.0	3861.1	0.002129	2389953.0	19052.4	0.001036	0.513	1.021		0.536		
35	2450373.0	3922.3	0.002118	2418352.0	19081.8	0.001030	0.514	1.021		0.535		
36	2479148.0	3982.3	0.002052	2446752.0	19110.5	0.000987	0.519	0.994		0.514		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 092374 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP130 M=1.3 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 092474 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700STEP130 M=1.3 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 092374 AND 092474 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1185771.0	101.7	0.003560	1199974.0	100.2	0.003466	UUUUU	1.016	0.0000	0.989	0.0000	0.989
2	1242917.0	292.4	0.003113	1257804.0	278.5	0.002698	0.133	0.825	0.0432	0.976	0.0386	5.121
3	1300062.0	474.3	0.003253	1315634.0	2678.9	0.003028	0.069	0.965	0.0431	1.164	0.0391	5.707
4	1357208.0	678.7	0.003901	1373464.0	5119.9	0.003226	0.173	1.247	0.0426	1.292	0.0394	6.114
5	1414354.0	904.5	0.004002	1431295.0	7580.7	0.003108	0.224	1.352	0.0433	1.285	0.0394	6.230
6	1471499.0	1131.8	0.003951	1489125.0	10029.8	0.002792	0.293	1.395	0.0429	1.185	0.0391	6.126
7	1528645.0	1351.9	0.003751	1546955.0	12449.0	0.002730	0.272	1.374	0.0428	1.185	0.0385	6.156
8	1585791.0	1563.9	0.003669	1604785.0	14829.5	0.002586	0.295	1.387	0.0426	1.144	0.0382	6.132
9	1642936.0	1773.5	0.003668	1662615.0	17186.6	0.002467	0.327	1.425	0.0430	1.111	0.0384	6.153
10	1700082.0	1983.6	0.003664	1720445.0	19544.9	0.002387	0.352	1.466	0.0427	1.092	0.0389	6.240
11	1757227.0	2194.9	0.003713	1778275.0	21928.8	0.002267	0.389	1.510	0.0419	1.052	0.0382	6.147
12	1814373.0	2404.4	0.003620	1836105.0	24264.5	0.002135	0.410	1.502	0.0421	1.003	0.0385	6.140
13	1857804.0	2562.8	0.003729	1880056.0	26578.8	0.001785	0.521	1.569		0.847		
14	1887234.0	2670.6	0.003588	1909839.0	26631.8	0.001773	0.506	1.523		0.846		
15	1916664.0	2774.0	0.003435	1939621.0	26683.8	0.001712	0.502	1.470		0.822		
16	1946236.0	2873.4	0.003311	1969548.0	26734.0	0.001653	0.501	1.430		0.798		
17	1975809.0	2970.2	0.003256	1999475.0	26782.7	0.001615	0.504	1.417		0.784		
18	2005239.0	3065.2	0.003193	2029258.0	26829.9	0.001554	0.513	1.400		0.758		
19	2034669.0	3157.5	0.003071	2059040.0	26875.3	0.001487	0.516	1.357		0.729		
20	2064099.0	3248.0	0.003076	2088822.0	26919.6	0.001483	0.518	1.368		0.731		
21	2093530.0	3337.3	0.002981	2118605.0	26962.7	0.001408	0.528	1.336		0.698		
22	2122960.0	3424.8	0.002959	2148388.0	27004.5	0.001395	0.528	1.334		0.694		
23	2152390.0	3511.0	0.002895	2178170.0	27045.4	0.001348	0.534	1.314		0.674		
24	2181962.0	3596.4	0.002898	2208097.0	27085.4	0.001339	0.538	1.324		0.672		
25	2211535.0	3681.4	0.002878	2238024.0	27125.1	0.001320	0.541	1.323		0.666		
26	2240965.0	3765.5	0.002824	2267807.0	27164.0	0.001290	0.543	1.306		0.654		
27	2270395.0	3847.7	0.002756	2297589.0	27200.4	0.001156	0.580	1.282		0.588		
28	2299825.0	3929.2	0.002780	2327372.0	27236.5	0.001260	0.547	1.300		0.644		
29	2329255.0	4010.0	0.002702	2357155.0	27273.5	0.001226	0.546	1.271		0.629		
30	2358685.0	4090.2	0.002744	2386937.0	27310.6	0.001260	0.541	1.297		0.649		
31	2388115.0	4170.0	0.002671	2416719.0	27347.5	0.001213	0.546	1.269		0.627		
32	2417688.0	4247.6	0.002595	2446646.0	27383.3	0.001194	0.540	1.240		0.620		
33	2447261.0	4324.0	0.002592	2476573.0	27418.8	0.001186	0.542	1.244		0.618		
34	2476691.0	4399.7	0.002546	2506356.0	27453.6	0.001146	0.550	1.228		0.599		
35	2506121.0	4474.6	0.002536	2536138.0	27488.0	0.001162	0.542	1.229		0.609		
36	2535551.0	4548.1	0.002453	2565921.0	27521.9	0.001116	0.545	1.195		0.588		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 121174 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2900STEPFP SLANT HOLE INJECTION P/D=10 ***

TADB= 19.46 DEG C UINF= 16.88 M/S TINF= 19.33 DEG C
RHO= 1.208 KG/M3 VISC= 0.14903E-04 M2/S XVO= 13.0 CM
CP= 1011. J/KGK PR= 0.716

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.12997E 07	0.10283E 03	0.35737E-02	0.661E-04	2.
2	132.8	0.13572E 07	0.28901E 03	0.28970E-02	0.611E-04	3.
3	137.9	0.14148E 07	0.44890E 03	0.26599E-02	0.594E-04	4.
4	143.0	0.14723E 07	0.59929E 03	0.25668E-02	0.587E-04	5.
5	148.1	0.15299E 07	0.74425E 03	0.24711E-02	0.580E-04	5.
6	153.2	0.15874E 07	0.88572E 03	0.24455E-02	0.580E-04	6.
7	158.2	0.16450E 07	0.10234E 04	0.23386E-02	0.572E-04	6.
8	163.3	0.17025E 07	0.11575E 04	0.23211E-02	0.573E-04	7.
9	168.4	0.17601E 07	0.12894E 04	0.22631E-02	0.570E-04	7.
10	173.5	0.18176E 07	0.14191E 04	0.22473E-02	0.569E-04	8.
11	178.6	0.18752E 07	0.15455E 04	0.21458E-02	0.562E-04	8.
12	183.6	0.19327E 07	0.16686E 04	0.21316E-02	0.561E-04	8.
13	187.5	0.19765E 07	0.17617E 04	0.21400E-02	0.739E-04	9.
14	190.1	0.20061E 07	0.18249E 04	0.21224E-02	0.745E-04	9.
15	192.7	0.20357E 07	0.18877E 04	0.21089E-02	0.755E-04	9.
16	195.4	0.20655E 07	0.19501E 04	0.20966E-02	0.740E-04	9.
17	198.0	0.20953E 07	0.20121E 04	0.20855E-02	0.740E-04	9.
18	200.6	0.21249E 07	0.20739E 04	0.20747E-02	0.735E-04	9.
19	203.2	0.21546E 07	0.21353E 04	0.20647E-02	0.722E-04	9.
20	205.8	0.21842E 07	0.21964E 04	0.20539E-02	0.727E-04	10.
21	208.5	0.22138E 07	0.22572E 04	0.20447E-02	0.720E-04	10.
22	211.1	0.22435E 07	0.23177E 04	0.20346E-02	0.728E-04	10.
23	213.7	0.22731E 07	0.23780E 04	0.20261E-02	0.716E-04	10.
24	216.3	0.23029E 07	0.24373E 04	0.19725E-02	0.707E-04	10.
25	218.9	0.23327E 07	0.24963E 04	0.20072E-02	0.721E-04	10.
26	221.6	0.23623E 07	0.25558E 04	0.19993E-02	0.751E-04	10.
27	224.2	0.23919E 07	0.26151E 04	0.19966E-02	0.662E-04	10.
28	226.8	0.24216E 07	0.26741E 04	0.19833E-02	0.751E-04	10.
29	229.4	0.24512E 07	0.27328E 04	0.19755E-02	0.688E-04	11.
30	232.0	0.24809E 07	0.27913E 04	0.19660E-02	0.718E-04	11.
31	234.6	0.25105E 07	0.28495E 04	0.19581E-02	0.701E-04	11.
32	237.3	0.25403E 07	0.29075E 04	0.19518E-02	0.656E-04	11.
33	239.9	0.25701E 07	0.29653E 04	0.19449E-02	0.702E-04	11.
34	242.5	0.25997E 07	0.30230E 04	0.19389E-02	0.675E-04	11.
35	245.1	0.26293E 07	0.30804E 04	0.19311E-02	0.715E-04	11.
36	247.8	0.26590E 07	0.31376E 04	0.19258E-02	0.770E-04	11.

RUN 121474 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2900STEP40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=10 ***

