FRIL Guide to Writing a Journal Article
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There are two key aspects about engineering research for students: 1) doing new and impactful work with solid results, and 2) effectively communicating the work. Both are critical. One without the other is a waste of time. This document focuses on communicating the work via a journal article, the broadest and most archival venue for distribution of scientific information. This guide is for the *lead author* – who did most of the research and, correspondingly, most of the writing.

To be accepted into the top journals, a manuscript requires solid research with a substantial demonstration:

- novel (represents a significant new contribution)
- fundamental (can be broadly useful)
- accurate (method and results)
- important to the field (and thus to society)

Therefore, there is a high expectation in terms of the completeness of the research and the quality of the manuscript before all authors agree it should be submitted.

The time from initial submission to final acceptance to a particular can be as much as one year depending on the reviewer feedback on these aspects (and more time if it is rejected and the manuscript is them modified and re-submitted to another journal). The journal paper review process (wile often time consuming and sometimes frustrating) generally greatly strengthens the impact and quality of your manuscript.

The five basic steps for writing a journal:
Step 0) LITERATURE REVIEW
Step 1) CHOOSE A JOURNAL and ARTICLE TYPE
Step 2) OUTLINE SECTIONS and PREPARE FIGURES
Step 3) WRITE EACH SECTION
Step 4) REVIEW YOURSELF THEN SUBMIT TO ME
Step 5) JOURNAL SUBMISSION AND REVIEW PROCESS

Most of these steps are applicable to a **conference paper** (with exceptions noted herein). However, journal papers are strong assets on a resume but require high-quality novel work that advances the state-of-the-art and the threshold for acceptance is MUCH higher than a conference paper. Also, writing a journal manuscript can take as long as three months (after all the data is obtained) and the time between first submission to publication can be as long as one year.

In the following, details are given on each of these steps, along with two appendices:
App. A Format of Figures, Tables and Captions
App. B Text and Grammar Notes

Step 0) LITERATURE REVIEW

- Keep an organized system for literature
- Read articles, take notes, file papers away such that you can find and reference them again
- Use resources like Google Scholar to find and read relevant papers before starting to write and to determine the specific novelty of your research
- Use Mendeley or Zotero to organize your library and foramt your citations when writing
- Set up Google Scholar or journal alerts to stay up-to-date on new articles in your field

Step 1) CHOOSE JOURNAL AND ARTICLE TYPE

Submit a manuscript to only one journal at a time (no parallel processing). Choosing a journal is typically a combination of optimizing relevancy, impact and distribution (in that order).

Relevancy is often best gauged by looking at the types of articles published in the last 2-3 years of a journal and comparing them to your work. Alos read the journal's "Aims and Scope" to see if your paper is a good fit. Looking at **your** paper's draft references is another good way to choose a journal – and as such the journal choice sometimes changes after Step 3 or even after Step 4. Obviously, some journals are more closely related to your work then others.

Impact can be crudely measured by checking journal's impact factor. Generally, the higher the impact factor of a journal, the more people will see your work and the more prestigious it will be on your resume. It is NOT as important as relevancy though. Also, the higher the impact factor, generally the harder it is to get your paper published in that journal. Note that aerospace journals tend to have lower impact factors than physics-based journals, but that is because aerospace articles are more often read and used by industry than academia, and thus less likely for the work to be cited in the public domain. So, the "effective" impact factor for aerospace journals is higher than the official version and you should consider that accordingly. Ideally, you want to choose a journal with the highest impact factor that allows at least a 50% chance of being accepted. For reference some fluid journal impact factors are given here.

Distribution means that you want to avoid submitting too much of your work to the same journal, as the journals may not favor accepting more than one article from you in a given period (e.g. one year) and it looks better on your resume.

Once you chose a journal, pay close attention to that journal's format. In fact, the format options sometimes help decide the journal if you only have a few figures or have very many figures.

Length**:** For a journal or conference paper, the length is decided by the specific journal. Journals also sometimes have different lengths. For the AIAA Journal, there are various types but the two most relevant for students are "full-length papers" and "technical notes" (other journals have different names for these two types, e.g. "original research" articles and "brief communications". For AIAA Journal full-length papers, typically 36 "units" are the suggested maximum, where each unit is a double-spaced 12 point font text page or a single figure, e.g., 24 double-spaced text pages (including abstract and references) and 12 figures. For technical notes, typically 9 "units" are the maximum, e.g., 5-6 double-spaced text pages and 3-4 figures.

