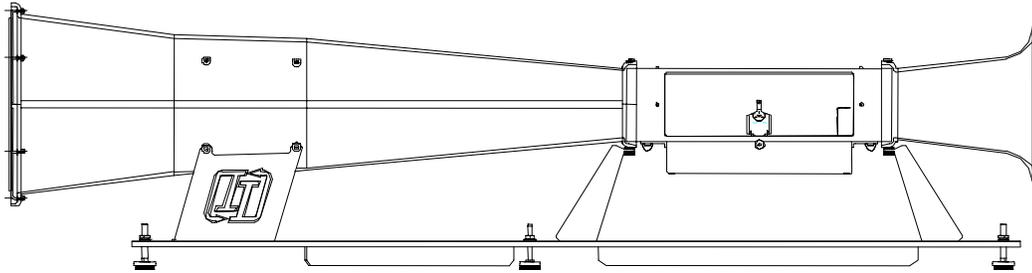# INTERACTIVE INSTRUMENTS

Jet Stream 500

32 Bit Windows™ Edition
Instruction Manual

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Table of Contents

Welcome

The Jet Stream Control Program is an easy to use interactive interface to the Jet Stream 500 wind tunnel which allows full functional control of the wind tunnel. The software is an easy to use 32 bit Windows™ program with built-in help that will allow you to quickly master the features of the Jet Stream 500 (*see* **Figure #1** below). The lift and drag forces are displayed graphically in real time with respect to the wind velocity. Lift over Drag (L/D) and the cross-sectional drag coefficient (Cd) can be displayed graphically to show the relative performance of aircraft wings, automobiles, rockets etc. at various wind speeds. Once a test is complete, the graphical data can be printed or stored to disk for further studies.

Windows Control Program Screen
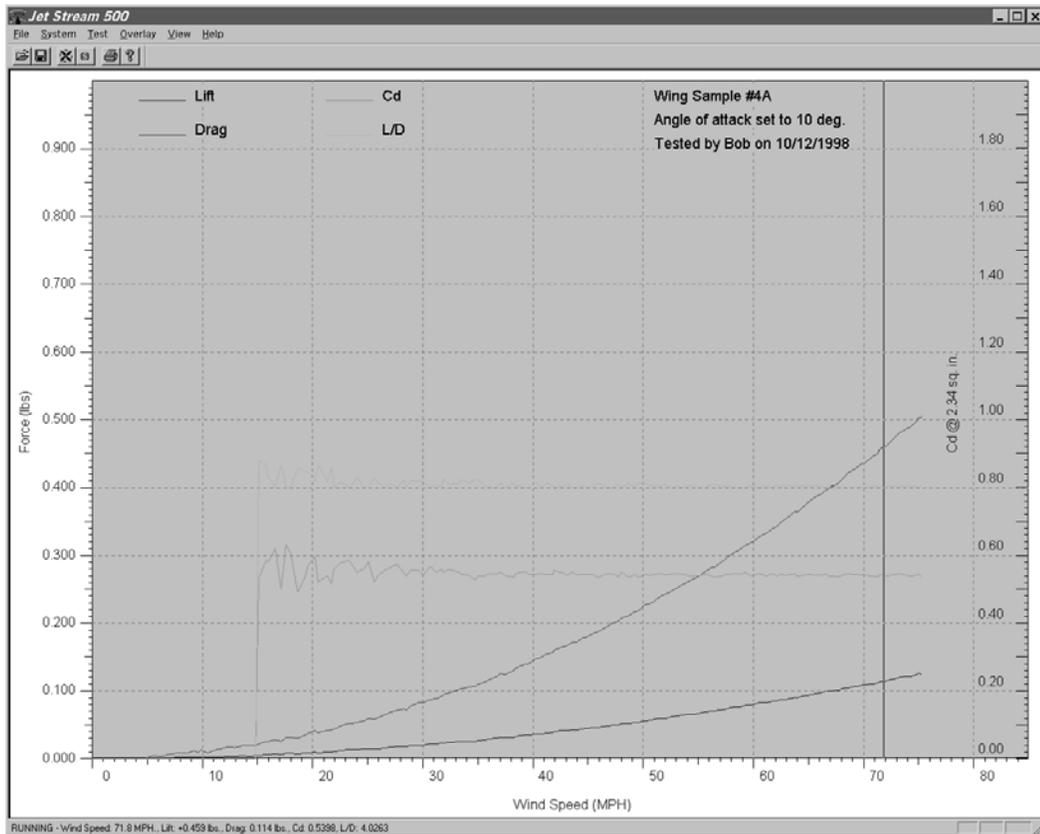
Figure #1