RUN 121274-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2900STEP40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 121474 AND 121274-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1294474.0	103.1	0.003598	1287625.0	98.5	0.003456	UUUUU	1.007	0.0000	0.967	0.0000	0.967
2	1351789.0	290.7	0.002947	1344638.0	274.0	0.002701	0.084	0.780	0.0032	0.980	0.0028	1.431
3	1409105.0	455.2	0.002794	1401650.0	580.4	0.002413	0.136	0.827	0.0032	0.931	0.0028	1.404
4	1466421.0	609.5	0.002589	1458662.0	873.7	0.002244	0.133	0.826	0.0031	0.902	0.0029	1.397
5	1523736.0	758.4	0.002609	1515675.0	1159.2	0.002067	0.208	0.880	0.0031	0.857	0.0029	1.364
6	1581052.0	903.4	0.002450	1572687.0	1438.0	0.002008	0.180	0.863	0.0032	0.855	0.0031	1.419
7	1638367.0	1044.4	0.002471	1629700.0	1730.1	0.001959	0.207	0.903	0.0032	0.852	0.0031	1.428
8	1695683.0	1183.3	0.002376	1686712.0	2019.4	0.001914	0.194	0.896	0.0031	0.849	0.0027	1.356
9	1752999.0	1319.5	0.002375	1743725.0	2277.8	0.001808	0.239	0.921	0.0031	0.815	0.0027	1.328
10	1810314.0	1453.5	0.002303	1800737.0	2532.6	0.001790	0.223	0.915	0.0032	0.820	0.0031	1.417
11	1867630.0	1585.3	0.002297	1857749.0	2811.6	0.001743	0.242	0.933	0.0032	0.809	0.0031	1.413
12	1924946.0	1714.6	0.002212	1914762.0	3087.9	0.001696	0.233	0.916	0.0033	0.798	0.0029	1.376
13	1968506.0	1811.9	0.002292	1958091.0	3329.4	0.001718	0.250	0.963		0.816		
14	1998023.0	1879.1	0.002258	1987453.0	3548.4	0.001760	0.221	0.957		0.841		
15	2027541.0	1945.5	0.002237	2016814.0	3600.6	0.001790	0.200	0.956		0.860		
16	2057201.0	2011.2	0.002209	2046318.0	3653.2	0.001790	0.190	0.952		0.865		
17	2086862.0	2076.3	0.002198	2075822.0	3705.9	0.001797	0.183	0.955		0.873		
18	2116380.0	2140.8	0.002165	2105183.0	3758.8	0.001800	0.169	0.948		0.879		
19	2145897.0	2204.3	0.002128	2134545.0	3811.6	0.001794	0.157	0.939		0.881		
20	2175415.0	2267.5	0.002152	2163906.0	3864.7	0.001817	0.156	0.956		0.896		
21	2204933.0	2330.6	0.002118	2193268.0	3917.7	0.001792	0.154	0.947		0.888		
22	2234450.0	2392.9	0.002097	2222629.0	3970.4	0.001795	0.144	0.944		0.894		
23	2263968.0	2454.0	0.002042	2251990.0	4023.0	0.001783	0.127	0.926		0.892		
24	2293628.0	2514.6	0.002059	2281494.0	4075.0	0.001753	0.149	0.939		0.881		
25	2323289.0	2575.8	0.002083	2310998.0	4127.6	0.001825	0.124	0.956		0.921		
26	2352807.0	2637.4	0.002083	2340359.0	4180.9	0.001803	0.134	0.962		0.914		
27	2382324.0	2698.9	0.002083	2369721.0	4233.2	0.001757	0.157	0.967		0.894		
28	2411842.0	2760.4	0.002077	2399082.0	4285.6	0.001806	0.131	0.970		0.923		
29	2441360.0	2821.8	0.002078	2428444.0	4338.5	0.001799	0.135	0.976		0.923		
30	2470877.0	2883.3	0.002080	2457805.0	4391.8	0.001823	0.124	0.982		0.939		
31	2500395.0	2944.2	0.002046	2487167.0	4444.8	0.001786	0.127	0.971		0.923		
32	2530056.0	3004.0	0.002002	2516670.0	4497.7	0.001815	0.093	0.955		0.942		
33	2559716.0	3063.8	0.002040	2546174.0	4550.6	0.001783	0.126	0.978		0.928		
34	2589234.0	3123.6	0.002013	2575536.0	4603.1	0.001787	0.112	0.970		0.934		
35	2618752.0	3182.9	0.001995	2604897.0	4655.6	0.001784	0.106	0.966		0.936		
36	2648269.0	3241.3	0.001961	2634258.0	4707.6	0.001753	0.106	0.953		0.923		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 121674-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2900STEP75 M=0.75 TH=0 SLANT HOLE INJECTION P/D=10 ***

RUN 121674-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2900STEP75 M=0.75 TH=1 SLANT HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 121674-1 AND 121674-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1277451.0	103.1	0.003646	1280184.0	97.7	0.003446	UUUUU	1.020	0.0000	0.964	0.0000	0.964
2	1334013.0	291.1	0.003001	1336867.0	274.4	0.002792	0.070	0.792	0.0063	1.012	0.0060	1.892
3	1390575.0	460.5	0.002990	1393550.0	770.3	0.002765	0.075	0.883	0.0063	1.065	0.0060	2.000
4	1447137.0	624.2	0.002795	1450233.0	1258.2	0.002509	0.102	0.890	0.0063	1.007	0.0060	1.976
5	1503699.0	782.7	0.002812	1506916.0	1739.7	0.002425	0.137	0.946	0.0063	1.005	0.0060	2.000
6	1560261.0	935.6	0.002594	1563599.0	2213.6	0.002240	0.136	0.912	0.0063	0.952	0.0061	1.977
7	1616823.0	1085.2	0.002693	1620282.0	2687.2	0.002204	0.182	0.982	0.0063	0.958	0.0061	2.003
8	1673385.0	1233.4	0.002547	1676965.0	3157.3	0.002118	0.168	0.959	0.0063	0.938	0.0061	1.993
9	1729947.0	1377.8	0.002558	1733648.0	3623.5	0.002136	0.165	0.989	0.0063	0.962	0.0061	2.036
10	1786508.0	1519.1	0.002441	1790331.0	4087.8	0.002049	0.161	0.967	0.0063	0.937	0.0061	2.019
11	1843070.0	1658.8	0.002495	1847014.0	4548.6	0.002038	0.183	1.011	0.0063	0.945	0.0061	2.042
12	1899632.0	1797.3	0.002403	1903697.0	5007.1	0.001967	0.181	0.993	0.0063	0.925	0.0062	2.046
13	1942620.0	1901.5	0.002485	1946776.0	5444.2	0.002079	0.164	1.041		0.986		
14	1971749.0	1973.5	0.002449	1975968.0	5856.3	0.002115	0.137	1.035		1.009		
15	2000878.0	2044.5	0.002423	2005160.0	5917.8	0.002091	0.137	1.033		1.004		
16	2030149.0	2114.6	0.002381	2034493.0	5978.9	0.002091	0.122	1.024		1.009		
17	2059420.0	2183.8	0.002370	2063826.0	6039.9	0.002086	0.120	1.027		1.012		
18	2088549.0	2252.8	0.002357	2093018.0	6100.5	0.002059	0.126	1.029		1.004		
19	2117678.0	2320.8	0.002308	2122210.0	6160.2	0.002028	0.121	1.015		0.995		
20	2146808.0	2388.4	0.002329	2151401.0	6220.3	0.002082	0.106	1.032		1.026		
21	2175938.0	2456.0	0.002304	2180593.0	6280.1	0.002014	0.126	1.028		0.997		
22	2205067.0	2522.7	0.002271	2209785.0	6339.0	0.002015	0.112	1.020		1.003		
23	2234196.0	2588.0	0.002210	2238977.0	6397.4	0.001983	0.103	0.999		0.991		
24	2263467.0	2652.8	0.002236	2268310.0	6454.9	0.001951	0.128	1.017		0.979		
25	2292738.0	2718.3	0.002254	2297643.0	6513.0	0.002026	0.101	1.032		1.021		
26	2321867.0	2783.9	0.002248	2326835.0	6571.8	0.001999	0.111	1.035		1.012		
27	2350996.0	2849.5	0.002249	2356027.0	6629.6	0.001951	0.133	1.042		0.992		
28	2380126.0	2915.2	0.002253	2385218.0	6687.4	0.002010	0.108	1.049		1.026		
29	2409256.0	2980.5	0.002232	2414411.0	6745.7	0.001977	0.114	1.045		1.013		
30	2438385.0	3046.1	0.002266	2443602.0	6804.2	0.002026	0.106	1.067		1.042		
31	2467514.0	3111.3	0.002201	2472794.0	6862.6	0.001973	0.104	1.042		1.019		
32	2496785.0	3175.2	0.002185	2502127.0	6920.0	0.001954	0.106	1.039		1.013		
33	2526056.0	3239.2	0.002206	2531461.0	6978.0	0.002018	0.085	1.055		1.050		
34	2555185.0	3303.5	0.002199	2560652.0	7035.9	0.001941	0.117	1.056		1.014		
35	2584314.0	3367.4	0.002185	2589844.0	7092.8	0.001950	0.107	1.055		1.022		
36	2613444.0	3430.2	0.002121	2619036.0	7149.1	0.001904	0.102	1.029		1.001		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 102274 VELOCITY AND TEMPERATURE PROFILES FOR FIGS. 34 AND 35

REX =	0.15100E 06	REM =	515.	RFH =	448.		
XVO =	108.36 CM.	DEL2 =	0.066 CM.	DEH2 =	0.058 CM.		
UINF =	11.83 M/S	DEL99=	0.476 CM.	DELT99 =	0.456 CM.		
VISC =	0.15200E-04 M2/S	DEL1 =	0.130 CM.	UINF =	11.84 M/S		
PORT =	19	H =	1.959	VISC =	0.15238E-04 M2/S		
XLOC =	127.76 CM.	CF/2 =	0.17374E-02	TINF =	21.54 DEG C		
				TPLATE =	38.29 DEG C		

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+	Y(CM.)	T(DEG C)	TBAR	TBAR
0.025	0.053	4.14	0.350	8.2	8.41	0.0165	35.44	0.171	0.829
0.028	0.059	4.36	0.369	9.1	8.85	0.0190	34.66	0.217	0.783
0.030	0.064	4.40	0.372	9.9	8.93	0.0216	33.76	0.271	0.729
0.033	0.069	4.51	0.382	10.7	9.15	0.0241	33.35	0.295	0.705
0.038	0.080	4.71	0.398	12.4	9.56	0.0292	32.68	0.336	0.664
0.043	0.091	4.86	0.411	14.0	9.86	0.0343	32.09	0.371	0.629
0.051	0.107	5.09	0.430	16.5	10.32	0.0394	31.61	0.400	0.600
0.058	0.123	5.38	0.455	19.0	10.91	0.0444	31.26	0.421	0.579
0.069	0.144	5.55	0.469	22.2	11.25	0.0521	30.81	0.448	0.552
0.081	0.171	5.91	0.500	26.4	11.98	0.0597	30.49	0.467	0.533
0.094	0.197	6.25	0.528	30.5	12.67	0.0698	29.97	0.498	0.502
0.109	0.229	6.66	0.563	35.4	13.51	0.0825	29.54	0.524	0.476
0.127	0.267	6.98	0.590	41.2	14.16	0.0952	28.93	0.560	0.440
0.147	0.309	7.38	0.624	47.8	14.97	0.1105	28.48	0.588	0.412
0.168	0.352	7.91	0.669	54.4	16.05	0.1283	27.78	0.629	0.371
0.191	0.400	8.51	0.720	61.8	17.27	0.1486	26.95	0.679	0.321
0.213	0.448	8.99	0.760	69.2	18.22	0.1714	26.31	0.717	0.283
0.236	0.496	9.40	0.795	76.6	19.06	0.1994	25.38	0.774	0.226
0.262	0.550	9.88	0.835	84.9	20.03	0.2248	24.58	0.821	0.179
0.287	0.603	10.26	0.867	93.1	20.81	0.2502	23.97	0.858	0.142
0.312	0.656	10.60	0.896	101.3	21.49	0.2756	23.39	0.893	0.107
0.338	0.710	10.92	0.923	109.6	22.15	0.3010	22.96	0.919	0.081
0.376	0.790	11.26	0.952	121.9	22.84	0.3264	22.61	0.940	0.060
0.414	0.870	11.47	0.970	134.3	23.26	0.3645	22.22	0.962	0.038
0.452	0.950	11.63	0.984	146.7	23.60	0.4026	21.96	0.978	0.022
0.490	1.030	11.75	0.993	159.0	23.83	0.4407	21.80	0.988	0.012
0.528	1.110	11.80	0.997	171.4	23.93	0.4788	21.71	0.993	0.007
0.566	1.190	11.83	1.000	183.7	23.99	0.5169	21.64	0.998	0.002
						0.555	21.61	0.999	0.001
						0.593	21.60	1.000	0.000