EXCEPTIONS: For a conference paper, there is often no page limit so you can include additional figures and discussion. For a thesis there is no page limit, so can put in *everything* that you feel is needed for someone to repeat your measurements or simulations, i.e. strive to make sure that someone (e.g. a new graduate student) can have all the details necessary to reasonably reproduce the methodology/facility and your results. If your chapters are following journal papers and thus are limited in length accordingly, this additional information is most easily added by an Appendix, which can be as short as a half-page or as long as is needed.

Step 2) OUTLINE SECTIONS and PREPARE FIGURES

Write an outline that describes the key elements of your work and is consistent with samples and the author guidelines of <u>your journal</u>, e.g. as follows. Collecting a draft of your figures (e.g. in PPT form is fine) will help you develop the outline (and may identify new figures needed).

0. Abstract (which is an overview of *all* the below sections)
1. Introduction (all three of the below parts are unique and critical!)
    - 1.1 Motivation of Work (why do we care about this area of study?)
    - 1.2 Previous Studies (work that serves as a foundation to your study)
    - 1.3 Objective of Work (what you tried to do & the uniqueness of work)
2. Methods
    - 2.1 Approach (experimental facility, theory w/ all relevant equations & numerical schemes)
    - 2.2 Data Analysis (how raw data is extracted converted for use in the results)
    - 2.3. Test Conditions (give tables & explain how/why you chose them)
3. Results (organized via sets of parametric studies or increasing level of complexity)
4. Summary
    - 5.1 Conclusions (a brief overview of the most important results)
    - 5.2 Recommendations (suggestions if you, or someone else, were to continue)
5. Acknowledgements (sponsors and those who gave key advice/information*)
6. References (list *all* papers you feel should be read to have proper background)
7. Tables (grouped at end of text of manuscript or of chapter)
8. Figures (grouped at end of text of manuscript or of chapter)

FIGURES: Once the outline is finished, compile all the figures in the desired order and proper format. Figures (like the text) should "tell the story", with the reader first and foremost in mind. Note that **I am very picky about figures (and you should be too!)** Figures should be as clear and straightforward to understand as possible. Organize the figures in order of test conditions or via various data-processes. For methods use schematics and example data images to explain your process. For results section, always put flow visualization before analysis.

To prepare figures and tables, use a word document with one figure (or table) and its caption per page (note that a figure can have several parts but a table cannot) and closely follow Appendix A for format. Consider captioning figures and tables using the “Caption” function in Word so that the numbers automatically update.

Finalize figures with me to finish Step 2. I generally prefer to mark up a hard (printed out copy) of the figures for the first one or two iterations – then tend to like soft copies for subsequent versions so I can edit the captions. Expect *many* review iterations if you do not follow Appendix A carefully.

Step 3) WRITE EACH SECTION

Refer to Appendix B on text style

Order: Do *not* write in the order of the table of contents. One of my previous students stated "Writing the Results first is especially good for engineers who are not the best writers in the world. It's very systematic and you soon realize that you can actually do this". As such, I often suggest the following order when writing:

Title, Methods, Results, Introduction, Summary, Abstract, then revisit Title.

In the end, this is a matter of preference and whichever section feels easiest for you to get started on may be the best. In the following, I have listed them in order of their final organization, but you should maybe consider the above order when writing.

Title – This is often a difficult fight between conciseness and clarity. But in general you should try to use the least amount of words as possible, an old adage is nothing in the "teens", meaning never use more than 12 words (and 4-8 is generally ideal but sometimes it's hard to simplify it that much!)

Abstract – OVERVIEW OF WHOLE PAPER describe objectives, methods, results and conclusions briefly, i.e. in one double-spaced page (*It is best to write this section last*). One ex-student suggested "going through your paper and picking off sentences that highlight the study" You can then copy those sentences into the abstract in the main text paper order and reword to polish your abstract. An example abstract is below

The objective of this study was to develop and employ a numerical simulation strategy for predicting the liquid water content (LWC) at the test section plane of the NASA Glenn Icing Research Tunnel (IRT). In particular, predictions were desired to characterize the icing cloud uniformity as a function of tunnel speed, droplet size, etc. The droplets were injected with a polydisperse distribution and based on previous computational airflow results, which included the spray bar wakes, the air jets and the heat exchanger flow. To first understand the cloud dynamics emanating from isolated nozzles, experiments and simulations were conducted with only four injectors spraying in the IRT. The simulations showed good representation of the width and position (though the not necessarily shape) of the individual spray clouds at the test section plane. Next, droplets issued by the baseline group of Mod-1 nozzles (used for conventional icing operation) were simulated to determine the test section LWC distributions to compare with experiments. The simulations indicated the importance of including turbulent diffusion, and that increased tunnel speed and droplet size tended to reduce overall uniformity, which was generally consistent with experimental results.

