Preface

This text is based on the notes for a course I've given for 20 years at Virginia Tech. I started giving the class because it seemed to me that the students needed an aircraft aerodynamics oriented course to take the fundamentals normally taught one step further. It is an elective, generally taken by seniors and graduate students. However, second semester juniors can take the class without undo difficulty. They should have a basic text such as Bertin and Cummings or Anderson available to refresh their recollection of the fundamental aerodynamic theory. If possible it would be desirable to take the class before their senior design project.

This is a text in "why" as opposed to a book on "how". That part of the education foundation is addressed in the companion volume, *Applied Computational Aerodynamics*, that was published in 2015, spearheaded by Russ Cummings, with Scott Morton, Dave McDaniel and myself as collaborators. There is some overlap. Ideally students would take both classes at the same time. However, their course load doesn't allow for this. With the powerful computational tools now available students need to understand what they should be doing with them!

The importance of working the exercises cannot be overstated. They have been developed to bring out key points. Students learn much more by working the exercises than if they just sit in class passively listening. If the book is being studied independently the exercises should not be overlooked. In addition, the text is integrated with a number of resources available on the web (a truly phenomenal development providing access to information). This includes both additional text material and software. In terms of the use of computational aerodynamics tools the exercises try to strike a balance between emphasizing the validation of the tools (and the student's skill using them) and their use to explore aerodynamics ideas.

A configuration aerodynamicist straddles the artificial academic divide between fluid mechanics oriented "aerodynamics" and classical flight mechanics, which has become less a class in bare airframe aerodynamics for the stability characteristics and the ability to generate moments with (primarily) aerodynamic control forces, and more of a class in EE-oriented control theory. My experience with fighter configurations was that it was easier to achieve performance goals than to make the airplane fly (i.e., good high angle of attack characteristics and we try to address this).

I have been fortunate to meet and work with many of the key contributors in both computational methodology and aircraft configuration development. Starting with a strong fundamental base forced on me at Virginia Tech, I had a chance to work with a wide variety of experts at Grumman. I was able to learn a lot from them. I was also able to talk with experts at national meetings, as well as NASA, WPAFB and Pax River. Moving back to Virginia Tech I was able to collaborate with more experts. And I was able to spend a year at the Air Force Academy, where, as might be expected, the Aeronautics Department has a very strong aircraft aerodynamics emphasis. In the last decade Russ Cummings has been a great collaborator. It has been a fantastic experience and hasn't stopped yet. If I try to name all the aerodynamicists that I've learned from it will be a book length list in itself, and I will offend someone by omitting them. Finally, I appreciate former students in the class sending me info that they know I will appreciate.

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