RUN 120274 VELOCITY AND TEMPERATURE PROFILES FOR FIGS. 34 AND 35

REX =	0.14592E 06	REM =	501.	REH =	430.
XVO =	109.04 CM.	DEL2 =	0.064 CM.	DEH2 =	0.055 CM.
UINF =	11.62 M/S	DEL99=	0.468 CM.	DELT99 =	0.479 CM.
VISC =	0.14911E-04 M2/S	DEL1 =	0.137 CM.	UINF =	11.62 M/S
PORT =	19	H =	2.130	VISC =	0.14931E-04 M2/S
XLOC =	127.76 CM.	CF/2 =	0.15863E-02	TINF =	17.86 DEG C
				TPLATE =	34.06 DEG C

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+	Y(CM.)	T(DEG C)	TBAR	TBAR
0.025	0.054	3.21	0.276	7.9	6.93	0.0165	31.77	0.141	0.859
0.028	0.060	3.30	0.284	8.7	7.14	0.0191	30.65	0.211	0.789
0.030	0.065	3.36	0.289	9.5	7.27	0.0216	30.12	0.244	0.756
0.033	0.071	3.45	0.297	10.2	7.47	0.0241	29.81	0.263	0.737
0.038	0.081	3.59	0.309	11.8	7.76	0.0292	29.22	0.299	0.701
0.043	0.092	3.88	0.334	13.4	8.39	0.0343	28.65	0.335	0.665
0.051	0.108	4.19	0.361	15.8	9.05	0.0419	28.12	0.368	0.632
0.061	0.130	4.48	0.386	18.9	9.68	0.0495	27.55	0.403	0.597
0.074	0.157	4.83	0.415	22.9	10.43	0.0597	26.99	0.438	0.562
0.089	0.190	5.33	0.459	27.6	11.52	0.0724	26.42	0.473	0.527
0.107	0.228	5.69	0.490	33.1	12.29	0.0851	25.80	0.512	0.488
0.127	0.271	6.36	0.547	39.4	13.74	0.1003	25.21	0.548	0.452
0.150	0.320	7.02	0.604	46.5	15.17	0.1156	24.66	0.582	0.418
0.175	0.374	7.86	0.676	54.4	16.98	0.1334	23.87	0.631	0.369
0.201	0.428	8.53	0.734	62.3	18.43	0.1537	23.07	0.681	0.319
0.226	0.483	9.13	0.786	70.2	19.73	0.1791	22.17	0.737	0.263
0.251	0.537	9.61	0.827	78.0	20.76	0.2045	21.39	0.784	0.216
0.277	0.591	9.98	0.859	85.9	21.56	0.2299	20.72	0.826	0.174
0.302	0.645	10.41	0.896	93.8	22.50	0.2553	20.10	0.864	0.136
0.328	0.700	10.76	0.926	101.7	23.24	0.2807	19.56	0.898	0.102
0.353	0.754	10.90	0.938	109.6	23.56	0.3061	19.23	0.919	0.081
0.378	0.808	11.10	0.955	117.5	23.99	0.3315	18.89	0.940	0.060
0.404	0.862	11.25	0.968	125.3	24.31	0.3569	18.61	0.957	0.043
0.429	0.917	11.35	0.977	133.2	24.52	0.3823	18.42	0.969	0.031
0.455	0.971	11.47	0.987	141.1	24.78	0.4077	18.30	0.976	0.024
0.480	1.025	11.51	0.990	149.0	24.87	0.4331	18.17	0.984	0.016
0.505	1.079	11.55	0.994	156.9	24.97	0.4585	18.12	0.987	0.013
0.531	1.134	11.62	1.000	164.8	25.11	0.4839	18.05	0.992	0.008
						0.509	18.00	0.995	0.005
						0.535	17.98	0.996	0.004
						0.560	17.95	0.998	0.002
						0.585	17.92	1.000	0.000

RUN 102274 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSLFP SLANT HOLE INJECTION P/D=5 ***

TADB= 21.40 DEG C UINF= 11.74 M/S TINF= 21.33 DEG C
RHO= 1.188 KG/M3 VISC= 0.15218E-04 M2/S XVC= 108.4 CM
CP= 1013. J/KGK PR= 0.717

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.14973E 06	0.43899E 03	0.27628E-02	0.689E-04	20.
2	132.8	0.18892E 06	0.55327E 03	0.30687E-02	0.717E-04	20.
3	137.9	0.22812E 06	0.67220E 03	0.30001E-02	0.711E-04	20.
4	143.0	0.26731E 06	0.78825E 03	0.29214E-02	0.703E-04	20.
5	148.1	0.30651E 06	0.90145E 03	0.28546E-02	0.697E-04	20.
6	153.2	0.34570E 06	0.10108E 04	0.27267E-02	0.685E-04	20.
7	158.2	0.38490E 06	0.11178E 04	0.27297E-02	0.687E-04	20.
8	163.3	0.42409E 06	0.12228E 04	0.26327E-02	0.678E-04	20.
9	168.4	0.46329E 06	0.13250E 04	0.25812E-02	0.673E-04	20.
10	173.5	0.50248E 06	0.14245E 04	0.24944E-02	0.666E-04	20.
11	178.6	0.54168E 06	0.15219E 04	0.24739E-02	0.664E-04	21.
12	183.6	0.58087E 06	0.16181E 04	0.24375E-02	0.662E-04	21.
13	187.5	0.61066E 06	0.16872E 04	0.21056E-02	0.726E-04	21.
14	190.1	0.63085E 06	0.17300E 04	0.21353E-02	0.801E-04	21.
15	192.7	0.65103E 06	0.17730E 04	0.21177E-02	0.810E-04	21.
16	195.4	0.67132E 06	0.18156E 04	0.21026E-02	0.796E-04	21.
17	198.0	0.69160E 06	0.18581E 04	0.21004E-02	0.799E-04	21.
18	200.6	0.71178E 06	0.19005E 04	0.21000E-02	0.798E-04	21.
19	203.2	0.73197E 06	0.19428E 04	0.20775E-02	0.779E-04	21.
20	205.8	0.75216E 06	0.19849E 04	0.20934E-02	0.793E-04	21.
21	208.5	0.77234E 06	0.20270E 04	0.20711E-02	0.780E-04	21.
22	211.1	0.79253E 06	0.20690E 04	0.20838E-02	0.797E-04	21.
23	213.7	0.81271E 06	0.21106E 04	0.20390E-02	0.776E-04	21.
24	216.3	0.83300E 06	0.21520E 04	0.20504E-02	0.797E-04	21.
25	218.9	0.85328E 06	0.21933E 04	0.20422E-02	0.780E-04	21.
26	221.6	0.87346E 06	0.22346E 04	0.20441E-02	0.823E-04	21.
27	224.2	0.89365E 06	0.22761E 04	0.20606E-02	0.733E-04	21.
28	226.8	0.91384E 06	0.23174E 04	0.20280E-02	0.826E-04	21.
29	229.4	0.93402E 06	0.23590E 04	0.20861E-02	0.776E-04	21.
30	232.0	0.95421E 06	0.24006E 04	0.20315E-02	0.799E-04	21.
31	234.6	0.97439E 06	0.24417E 04	0.20396E-02	0.780E-04	21.
32	237.3	0.99468E 06	0.24825E 04	0.19949E-02	0.770E-04	21.
33	239.9	0.10150E 07	0.25232E 04	0.20320E-02	0.782E-04	21.
34	242.5	0.10351E 07	0.25638E 04	0.19841E-02	0.746E-04	21.
35	245.1	0.10553E 07	0.26039E 04	0.19910E-02	0.794E-04	21.
36	247.8	0.10755E 07	0.26436E 04	0.19315E-02	0.850E-04	21.