Nomenclature – This is often optional, but nice to have. List alphabetically with Roman letters (e.g. D) followed by Latin symbols (e.g. Δ). Make all variables in italics, e.g. C_D not C_D and keep this consistent throughout text, captions and tables (sometimes hard to do in the figures). Make sure it is complete and exact. Divide subscript and superscripts into a separate section. Generally, do not include acronyms in this section and confine subscripted definitions to a special subscript section, e.g.

Nomenclature

M Mach number

u Streamwise velocity (x-direction)
y Normal direction coordinate
z Spanwise direction coordinate
f Circumferential angle
ρ Density
$( )_\infty$ Freestream value
$( )_0$ Stagnation value

Introduction

a) Motivation sub-section – a short section; primarily describe why making improvements in understanding or capability are important, e.g. how could the work be applied to some engineering systems or models

b) Previous Studies sub-section – discuss directly related studies to establish context of work, i.e. both the state-of-the-art and the issues remaining to be understood. Typically you can put these in groups according to ideas or subjects, and the sub-ordered chronologically. Note feel free to make judgments about the work but *only* with respect to your particular study (and not in general), i.e. you can say that that analysis doesn't fully apply here because your assumptions or test conditions are somewhat different, but don't say they had a bad analysis or results. When discussing previous studies, is a good idea to include a number from the journal to which you are submitting. Ideally, this will naturally happen if an appropriate journal is chosen.

c) Objectives sub-section – a short section; primarily describe what will be done and why; may also note any hypotheses you are testing. **Then, clearly explain *why* your work is unique, important and new** (and thus why it deserves to be published), e.g. "To the authors' knowledge, this study is the first to develop a hybrid model that predicts particle concentration." Writing this small section can be tricky since it tis difficult to sometimes clarify how you have advanced the state-of-the-art (in terms of data, a method, test conditions, etc.) but it is crucial to get your paper accepted. Often it is important cite the limitations of the previous studies in the contact of your specific objective. Don't criticize the previous work but explicitly show that yours is clearly different.

Methods– Facility & diagnostics should be described in sufficient detail for someone else to exactly and reproduce your set-up and measurements or simulations (without having to guess any of the subtle required details that you had to sort out).

Results - Generally write a paragraph about each figure **always** using each of three steps:

a) describe the figure's purpose, what is being plotted and what test conditions are considered
b) identify *and explain* all the significant trends shown on the plot
c) discuss how the specific results improve the understanding of important issues and/or support/enlarge/contradict the findings of previous studies or of earlier aspects of your paper.

Summary - Describe the important points and limitations of the results. This summary is a condensed version of the above part c) discussion of the results, but also gives implications of the present results to the relevant field of study. Include recommendations for future work that you suggest for a follow-on student.

Acknowledgements – thank those who supported your work! e.g., below example

Acknowledgments- This work was supported in part by the Defense Advanced Research Projects Agency under grant MDA972-01-C-0042 with Dr. Lisa Porter as Project Manager. Additionally, facilities of the San Diego Supercomputer Center were utilized for the direct numerical simulations.

The authors would like to thank Professor P.K. Yeung of Georgia Tech and Dr. Todd L. Bocksell of Pratt & Whitney for their valuable comments/input on this publication.

References – These papers are cited in the text of your article/thesis.

a) Formatting: There are two main formats number-based (e.g., AIAA journals) and author-based (e.g., IJMF). For number-based, the numbering based on the order of they first appear in the text and uses a dash if there are more than two references cited at a time. For example, the text will have "…which agrees for these conditions with previous studies on Eulerian schemes[3], Lagrangian schemes[4,5] and hybrid systems[6-10]". The corresponding References section lists these as "1. R. Smith & E. Loth…"

For author-based, the citation is based on last name of first author and uses "*et al.*" if there are more than two authors. For example, the text will have "…which agrees with previous studies on Eulerian schemes (Jones, 2000), Lagrangian schemes (Smith, 2001; Jones and Smith; 2003) and hybrid systems (Jones *et al.* 2006)." The corresponding References section lists these alphabetically with all authors as "Jones, M., Smith, R. & Loth, E. (2006)…"
Software support: consider using a software with a Word plug-in to format your citations and update the order as you edit the paper.

b) Selection: Always include **at least 3 references** from the journal to which you are submitting. If you can't find three, you probably picked the wrong journal. Consider citing people you want to read your paper or will may be likely to review your paper. They likely have citation alerts setup too and will be emailed when your paper gets published. Easy advertising for your research!