Requirements

Be sure your PC is 100% IBM or compatible and has at least:

- Windows 95 or Windows NT 4.0 or newer
- 33 MHz 80486 Microprocessor or faster (133 MHz Pentium or faster preferred)
- 32 meg of system RAM (128 meg or more is preferred)
- 640 X 480 16 color Video or higher (1024 x 768 True color or better is preferred)
- 3.5" Floppy Drive.
- 1 serial port (COM1 to COM9)

Optional Requirements

The following requirements enhance the use of the program:

- Color or B/W Inkjet or Laser printer

Getting Started

Installation

Connecting the Jet Stream 500 to the computer

- Locate the 9 pin serial cable supplied with this software package. Plug the male end of the 9 pin serial cable into the rear of the control panel, and the female end into the 9 pin connector on the rear of the computer. If the computer has a 25 pin serial connector instead of a 9 pin, be sure to use an adapter to convert the 9 pin to a 25 pin (Radio Shack part number 26-287).
- Secure both ends of the cables.
- Be sure both the computer and the Jet Stream 500 are plugged into the same wall outlet so they share the same power ground.
- Turn on the Jet Stream 500 using the power switch located in the rear of the control panel next to the power cord.

Installing the Software

- Set the computer screen and color resolution as high as the video display and video adapter allow. 1024 x 768 resolution with True color or better is preferred. This will allow the software the best graphical detail. *Note:* Computers configured with High or 256 color may have difficulties displaying the data properly.
- Insert the Jet Stream 500 installation floppy (or CD) in the computer.
- Run the program **SETUP** located on the disk and follow directions on the screen.
- Once the Jet Stream 500 control program is installed it will run automatically.

Configuring the Jet Stream 500 Control Program

After the software is installed the program will run automatically. If the program is run for the first time a dialog box is displayed (figure 2). Select the serial port that will be used to communicate with the Jet Stream 500 from the drop down menu and press OK. The serial port number will be saved to the hard drive in a configuration file so the serial port selection is made once.
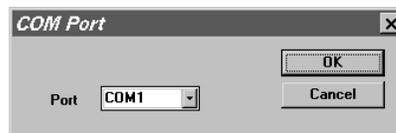
Figure 2

If the computer display prompts with: **Serial Communications Error!** means the software did not recognize the Jet Stream 500 connected to the computer's serial port. Be sure to check the following:

- Is the serial cable securely connected to the control panel and the computers serial port? If not, secure the cables.
- If the computer is connected to a network, be sure the network card interrupt does not conflict with the serial port (COM) interrupt (COM1 and COM3 use IRQ4, COM2 and COM4 use IRQ3). Many network cards and modems default to the same interrupt (IRQ3) as COM2. Review the network card or modem manual to change interrupt or consult with the network administrator for help.
- Is the computer serial port and the selected COM number the same? If not, reconfigure the software using the proper COM port number. Refer to the operating guide that was supplied with the computer.

- Check to see that the computer and Jet Stream 500 are powered from the same wall outlet
- Check that the Jet Stream 500 is powered up and ready (security key activated and data cable is securely connected between the control panel and test bed). If not, power up the unit before starting the program.