RUN 103074-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 103074-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 103074-1 AND 103074-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	150954.8	482.1	0.002978	150713.9	481.3	0.002862	UUUUU	1.078	0.0000	1.036	0.0000	1.036
2	190471.8	605.7	0.003280	190167.8	589.7	0.002633	0.197	1.106	0.0137	0.888	0.0126	2.420
3	229988.8	734.8	0.003251	229621.7	1181.6	0.002171	0.332	1.139	0.0134	0.760	0.0129	2.336
4	269505.8	861.2	0.003147	269075.6	1770.1	0.001768	0.438	1.138	0.0132	0.639	0.0125	2.167
5	309022.7	985.2	0.003132	308529.5	2332.5	0.001674	0.466	1.164	0.0131	0.622	0.0130	2.222
6	348539.7	1107.1	0.003035	347983.4	2908.5	0.001580	0.479	1.155	0.0130	0.601	0.0132	2.250
7	388056.7	1227.3	0.003050	387437.3	3491.8	0.001523	0.501	1.186	0.0137	0.592	0.0131	2.249
8	427573.6	1347.6	0.003041	426891.3	4067.9	0.001516	0.502	1.206	0.0133	0.601	0.0122	2.197
9	467090.6	1466.7	0.002983	466345.1	4609.2	0.001493	0.500	1.204	0.0131	0.602	0.0121	2.215
10	506607.6	1585.7	0.003042	505799.1	5145.2	0.001388	0.544	1.248	0.0131	0.569	0.0138	2.369
11	546124.6	1704.9	0.002991	545252.9	5744.4	0.001327	0.556	1.246	0.0129	0.552	0.0132	2.293
12	585641.6	1821.1	0.002887	584706.9	6315.4	0.001282	0.556	1.219	0.0130	0.541	0.0134	2.323
13	615674.6	1904.0	0.002541	614691.9	6882.6	0.001205	0.526	1.084		0.514		
14	636025.8	1955.6	0.002519	635010.6	6907.9	0.001279	0.492	1.081		0.549		
15	656377.0	2006.0	0.002427	655329.4	6933.8	0.001263	0.480	1.049		0.545		
16	676826.8	2054.8	0.002368	675746.6	6959.7	0.001286	0.457	1.029		0.559		
17	697276.9	2102.7	0.002334	696164.0	6986.0	0.001298	0.444	1.020		0.567		
18	717628.1	2149.6	0.002273	716482.8	7012.1	0.001273	0.440	1.000		0.560		
19	737979.3	2195.3	0.002214	736801.5	7037.6	0.001232	0.443	0.979		0.545		
20	758330.6	2240.6	0.002224	757120.3	7063.6	0.001324	0.405	0.989		0.589		
21	778682.1	2284.9	0.002127	777439.3	7089.4	0.001210	0.431	0.951		0.541		
22	799033.3	2327.7	0.002080	797758.0	7114.6	0.001268	0.390	0.935		0.570		
23	819384.5	2369.9	0.002063	818076.8	7140.0	0.001235	0.401	0.932		0.558		
24	839834.3	2412.0	0.002069	838493.9	7165.1	0.001228	0.406	0.939		0.557		
25	860284.4	2453.6	0.002008	858911.4	7190.1	0.001234	0.386	0.916		0.562		
26	880635.6	2494.4	0.001998	879230.1	7215.6	0.001266	0.366	0.915		0.580		
27	900986.9	2535.8	0.002065	899548.9	7240.6	0.001194	0.422	0.950		0.549		
28	921338.1	2577.2	0.001995	919867.6	7265.3	0.001233	0.382	0.922		0.570		
29	941689.6	2618.1	0.002023	940186.6	7290.6	0.001262	0.376	0.939		0.586		
30	962040.8	2659.0	0.001994	960505.4	7316.5	0.001283	0.357	0.930		0.598		
31	982392.0	2699.3	0.001960	980824.1	7342.2	0.001242	0.366	0.918		0.582		
32	1002841.0	2739.0	0.001938	1001241.0	7368.0	0.001292	0.333	0.911		0.607		
33	1023291.0	2778.3	0.001924	1021658.0	7394.1	0.001276	0.337	0.908		0.602		
34	1043643.0	2817.7	0.001942	1041977.0	7419.9	0.001262	0.350	0.921		0.598		
35	1063994.0	2856.7	0.001884	1062296.0	7445.6	0.001268	0.327	0.896		0.603		
36	1084345.0	2894.6	0.001835	1082614.0	7471.1	0.001234	0.328	0.877		0.589		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 102874 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL75 M=0.75 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 102974 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL75 M=0.75 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 102874 AND 102974 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	149570.7	526.6	0.003005	149481.8	526.3	0.002951	UUUUU	1.088	0.0000	1.068	0.0000	1.068
2	188725.4	651.0	0.003348	188613.1	638.0	0.002758	0.176	1.127	0.0254	0.928	0.0241	3.563
3	227880.0	787.4	0.003623	227744.4	1689.6	0.002805	0.226	1.266	0.0256	0.981	0.0238	3.693
4	267034.7	929.2	0.003618	266875.8	2721.9	0.002452	0.322	1.306	0.0257	0.885	0.0238	3.622
5	306189.3	1069.7	0.003557	306007.2	3745.2	0.002256	0.366	1.319	0.0256	0.837	0.0227	3.501
6	345343.9	1207.0	0.003457	345138.6	4718.5	0.002117	0.388	1.313	0.0254	0.804	0.0238	3.605
7	384498.6	1342.9	0.003485	384269.9	5731.0	0.002102	0.397	1.353	0.0253	0.816	0.0236	3.654
8	423653.3	1479.2	0.003479	423401.3	6734.1	0.002044	0.413	1.377	0.0254	0.809	0.0233	3.666
9	462807.9	1615.7	0.003491	462532.6	7726.5	0.002004	0.426	1.406	0.0255	0.807	0.0237	3.743
10	501962.6	1753.1	0.003525	501664.0	8721.6	0.001926	0.454	1.443	0.0255	0.788	0.0234	3.721
11	541117.2	1891.0	0.003521	540795.3	9722.4	0.001848	0.475	1.463	0.0256	0.768	0.0233	3.704
12	580271.9	2027.5	0.003450	579926.7	10702.8	0.001759	0.490	1.454	0.0255	0.741	0.0231	3.673
13	610029.4	2125.9	0.003056	609666.6	11656.7	0.001634	0.465	1.301		0.695		
14	630194.1	2186.8	0.002978	629819.3	11689.3	0.001605	0.461	1.276		0.688		
15	650358.7	2245.7	0.002862	649971.9	11721.1	0.001543	0.461	1.234		0.665		
16	670621.0	2302.8	0.002788	670222.1	11751.9	0.001510	0.458	1.209		0.655		
17	690883.6	2358.5	0.002735	690472.7	11781.9	0.001468	0.463	1.193		0.640		
18	711048.3	2413.3	0.002690	710625.3	11811.1	0.001420	0.472	1.181		0.623		
19	731212.9	2467.2	0.002652	730777.9	11839.1	0.001356	0.489	1.170		0.598		
20	751377.5	2519.6	0.002538	750930.6	11866.2	0.001332	0.475	1.126		0.591		
21	771542.4	2570.9	0.002543	771083.5	11892.3	0.001257	0.506	1.135		0.561		
22	791707.0	2621.5	0.002471	791236.1	11917.8	0.001268	0.487	1.108		0.568		
23	811871.6	2670.9	0.002421	811388.8	11942.8	0.001216	0.498	1.091		0.548		
24	832133.9	2719.5	0.002397	831639.0	11967.0	0.001181	0.507	1.085		0.535		
25	852396.6	2767.4	0.002346	851889.5	11990.3	0.001133	0.517	1.068		0.516		
26	872561.1	2814.5	0.002320	872042.2	12013.5	0.001162	0.499	1.061		0.531		
27	892725.8	2861.6	0.002346	892194.8	12035.8	0.001052	0.552	1.078		0.483		
28	912890.4	2908.4	0.002287	912347.4	12057.4	0.001085	0.526	1.055		0.501		
29	933055.3	2954.5	0.002282	932500.3	12078.4	0.001095	0.520	1.057		0.507		
30	953219.9	3000.0	0.002224	952652.9	12101.4	0.001083	0.513	1.035		0.504		
31	973384.6	3044.7	0.002202	972805.6	12122.8	0.001043	0.527	1.029		0.487		
32	993646.9	3088.6	0.002147	993055.8	12143.9	0.001053	0.510	1.008		0.494		
33	1013909.0	3131.8	0.002133	1013306.0	12165.0	0.001033	0.516	1.005		0.486		
34	1034074.0	3174.8	0.002127	1033459.0	12185.6	0.001011	0.525	1.006		0.478		
35	1054238.0	3217.0	0.002054	1053611.0	12206.0	0.001011	0.508	0.975		0.480		
36	1074403.0	3258.0	0.002008	1073764.0	12226.1	0.000987	0.509	0.957		0.470		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 120274 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSLFP SLANT HOLE INJECTION P/C=10 ***

TADB= 17.70 DEG C UINF= 11.55 M/S TINF= 17.64 DEG C
RHO= 1.202 KG/M3 VISC= 0.14911E-04 M2/S XVO= 109.1 CM
CP= 1012. J/KGK PR= 0.717

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.14482E 06	0.42884E 03	0.24237E-02	0.692E-04	39.
2	132.8	0.18417E 06	0.53195E 03	0.28176E-02	0.726E-04	39.
3	137.9	0.22351E 06	0.64285E 03	0.28203E-02	0.725E-04	39.
4	143.0	0.26285E 06	0.75171E 03	0.27133E-02	0.715E-04	40.
5	148.1	0.30220E 06	0.85825E 03	0.27025E-02	0.715E-04	40.
6	153.2	0.34154E 06	0.96241E 03	0.25923E-02	0.705E-04	40.
7	158.2	0.38088E 06	0.10630E 04	0.25213E-02	0.698E-04	40.
8	163.3	0.42023E 06	0.11602E 04	0.24206E-02	0.690E-04	40.
9	168.4	0.45957E 06	0.12550E 04	0.23988E-02	0.689E-04	40.
10	173.5	0.49891E 06	0.13489E 04	0.23739E-02	0.688E-04	40.
11	178.6	0.53826E 06	0.14409E 04	0.23021E-02	0.682E-04	40.
12	183.6	0.57760E 06	0.15312E 04	0.22901E-02	0.680E-04	40.
13	187.5	0.60750E 06	0.15967E 04	0.20178E-02	0.712E-04	40.
14	190.1	0.62776E 06	0.16390E 04	0.21461E-02	0.805E-04	40.
15	192.7	0.64802E 06	0.16822E 04	0.21198E-02	0.813E-04	40.
16	195.4	0.66838E 06	0.17251E 04	0.21015E-02	0.799E-04	40.
17	198.0	0.68874E 06	0.17678E 04	0.21148E-02	0.805E-04	40.
18	200.6	0.70901E 06	0.18107E 04	0.21121E-02	0.804E-04	40.
19	203.2	0.72927E 06	0.18533E 04	0.20924E-02	0.785E-04	40.
20	205.8	0.74953E 06	0.18957E 04	0.20866E-02	0.799E-04	40.
21	208.5	0.76979E 06	0.19380E 04	0.20791E-02	0.783E-04	40.
22	211.1	0.79005E 06	0.19808E 04	0.21458E-02	0.813E-04	40.
23	213.7	0.81032E 06	0.20229E 04	0.19965E-02	0.772E-04	40.
24	216.3	0.83068E 06	0.20640E 04	0.20617E-02	0.802E-04	40.
25	218.9	0.85104E 06	0.21055E 04	0.20266E-02	0.779E-04	40.
26	221.6	0.87130E 06	0.21468E 04	0.20480E-02	0.827E-04	40.
27	224.2	0.89156E 06	0.21886E 04	0.20741E-02	0.743E-04	40.
28	226.8	0.91182E 06	0.22303E 04	0.20389E-02	0.831E-04	40.
29	229.4	0.93208E 06	0.22722E 04	0.20866E-02	0.781E-04	40.
30	232.0	0.95234E 06	0.23142E 04	0.20533E-02	0.804E-04	40.
31	234.6	0.97261E 06	0.23554E 04	0.20084E-02	0.778E-04	40.
32	237.3	0.99297E 06	0.23960E 04	0.19943E-02	0.769E-04	40.
33	239.9	0.10133E 07	0.24363E 04	0.19780E-02	0.770E-04	40.
34	242.5	0.10336E 07	0.24764E 04	0.19810E-02	0.747E-04	40.
35	245.1	0.10539E 07	0.25163E 04	0.19455E-02	0.783E-04	40.
36	247.8	0.10741E 07	0.25548E 04	0.18581E-02	0.829E-04	40.

