HIRENASD geometry

Variable definitions used in provided data files

J.Heeg

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There are 7 chord-wise rows of pressure transducers. The following table contains the variable names that appear in the geometry files that provide the transducer locations.

**File names:**

Excel format: Pressure\_locations.xls

Ascii format: Pressure\_locations\_asciifile

Matlab format: Xducer\_locs\_outputfile.mat

Tecplot format: Pressure\_locations.dat (layout files: Pressures\_locations\_nondim\_plot.lay and Pressure\_locations\_dim\_plot.lay)

**Coordinate system definition**:

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Origin is located at the wing root leading edge. Positive directions: x- flow-wise: aft; y- spanwise: from root to tip; z- wing thickness direction: from wing lower surface to upper surface (right hand rule using the defined x and y positive directions)\_

Note that I am using these awkward descriptions because the model was tested vertically suspended from the wind tunnel ceiling. The lift is still in the z-axis direction, but the usual definitions of up and down, relative to gravity are not in the z-axis direction.

**Variable names: (for matlab-specific information, please see additional description at the end of this document)**

|  |  |  |
| --- | --- | --- |
| Variable name | Definition | Units, where appropriate |
| x | Flow-direction coordinate, positive aft | meters |
| y | Span-wise coordinate, positive root to tip | Meters |
| z | Wing thickness direction coordinate, positive from wing bottom surface to wing top surface; (right hand rule using x and y definitions) | meters |
| x\_normalized | At each span station, the x-coordinate is normalized to run from 0 to 1. Using the leading edge coordinate and chord for each span station, the normalized coordinate is computed: X\_normalized =(X – X\_le)/chord |  |
| section (or station or span\_station) | Numbering of the chord-wise rows of pressure transducers: the station closest to the root is labeled 1; the station closest to the tip is labeled 7 |  |
| X\_le | Leading edge location at each of the 7 span stations | Meters |
| chord (or local chord length) | Chord length at each of the 7 span stations | meters |
| eta | Normalized y-location of each of the 7 span stations. Normalized by span of the wing, 1.285 meters |  |
| Port number ( or isensor\_keep) | Pressure port number for a given span station. The pressure transducer numbering is separate for each span station. Top and bottom ports are numbered as a single set. Missing numbers in the sequence indicate sensors that were determined to be nonfunctional (Data point 132 was used to make this functionality assessment.) |  |

**Reference Quantities:**

Span = 1.285 meters

Reference chord length = 0.3445 meters (note that this is not used in normalizing the chord sections. The local chord length is used)

Root chord = 0.5494 meters

Tip chord = 0.1493 meters

**Notes regarding span station:**

A small discrepancy has been noted, likely due to round off, between the values given as the y-coordinate and the normalized coordinate, eta. The following table shows that the maximum difference in span station using the published values of eta rather than recalculated values is 1.6 millimeters in span location.

Span = 1.285 meters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Y coordinate, meters | Eta | Eta \* span | Difference, millimeters | % difference |
| 0.1848 | 0.145 | 0.1863 | 1.476 | 0.7985 |
| 0.4135 | 0.323 | 0.4151 | 1.5872 | 0.3839 |
| 0.5846 | 0.456 | 0.586 | 1.3889 | 0.2376 |
| 0.7559 | 0.589 | 0.7569 | 0.9218 | 0.1219 |
| 0.8408 | 0.655 | 0.8417 | 0.835 | 0.0993 |
| 1.0325 | 0.804 | 1.0331 | 0.6536 | 0.0633 |
| 1.224 | 0.953 | 1.2246 | 0.6483 | 0.053 |

**MATLAB structures**

The variables defined above are in the matlab data file, but they are incorporated into data structures. The file contains 2 data structures: station\_geom and Xducer\_locs\_output.

**station\_geom** has 5 fields x\_le, x\_te, chord, y and eta. Each of these fields contains 7 values, one for each span station.

Example of extracting data from this data structure:

The nondimensional y location of the 5th station:

Eta\_spanstation5 = station\_geom.eta(5)

**Xducer\_locs\_output** has 8 fields of data: n\_sensors, x,y,z,nsens,x\_normalized, x\_signed and isensor\_keep

Example of extracting data from this data structure:

The nondimensional x location of the 10th transducer at the 5th span station:

x\_normalized\_5\_10 = Xducer\_locs\_output(5).x\_normalized(10)