DATA FILE NAMING CONVENTION

An example data file name is : **`HIS1-1.DAT`**

- The 1st and 2nd characters indicate the Reynolds number (Re_θ) of the flow (**`LO`**: Re_θ = 7300 (2-D), 5940 (3-D); **`HI`**: Re_θ = 23400 (2-D), 23200 (3-D)). So, the example file (**`HIS1-1.DAT`**) contains data for a Re_θ = 23200 flow.

- The 3rd and 4th characters of the file name indicate the measurement station (**`2D`**: 2-D; **`S0`**: Station 0; etc.). So, the example file (**`HIS1-1.DAT`**) contains data at station 1.

- Each data set was too large to fit into one file. So, each data set is contained in two files. The 6th character of the file name delineates the two files.

COLUMN NAMES

This file contains the definitions of the column names for the ASCII pressure spectra data files. A list of symbols is included at the end of this file.

NOTE: The Corcos correction is included in these data files, however, it was **not** applied to the non-dimensional power spectra that are contained in these files.

RawF	=	Dimensional frequency (Hz)
RawP	=	Dimensional power spectral density (Pa²/Hz)
RawPdB	=	Power spectral density in SPL re 20 µPa
CorcF	=	Non-dimensional frequency (= $\omega d / 2U_C$: assuming $U_C = 14u_\tau$)
CorcCor	=	Corcos correction (= $\Phi_{TRUE} / \Phi_{MEAS}$)
CorcP	=	Corcos corrected power spectral density (Pa²/Hz)
CorcPdB	=	Corcos corrected power spectral density in SPL re 20 µPa

$$\text{InF1} = \frac{\omega \nu}{u_\tau^2}$$

$$\text{InP1} = 10\, log_{10}\left[\frac{\Phi(\omega) u_\tau^2}{\tau_W^2\ \nu}\right]$$

$$\text{InP2} = 10\, log_{10}\left\{\frac{\left[\frac{\Phi(\omega) u_\tau^2}{\tau_W^2\ \nu}\right]\left[\overline{v^{+2}}\left(\frac{\partial U^+}{\partial y^+}\right)^2\right]_{2-D}}{\left[\overline{v^{+2}}\left(\frac{\partial U^+}{\partial y^+} + \frac{\partial W^+}{\partial y^+}\right)^2\right]_{3-D}}\right\}$$

$$\text{OutF1} = \frac{\omega \delta^*}{U_e}$$

$$\mathrm{OutP1} = 10\, log_{10}\left[\frac{\Phi(\omega)U_e}{\tau_W^2\ \delta^*}\right]$$

$$\mathrm{OutP2} = 10\, log_{10}\left[\frac{\Phi(\omega)U_e}{Q_e^2\ \delta^*}\right]$$

$$\mathrm{OutF2} = \frac{\omega\delta^*}{u_\tau}$$

$$\mathrm{OutP3} = 10\, log_{10}\left[\frac{\Phi(\omega)u_\tau}{\tau_W^2\ \delta^*}\right]$$

$$\mathrm{OutP4} = 10\, log_{10}\left[\frac{\Phi(\omega)u_\tau}{Q_e^2\ \delta^*}\right]$$

$$\mathrm{OutF3} = \frac{\omega\delta}{u_\tau}$$

$$\mathrm{OutP5} = 10\, log_{10}\left[\frac{\Phi(\omega)u_\tau}{\tau_W^2\ \delta}\right]$$

$$\mathrm{OutP6} = 10\, log_{10}\left[\frac{\Phi(\omega)u_\tau}{Q_e^2\ \delta}\right]$$

$$\mathrm{OutF4} = \frac{\omega\delta}{U_e}$$

$$\mathrm{OutP7} = 10\, log_{10}\left[\frac{\Phi(\omega)U_e}{\tau_W^2\ \delta}\right]$$

$$\mathrm{OutP8} = 10\, log_{10}\left[\frac{\Phi(\omega)U_e}{Q_e^2\ \delta}\right]$$