Step 4) TEXT REVIEW PROCESS

Wait 3-4 days, then edit by carefully rereading and editing word by word your entire paper. No one know your work as good as you, but you have to try and proof as if you are a first time reader who has never seen the material before! It is best to read it out load as you proofread. This forces you to go slower and makes it easier to catch grammar errors. It also makes it easier to check that the text and figures gives a straightforward explanation that is *as simple as possible* while capturing all the relevant physics or discussion. Edit from a big picture and small picture perspective as described below.

When revising think both globally and locally.

Globally, pay strict attention to organization (from section order to sentence order) and to grouping ideas and concepts together. This often takes iteration and careful thought as to what makes the story most straightforward and convincing for the reader who is coming into this with very little background. The best manuscripts tell a compelling story that builds knowledge and interest to the reader while remaining informative and technical.

Locally, pay strict attention to being complete, precise and consistent in your descriptions. When reviewing, make sure that each sentence focus on a *single thought*. Also make sure that each paragraph groups like ideas together. A paragraph should also have an initial sentence that helps segue ways from the previous paragraph, and a final thought sentence at the end.

After you have reviewed, send me a soft DocX version which I will then edit using track changes and by inserting comments and return to you.

When you receive my edited version. First consider my text changes then comments.
For text changes, if you agree then go ahead and accept them. If you don't agree, please discuss them with me. I don't mind at all being over-ruled (I generally make as many mistakes as you) and I thus encourage you to be critical of my comments. However, I do mind suggesting something and then later finding out it wasn't changed nor discussed (or even wrong). Once you have accepted my change, make your new changes with track changes turned on.
For comments, make a point to definitely discuss with me and/or add your reply to my comment IN CAPS within the same comment box (I will do the same for your comments).

The go back to beginning of this step and repeat until convergence.

Step 5) JOURNAL SUBMISSION AND REVIEW PROCESS

Once the above is done, there is still more work

Other Elements. First you have to check the journal format see if any other elements are needed. Sometimes they request key words (grab these from summary or abstract, try to hit major "google-able" words that are not already in the title) or highlights (e.g., a key result figure). They may also request suggested reviewers – consider people in your reference list as they are a pool the editor would consider as well. It is good sometime for me to notify the suggested reviewers that we have put their names forth, so they are aware of that and perhaps can be more helpful in the review or can be deleted if they want to opt out. Finally, most journals require a cover letter (addressed to the editor) which should outline how the work is important and why it is appropriate for that specific journal. Also include any potential conflicts of interest.

Editor Assigns for review? Some journals always send out for review (e.g. AIAA) which can take anywhere from 1-10 months depending on the journal (older ones are usually slower). However some journals (especially newer ones) will pre-screen articles by the editor within a week or two and your article may thus be rejected very quickly. But if pre-screened *and* assigned for review, your chances for acceptance are good.

Editor and Reviewer comments? The outcomes are usually: rejected, minor revision, or major revision. If the paper is "rejected" (hopefully less than 50% of the time), use the editor and reviewer comments to revise your manuscript BEFORE submitting to another journal. If the revision is "minor", you may need to only update the manuscript (this is generally rare). If the revision is "major" (most common outcome), you need to submit a revised manuscript with changes noted and a rebuttal addressing all the comments of the reviewer (see sample below). *Don't be discouraged by negative comments, as this is a chance to improve your manuscript.* Be very careful to address all the details of the editor and the reviewer and any deadlines. If you miss a detail or a deadline, you can then be rejected or the entire review process may be repeated (going to reviewers who will submit a second set of reports, and you have to revise yet again).
When writing your rebuttal, first wait at least 3-4 days after reading and discussing the reviews, as you may be initially upset about the criticism (that often happens with me). Then create a document that includes and numbers all the reviewer comments (number the comments even if the reviewer did not) followed by your response after each of these. Try to be on the side of the reviewer when writing your response and making text changes, arguing that the reviewer did not understand what you wrote will not fly with the editor! Instead, rewrite so that it is more easily understandable. Be polite, humble, and appreciate of the reviewer feedback. If you disagree with any reviews, remember the Cover Letter is likely only read by editor and may be a good place to discuss the reviews.

