Experiments, Logbooks and Reports

- Next week in lab – your first experiment
- Next week in class: analogue instrumentation for engineering tests
  - Check out the course manual on
    - Instrumentation Lab Overview
    - Analogue Instrumentation (see also the electronics review)
  - Homework
- Evaluations

Experiments, Logbooks and Reports

- Preparing for Lab.
- Working in the Lab.

} Logbooks

- After lab
- Reports

Each submitted twice. You write reports on your 1st, 3rd and 5th experiments. (The ones you do in the weeks of 1/29, 2/26, 4/2). Your first report will be on the experiment you do this week.

Preparing for lab

- Take relevant online class
- Read the manual
- Meet with your team
- Visit lab, if you need
- Choose objectives
- Prepare other logbook items.
  - Equipment list (+ info to be added during test)
  - Procedure (results tables, plots set up)
  - Uncertainties (primary, tables for calculating derived)
- Cascade effect
- Submit logbook prep by email to TA *before start of lab.* Use ‘youSendIt.com’ for big files (>=5MBytes). Link on course homepage

Relevant Online Class?

- One online class for each of experiments 1-4
  - Ex. 1: Flow Visualization
  - Ex. 2: Measuring Static Structures
  - Ex. 3: Flow measurement
  - Ex. 4: Laser Doppler Anemometry
- These don’t describe experiment directly. They cover critical parts of the syllabus on transducers and experimental techniques, with particular relevance to each experiment.

Visiting the Lab

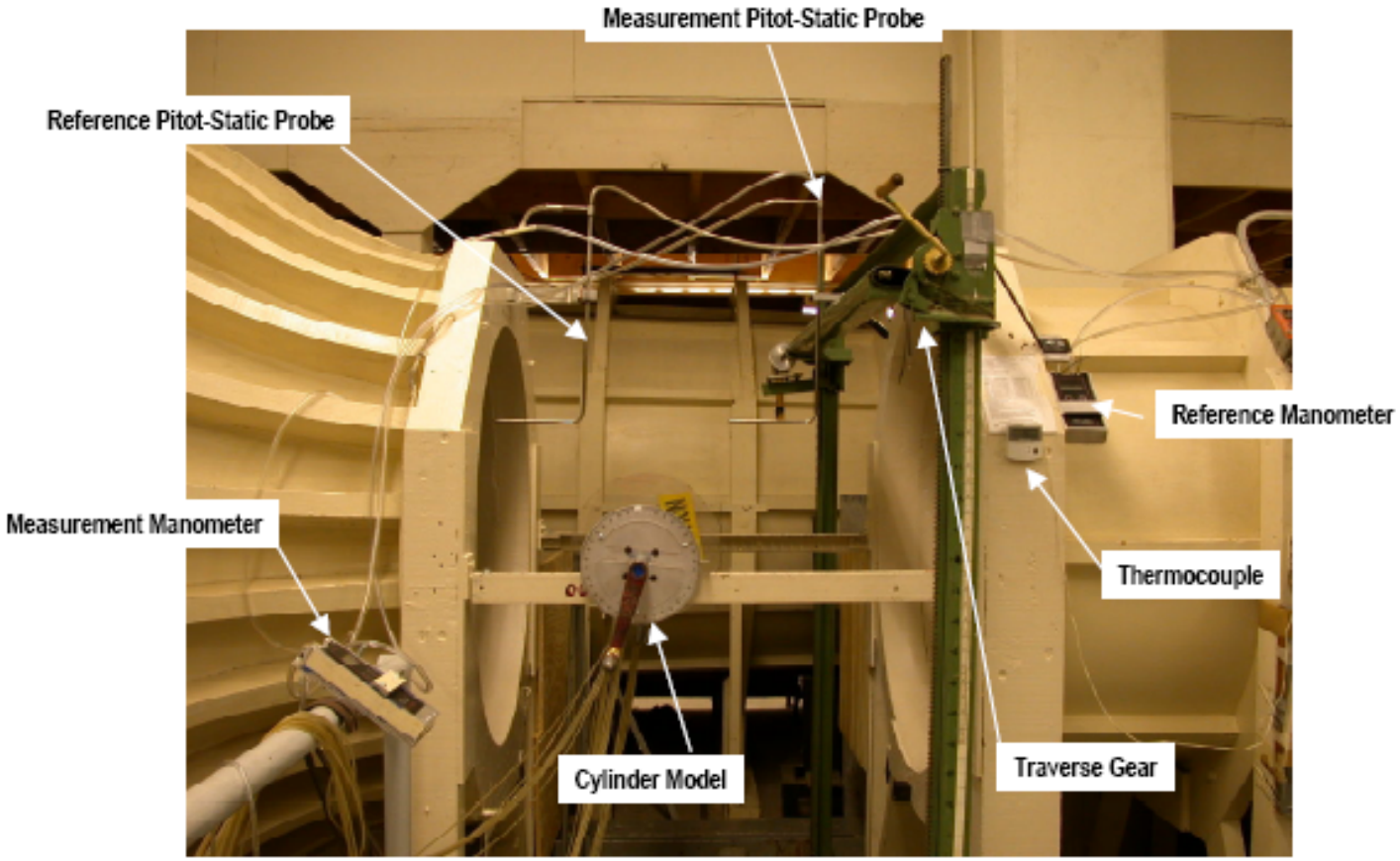
- Any time during the working week (8-5) when the lab is not being used
  - Monday except 10-11
  - Tuesday before 9:30
  - Wednesday after 2
  - Thursday before 9:30 and after 3:15
- If the lab is not open come and get me

