Writing Technical Reports —

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Author's Note: These dogmas were first scribbled down at the request of a colleague. They are the result of 27 years of struggling with technical reports—my own and others—first at Wheeler Laboratories and currently at the MITRE Corporation. Experience has convinced me that when an engineer is under pressure to produce a report, he wants specifics, not generalities; a law, not a lecture. And that's what he gets here.

THE TITLE

1) Write down every word that applies to the topic.

2) Select a minimum number, based on the following objectives.

a) Convey the essence (general area, specific feature, nature of the work done). Don't strive for absolute accuracy; just don't be inaccurate.

b) Make sure the report is retrievable. Think about typical filing categories.

3) Don't claim the world. The chances are that someone else has already treated the subject.

4) Arrange the words attractively. Avoid a jaw-breaking series of nouns and adjectives. Try a few prepositions instead. (This suggestion applies throughout the report.)

5) This process works best for me when I do it on a blackboard.

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THE OUTLINE

1) Start with an outline. Fight off the temptation to start drafting without one. Or, if you've already started without one, go back and reconstruct it as soon as you find yourself in trouble.

2) You'll do better with two outlines: one brief, one detailed.

3) The first one should have just main section headings. It really matters whether it makes good sense, so expose it to a tough critic early in the game. Nothing is more frustrating than to find yourself coming down the home stretch and wishing you'd thought to structure the whole report differently. (Have you ever considered outlining the final report your first day on the job? It could change your entire approach.)

4) The second outline fleshes out the first, getting the gist down by using phrases for paragraphs and words for sentences. You'll find it's much easier to sequence these notations than it is to cut, paste, and rework draft material. It makes a good place for reminders, too; mark the figures and tables right on

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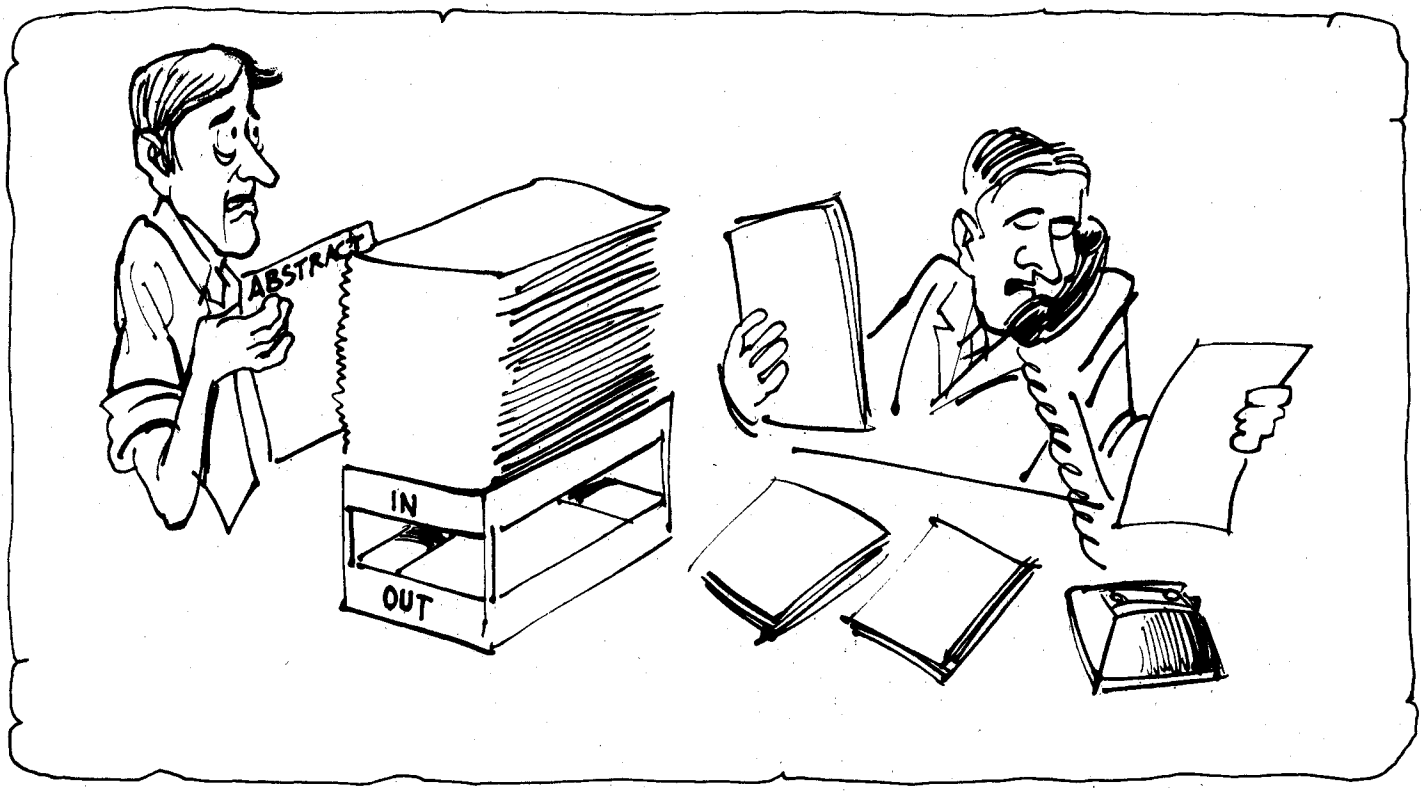