When revising the manuscript, use track changes at first. But then the final version should be cleaned up by identify the significant changed portions (anywhere where more than a few words were changed) with red or **bold** font. Once this is done, accept all changes so that messy aspect does not show up. You do not need to show portions that were deleted.

EXAMPLE REBUTTAL:

REFEREE 1 Comments ***Authors response are given in red text***

1 The manuscript describes a detailed CFD investigation of a class of low-sonic boom inlet design for potential use on new-generation supersonic aircraft. The manuscript is generally well-written and represents a significant and sound investigation.

We thank the reviewer for these comments, and for the detailed review in general. We feel that the changes have significantly improved the contribution and clarity of the manuscript.

However, a number of aspects need to be addressed:

2 the manuscript appears to assume a comparatively good level of knowledge about engine inlet and sonic-boom aspects. The introduction could be more extensive both in terms of explaining more about sonic booms (aspects such as near-field versus far-field aspects, the interactional aerodynamics with other aircraft components) as well as an extended survey of past and ongoing related work in this area.

Good Point. We have revised and expanded the introduction to discuss sonic boom issues and included references accordingly.

Further comments:

3 the equations for Mach number and Reynolds number could be moved to nomenclature

This has been done.

EXAMPLE REVISION:

Rarefaction Effects on a Spherical Particle

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Date Submitted : 20-Nov-06 with Journal Log Number : J28657
Date Revised: 5-March-08 with revised portions are shown in red

Abstract

A comprehensive review of compressibility and rarefaction effects on spherical particle drag was conducted based on existing experimental data, theoretical limits and DSMC results. The key to the accurate prediction of the drag was recognition of a nexus point with respect to effects of Mach number and Knudsen number. In particular, it was found that a single drag coefficient (of about 1.63) is obtained for all particle conditions when the particle Reynolds number of about 45, i.e. the drag coefficient …