Objectives?

- It is best to generate your own original goals, wherever possible.
- Goals should be realistic (and followed up in rest of preparation), but don’t worry about not having enough time to complete all the goals in the lab (as long as lab time spent productively, you get a good productivity grade)

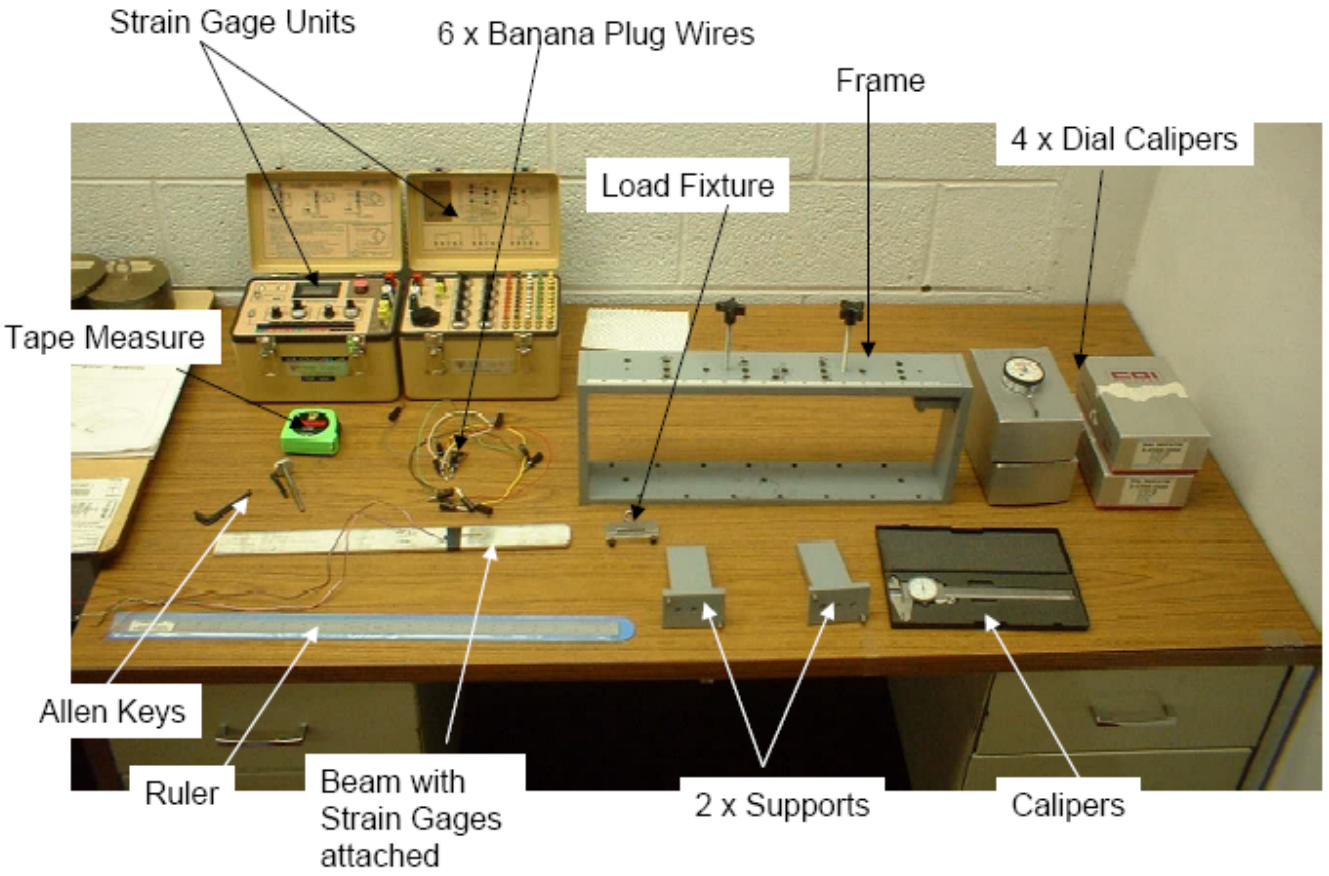
Experiment 3

Disturbance of cylinder on reference probe?
Accuracy of multitube manometer?
Quality of empty tunnel flow?



Experiment 2

- Force of dial indicator plungers?
- Consistency of strain gage and dial indicators
- Sensitivity to deliberate twist?
- Beam system as weighing machine?