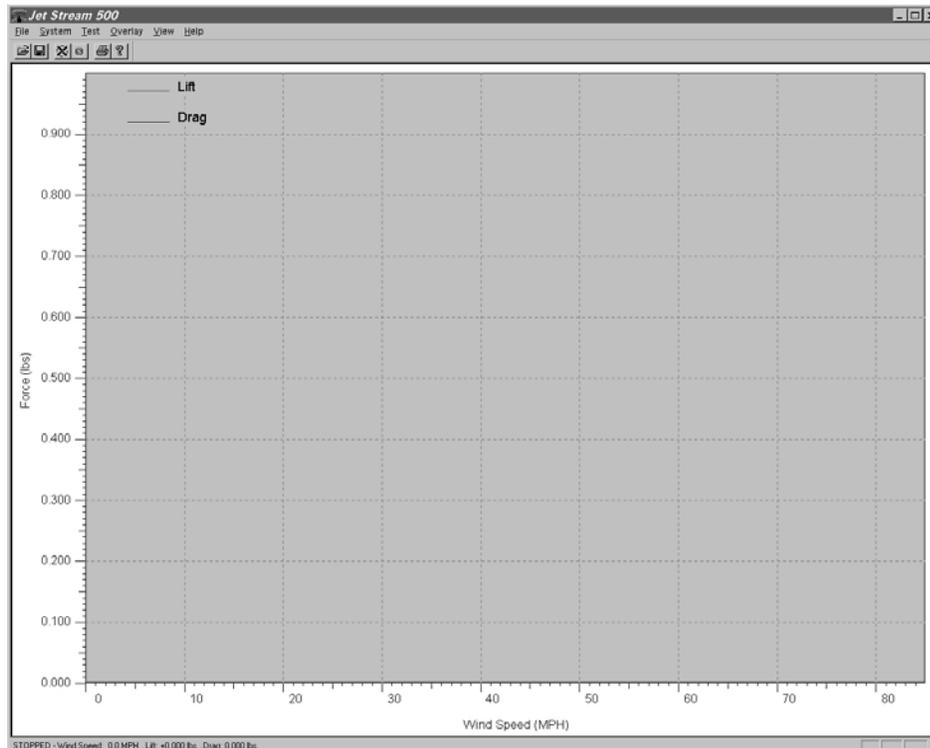If the software recognizes the Wind tunnel the computer will display a window as shown in figure 3.

Figure 3

You may adjust the program window for any size. The graph will automatically adjust to fill the window. The software is now fully configured and ready to run.

Working with the Control Program

A quick tour of the screen

Looking at the Jet Stream 500 Control Program window you will see the real time display graph area in gray. The Y (vertical) axis represents the lift and drag force and the X (horizontal) axis represents wind speed. If the Cd (coefficient of drag) or the L/D (lift/drag) axis are enabled, the scale will be to the right side of the graph. The graph will display both positive or negative lift and drag forces on the wing, car or rocket with respect to the measured wind speed.
Note: Lift, drag, Cd and L/D graphs will be represented with different colors to distinguish between them.

At the top of the display is the menu and toolbar. The menu and toolbar are used to configure and run wind tunnel. Just below the graph is a status line. The status line displays the current wind speed, lift, drag, L/D and Cd (if enabled). During a test, these values represent the current status of the object attached to the test bed. This line is also used to display a quick one line help message for the menu and toolbar items.

Toolbar Items

The Jet Stream 500 tool bar is used for quick access to the most frequently used features. The toolbar is made up of three groups of buttons. The first group recalls or saves the graphical information to disk. The second group controls the operation of the wind tunnel. The third group is for miscellaneous system features such as printing and displaying the on line help.

Figure 4

The toolbar can be relocated or disabled to increase the size of the graphical viewing area. This may be useful to increase the graphing area for low resolution video modes (800 X 600 and below). To enable and disable the toolbar, toggle the toolbar option in the **View** menu selection. The toolbar can be moved to the side of the graph or moved away from the window to become a stand alone Toolbar. This is done by placing the mouse over the toolbar and dragging it to the desired location.