RUN 121074-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=10 ***

RUN 121074-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 121074-1 AND 121074-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	143641.8	522.9	0.002591	143607.7	522.8	0.002487	UUUUU	1.069	0.0000	1.026	0.0000	1.026
2	182664.3	631.3	0.002965	182620.9	622.2	0.002610	0.120	0.992	0.0034	0.873	0.0034	1.361
3	221686.8	747.3	0.002980	221634.1	854.0	0.002507	0.159	1.036	0.0034	0.872	0.0034	1.377
4	260709.3	858.5	0.002718	260647.4	1079.8	0.002302	0.153	0.976	0.0034	0.827	0.0030	1.288
5	299731.8	967.2	0.002856	299660.6	1283.7	0.002200	0.230	1.055	0.0034	0.812	0.0030	1.284
6	338754.4	1072.8	0.002556	338673.9	1483.2	0.002074	0.189	0.967	0.0034	0.785	0.0032	1.294
7	377776.9	1176.2	0.002743	377687.1	1688.2	0.002093	0.237	1.061	0.0034	0.809	0.0032	1.330
8	416799.4	1279.9	0.002572	416700.3	1892.9	0.002053	0.202	1.015	0.0034	0.810	0.0026	1.249
9	455821.9	1381.0	0.002610	455713.6	2071.7	0.001978	0.242	1.048	0.0034	0.794	0.0026	1.240
10	494844.4	1480.3	0.002475	494726.8	2247.8	0.001909	0.229	1.011	0.0034	0.779	0.0031	1.316
11	533866.9	1577.9	0.002531	533740.0	2442.6	0.001825	0.279	1.049	0.0034	0.757	0.0031	1.298
12	572889.4	1674.3	0.002407	572753.3	2635.0	0.001792	0.256	1.012	0.0034	0.753	0.0027	1.241
13	602546.6	1742.6	0.002125	602403.4	2798.9	0.002187	*****	0.903		0.929		
14	622643.1	1788.1	0.002396	622495.2	2940.9	0.001306	0.455	1.024		0.558		
15	642739.8	1835.2	0.002280	642587.0	2970.8	0.001668	0.269	0.981		0.717		
16	662933.6	1880.9	0.002270	662776.1	3004.5	0.001682	0.259	0.983		0.728		
17	683127.9	1926.6	0.002273	682965.5	3038.7	0.001717	0.245	0.990		0.747		
18	703224.4	1972.6	0.002292	703057.3	3073.2	0.001719	0.250	1.004		0.753		
19	723321.0	2018.2	0.002244	723149.1	3107.7	0.001709	0.238	0.988		0.753		
20	743417.6	2063.6	0.002272	743240.9	3142.6	0.001755	0.228	1.006		0.777		
21	763514.4	2108.4	0.002177	763333.0	3176.9	0.001658	0.238	0.970		0.738		
22	783611.0	2152.6	0.002211	783424.8	3211.1	0.001740	0.213	0.990		0.779		
23	803707.6	2196.3	0.002138	803516.6	3245.9	0.001727	0.193	0.962		0.777		
24	823901.5	2240.4	0.002242	823705.7	3280.4	0.001698	0.242	1.014		0.768		
25	844095.7	2284.7	0.002160	843895.1	3314.8	0.001722	0.203	0.981		0.782		
26	864192.3	2328.4	0.002189	863986.9	3349.9	0.001767	0.192	0.999		0.807		
27	884288.8	2372.7	0.002208	884078.7	3384.5	0.001678	0.240	1.013		0.769		
28	904385.4	2416.9	0.002187	904170.5	3418.5	0.001700	0.223	1.008		0.783		
29	924482.3	2461.4	0.002241	924262.6	3453.1	0.001747	0.221	1.037		0.808		
30	944578.8	2505.9	0.002179	944354.4	3488.4	0.001761	0.192	1.013		0.818		
31	964675.4	2549.2	0.002127	964446.2	3523.2	0.001700	0.201	0.993		0.793		
32	984869.3	2591.7	0.002094	984635.3	3557.8	0.001735	0.171	0.981		0.813		
33	1005063.0	2633.9	0.002103	1004824.0	3592.2	0.001687	0.198	0.989		0.794		
34	1025160.0	2675.9	0.002072	1024916.0	3626.2	0.001693	0.183	0.978		0.799		
35	1045256.0	2717.3	0.002046	1045008.0	3659.9	0.001658	0.189	0.970		0.786		
36	1065353.0	2757.5	0.001950	1065100.0	3693.2	0.001651	0.153	0.928		0.786		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 120574-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL80 M=0.8 TH=0 SLANT HOLE INJECTION P/D=10 ***

RUN 120574-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 520HSL80 M=0.8 TH=1 SLANT HOLE INJECTION P/D=10 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 120574-1 AND 120574-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	143312.5	521.7	0.002801	144121.1	524.6	0.002700	UUUUU	1.156	0.0000	1.114	0.0000	1.114
2	182245.5	635.7	0.003052	183273.8	631.0	0.002732	0.105	1.020	0.0065	0.914	0.0062	1.750
3	221178.6	755.7	0.003115	222426.5	981.0	0.002771	0.110	1.082	0.0065	0.964	0.0062	1.834
4	260111.6	873.3	0.002924	261579.3	1327.5	0.002548	0.129	1.049	0.0066	0.915	0.0065	1.842
5	299044.6	988.6	0.003000	300731.9	1680.5	0.002493	0.169	1.107	0.0066	0.921	0.0065	1.871
6	337977.7	1101.5	0.002800	339884.6	2028.2	0.002272	0.189	1.059	0.0066	0.860	0.0066	1.831
7	376910.7	1211.6	0.002857	379037.4	2376.5	0.002368	0.171	1.104	0.0066	0.916	0.0066	1.915
8	415843.8	1320.6	0.002744	418190.1	2724.4	0.002242	0.183	1.081	0.0066	0.885	0.0061	1.835
9	454776.8	1427.0	0.002720	457342.8	3052.0	0.002253	0.172	1.091	0.0066	0.905	0.0061	1.873
10	493709.8	1533.0	0.002728	496495.5	3377.7	0.002149	0.212	1.113	0.0066	0.878	0.0067	1.929
11	532642.9	1639.7	0.002750	535648.2	3724.0	0.002207	0.197	1.139	0.0066	0.915	0.0067	1.987
12	571575.9	1744.7	0.002645	574800.9	4070.3	0.002147	0.188	1.111	0.0066	0.903	0.0069	2.021
13	601165.1	1819.8	0.002358	604557.1	4404.1	0.002042	0.134	1.001		0.868		
14	621215.6	1868.1	0.002446	624720.7	4717.4	0.002140	0.125	1.045		0.915		
15	641266.1	1917.0	0.002431	644884.3	4760.2	0.002097	0.137	1.045		0.903		
16	661413.7	1965.7	0.002421	665145.6	4802.7	0.002118	0.125	1.047		0.917		
17	681561.6	2014.3	0.002423	685407.2	4845.7	0.002138	0.118	1.054		0.931		
18	701612.1	2062.9	0.002414	705570.8	4888.9	0.002140	0.113	1.056		0.938		
19	721662.6	2111.0	0.002383	725734.4	4931.9	0.002119	0.111	1.049		0.934		
20	741713.1	2159.4	0.002440	745898.1	4975.3	0.002183	0.106	1.080		0.967		
21	761763.9	2207.6	0.002356	766062.0	5017.9	0.002038	0.135	1.048		0.908		
22	781814.4	2254.7	0.002338	786225.6	5061.1	0.002239	0.043	1.046		1.002		
23	801864.9	2301.6	0.002332	806389.3	5104.5	0.002067	0.114	1.048		0.930		
24	822012.5	2348.8	0.002372	826650.5	5146.8	0.002118	0.107	1.072		0.958		
25	842160.4	2396.4	0.002365	846912.1	5189.6	0.002120	0.104	1.074		0.963		
26	862210.9	2443.6	0.002346	867075.8	5232.6	0.002141	0.087	1.070		0.978		
27	882261.4	2490.8	0.002348	887239.4	5275.2	0.002080	0.114	1.076		0.954		
28	902311.9	2537.8	0.002341	907403.0	5317.3	0.002097	0.104	1.077		0.966		
29	922362.7	2585.4	0.002403	927566.9	5360.1	0.002141	0.109	1.111		0.991		
30	942413.2	2633.0	0.002334	947730.6	5403.3	0.002140	0.083	1.084		0.994		
31	962463.6	2679.5	0.002296	967894.2	5445.5	0.002042	0.111	1.071		0.953		
32	982611.3	2725.4	0.002277	988155.4	5487.0	0.002067	0.092	1.066		0.969		
33	1002759.0	2770.7	0.002242	1008417.0	5528.8	0.002072	0.076	1.054		0.975		
34	1022809.0	2815.8	0.002248	1028580.0	5569.8	0.001996	0.112	1.061		0.943		
35	1042860.0	2860.6	0.002221	1048744.0	5610.2	0.002005	0.097	1.052		0.951		
36	1062910.0	2904.0	0.002102	1068907.0	5649.7	0.001909	0.092	1.000		0.909		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 092874 VELOCITY AND TEMPERATURE PROFILES FOR FIGS. 40 AND 41

REX = 0.11787E 07		REM =	2663.	REH =	1843.
XVO =	20.98 CM.	DEL2 =	0.241 CM.	DEH2 =	0.167 CM.
UINF =	16.83 M/S	DEL99=	2.045 CM.	DELT99 =	1.894 CM.
VISC =	0.15247E-04 M2/S	DEL1 =	0.350 CM.	UINF =	16.84 M/S
PORT =	19	H =	1.450	VISC =	0.15263E-04 M2/S
XLOC =	127.76 CM.	CF/2 =	0.16794E-02	TINF =	21.96 DEG C
				TPLATE =	36.46 DEG C

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+	Y(CM.)	T(DEG C)	TBAR	TBAR
0.025	0.012	7.31	0.434	11.5	10.60	0.0165	33.33	0.218	0.782
0.028	0.014	7.56	0.449	12.6	10.96	0.0190	32.24	0.293	0.707
0.030	0.015	7.79	0.463	13.8	11.29	0.0216	31.51	0.344	0.656
0.036	0.017	8.21	0.488	16.1	11.91	0.0241	31.09	0.373	0.627
0.043	0.021	8.62	0.512	19.5	12.50	0.0292	30.21	0.434	0.566
0.053	0.026	9.15	0.544	24.1	13.26	0.0368	29.45	0.487	0.513
0.066	0.032	9.51	0.565	29.9	13.79	0.0470	28.63	0.544	0.456
0.081	0.040	9.75	0.579	36.8	14.14	0.0597	28.02	0.587	0.413
0.099	0.048	10.06	0.598	44.8	14.59	0.0775	27.45	0.627	0.373
0.119	0.058	10.31	0.612	54.0	14.94	0.0978	27.08	0.653	0.347
0.142	0.070	10.58	0.629	64.3	15.35	0.1232	26.73	0.677	0.323
0.168	0.082	10.73	0.637	75.8	15.55	0.1537	26.41	0.699	0.301
0.198	0.097	11.03	0.656	89.6	16.00	0.1892	26.07	0.722	0.278
0.234	0.114	11.27	0.670	105.7	16.34	0.2299	25.82	0.740	0.260
0.274	0.134	11.56	0.687	124.1	16.76	0.2756	25.51	0.762	0.238
0.320	0.156	11.87	0.705	144.8	17.21	0.3264	25.27	0.778	0.222
0.371	0.181	12.07	0.717	167.7	17.51	0.3899	24.97	0.799	0.201
0.432	0.211	12.38	0.735	195.3	17.94	0.4661	24.71	0.817	0.183
0.503	0.246	12.73	0.756	227.5	18.46	0.5601	24.40	0.839	0.161
0.592	0.289	13.08	0.777	267.7	18.97	0.6871	24.02	0.865	0.135
0.693	0.339	13.47	0.800	313.7	19.53	0.8141	23.68	0.888	0.112
0.818	0.400	13.86	0.823	370.0	20.09	0.9411	23.41	0.908	0.092
0.970	0.474	14.39	0.855	438.9	20.87	1.0681	23.17	0.924	0.076
1.123	0.549	14.84	0.882	507.8	21.52	1.1951	22.96	0.939	0.061
1.275	0.623	15.23	0.905	576.8	22.08	1.3221	22.78	0.952	0.048
1.427	0.698	15.68	0.932	645.7	22.73	1.4491	22.60	0.964	0.036
1.580	0.772	15.98	0.950	714.7	23.17	1.5761	22.47	0.973	0.027
1.732	0.847	16.30	0.969	783.6	23.64	1.7031	22.34	0.982	0.018
1.885	0.921	16.53	0.982	852.5	23.97	1.8301	22.27	0.987	0.013
2.037	0.996	16.68	0.991	921.5	24.18	1.9571	22.20	0.992	0.008
2.189	1.070	16.81	0.999	990.4	24.37	2.0841	22.14	0.996	0.004
2.342	1.145	16.83	1.000	1059.3	24.40	2.2111	22.11	0.998	0.002
						2.338	22.09	1.000	0.000
						2.465	22.08	1.000	0.000

