

## General Guidelines For Technical Writing

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1. Avoid passive voice: *The rocket has wings to produce lift* rather than ***It was decided that the rocket would have wings to produce lift.***  
Whenever you use the word “it” make sure that it refers to an object.
2. Avoid beginning sentences with unnecessary clauses: *The rocket has wings to produce lift* rather than *In order to produce lift, the rocket has wings.*
3. Avoid “dead wood:” *The overlap area depends on spacecraft separation* rather than *The overlap area is **obviously dependent** on the **amount of** separation between spacecraft.*
4. Use past tense to describe what others did in the past. Use present tense to describe what you did in the project. Use future tense to describe what will be done by others (or you) in the future. *Cassady and Kid<sup>1</sup> **made** several contributions to South American security. The engine mass **is computed** using a spreadsheet, which **is based** on formulas **developed** by Olds<sup>2</sup>. The launch vehicle system **will be** based at Vandenburg Air Force Base.*
5. Use parallel lists. *Batteries must be able to store adequate energy, withstand temperature extremes, and meet weight constraints* rather than *Batteries must be able to store adequate energy, withstand temperature extremes, and weight constraints must be satisfied.*
6. Avoid use of vague adjectives, especially *very, quite, highly, etc.* The statement *The system is **very complex*** conveys no more information than *The system is **complex**.*
7. Avoid splitting infinitives: *The algorithm is intended **to determine** the attitude **accurately*** rather than *The algorithm is intended **to accurately determine** the attitude.*
8. Watch for subject-verb disagreement, especially in long sentences where there’s a lot of real estate between the subject and the verb: *The **engines**, which were initially developed for the first stage of a multi-stage launch vehicle, **achieve** nearly 98% of the theoretical maximum performance* rather than *The **engines**, which were initially developed for the first stage of a multi-stage launch vehicle, **achieves** nearly 98% of the theoretical maximum.* The common mistake here is to think that “vehicle” is the subject of “achieves,” whereas “engines” is the subject.
9. Use a colon to introduce a list or after a complete sentence leading to an equation.  
*Two formations were considered: a master-slave scenario, and a constant-time separation scenario.*  
*The angle can be calculated using the law of cosines:*  
[equation]
10. Use the correct form of *affect* and *effect*. Usually *affect* is a verb and *effect* is a noun.  
Examples:  
*The tether **affects** the communications system.*  
*The **effect** of the tether is to connect the two spacecraft.*  
*The tether **effects** a stabilizing mechanism for the interferometer.* [this usage of effect as a verb is less common than its usage as a noun]

11. Use a semicolon to separate two complete statements combined in one sentence or to separate items in a list.

*The preferred configuration is the leader-follower configuration; however, the same-ground-track configuration is also useful.*

*There are five modes of operation in an RBCC engine: the initial rocket mode at takeoff; the injector mode to entrain air for use as additional oxidizer for the rocket engine; the ramjet mode wherein all of the oxidizer is taken from the atmosphere; the scramjet mode, which also uses atmospheric oxygen; and the final rocket mode which begins where the atmosphere is too thin for continued scramjet operation.*

12. Be careful with placement of modifiers.

*The results are **rotated using an appropriate rotation matrix** after the application of the trigonometric identities rather than *The results are rotated* after the application of the trigonometric identities **using an appropriate rotation matrix**.*

The problem here is that the phrase “using an appropriate rotation matrix” is associated with the object “application of the trigonometric identities” rather than with the verb “are rotated.” This is called a “misplaced modifier.”

13. Chapters should be organized with a consistent structure. Every chapter should include an unnumbered section of “introductory paragraph” introducing the chapter’s subject and ending with an outline of the chapter. Every chapter (except the last chapter) should conclude with a numbered Summary section providing a summary and a transition to the next chapter. Here is one possible structure for the first chapter:

(unnumbered) Introductory paragraphs: basic facts, applications, limitations, outline or overview of chapter

1.1 Problem Statement (a brief paragraph describing the problem that your thesis attacks)

1.2 Related Work (a brief literature review of the papers that most closely deal with the problem)

1.3 Approach and Results (a brief discussion of the techniques used in your work and the results you obtain)

1.4 Outline of the Report (including appendices)

14. Each figure in the report should have a caption and a figure number (below the figure, numbered 1 through N in order of appearance in the report). The caption should have a short part and possibly a longer description. The short part is what appears in the List of Figures. The use of “Title Case” and “Sentence case” are both acceptable, but the usage should be consistent throughout. When referring to a figure, describe the plot or diagram as if you were describing it to someone who cannot see the figure.