$$\mathrm{OutF5} = \frac{\omega\, \varDelta}{u_\tau}$$

$$\mathrm{OutP9} = 10\, log_{10}\left[\frac{\varPhi(\omega)u_\tau}{\tau_W^2\ \varDelta}\right]$$

$$\mathrm{OutP10} = 10\, log_{10}\left[\frac{\varPhi(\omega)u_\tau}{Q_e^2\ \varDelta}\right]$$

$$\mathrm{OutF6} = \frac{\omega\, \varDelta}{U_e}$$

$$\mathrm{OutP11} = 10\, log_{10}\left[\frac{\varPhi(\omega)U_e}{\tau_W^2\ \varDelta}\right]$$

$$\mathrm{OutP12} = 10\, log_{10}\left[\frac{\varPhi(\omega)U_e}{Q_e^2\ \varDelta}\right]$$

$$\mathrm{OutF7} = \frac{\omega\, y_{\tau\, MAX}}{\left(U^2 + W^2\right)_{\tau\, MAX}^{\frac{1}{2}}}$$

$$\mathrm{OutP13} = 10\, log_{10}\left[\frac{\varPhi(\omega)\left(U^2 + W^2\right)_{\tau\, MAX}^{\frac{1}{2}}}{\tau_{MAX}^2\ y_{\tau_{MAX}}}\right]$$

$$\mathrm{OutF8} = \frac{\omega\, y_{W_{MAX}}}{\left(U^2 + W^2\right)_{W_{MAX}}^{\frac{1}{2}}}$$

$$\mathrm{OutP14} = 10\, log_{10}\left[\frac{\varPhi(\omega)\left(U^2 + W^2\right)_{W_{MAX}}^{\frac{1}{2}}}{\left(\frac{1}{2}\rho W_{MAX}^2\right)^2\ y_{W_{MAX}}}\right]$$

LIST OF SYMBOLS

d .... Pressure transducer sensing diameter

f .... Frequency, Hz

Q .... Dynamic pressure, $½\rho U_e^2$

u_τ .... Friction velocity, $(\tau_W/\rho)^{½}$

U, V, W .... Mean velocity components in the x, y, and z direction, respectively

U_C .... Magnitude of the convection velocity of pressure fluctuations. Assumed that $U_C = 14u_\tau$ here.

x, y, z .... Coordinate system axes

δ .... Boundary layer thickness. Distance from the wall where $(U^2+W^2)^{½}/U_e = 0.995$

δ^* .... Boundary layer magnitude displacement thickness

$$\delta^* = \int_0^\delta \left[1 - \frac{\left(U^2+W^2\right)^{\frac{1}{2}}}{U_e}\right] dr \qquad (\text{Prolate Spheroid})$$

$$\delta^* = \int_0^\delta \left[1 - \frac{\left(U^2+W^2\right)^{\frac{1}{2}}}{U_e}\right] dy \qquad (\text{Wing - Body Junction})$$

Δ .... Boundary layer thickness based on the velocity defect law (from Rotta, 1962)

$$\Delta = \frac{\delta^* U_e}{u_\tau} = \int_0^\infty \left(\frac{U_e - U}{u_\tau}\right) dy$$

ν .... Kinematic viscosity of air

ρ .... Mass density of air

τ_W .... Shear-stress magnitude at the wall

τ .... Reynolds shear stress, $\rho\left[(\overline{uv})^2 + (\overline{vw})^2\right]^{½}$

Φ .... Spectral power density of surface pressure fluctuations such that

$$\overline{p^2} = \int_0^\infty \Phi(\omega)\, d\omega$$

ω .... Circular frequency, $(2\pi f)$, rad/s

superscript:

$(\ )'$ .... The root mean square value of a fluctuating quantity

$(\ )^+$ .... Indicates that the variable is made non-dimensional using the viscous scales: τ_W for pressure, u_τ for velocity, and ν / u_τ for length

$(\overline{\ })$ .... Denotes a long-time averaged quantity

subscript:

$(\ )_{MAX}$ .... The maximum of ( ).

When one variable is the subscript to another variable, the latter variable is evaluated at the condition of the former variable. For example, $y_{\tau_{max}}$ is the y location of τ_{max} (maximum Reynolds shear stress)