APPENDIX A: Format of Figures, Tables and Captions

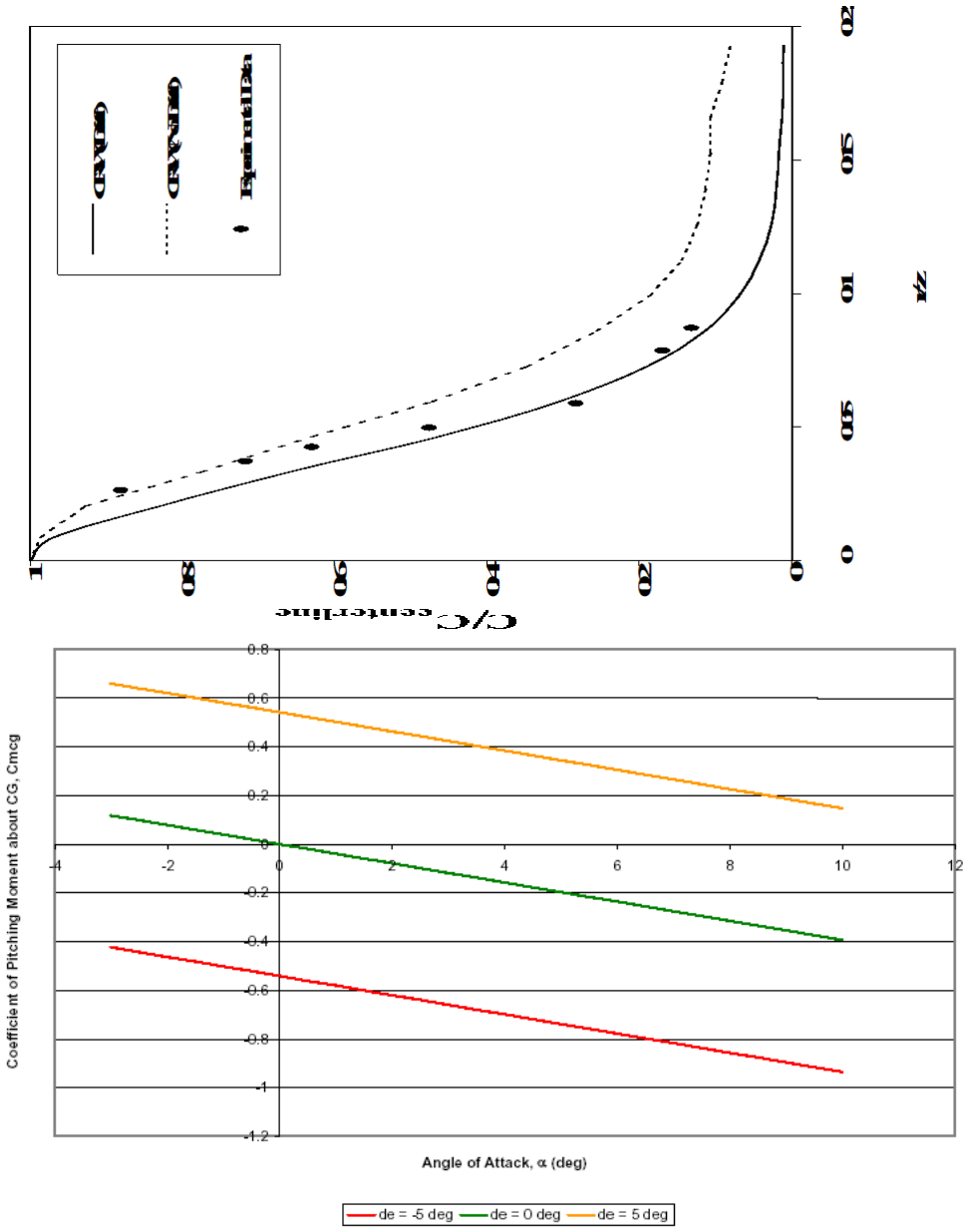


Fig. 1 Sample figures from students: a) a good example that use minimum information to clearly show results and b) a bad example (where font is too small, axes are not on outside, legend is not in column format, yellow is used, labels have variable name and variable.

FONT SIZE

Make sure that all text font-size (legends, axes labels, and axes numbers) and all data symbols are sufficiently large so that if the figure were squeezed down into a 1" by 1" box, it would still be clearly readable. The good test for this if they the font size should be 12 point (same as captions size when in a word document) like in Figure 1a – **not** like in Fig. 1b. The first set of figures by most students **will fail this test**.

AXES TRENDS

Always try to non-dimensionalize your data so that each axis is of order unity when plotted. This also allows a wide range of test condition data to be compared consistently and allows you reveal the non-dimensional parameters that control the trends. If the correlation is poor, you may not have identified the correct controlling parameter or you may need to group the data in your figure in terms of a fixed value of another non-dimensional parameter (e.g., filled symbols for supersonic conditions and open symbols for subsonic conditions) to better see the trend. Note that it takes *at least* three points to make a convincing linear trend (straight line) and *at least* four points to make a convincing non-linear trend (curve). Generally, limit the number of comparisons to 4-5 on a single plot, else it gets too cluttered.

AXES FORMAT and LABELS

Use a four-sided box to show data with no internal grid lines within the box and place the data legend within the box (note Fig. 1b violates those conditions). For the ranges, generally best to start **at zero** and go to the maximum that is at least a few % higher than your highest data point. If there are several figures of a similar type, it is helpful to use consistent ranges so they relative values can be better understood. Only use a minimum different from zero if the data point values vary by less than 25%. But if there is a large variation in range (more than one order of magnitude), consider log-scales. Use 4-6 major ticks on each axis with a minimum number of digits for each tick mark, e.g. 0, 0.1, …0.4 (not 0.23400). Note **never** put an outside box around a figure (these extra line give a cluttered look). Unfortunately, MS Excel by default puts a box around a graphic.

DATA SYMBOLS AND LINES

Experimental data should use symbols (*without* connecting lines) and computational data should use lines (*without* symbols). For experimental values, use different symbols for different conditions (circles, triangles, squares, etc.) with different filling (black, grey or white) or use "x" and "+" if you need more. If using more than one shape, make symbols sizes at least 50% larger than that of Fig. 1a. To describe various computational results, use different line thicknesses, or dashes, or dots, or even shades of grey to delineate. All lines should be smooth to the eye – no wiggles. Wiggly plot lines sometimes appear when you cut and paste from Excel to Word! Consider that your reader could be color-blind. Use easily distinguishable symbols and colors that aren't common for colorblindness (like blue and orange).

COLOR?