15. Each table in the report should have a caption and a table number (above the table, numbered 1 through N in order of appearance in the report). Tables should be as simple as possible. I prefer the “Simple1” style in Word rather than the default style that has horizontal and vertical lines between every “cell” of the table. The caption should have a short part and possibly a longer description. The short part is what appears in the List of Tables.

Table 1. Typical Temperature Ranges for Selected Spacecraft Components. Adapted from Table 11-40 of Ref. 1

<i>Components</i>	<i>Typical Temperature Range, °C</i>
Electronics	0 to 40
Batteries	5 to 20

16. Whereas vs while: “While” implies a simultaneous relationship between two events, whereas “whereas” implies a contrast. *Nero fiddled **while** Rome burned. Spin-stabilized satellites use gyroscopic effects for stabilization **whereas** gravity-gradient stabilized satellites use the passive torque caused by the gravitational field’s gradient.*
17. Numbering and references to numbers should be consistent. Generally, use App. A to refer to an appendix, Ch. 1 to refer to a chapter, Eq. (1) to refer to an equation, Fig. 1 to refer to a figure, p. 1 to refer to a page number, Ref. 1 to cite a bibliographic reference (also common to use a superscript<sup>1</sup>), § 1-1 to refer to a section, and Table 1 to refer to a table. For plural, use Apps. A–C, Chs. 1–4, Eqs. (1–3), Figs. 1–5, pp. 1–8, Refs. 1–11 (or with superscripts<sup>1–11</sup>), §§ 1-1–1-4, and Tables 1–3. The main thing is to be consistent!
18. Avoid beginning a sentence with a symbol or abbreviation. Examples:  
*The Lagrangian point L4 corresponds to a stable orbit* rather than *L4 is a stable Lagrangian point.*  
*Figure 1 illustrates a typical trajectory* rather than *Fig. 1 illustrates a typical trajectory.*
19. When using numbers such as 0.01, always use a leading zero. Reproductions of documents sometimes don’t make the decimal clearly visible.
20. When using numbers like  $1.0 \times 10^{-6}$ , don’t use the letter “x” for “times.” Use the appropriate symbol. Under no circumstances should you use “1e-6”.
21. Never end a section with an equation. Add some discussion of the equation and transition to the next section.
22. Don’t use “this” as the subject of a sentence or as a noun in general. Be specific. Example: *This alternative is feasible* rather than *This is feasible.*
23. Don’t let lines break between a number and its units. For example, you don’t want a line break between “1000” and “km”. Most word-processing software allows you to put an unbreakable non-printing space between two words. In Word, use CTRL-SHIFT-SPACE. In LaTeX, use a tilde (~).
24. The word *data* is plural. *The data were taken* instead of *The data was taken.*
25. “its vs it’s”. “Its” is possessive: “we calculated its moments of inertia” “It’s” is a contraction of “it is”.
26. Feel vs think. *We think that this alternative is more effective than the others* instead of *We feel that this alternative is more effective than the others.*
27. Avoid possessiveness. *The remote manipulator is an efficient mechanism* rather than *Our remote manipulator is an efficient mechanism.*
28. Refer to equation numbers only *after* the equation appears.

## Editorial Abbreviations:

awk Awkward. This has been used as a means to communicate that used phrasing is deemed awkward and should be reworded in order to negate its awkwardness.

c.s. Comma Splice (or run-on sentence). Example:

*The spacecraft requires 1 kW of power during eclipse, a large battery is needed.*

dw Dead Wood. Examples: *because* instead of *in view of the fact that*; *because* instead of *due to the fact that*; *like* instead of *along the lines of*

mm Misplaced Modifier. Example:

*The spacecraft has a gallium arsenide solar panel on an articulated appendage* rather than *The spacecraft has a solar panel on an articulated appendage that uses gallium arsenide.*

NaS. Not a Sentence. (aka Sentence Fragment. A very bad thing.)

p.v. Passive Voice. It is generally not a good idea to write passively vs Writing actively is generally a better idea.

prep. Preposition ending a sentence. Avoid it. *What were you thinking of?*

s.i. Split Infinitive. Example: “to boldly go” should be “to go boldly”

s-v Subject-Verb Disagreement: Example: “The rockets that will be launched from the site is very large.” should be “The rockets that will be launched from the site are large.”

sp. Spelling Error.

w.c. Word Choice. Example: “Microelectronic mechanical devices are teensy.” Should be “Microelectronic mechanical devices are small.” Even better would be to write “The smallest features of microelectronic mechanical devices are typically on the order of microns.”

¶ Paragraph. Usually means *start a new ¶ here.*

§ Section. Usually means *start a new § here.*