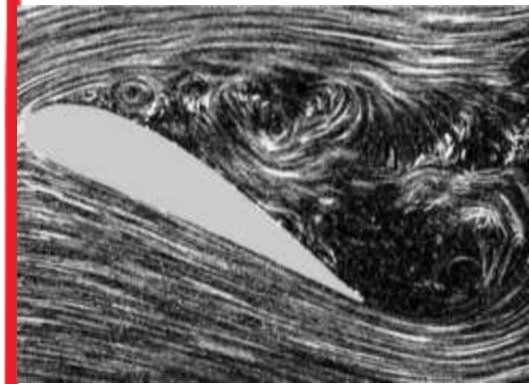


MAE 253 – Experimental Aerodynamics I

XFOIL Introduction.

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Outline

- XFOIL – brief intro
- XFOIL set-up
- Typical XFOIL run for an airfoil, in-class exercise
- Output processing (writing .dat, .pol files, plotting etc.)

XFOIL – Brief Introduction

- XFOIL is an open-source code free for use in the public domain written by Prof Mark Drela (MIT)
- Used for design and analysis for airfoils in subsonic regime.
- Some capabilities: Inviscid, viscous analysis (our focus), Airfoil design, plotting C_p distributions, drag polar etc.
- A good tool for comparison with experiments!
- More details:
 - 1) <http://web.mit.edu/drela/Public/web/xfoil/> (download as per OS)
 - 2) XFOIL – An Analysis and Design System for Low Reynolds Number Airfoils

XFOIL Set-up, demo

- Setting up on Windows, Mac, Ubuntu.
- Loading an Airfoil Geometry (splitting them into panels).
- Inviscid analysis – single α
sequence of α 's.
- Viscous analysis – single α
sequence of α 's.

Set-up on Windows

- Download *XFOIL6.99.zip* file and extract it.
- Place this folder in *Documents* and ensure all .exe files (xfoil.exe, pplot.exe, pxplot.exe) are inside *bin* folder. Folder path should look something like this :
C:\Users\Hariharan\Documents\XFOIL6.99\Xfoil699src\bin
- Copy the above folder path → Environment variables → edit the *PATH* variable with above folder address.
- Type xfoil in the command window and check if it runs.
- What if the above does not work?

Set up on Mac OS

- Go to <https://www.xquartz.org/> and install X11 from the website.
- Go to <http://xfoil4mac.altervista.org/> and download the Xfoil.app.
- Drag and drop Xfoil.app in your Applications folder.

Setup on Ubuntu

- The command *sudo apt-get install xfoil* should install XFOIL. Additional libraries if required can be obtained from

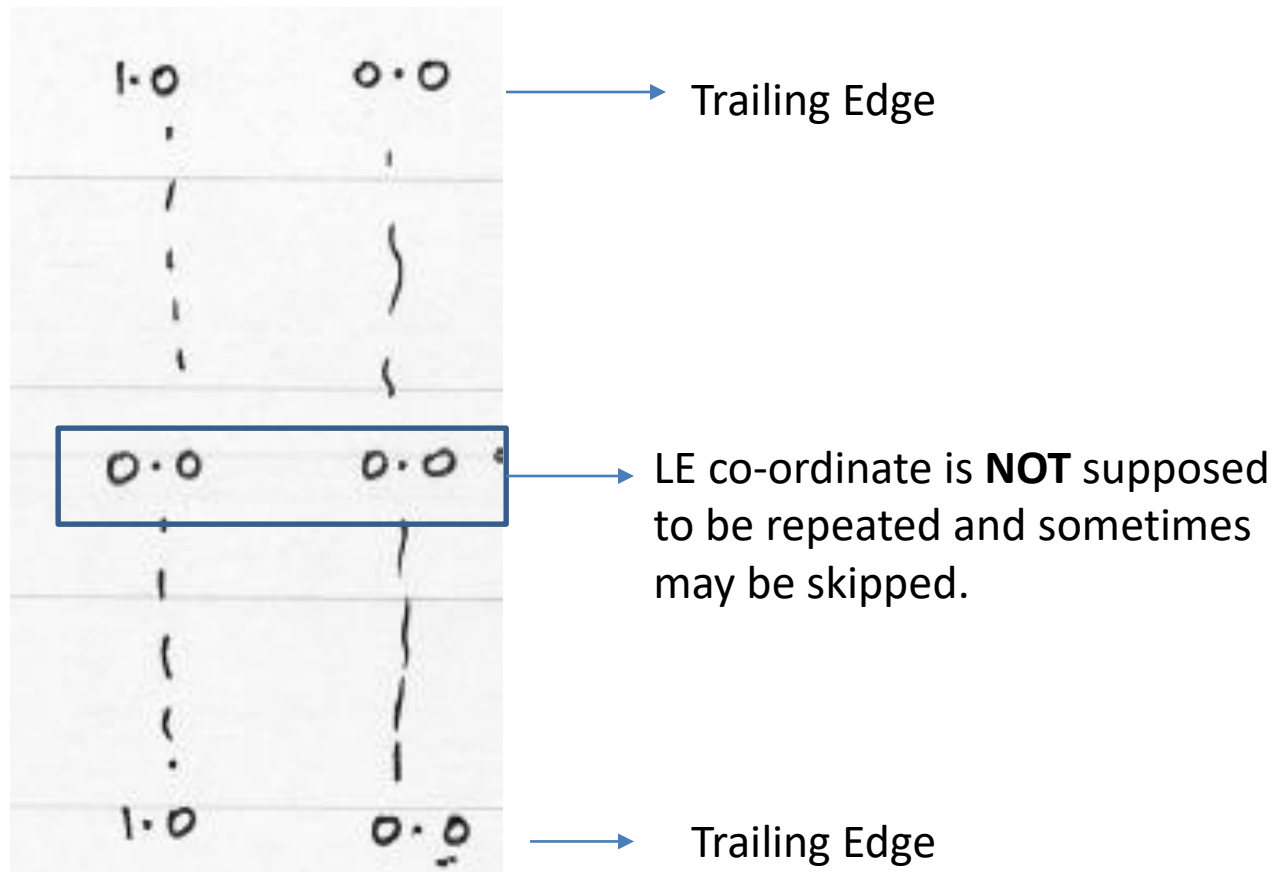
<https://packages.ubuntu.com/trusty/science/xfoil>

- If the above does not work, follow the instructions on this page

<https://giuseppeschettini.wordpress.com/2008/11/27/how-to-compile-xfoil-697-in-linux/>

Loading airfoil

- NACA airfoils can be loaded directly from XFOIL.
- http://m-selig.ae.illinois.edu/ads/coord_database.html
- Ensure that co-ordinate file looks like:



XFOIL run

- Demo run: NACA 4412 at Re 4 million
 $\alpha = -4$ to 24 degrees.
- Demo run: NACA 2412 – similar Re, α range.
- How to view transition curves ?
- How to save your XFOIL data ?
- How to plot drag polar ?