The toolbar buttons are defined below.

Open
Open an existing Jet Stream 500file (*filename*.JET) and restore the graphical data. Opening the file also restores the comment text, Cd area and English/Metric units status. *See* **Open** menu item below.

Save
Store the graphical test results along with the comment text, Cd area and English./Metric units status. *See* **Save As** menu item below.

Set Wind
Ramps the wind speed to the desired value. *See* **Set Wind Speed** menu item below.

Stop
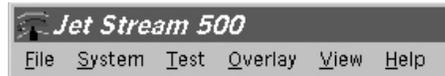Stop the wind speed. *See* **Stop Wind** menu item below.

Print
Displays the Print dialog. *See* **Print** menu item below.

Help
Displays the on line help.

Menu Items

The Jet Stream 500 Menu organizes the functions into 6 groups.

Files

Open a Jet file, Save test results, Print or Exit the program. Once a test is complete, the test results can be saved for future reference. The data can be loaded in the same directory as the Jet Stream 500 Control Program or under a different subdirectory. *See* **Files Menu** below.

System

Configure the system communications port and axis scales. The serial communications port is typically configured once but if the Challenge must be moved to a different port, use this menu item to change the port number. The lift, drag, Cd and L/D axis scales can be altered to make full use of the screen resolution. *See* **System Menu** below.

Test

Configures a test and selects an operation for the Jet Stream 500. Once a test begins, the control panel attached to the wind tunnel has no control over it other than halting the remote access. Controlling the Jet stream 500 is accomplished by using the computer. As the computer instructs the wind tunnel to change wind speed, the Control panel gathers data from the test bed and the Windows program reads the data using the serial port. The Windows program then displays the results it graphically. *See* **Test Menu** below.

Overlay

Data from a previous test can overlay another test result so that visual comparisons can be made. The overlay data color will be different than new data to allow for easy visual comparison between two curves. To clear an overlay, select Clear from the Overlay Menu. *See* **Overlay Menu** below.

View

The status bar and tool bar are enabled by default. They can be disabled to gain more viewing area. *See* **View Menu** below.
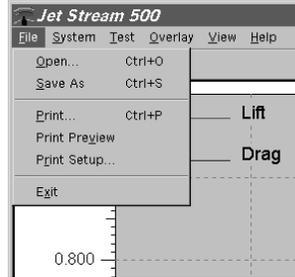
Help

On Line Help.

Each menu group contains sub-menu items as shown below.

Note: Some of the menu items have a letter or control key next to them. This is an accelerator key that can be typed at any time to select the function. For example to go to a wind speed, type the letter W and the "Wind Speed" dialog will appear.

Files

Open (Ctrl+O)
> Load a pre-saved Jet stream 500 file (*filename*.JET) from disk or network. Once a file is saved to a disk, the file can be loaded back into the Jet Stream 500 Control Program to view the information, overlay with another test and/or reprint the results.

Save As (Ctrl+S)
> Save the current results to disk. Once a model has been evaluated, the data can be saved to disk or onto a network for future evaluation. If the file already exists, a dialog will appear asking if it should be overwritten. Press **Save** to save the file or **Cancel** to exit the dialog.   The data is stored in ASCII format so the results can be read into a spreadsheet program (eg. Excel) for further analysis and graphing.

Print (Ctrl+P)
> Displays the default printer dialog box for your printer. Press **OK** to begin printing.

Print Preview
> Displays on the screen the way the graph will look after it is printed. If the print does not look acceptable, you can alter the graph or printer options before the graph is printed.

Print Setup
> Displays the printer setup dialog. Use this dialog to select a printer (if more than one are available) and configure the print options before printing. Since the graphs are better suited for landscape mode (horizontal) be sure the printer is set to landscape mode before printing. This can be done in the printer properties dialog for the selected printer. If you have a color printer, the graph will print the graph data in color.

Exit
> Exit the Jet Stream 500 control program.