RUN 092874 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700HSLFP SLANT HOLE INJECTION P/D=5 ***

TADB= 21.87 DEG C UINF= 16.81 M/S TINF= 21.75 DEG C
RHO= 1.187 KG/M3 VISC= 0.15243E-04 M2/S XVO= 21.0 CM
CP= 1013. J/KGK PR= 0.716

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.11776E 07	0.18684E 04	0.22298E-02	0.516E-04	28.
2	132.8	0.12337E 07	0.19950E 04	0.22897E-02	0.519E-04	28.
3	137.9	0.12897E 07	0.21229E 04	0.22765E-02	0.517E-04	28.
4	143.0	0.13457E 07	0.22495E 04	0.22419E-02	0.517E-04	28.
5	148.1	0.14017E 07	0.23750E 04	0.22392E-02	0.517E-04	28.
6	153.2	0.14578E 07	0.24998E 04	0.22167E-02	0.515E-04	28.
7	158.2	0.15138E 07	0.26237E 04	0.22067E-02	0.515E-04	28.
8	163.3	0.15698E 07	0.27462E 04	0.21636E-02	0.513E-04	29.
9	168.4	0.16258E 07	0.28666E 04	0.21344E-02	0.511E-04	29.
10	173.5	0.16819E 07	0.29854E 04	0.21079E-02	0.510E-04	29.
11	178.6	0.17379E 07	0.31029E 04	0.20855E-02	0.509E-04	29.
12	183.6	0.17939E 07	0.32195E 04	0.20774E-02	0.509E-04	29.
13	187.5	0.18365E 07	0.33057E 04	0.19428E-02	0.682E-04	29.
14	190.1	0.18653E 07	0.33617E 04	0.19322E-02	0.678E-04	29.
15	192.7	0.18942E 07	0.34172E 04	0.19113E-02	0.681E-04	29.
16	195.4	0.19232E 07	0.34722E 04	0.18930E-02	0.666E-04	29.
17	198.0	0.19522E 07	0.35267E 04	0.18864E-02	0.666E-04	29.
18	200.6	0.19810E 07	0.35812E 04	0.18845E-02	0.665E-04	29.
19	203.2	0.20099E 07	0.36354E 04	0.18661E-02	0.650E-04	29.
20	205.8	0.20387E 07	0.36891E 04	0.18546E-02	0.656E-04	29.
21	208.5	0.20676E 07	0.37428E 04	0.18605E-02	0.651E-04	29.
22	211.1	0.20964E 07	0.37966E 04	0.18636E-02	0.661E-04	29.
23	213.7	0.21253E 07	0.38497E 04	0.18176E-02	0.641E-04	29.
24	216.3	0.21543E 07	0.39025E 04	0.18344E-02	0.657E-04	29.
25	218.9	0.21833E 07	0.39552E 04	0.18166E-02	0.645E-04	29.
26	221.6	0.22121E 07	0.40079E 04	0.18293E-02	0.685E-04	29.
27	224.2	0.22410E 07	0.40605E 04	0.18154E-02	0.591E-04	29.
28	226.8	0.22698E 07	0.41130E 04	0.18195E-02	0.688E-04	29.
29	229.4	0.22987E 07	0.41654E 04	0.18063E-02	0.626E-04	29.
30	232.0	0.23275E 07	0.42180E 04	0.18364E-02	0.665E-04	29.
31	234.6	0.23564E 07	0.42707E 04	0.18111E-02	0.645E-04	30.
32	237.3	0.23854E 07	0.43228E 04	0.17956E-02	0.638E-04	30.
33	239.9	0.24144E 07	0.43749E 04	0.18129E-02	0.648E-04	30.
34	242.5	0.24432E 07	0.44270E 04	0.17910E-02	0.621E-04	30.
35	245.1	0.24721E 07	0.44788E 04	0.17961E-02	0.661E-04	30.
36	247.8	0.25009E 07	0.45306E 04	0.17896E-02	0.714E-04	30.

RUN 100174-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700HSL40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 100374 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 2700HSL40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 100174-1 AND 100374 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	1173846.0	1817.7	0.002345	1179040.0	1825.8	0.002340	UUUUJ	1.040	0.0000	1.038	0.0000	1.038
2	1229690.0	1950.1	0.002395	1235131.0	1947.2	0.001991	0.169	1.057	0.0126	0.879	0.0120	2.713
3	1285534.0	2085.3	0.002450	1291222.0	2720.1	0.001638	0.331	1.077	0.0128	0.720	0.0120	2.491
4	1341379.0	2222.1	0.002450	1347314.0	3479.4	0.001412	0.424	1.088	0.0127	0.627	0.0122	2.390
5	1397223.0	2358.4	0.002431	1403405.0	4240.2	0.001342	0.448	1.086	0.0126	0.599	0.0120	2.329
6	1453067.0	2493.0	0.002388	1459496.0	4983.7	0.001251	0.476	1.094	0.0123	0.573	0.0127	2.417
7	1508912.0	2628.2	0.002455	1515588.0	5767.9	0.001215	0.505	1.118	0.0126	0.554	0.0124	2.333
8	1564756.0	2764.1	0.002411	1571679.0	6529.2	0.001209	0.499	1.125	0.0125	0.564	0.0118	2.316
9	1620600.0	2897.5	0.002367	1627770.0	7256.8	0.001155	0.512	1.106	0.0126	0.540	0.0120	2.299
10	1676444.0	3030.7	0.002402	1683862.0	7990.9	0.001104	0.540	1.132	0.0124	0.520	0.0123	2.323
11	1732289.0	3164.5	0.002388	1739953.0	8741.7	0.001035	0.567	1.148	0.0126	0.497	0.0125	2.342
12	1788133.0	3295.1	0.002291	1796044.0	9502.4	0.000996	0.565	1.100	0.0125	0.478	0.0120	2.240
13	1830575.0	3391.2	0.002238	1838674.0	10216.3	0.001007	0.549	1.142		0.515		
14	1859334.0	3453.5	0.002090	1867561.0	10246.0	0.001045	0.500	1.061		0.531		
15	1888094.0	3513.0	0.002045	1896448.0	10276.4	0.001057	0.483	1.057		0.547		
16	1916993.0	3571.2	0.001999	1925475.0	10306.9	0.001056	0.472	1.051		0.555		
17	1945893.0	3628.2	0.001960	1954502.0	10337.6	0.001065	0.457	1.034		0.562		
18	1974653.0	3684.0	0.001916	1983389.0	10368.5	0.001073	0.440	1.004		0.562		
19	2003412.0	3735.7	0.001675	2012276.0	10399.4	0.001058	0.369	0.889		0.561		
20	2032172.0	3796.4	0.002542	2041163.0	10429.3	0.001016	0.600	1.354		0.541		
21	2060932.0	3856.9	0.001654	2070051.0	10459.4	0.001060	0.359	0.886		0.568		
22	2089692.0	3906.4	0.001789	2098938.0	10490.0	0.001056	0.410	0.958		0.565		
23	2118452.0	3957.5	0.001761	2127825.0	10520.3	0.001039	0.410	0.966		0.570		
24	2147351.0	4008.1	0.001750	2156852.0	10550.5	0.001051	0.399	0.930		0.559		
25	2176250.0	4058.7	0.001768	2185879.0	10581.0	0.001060	0.401	0.961		0.576		
26	2205010.0	4108.9	0.001721	2214766.0	10611.9	0.001073	0.376	0.937		0.584		
27	2233770.0	4158.7	0.001735	2243653.0	10642.1	0.001018	0.413	0.942		0.553		
28	2262530.0	4208.7	0.001736	2272540.0	10672.4	0.001075	0.381	0.944		0.584		
29	2291290.0	4258.2	0.001705	2301428.0	10703.4	0.001069	0.373	0.912		0.572		
30	2320050.0	4307.6	0.001726	2330315.0	10735.1	0.001124	0.349	0.928		0.605		
31	2348810.0	4357.3	0.001729	2359202.0	10767.2	0.001098	0.365	0.950		0.603		
32	2377709.0	4406.9	0.001711	2388229.0	10799.3	0.001118	0.346	0.948		0.620		
33	2406608.0	4456.3	0.001721	2417256.0	10831.9	0.001138	0.339	0.950		0.628		
34	2435368.0	4506.0	0.001735	2446143.0	10863.8	0.001067	0.385	0.967		0.595		
35	2464128.0	4555.5	0.001704	2475030.0	10895.7	0.001137	0.333	0.960		0.641		
36	2492887.0	4604.6	0.001704	2503917.0	10928.4	0.001128	0.338	0.997		0.660		

STANTON NUMBER RATIO BASED ON EXPERIMENTAL FLAT PLATE VALUE AT SAME X LOCATION

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 092874 VELOCITY PROFILE FOR FIG. 44

REX = 0.74658E 06 REM = 1848.