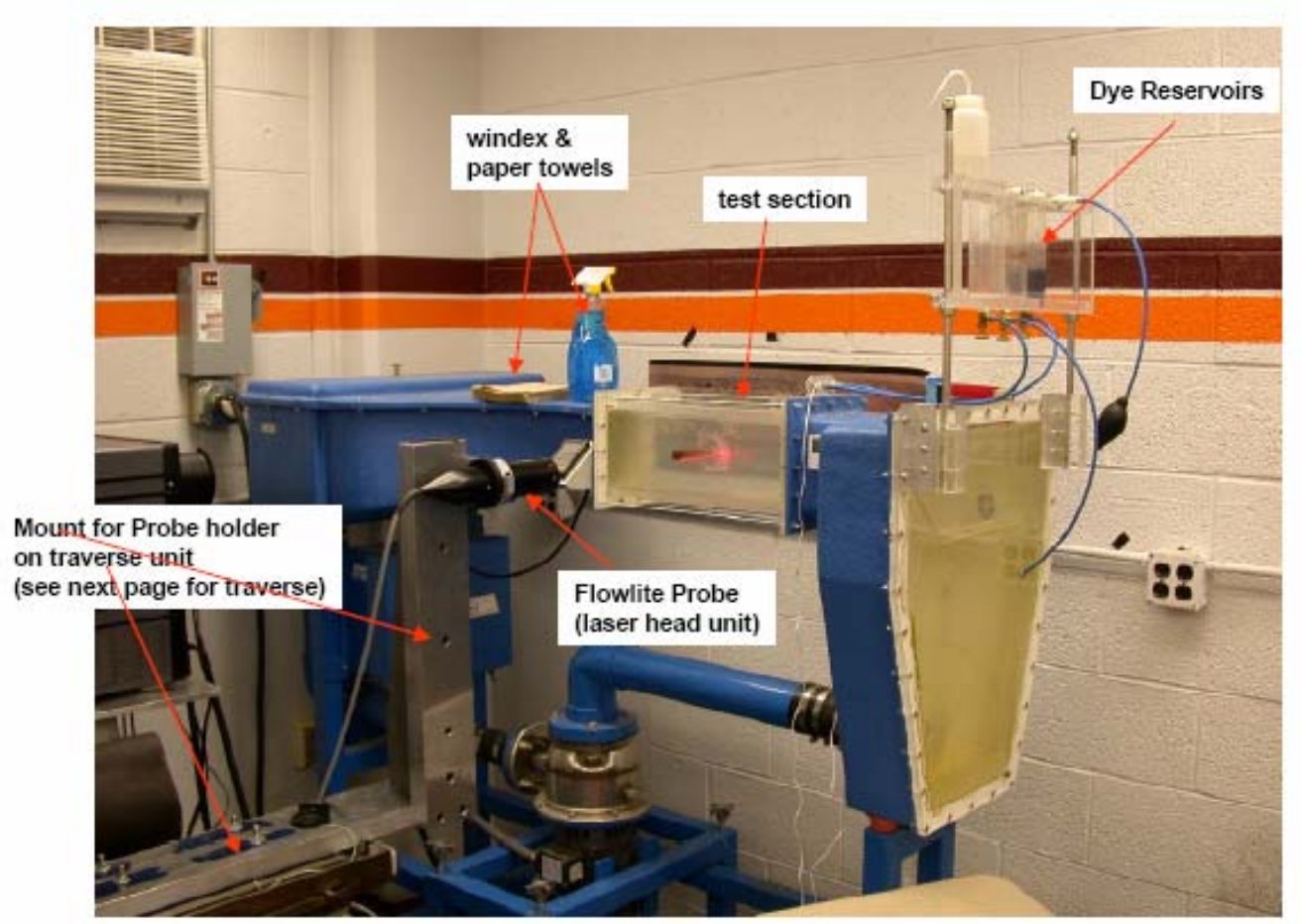


Experiment 1

- Own model?
- Accuracy of calibration?
- Ability of airfoil wing in function in reverse?
- Wake of strut?

Experiment 4

- Facility calibration?
- How good is inflow?
- Flow structure near free surface?
- Boundary layer on lower/side walls?



Working In The Lab

- Proceed with planned experiment. Continue using same logbook. Leave preparation sheet untouched, but copy items into Experiment Record, as needed.
- Start with what you planned, keep logbook as you go as a diary, including times and who did what, and all results/photos/files etc.
- Document everything in the logbook including good and bad, successes and mistakes (e.g. measurements made with the equipment not set out correctly)
- No problem if you deviate from plan, change goals on the fly, or don't complete goals (just make sure productive)
- Check out example logbook in manual, appendix 1. This would get a grade of 9.5 to 10.

At End of Lab

• Submit logbook to TA using USB jump drive. No time extensions.
• Check you have everything you will need for your report. See the *Exit Checklist* in the manual (Expts Overview section)

Lab work and logbook is a **team** effort, and gets a **team** grade

After Lab

- Complete any analysis by yourself
- Write up an lab report reflecting your interpretation of the results and what they really show
- Submit report within 1 week

Work after lab and reports **must** be **individual** efforts. Reports get an **individual** grade

Report Info

- Reports must be your own work. No copying or quoting from other sources. No copying or quoting from lab manual except for:
  - figures (if referenced – see sample report).
  - phrases appearing in quotes in Recommended Report Format sections.
- Must use official cover page with honor code pledge. Cover page can be downloaded from Appendix 1.
- Must submit report as a PDF file and on paper. Use PrimoPDF software to generate PDFs (see link on course webpage). Try this out now.
- Submit electronic copy to your TA by email attachment (youSendIt.com if >5M).