it. This detailed outline will be especially valuable if your writing process has to be interrupted.

5) Don't throw either outline away until the report issues.

THE ABSTRACT

1) Think of the abstract as a substitute for the report for a busy reader. Tell him as much as you reasonably can.

2) As a logical consequence of 1), the abstract should never begin with the words, "This report . . . "

3) The length of the abstract should be proportional to the length of the report, but never less than three sentences nor more than a full page.

4) The first sentence should expand the report title to include all the words you managed to delete.

5) The next sentence should state *why* the work was done, in case the first sentence didn't.

6) From here on it's free style, but it's essential to tell the reader what you did, where it fits in, and what contribution it makes, plus the most significant product if it can be briefly stated. This all *can* be covered in the space prescribed.

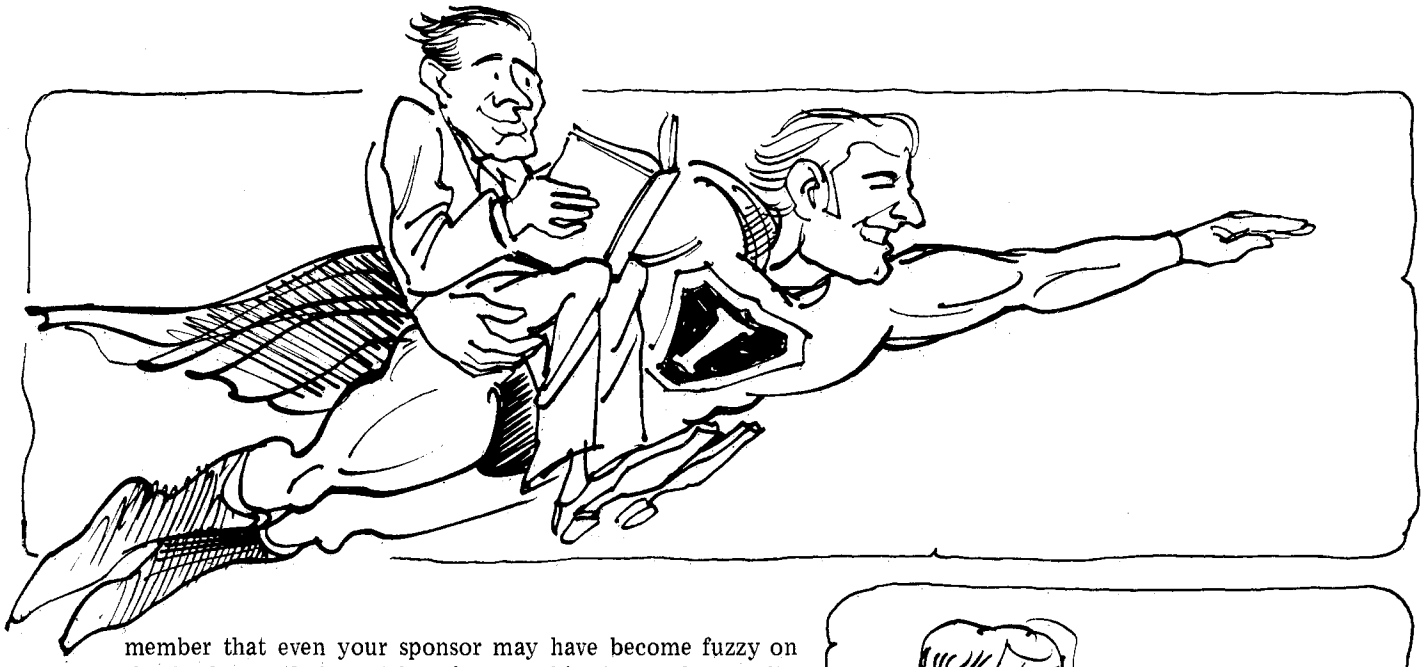
7) Whatever you do, make the abstract attractive. Aside from the title, here's your best chance to attract readers. Mention related applications of your work, or hint at them; you never know what you might trigger.