System
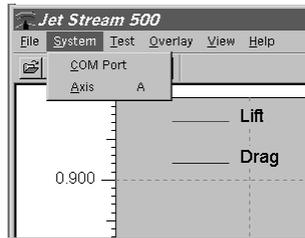
COM Port

Change the computer's serial COM port for the Jet Stream 500. Before making the changes to the port, be sure you know which COM port the wind tunnel is plugged into. The port number will be saved in the Windows directory under the file "**JET.INI**".

Axis (A)

Set the maximum scale value for the lift and drag, Cd and L/D K axis. Select the appropriate maximum value from each drop down menu and the Jet Stream 500 software will scale the axis appropriately. Each graph can also be enabled or disabled to view only the desired data. When a graph is enabled, the data for the curve is graphically displayed on the screen. If a curve is disabled during a test, the data is still collected so it can be re displayed at a later time. Don't worry about setting up the axis before a test because the software will automatically adjust each axis if the data exceeds the scale. Once a test is finished, the axis can be altered to fill the display window.

Test
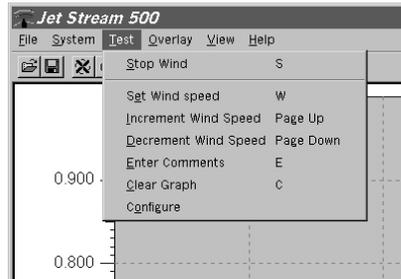
Stop Wind (S)

Set the wind speed to 0 MPH. Before adjusting the angle of attack or removing a model from the test area, be sure to return the wind speed to 0 MPH.

Set Wind Speed (W)

Enter the desired wind speed from the keyboard. The wind speed will slowly ramp up or down to the selected wind speed. The set wind speed will then be maintained. If the wind starts from rest after a previous run, a dialog will appear asking if the graph should be cleared before restarting. Answering no will keep the old graph data and overwrite it with the new data as the wind speed increases. Wind speed regulation under 5 MPH may not regulate properly due to the limited control at low speeds.

Increment Wind Speed (Page Up)

Increment the wind speed in 5 MPH increments (or 10 KPH) levels each time. The wind speed can increment up to the maximum allowed speed. Using the Up cursor arrow will increment the wind speed in 1 mph increments

Decrement Wind Speed (Page Down)

Decrement the wind speed in 5 MPH increments (or 10 KPH) levels each time. The wind speed can decrement down to 0 MPH. Wind speed regulation under 5 MPH may not regulate properly due to the limited control at low speeds. Using the Down cursor arrow will decrement the wind speed by 1 mph.

Enter Comments (E)

Enter up to 5 comment lines. The comments will be placed over the graph area as a reminder of the test parameters, student name date etc. Each comment line can contain up to 50 characters each. The comment information can be stored along with the graphed results when the data is stored to disk.
Note: After entering the first line of comments, press the TAB key to advance to the next comment line. When done, press the return key to place the comments on the graph.

Clear Graph (C)

Clear the test data from the screen This command will not clear the overlay data, use **Overlay Clear** to remove the overlay results.

Configure

Changes the current test configuration. The display units can be changed between English (pounds, miles per hour and inches) or metric (kilograms, kilometers per hour and centimeters).

The maximum wind speed can also be set to restrict higher speeds. Restricting the maximum wind speed helps keep the noise level to a minimum. A line can be added to the JET.INI file to place an absolute limit on the wind speed. Placing the line

ABSOLUTE MAX SPEED = 30 in the file will restrict the maximum wind speed to 30 MPH.

The cross sectional area can also be entered if the coefficient of drag (Cd) is to be calculated. Cd is a useful value that compares the measured drag on an object and compares it to the calculated drag of a flat vertical surface of the same size. The lower the Cd value, the easier the object moves through air.   The higher the number, demonstrates a less efficient design. Measure the model's cross-sectional area (square inches in English units or square centimeters in metric) and enter the number in the Cd Area. As the wind speed increases, the model drag is measured and compared with the wind speed to calculate Cd. Each time a model is inserted or changed, the Cd Area should be updated so the calculated data is accurate. The Cd Area can be modified at any time and the graph will update to reflect the new value.

