



## Flow-Lab™ System components

The Flow-Lab™ includes the following components: Flow loop, Interchangeable test sections, Measurement system and Documentation, described below.



### Flow loop

The flow loop is a re-circulating water tunnel that accommodates interchangeable test sections. The water tunnel is small enough to fit on a bench and portable for easy stowage. The tunnel uses tap water and seeding particles (optional). Water flow is provided by a 1/3 HP submersible pump, capable of delivering 40 gallons per minute,

corresponding to a fluid velocity of approximately 1 m/s across the 2" x 2" test section, or 5 m/s at the centerline of the axisymmetrical jet ( $Re = \sim 60,000$ ).

Flow rate is controlled using a gate valve and an adjustable stand-pipe. Two exit plenums are available. The weir exit plenum comes with the basic system, and a free exit plenum is also available. The free exit plenum is required for the hydraulic jump test section and can be used with the other test sections for increased velocity. The weir exit plenum is constructed to allow visualizing the cross sectional area of the test section from behind.

### Documentation

The Documentation describes suggested experiments, including a discussion of study topics, procedures for setting-up and carrying out the experiments and sample questions. The documentation is included as a Microsoft Word® document for modification to meet instructor's specific requirements.



### Interchangeable test sections

The interchangeable test sections are each 2" x 2" x 24" and constructed of Plexiglas with o-ring seals at the end flanges. The interchangeable test sections are listed below, along with suggested study topics.

## Interchangeable test sections    Suggested study topics

<b>Cylinder</b>	wake flow vortex shedding Strouhal number
<b>Airfoil with adjustable angle of attack</b>	lift and drag forces boundary layer thickness separated and re-attaching flows stall
<b>Pipe flow</b>	transition to turbulence Reynolds number skin friction and pressure drop laminar and turbulent velocity profiles
<b>Flat plate (optional)</b>	boundary layer thickness momentum and displacement thickness bursting phenomena
<b>Axisymmetric turbulent jet &amp; Impinging jet (optional)</b>	jet flow conservation of momentum and mass entrainment and intermittency self-similarity
<b>Hydraulic jump (optional)</b>	supersonic flow subcritical and supercritical flow Froude number
<b>Blank plug</b>	for mounting user-supplied models

### Measurement system

The Measurement system consists of a 1D laser Doppler velocimeter and 3D manual traverse with integrated software. The outputs from the measurement system are velocity vs. time and profiles of mean and rms velocity. All hardware and software required to carry out the experiments is included<sup>1</sup> and a computer controlled traverse is available as an option. Flow-Lab™ is also available with the VioSense PIV system, PixelFlow-Educational™. For more information, see the PixelFlow-Educational™ and MiniLDV™ Product descriptions.

### Benefits

- A powerful complement to undergraduate fluid mechanics courses
- Includes all documentation in Word format for easy modification
- Includes 6 classic fluid mechanics flows<sup>2</sup> and dye visualization
- Written by and developed by experienced fluid mechanics and instrumentation engineers
- Turnkey system

<sup>1</sup> except the PC, which is available as an option.

<sup>2</sup> Note: some flows are optional.



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