XVO = 10.07 CM. DEL2 = 0.291 CM.
UINF = 9.78 M/S DEL99= 2.408 CM.
VISC = 0.15419E-04 M2/S DEL1 = 0.410 CM.
PORT = 9 H = 1.407
XLOC = 127.76 CM. CF/2 = 0.18480E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.011	3.31	0.338	6.9	7.87
0.028	0.012	3.42	0.350	7.6	8.14
0.030	0.013	3.57	0.365	8.3	8.50
0.033	0.014	3.63	0.371	9.0	8.63
0.038	0.016	4.01	0.410	10.4	9.54
0.046	0.019	4.35	0.444	12.5	10.34
0.056	0.023	4.79	0.489	15.2	11.38
0.069	0.028	5.09	0.520	18.7	12.10
0.084	0.035	5.38	0.550	22.9	12.80
0.102	0.042	5.58	0.570	27.7	13.26
0.122	0.051	5.79	0.592	33.2	13.78
0.145	0.060	5.91	0.604	39.5	14.05
0.170	0.071	6.15	0.629	46.4	14.64
0.201	0.083	6.27	0.641	54.7	14.91
0.236	0.098	6.38	0.652	64.4	15.18
0.277	0.115	6.53	0.667	75.5	15.52
0.323	0.134	6.71	0.686	88.0	15.95
0.373	0.155	6.86	0.701	101.8	16.31
0.437	0.181	6.98	0.714	119.1	16.61
0.513	0.213	7.16	0.732	139.9	17.03
0.615	0.255	7.40	0.756	167.6	17.59
0.742	0.308	7.64	0.781	202.3	18.16
0.894	0.371	7.95	0.813	243.8	18.91
1.046	0.435	8.17	0.835	285.4	19.44
1.199	0.498	8.40	0.859	326.9	19.98
1.351	0.561	8.63	0.882	368.5	20.52
1.504	0.624	8.86	0.906	410.1	21.08
1.656	0.688	9.03	0.923	451.6	21.48
1.808	0.751	9.21	0.942	493.2	21.91
1.961	0.814	9.38	0.959	534.7	22.31
2.113	0.878	9.50	0.971	576.3	22.60
2.266	0.941	9.62	0.983	617.8	22.87
2.418	1.004	9.71	0.992	659.4	23.08
2.570	1.067	9.75	0.997	701.0	23.20
2.723	1.131	9.78	1.000	742.5	23.26

STANTON NUMBER DATA RUN 070473 *** DISCRETE HOLE RIG *** NAS-3-14336

*** 2800STEPFP NORMAL HOLE INJECTION P/D=5 ***

TADB= 28.63 DEG C UINF= 16.43 M/S TINF= 28.51 DEG C
RHO= 1.158 KG/M3 VISC= 0.15888E-04 M2/S XVO= 11.7 CM
CP= 1013. J/KGK PR= 0.715

PLATE	X	REX	REENTH	STANTON NO	DST	DREEN
1	127.8	0.12001E 07	0.98204E 02	0.37397E-02	0.669E-04	2.
2	132.8	0.12526E 07	0.27843E 03	0.31234E-02	0.621E-04	3.
3	137.9	0.13051E 07	0.43687E 03	0.29101E-02	0.612E-04	4.
4	143.0	0.13576E 07	0.58625E 03	0.27784E-02	0.606E-04	5.
5	148.1	0.14102E 07	0.72943E 03	0.26739E-02	0.599E-04	5.
6	153.2	0.14627E 07	0.86812E 03	0.26077E-02	0.591E-04	6.
7	158.2	0.15152E 07	0.10030E 04	0.25271E-02	0.590E-04	6.
8	163.3	0.15677E 07	0.11335E 04	0.24432E-02	0.585E-04	6.
9	168.4	0.16202E 07	0.12613E 04	0.24230E-02	0.586E-04	7.
10	173.5	0.16728E 07	0.13875E 04	0.23828E-02	0.584E-04	7.
11	178.6	0.17253E 07	0.15113E 04	0.23316E-02	0.583E-04	7.
12	183.6	0.17778E 07	0.16327E 04	0.22913E-02	0.573E-04	8.
13	187.5	0.18177E 07	0.17243E 04	0.23208E-02	0.404E-04	8.
14	190.1	0.18448E 07	0.17854E 04	0.21974E-02	0.418E-04	8.
15	192.7	0.18718E 07	0.18453E 04	0.22214E-02	0.423E-04	8.
16	195.4	0.18990E 07	0.19050E 04	0.21904E-02	0.416E-04	8.
17	198.0	0.19262E 07	0.19639E 04	0.21619E-02	0.413E-04	8.
18	200.6	0.19532E 07	0.20228E 04	0.21864E-02	0.418E-04	8.
19	203.2	0.19803E 07	0.20817E 04	0.21608E-02	0.405E-04	8.
20	205.8	0.20073E 07	0.21390E 04	0.20766E-02	0.392E-04	8.
21	208.5	0.20344E 07	0.21973E 04	0.22258E-02	0.416E-04	8.
22	211.1	0.20614E 07	0.22559E 04	0.20989E-02	0.409E-04	8.
23	213.7	0.20885E 07	0.23121E 04	0.20541E-02	0.404E-04	8.
24	216.3	0.21156E 07	0.23685E 04	0.21092E-02	0.418E-04	8.
25	218.9	0.21428E 07	0.24240E 04	0.19952E-02	0.404E-04	9.
26	221.6	0.21699E 07	0.24798E 04	0.21272E-02	0.421E-04	9.
27	224.2	0.21969E 07	0.25370E 04	0.20972E-02	0.413E-04	9.
28	226.8	0.22240E 07	0.25930E 04	0.20342E-02	0.401E-04	9.
29	229.4	0.22510E 07	0.26485E 04	0.20680E-02	0.401E-04	9.
30	232.0	0.22781E 07	0.27038E 04	0.20122E-02	0.403E-04	9.
31	234.6	0.23051E 07	0.27591E 04	0.20710E-02	0.403E-04	9.
32	237.3	0.23323E 07	0.28133E 04	0.19329E-02	0.391E-04	9.
33	239.9	0.23595E 07	0.28663E 04	0.19803E-02	0.394E-04	9.
34	242.5	0.23865E 07	0.29202E 04	0.20000E-02	0.395E-04	9.
35	245.1	0.24136E 07	0.29746E 04	0.20180E-02	0.417E-04	9.
36	247.8	0.24406E 07	0.30294E 04	0.20330E-02	0.456E-04	9.

RUN 092274-1 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 1900STEP40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 092274-2 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 1900STEP40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 092274-1 AND 092274-2 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	796292.8	69.3	0.004258	796377.3	63.0	0.003870	UUUUU	1.044	0.0000	0.949	0.0000	0.949
2	828861.1	198.6	0.003682	828948.9	173.4	0.002908	0.210	0.869	0.0128	0.950	0.0115	2.346
3	861429.3	316.1	0.003532	861520.6	634.4	0.002455	0.305	0.933	0.0127	0.852	0.0121	2.360
4	893997.5	428.3	0.003357	894092.3	1101.7	0.002046	0.391	0.955	0.0127	0.740	0.0117	2.223
5	926565.7	535.8	0.003246	926663.9	1547.7	0.001900	0.415	0.976	0.0127	0.709	0.0115	2.199
6	959133.9	640.1	0.003156	959235.6	1981.4	0.001695	0.463	0.992	0.0123	0.649	0.0118	2.176
7	991702.1	742.2	0.003113	991807.3	2420.2	0.001673	0.463	1.015	0.0125	0.654	0.0103	2.048
8	1024270.0	842.3	0.003036	1024378.0	2809.7	0.001637	0.461	1.022	0.0126	0.653	0.0105	2.086
9	1056838.0	939.6	0.002941	1056950.0	3202.7	0.001556	0.471	1.017	0.0125	0.631	0.0106	2.086
10	1089406.0	1035.9	0.002969	1089522.0	3595.4	0.001444	0.514	1.052	0.0121	0.595	0.0120	2.218
11	1121975.0	1131.7	0.002918	1122093.0	4032.9	0.001366	0.532	1.057	0.0126	0.570	0.0105	2.027
12	1154543.0	1223.7	0.002728	1154665.0	4417.5	0.001259	0.539	1.008	0.0125	0.532	0.0120	2.151
13	1179295.0	1291.2	0.002754	1179420.0	4839.3	0.001386	0.497	1.032		0.591		
14	1196067.0	1335.7	0.002544	1196194.0	4862.7	0.001397	0.451	0.962		0.600		
15	1212840.0	1377.3	0.002410	1212968.0	4885.5	0.001319	0.453	0.919		0.569		
16	1229694.0	1417.5	0.002371	1229824.0	4907.7	0.001332	0.438	0.912		0.578		
17	1246548.0	1457.0	0.002339	1246680.0	4930.2	0.001346	0.425	0.907		0.587		
18	1263320.0	1495.7	0.002271	1263454.0	4952.7	0.001326	0.416	0.887		0.582		
19	1280093.0	1533.2	0.002196	1280229.0	4974.9	0.001321	0.398	0.864		0.583		
20	1296866.0	1570.1	0.002193	1297003.0	4997.2	0.001335	0.391	0.869		0.591		
21	1313639.0	1606.4	0.002137	1313778.0	5019.2	0.001286	0.398	0.853		0.573		
22	1330411.0	1642.0	0.002102	1330552.0	5041.2	0.001328	0.368	0.845		0.594		
23	1347184.0	1677.0	0.002058	1347327.0	5063.2	0.001301	0.368	0.832		0.584		
24	1364038.0	1711.6	0.002073	1364182.0	5085.1	0.001305	0.370	0.844		0.589		
25	1380892.0	1746.0	0.002022	1381038.0	5106.9	0.001285	0.364	0.828		0.582		
26	1397664.0	1780.2	0.002047	1397813.0	5129.1	0.001362	0.334	0.843		0.620		
27	1414437.0	1815.3	0.002134	1414587.0	5151.8	0.001334	0.375	0.884		0.610		
28	1431210.0	1850.0	0.002006	1431361.0	5174.0	0.001310	0.347	0.836		0.601		
29	1447982.0	1884.2	0.002065	1448136.0	5196.3	0.001351	0.346	0.865		0.622		
30	1464755.0	1918.5	0.002020	1464910.0	5219.3	0.001385	0.314	0.851		0.640		
31	1481528.0	1952.3	0.002002	1481685.0	5242.2	0.001341	0.330	0.848		0.623		
32	1498382.0	1985.8	0.001988	1498540.0	5265.2	0.001395	0.298	0.846		0.650		
33	1515236.0	2019.4	0.002009	1515396.0	5288.4	0.001374	0.316	0.859		0.642		
34	1532008.0	2052.8	0.001977	1532171.0	5311.6	0.001388	0.298	0.850		0.651		
35	1548781.0	2085.9	0.001963	1548945.0	5334.8	0.001377	0.298	0.848		0.648		
36	1565554.0	2118.6	0.001938	1565720.0	5358.0	0.001381	0.288	0.841		0.652		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION

RUN 090874 VELOCITY PROFILE FOR FIG. 47

REX = 0.24107E 07 REM = 4720.