The display units and maximum wind speed are saved in a configuration file "JET.INI" located in the Windows directory so they can be restored even after the program is terminated. The display units are also saved along with the test results and restored when the results are read back from disk.

Overlay
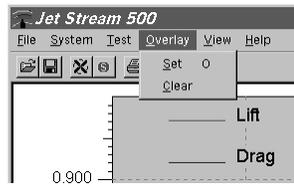
Set (O)

Data from a previous test or disk file can overlay another test result so that visual comparisons can be made. This is useful to view variations between different test models because force vs. wind speed variations can be compared visually. To set an overlay, first display the first (overlay) data sample on the screen by performing a test or loading it from disk. Then select the Overlay Menu and select **Set** to copy the data into the overlay display. Be sure to save test data before setting it as an overlay because data sent to the overlay display can't be saved. The curve colors will change to reflect the overlay data. Next, perform another test or read the second data sample from diskette. You should be able to view the differences between the data samples by noting the variations between the two curves.

Clear

To clear an overlay, select Clear from the Overlay Menu.

View
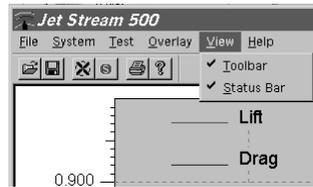
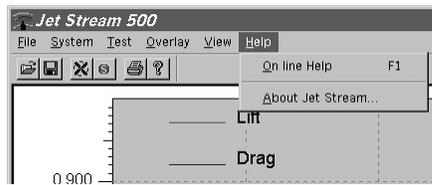**Toolbar**
Enable or disable the toolbar.

Status Bar
Enable or disable the Status bar.

Help

On Line Help (F1)
Displays the on line help Table of Contents.

About Jet Stream
Displays about screen with Version Number and Copyright notice.

Summary of the commands

File
   Open   Open a **JET** file on disk or network and read
   Save As   Save test results and configuration to disk
   Print   Print the current graphical data on the printer
   Print Preview   Preview graphical data
   Print Setup   Select printer and print orientation
   Exit   Exit the program

System
   Com Port   Select the Jet Stream 500 test menu
   Axis   Modify axis scales and enable/disable graphs

Test
   Stop Wind (S)   Stop Wind
   Set Wind Speed (W)   Set desired wind speed
   Increment Wind Speed (Page Up)   Increment wind speed by 5 MPH
   Decrement Wind Speed (Page Down)   Decrement wind speed by 5 MPH
   Enter Comments (E)   Enter comments on graph
   Clear Graph (C)   Clear graph data
   Configure   Configure test parameters

Overlay Menu
   Set   Save current test results as overlay
   Clear   Clear overlay data

View
   Toolbar   Enable or disable the tool bar
   Status Bar   Enable or disable the Status bar

Help
   On Line Help (F1)   Display on line help
   About Jet Stream   Display software version

Other helpful keyboard and mouse commands that are not found in the Test Menu are as shown below:

Keyboard Functions

Page Up	Increase Wind Speed by 5 MPH (or KPH)
Page Down	Decrease Wind Speed by 5 MPH (or KPH)
Cursor Up	Increase Wind Speed by 1 MPH (or KPH)
Cursor Down	Decrease Wind Speed by 1 MPH (or KPH)
Home	Return wind speed to zero

Mouse Functions

Double click on graph   Sets wind speed to position on the graph

Troubleshooting

Serial Communications Error
- Is the serial cable securely connected to the control panel and the computer's serial port? If not, secure the cables with the screws supplied.
- If the computer is connected to a network, be sure the network card interrupt does not conflict with the serial port (COM) interrupt (COM1 and COM3 use IRQ4, COM2 and COM4 use IRQ3). Many network cards default to the same interrupt (IRQ3) as COM2. Review the network card manual to change interrupt or consult with the network administrator for help.
- Is the computer serial port and COM number correct? If not, reconfigure the software using the proper COM port number. Refer to the operating guide that was supplied with the computer.
- Check to see that the computer and Jet Stream 500 are powered from the same wall outlet
- Check that the Jet Stream 500 is powered up and ready (security key activated and data cable is securely connected between the control panel and test bed). If not, power up the unit before starting the program.