Report Grading

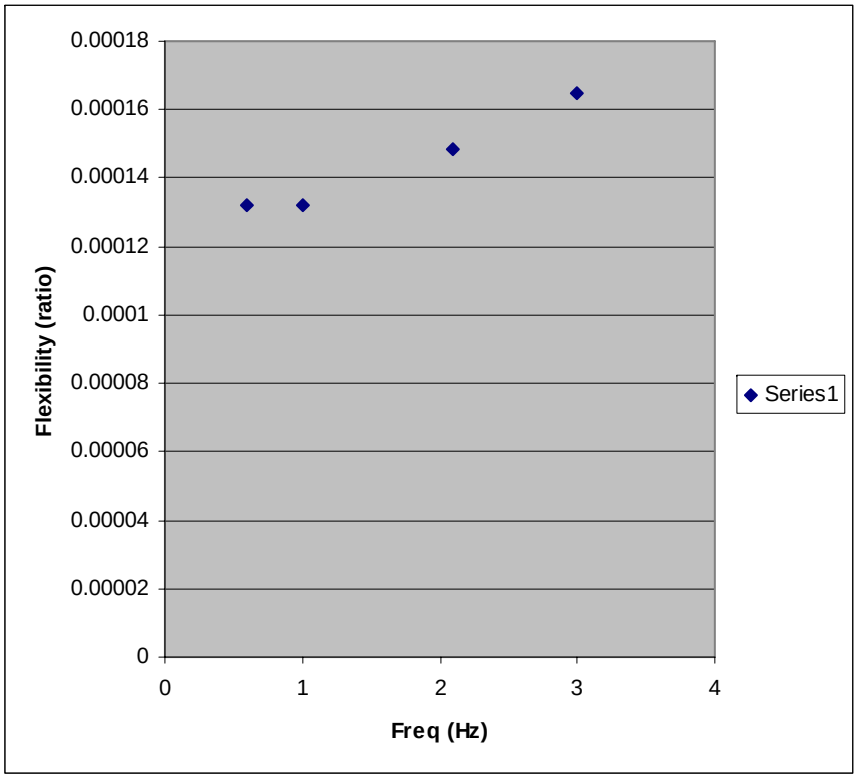
- 25% first submission. 75% second submission.
- Late reports: 20% per day penalty up to a 3 day max.
- Grade calculated on a standard grade sheet form, published in appendix 1. Look at this to see what counts.

Preparing to write

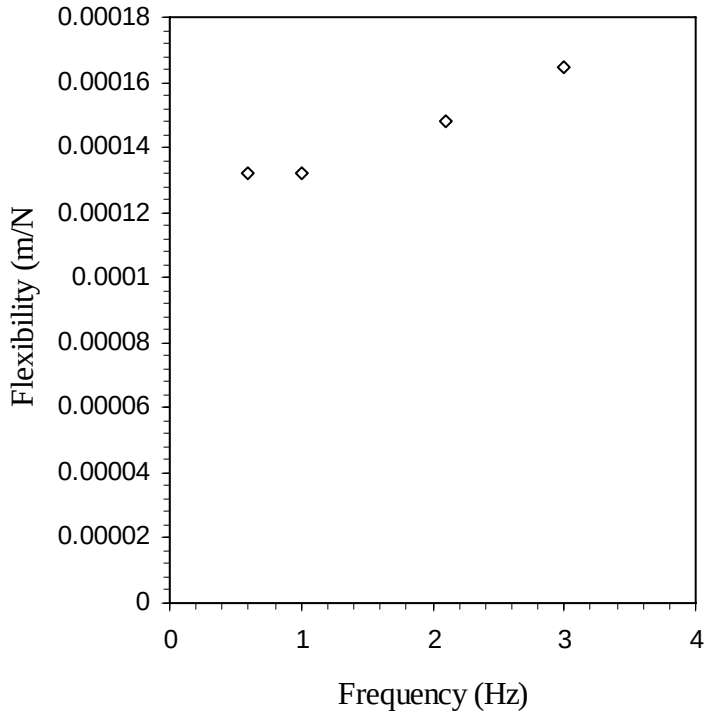
- Complete your analysis
- Complete your uncertainty calculations
- Complete your plots (must be properly formatted)
- Complete your diagrams and photos (add labels, dimensions, draw additional diags. if needed)
- Have a good idea of your overall objectives and conclusions