Try to avoid too much color on plots as some journals will have online PDF's in color but their print versions in grey-scale. Therefore, make sure your plots allow a reader to easily interpret the different lines or symbols without needing the color version (this is also helpful for color-blind people and those with poor vision, like me). Finally, be very consistent with your figure format (symbols patterns, line patterns, variable names, etc.) from one figure to the next. For example, if experimental data was a solid circle in a previous graph, then the same conditions should be a solid circle in the other figures. Never use yellow or other light colors for lines or symbols as they won't show up well on a projector when you present in a PPT. Similarly avoid nearby colors that are similar like red and orange.

FONT STYLE

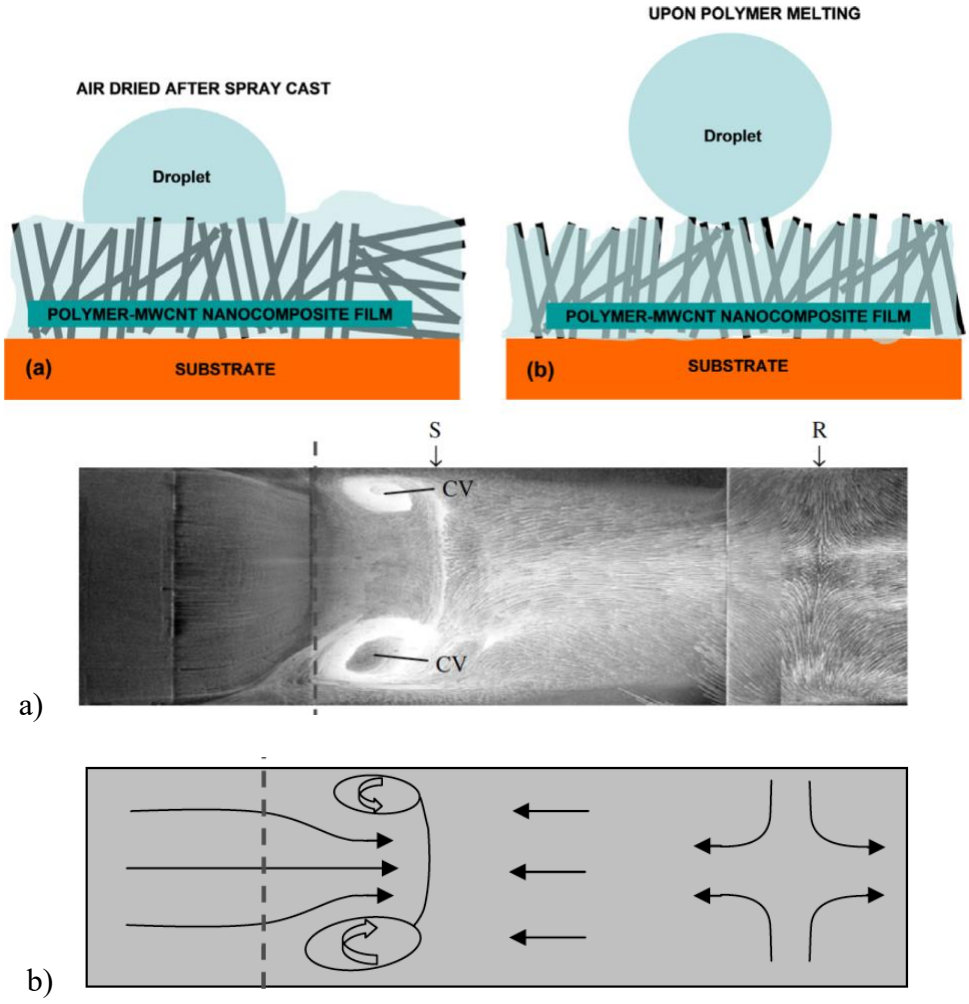
For font style, be consistent for all figures and all parts of each figure (axes labels, legend, numbers, etc.) I suggest either Times or a sans-serif font as in Ariel. Always use a symbol (e.g., β) when labeling the axis of a figure and use the word definition (e.g., efficiency factor) in the figure caption. See Fig. 1 for a good and a bad example of this.

MULTIPLE FIGURES Put multiple *related* plots together by using an a), b), c),.. format so long as they still fit on one page with the above resolution requirements of font and symbols size. Use one figure caption (written in sentence form) for the entire figure set with all the common aspects first, followed by the unique aspects of each part of the figure. For example:

Figure 1. Comparison of numerical results for the radial particle concentration of an axisymmetric jet to the data of Yuu *et al.*[1] for: a) the DRW model where the drift of MacInnes & Bracco[3] is utilized, and b) the CRW model.