Printer not printing graphics properly
Check the printer configuration to be sure that the proper Windows printer driver is selected. Find the printer properties dialog box and print a test page.

Results appear to vary during test
Be sure to allow time for the sensitive electronics to warm up before beginning your test. As the sensors come up to temperature, the data may vary. Also, be sure the tunnel is in a warm (70° - 80° F) room with little draft. Be sure the tunnel is on a stable, flat surface.

Communication Failure
If this message is displayed, be sure that the serial cable is properly plugged in and secured. If the message continues, be sure that no other software is trying to use the serial port at the same time. Also, check that the port is 100% compatible with the standard IBM software.

File is not a proper data file
If the user tries to read in a file that is not in the proper data format or is damaged, the display will prompt **file.exe Is not a proper data file** where **file.ext** is the name of the file. Check the file name and retry.

Limited Warranty

Interactive Instruments, Inc. warrants the **Jet Stream 500 Control Program** and **cable** against defects in material and workmanship for a period of *one* year from receipt by the end user (*proof of purchase required*). If Interactive Instruments, Inc. receives notice of such defects during the warranty period, Interactive Instruments will either, at its option, repair or replace products which prove to be defective.

Should Interactive Instruments be unable to repair or replace the product within a reasonable amount of time, customer's alternative exclusive remedy shall be a refund of the purchased price upon return of the product.

If this product was purchased as part of a system in a coordinated shipment or as a system add-on, it is warranted against defects in material and workmanship during the same period as the system.

Exclusions

The above warranty shall not apply to defects resulting from:
improper or inadequate maintenance by customer; customer-supplied software or interfacing; unauthorized modification or misuse; operation outside of the environmental specifications for the product; or improper site preparation and maintenance.

Glossary

Angle of Attack	A vertical adjustment that can be made to the model under test to vary the angle of the model with reference to the wind direction.
Control Panel	The main control panel that is used to control the operation of the wind tunnel.
Data Cable	9 pin cable that connects the test bed to the control panel.
Drag	Force exerted on the model in the same direction of the wind.
Error Condition	Prompts are displayed on the LCD panel when the controller recognizes an error condition.
Force Sensor	Electrical sensors that are used to measure the lift and drag forces exerted on the test model.
LCD	Liquid Crystal Display which is used to display the test results and error conditions on the control panel.
L/D	Lift divided by Drag ratio is derived by dividing the drag force into the lift. This ratio is commonly used to determine the characteristics of airfoils.
Lift	Force exerted on the test model that causes the model to raise or drop due to the wind speed.
Microprocessor	The digital controller that monitors the wind speed, model forces, control panel functions, updates the LCD panel, and performs the required calculations for operation.
Pitot Tube	A tube that is used to measure and control the wind speed within the tunnel.
Pressure Sensor	The sensor that measures the static and active pressures from the pitot tube so the pressure difference can be measured by the microcontroller.
Security Key	A key that is located on the control panel that disables the operation of the wind tunnel when locked.
Stall	The condition where the airfoil cannot produce enough lift because of excessive turbulence due to the angle of attack and/or the wind speed.
Strain Gage	*See* **Force Sensor**.
Test Area	Area within the wind tunnel where the test model is placed.
Test Bed	Area within the wind tunnel where the test model is mounted. The test model is removable for easy placement of the test model.
Test Model	The model that is attached to the test pedestal on the test bed.
Test Pedestal	The post that is used to mount the model under test to the test bed.