Formatting your plots

(See howToPlot.xls in Appendix 1)



Excel default (OK for Logbooks, bad for reports)



OK for Reports

Writing the report – General Suggestions

- Writing should be complete but as brief as possible
- Don’t assume too much prior knowledge – write for an engineer at your level who has never been to VT and seen you or the lab
- Don’t write a diary – organize things logically, not chronologically
- Use passive voice
  - I made measurements -> Measurements were made
- Read and rework your writing
- Use standard report organization

Standard Report Organization

Required!

1. Introduction
2. Apparatus and Techniques
3. Results and Discussion
4. Conclusions

- References
- Appendix(es)
- Figures

Make up your own subsections as needed.
Number them numerically:
2. Apparatus and Techniques
2.1 The Water Tunnel and Model
2.2 LDA System
See sample report for formatting ideas

1. Introduction

- Objectives that best fit how you think your particular study turned out.
  - Likely different than your initial objectives
  - Likely different than your teammates
  - Objectives evolve!
- Summary of how aims achieved
  - Includes mention of measurements made or procedures used.
- Background to technical area of experiment or techniques.

2. Apparatus and Techniques

- Descriptions of all apparatus and instrumentation, and how used, along with…
- Labeled, dimensioned diagrams or photos of key apparatus and instrumentation, and…
- Uncertainty estimates for all primary measurements.

What to include?

- All details that might have affected your results.
  - E.g. For the water and wind tunnels: test section size (quantitative 3D), flow quality (esp flaws), model position (quantitative 3D), contraction size, speed range…
  - E.g. For the structures rig: Type & origin, design, dimensions, how well the supports fit, where, where the holes for dial indicators, flaws…
- Be precise.
  - *Not* precise: “The model was located in the center of the test section”
  - Precise: “The model was located close to the center of the test section, with its span horizontal and perpendicular to the flow direction. The model center was 245mm downstream of the test section entrance and 471 mm above its lower wall”

Describing Procedures/Primary Uncertainties

- Often best given together or next to the equipment description (i.e. not separate sections)
  - E.g. A traverse built on a milling machine base was used to position the probe to a grid of measurement points. Positions were accurate to ±5mm…. At each point…
  - E.g. A series of weights were used to load the beam at 4 points across the beam span. Weights were measured using a…accurate to 0.1lb. Loading points were every 1.5±0.2 inches

3. Results and Discussion

- Results.
  - Presentation of results in figures, tables
  - Description of axes, scales, units, analysis procedures
  - Presentation of uncertainties in results (details of uncertainty calculations required but it is usually best to put these in as an appendix)
- Discussion
  - Description of what's in the plots, tables, uncertainty estimates (how the results vary)
  - Description of what it means
  - Conclusions you can draw from the results
- Be precise and describe details –
  - "At high angle of attack the airfoil was completely stalled" 
  - "At an angle of attack of 10 degrees the separation point was located at x/c=0.15±0.05, the flow moving well away from the suction surface downstream of this point. The flow appeared completely stalled at this condition, and quite turbulent in the separation zone 

4. Conclusions

- Short summary of what was done.
- Numbered statements summarizing what was learned
- Should not present any new material. E.g. numbered conclusions are most often near repetition of statements elsewhere in report.

- Good luck with your first experiment
- Come and see me if you have any questions
- Don’t forget the homework for instrumentation next week