XVO = 17.81 CM. DEL2 = 0.215 CM.
UINF = 34.19 M/S DEL99= 1.914 CM.
VISC = 0.15594E-04 M2/S DEL1 = 0.295 CM.
PORT = 9 H = 1.369
XLOC = 127.76 CM. CF/2 = 0.15421E-02

Y(CM.)	Y/DEL	U(M/S)	U/UINF	Y+	U+
0.025	0.013	17.30	0.506	21.9	12.88
0.028	0.015	17.69	0.517	24.1	13.18
0.030	0.016	18.12	0.530	26.2	13.49
0.033	0.017	18.37	0.537	28.4	13.68
0.038	0.020	18.77	0.549	32.8	13.98
0.043	0.023	19.18	0.561	37.2	14.28
0.051	0.027	19.63	0.574	43.7	14.62
0.061	0.032	20.03	0.586	52.5	14.92
0.074	0.038	20.43	0.598	63.4	15.22
0.089	0.046	21.02	0.615	76.5	15.66
0.107	0.056	21.52	0.629	91.8	16.03
0.127	0.066	21.97	0.643	109.3	16.37
0.150	0.078	22.39	0.655	129.0	16.68
0.175	0.092	23.01	0.673	150.9	17.14
0.206	0.107	23.28	0.681	177.1	17.34
0.241	0.126	23.96	0.701	207.8	17.85
0.282	0.147	24.55	0.718	242.7	18.29
0.356	0.186	25.33	0.741	306.2	18.87
0.411	0.215	25.87	0.757	354.3	19.27
0.475	0.248	26.51	0.775	408.9	19.75
0.546	0.285	27.09	0.793	470.2	20.18
0.622	0.325	27.72	0.811	535.8	20.64
0.711	0.372	28.32	0.828	612.3	21.09
0.813	0.425	29.08	0.851	699.8	21.66
0.927	0.484	29.80	0.872	798.2	22.20
1.054	0.551	30.56	0.894	907.5	22.76
1.181	0.617	30.94	0.905	1016.9	23.05
1.308	0.683	31.96	0.935	1126.2	23.80
1.435	0.750	32.53	0.951	1235.6	24.23
1.562	0.816	33.05	0.967	1344.9	24.62
1.689	0.883	33.37	0.976	1454.3	24.86
1.816	0.949	33.73	0.986	1563.6	25.12
1.943	1.015	34.03	0.995	1672.9	25.34
2.070	1.082	34.14	0.999	1782.3	25.43
2.197	1.148	34.19	1.000	1891.6	25.47

RUN 090874 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 4800STEPFP SLANT HOLE INJECTION P/D=5 ***

TADB= 26.38 DEG C UINF= 34.25 M/S TINF= 25.86 DEG C
RHO= 1.169 KG/M3 VISC= 0.15620E-04 M2/S XVO= 17.8 CM
CP= 1014. J/KGK PR= 0.717

PLATE	X	REX	REENTH	STANTON NO	DST	CREEN
1	127.8	0.24108E 07	0.16943E 03	0.30424E-02	0.557E-04	3.
2	132.8	0.25222E 07	0.48866E 03	0.26901E-02	0.519E-04	5.
3	137.9	0.26335E 07	0.78162E 03	0.25706E-02	0.506E-04	7.
4	143.0	0.27449E 07	0.10608E 04	0.24422E-02	0.492E-04	8.
5	148.1	0.28563E 07	0.13298E 04	0.23880E-02	0.487E-04	9.
6	153.2	0.29677E 07	0.15931E 04	0.23413E-02	0.483E-04	10.
7	158.2	0.30791E 07	0.18510E 04	0.22891E-02	0.478E-04	10.
8	163.3	0.31904E 07	0.21024E 04	0.22253E-02	0.471E-04	11.
9	168.4	0.33018E 07	0.23482E 04	0.21875E-02	0.468E-04	12.
10	173.5	0.34132E 07	0.25892E 04	0.21413E-02	0.464E-04	12.
11	178.6	0.35246E 07	0.28259E 04	0.21091E-02	0.461E-04	13.
12	183.6	0.36359E 07	0.30581E 04	0.20607E-02	0.457E-04	13.
13	187.5	0.37206E 07	0.32279E 04	0.19170E-02	0.673E-04	14.
14	190.1	0.37780E 07	0.33385E 04	0.19321E-02	0.684E-04	14.
15	192.7	0.38353E 07	0.34490E 04	0.19178E-02	0.687E-04	14.
16	195.4	0.38929E 07	0.35587E 04	0.19006E-02	0.674E-04	15.
17	198.0	0.39506E 07	0.36678E 04	0.19004E-02	0.675E-04	15.
18	200.6	0.40079E 07	0.37768E 04	0.18966E-02	0.674E-04	15.
19	203.2	0.40653E 07	0.38846E 04	0.18562E-02	0.656E-04	16.
20	205.8	0.41227E 07	0.39918E 04	0.18785E-02	0.667E-04	16.
21	208.5	0.41800E 07	0.40987E 04	0.18424E-02	0.651E-04	16.
22	211.1	0.42374E 07	0.42044E 04	0.18398E-02	0.658E-04	16.
23	213.7	0.42947E 07	0.43091E 04	0.18075E-02	0.641E-04	16.
24	216.3	0.43524E 07	0.44139E 04	0.18404E-02	0.660E-04	17.
25	218.9	0.44100E 07	0.45196E 04	0.18424E-02	0.655E-04	17.
26	221.6	0.44674E 07	0.46248E 04	0.18212E-02	0.678E-04	17.
27	224.2	0.45247E 07	0.47268E 04	0.17317E-02	0.594E-04	17.
28	226.8	0.45821E 07	0.48294E 04	0.18412E-02	0.686E-04	18.
29	229.4	0.46395E 07	0.49329E 04	0.17616E-02	0.621E-04	18.
30	232.0	0.46968E 07	0.50360E 04	0.18312E-02	0.660E-04	18.
31	234.6	0.47542E 07	0.51401E 04	0.17919E-02	0.640E-04	18.
32	237.3	0.48118E 07	0.52422E 04	0.17647E-02	0.628E-04	18.
33	239.9	0.48695E 07	0.53438E 04	0.17729E-02	0.638E-04	19.
34	242.5	0.49268E 07	0.54451E 04	0.17569E-02	0.617E-04	19.
35	245.1	0.49842E 07	0.55465E 04	0.17735E-02	0.647E-04	19.
36	247.8	0.50415E 07	0.56479E 04	0.17592E-02	0.674E-04	19.

RUN 091474 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 4800STEP40 M=0.4 TH=0 SLANT HOLE INJECTION P/D=5 ***

RUN 091674 *** DISCRETE HOLE RIG *** NAS-3-14336 STANTON NUMBER DATA

*** 4800STEP40 M=0.4 TH=1 SLANT HOLE INJECTION P/D=5 ***

LINEAR SUPERPOSITION IS APPLIED TO STANTON NUMBER DATA FROM
RUN NUMBERS 091474 AND 091674 TO OBTAIN STANTON NUMBER DATA AT TH=0 AND TH=1

PLATE	REXCOL	RE DEL2	ST(TH=0)	REXHOT	RE DEL2	ST(TH=1)	ETA	STCR	F-COL	STHR	F-HOT	LOGB
1	2411097.0	170.8	0.003067	2413706.0	166.3	0.002982	UUUUU	1.008	0.0000	0.980	0.0000	0.980
2	2522490.0	488.8	0.002643	2525219.0	461.1	0.002306	0.128	0.800	0.0128	0.955	0.0120	2.716
3	2633883.0	776.9	0.002529	2636732.0	2022.5	0.001797	0.290	0.857	0.0127	0.791	0.0119	2.579
4	2745276.0	1054.8	0.002462	2748246.0	3533.3	0.001487	0.396	0.899	0.0128	0.682	0.0120	2.492
5	2856669.0	1326.9	0.002422	2859759.0	5028.9	0.001404	0.420	0.935	0.0127	0.665	0.0123	2.554
6	2968062.0	1593.3	0.002361	2971272.0	6551.4	0.001326	0.438	0.952	0.0128	0.644	0.0123	2.564
7	3079455.0	1857.0	0.002374	3082786.0	8068.0	0.001276	0.463	0.993	0.0128	0.634	0.0120	2.548
8	3190847.0	2121.4	0.002372	3194299.0	9551.6	0.001277	0.462	1.024	0.0128	0.646	0.0121	2.613
9	3302240.0	2383.5	0.002335	3305812.0	11043.6	0.001193	0.489	1.036	0.0129	0.614	0.0122	2.594
10	3413633.0	2644.3	0.002348	3417326.0	12532.1	0.001156	0.508	1.067	0.0127	0.604	0.0122	2.613
11	3525026.0	2903.7	0.002310	3528839.0	14022.7	0.001086	0.530	1.073	0.0128	0.576	0.0122	2.585
12	3636419.0	3158.8	0.002271	3640352.0	15498.2	0.000986	0.566	1.076	0.0128	0.530	0.0124	2.552
13	3721078.0	3349.5	0.002238	3725103.0	16963.2	0.000987	0.559	1.076		0.535		
14	3778445.0	3476.3	0.002176	3782532.0	17021.7	0.001049	0.518	1.055		0.572		
15	3835812.0	3600.0	0.002130	3839961.0	17082.7	0.001073	0.497	1.042		0.589		
16	3893457.0	3720.7	0.002074	3897669.0	17144.0	0.001061	0.488	1.023		0.586		
17	3951103.0	3838.9	0.002041	3955377.0	17205.2	0.001066	0.478	1.015		0.592		
18	4008470.0	3954.9	0.002000	4012807.0	17266.6	0.001070	0.465	1.002		0.597		
19	4065838.0	4067.7	0.001928	4070236.0	17327.5	0.001050	0.455	0.973		0.589		
20	4123205.0	4178.6	0.001932	4127665.0	17388.5	0.001071	0.445	0.982		0.604		
21	4180573.0	4287.7	0.001868	4185095.0	17449.1	0.001038	0.444	0.956		0.588		
22	4237940.0	4394.6	0.001853	4242525.0	17509.4	0.001058	0.429	0.955		0.602		
23	4295308.0	4499.7	0.001809	4299954.0	17569.6	0.001036	0.427	0.938		0.592		
24	4352953.0	4604.1	0.001824	4357662.0	17629.9	0.001061	0.418	0.952		0.609		
25	4410599.0	4708.8	0.001823	4415370.0	17691.2	0.001072	0.412	0.957		0.618		
26	4467966.0	4812.9	0.001804	4472799.0	17752.6	0.001066	0.409	0.953		0.618		
27	4525333.0	4914.8	0.001744	4530229.0	17811.1	0.000966	0.446	0.927		0.562		
28	4582700.0	5016.9	0.001810	4587658.0	17869.8	0.001077	0.405	0.967		0.629		
29	4640069.0	5118.9	0.001745	4645088.0	17931.2	0.001059	0.393	0.938		0.621		
30	4697436.0	5220.6	0.001796	4702517.0	17993.7	0.001115	0.379	0.970		0.656		
31	4754803.0	5322.8	0.001763	4759947.0	18057.3	0.001096	0.378	0.957		0.648		
32	4812448.0	5423.2	0.001733	4817654.0	18120.3	0.001095	0.368	0.946		0.649		
33	4870094.0	5523.6	0.001762	4875363.0	18183.8	0.001114	0.368	0.967		0.663		
34	4927462.0	5624.4	0.001746	4932792.0	18247.4	0.001100	0.370	0.962		0.657		
35	4984829.0	5725.0	0.001758	4990221.0	18311.5	0.001128	0.358	0.974		0.676		
36	5042196.0	5825.3	0.001733	5047650.0	18375.9	0.001113	0.358	0.964		0.670		

STANTON NUMBER RATIO BASED ON ST*PR**0.4=0.0295*REX**(-.2)*(1.-(XI/(X-XVO))**0.9)**(-1./9.)

STANTON NUMBER RATIO FOR TH=1 IS CONVERTED TO COMPARABLE TRANSPIRATION VALUE
USING ALOG(1 + B)/B EXPRESSION IN THE BLOWN SECTION