SCHEMATICS of FACILTIES, PHYSICS OR FLOWS

When possible try to have a simple schematic coupled with a photograph for experimental setups or flow visualization (see below examples)



TABLES

Captions are above for tables (are below for figures) with symbols (h) in the table cells and text descriptions in the captions. Any footnotes, can be placed below, e.g.

Table 1 Summary of standard deviation (in mm) from the mean shock position for all ramped-vane (RV) and split-ramp (SR) cases tested.[a]

VG	h, mm	$15\delta_o$	$25\delta_o$	$35\delta_o$
RV	2	2.36	2.85	2.41
RV	3	2.41	2.99	2.49
RV	4	2.83	2.02	2.63
SR	3	2.79	2.85	2.32
SR	4	3.09	3.73	2.38

[a]The standard deviation for the baseline case is 2.50.

FINAL NOTES

1) Note that units for variables in tables or figures should have a comma but not a period, e.g. "*h*, mm" for height, given in millimeters.
2) Watch the number of "significant figures." Numbers like 52294.87695 probably have a too many significant figures unless this is consistent with prediction or experimental accuracy!
3) Make figures and tables clear, powerful and concise. This makes them more effective for old people (who may have poor vision and limited time) but are often in supervisory or funding-level positions!

Center all figures, tables, figure captions, and table titles.

APPENDIX B: Text and Grammar Notes

Text Spacing and Format: Generally, double-space all text and indent all paragraphs, but no extra line space between paragraphs. Add an extra line before and after any equations or tables. Include page numbers at bottom centered. Always define any acronyms, e.g., "Computational Fluid Dynamics (CFD)" the first time it is used in the text. When referring to a specific figure in the text, capitalize and abbreviated the word figure, e.g., "as shown by Fig. 5 as well as Figs. 6-10". Same with the word reference, e.g., "as found by Refc. 5 as well as Refcs. 6-10."

Text Tense: Use past tense for work that was done (i.e. "The grid was constructed using …") and present tense for aspects that will never change (i.e. "This figure shows….", "This geometry exhibits high performance…" or "This is the first study to investigate…"). Roughly following these guidelines, tense generally is based on section as follows

1. Abstract (**mixed tense**; since it is an overview of *all* the below sections)
2. Introduction
    - 2.1 Motivation of Work: **present tense**
    - 2.2 Previous Studies: **past tense**
    - 2.3 Objective of Work: **present tense**
3. Methods **past tense on what was done/chosen; present tense on what still exits**
4. Results **present tense, except for qctions completed, e.g., "FFT was performed to"**
    - 5.1 Conclusions **present tense , except for , e.g. "FFT was performed to"**
    - 5.2 Recommendations **future tense, e.g., "FFT should be performed to"**

Numbers and Units:

For a number without units, use text if less than ten, e.g., "six airfoils were used for 23 conditions." Values with units in text or captions should have a space before the unit but not a period after the unit, e.g. "5 m/s" for five meters (not 5m/s).

Since you are using a space, avoid line breaks between values and the units, e.g., "mass of 1504 kg" has an awkward break. Use commas if more than 4 digits, e.g., "150,505" vs. "150505".

Style Points:

1) Avoid significant use of personal pronouns, such as: "I" and "we"
2) Use precise and scientific language (avoid conversational phrases)
3) Avoid vague words such as: "seems", "very", "really", "actually", etc.
4) Sentences longer than three lines of text are too long.
5) Do not start a sentence with "This is . . ." and instead say "This code is . . ." , especially if you mentioned several things in the sentence before!
6) Do not start a sentence with a number (5), a variable (*D*) or an abbreviation "Refc."
7) Note that "affect" is a verb while "effect" is a noun, e.g. "The effect of staring at a computer screen is eyestrain and this may affect your vision."
8) Data is a plural and datum is singular, but datum is rarely used
9) Avoid contractions, e.g. e.g. use "do not" rather than "don't"
10) Stay consistent when choosing passive or active voice. Most journals prefer passive.

Punctuation Points*:

1) Place a comma before the "and" in a series, e.g., "drag, lift, and moment."
2) Hyphens should be used to connect an adjective to a noun, not a noun to a noun, e.g. "full-scale airfoil" is OK but "velocity-distributions" is not.
3) Separate sentences with two spaces. For example, see spacing in published version of Applied Physics Letters and AIAA Journal.

*a pun on punctuation ☺