THE INTRODUCTION

1) This is *not* a substitute for the report, and so should not echo the abstract. Presumably, the reader has by now decided to read the report.

2) The Introduction *may* open with the words, "This report . . . ," but there is usually a more attractive way to lead off.

3) Here's the place for context, relation to prior work, general objective, and approach. (Even if you didn't have a systematic approach, invent one for the reader's benefit; he'll find it easier to absorb your ideas.) Don't be cryptic. Re-



member that even your sponsor may have become fuzzy on the background, lost sight of your objective, and even dis-remembered the key words. Surely the casual reader needs orientation.

4) Your chances of carrying the reader along on your train of thought will improve if you not only tell him what's in subsequent sections but outline the logical flow.

5) If the introduction runs beyond two pages, consider breaking out the substantive parts into additional sections.

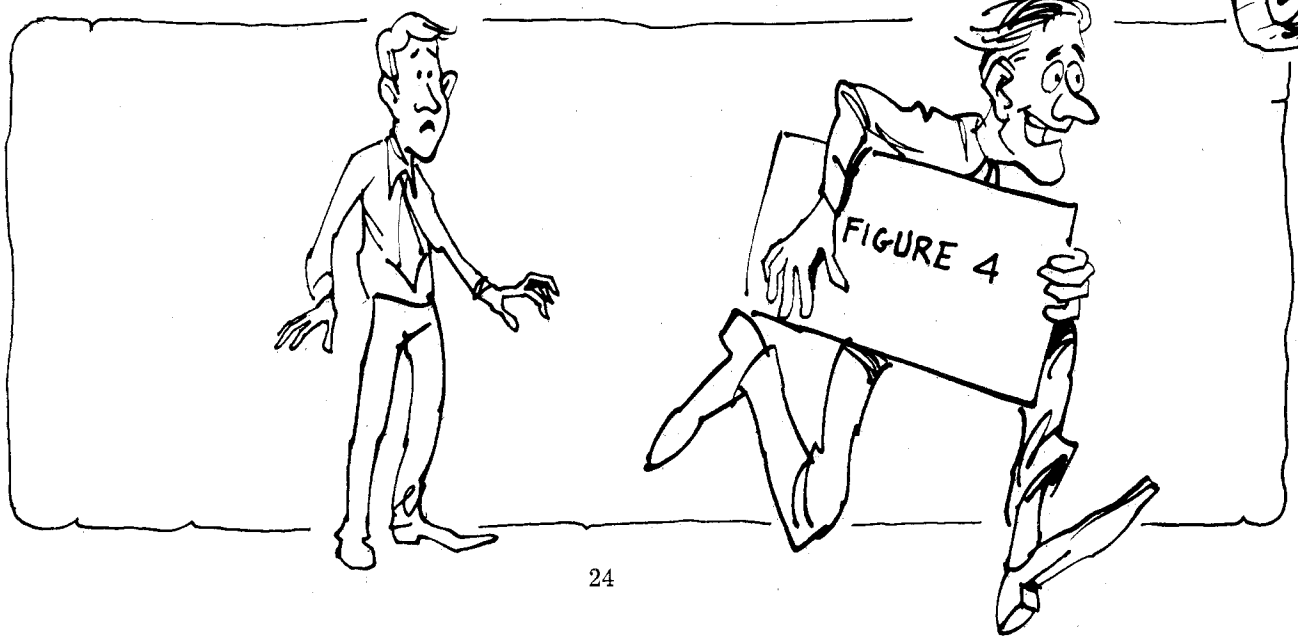
THE BODY

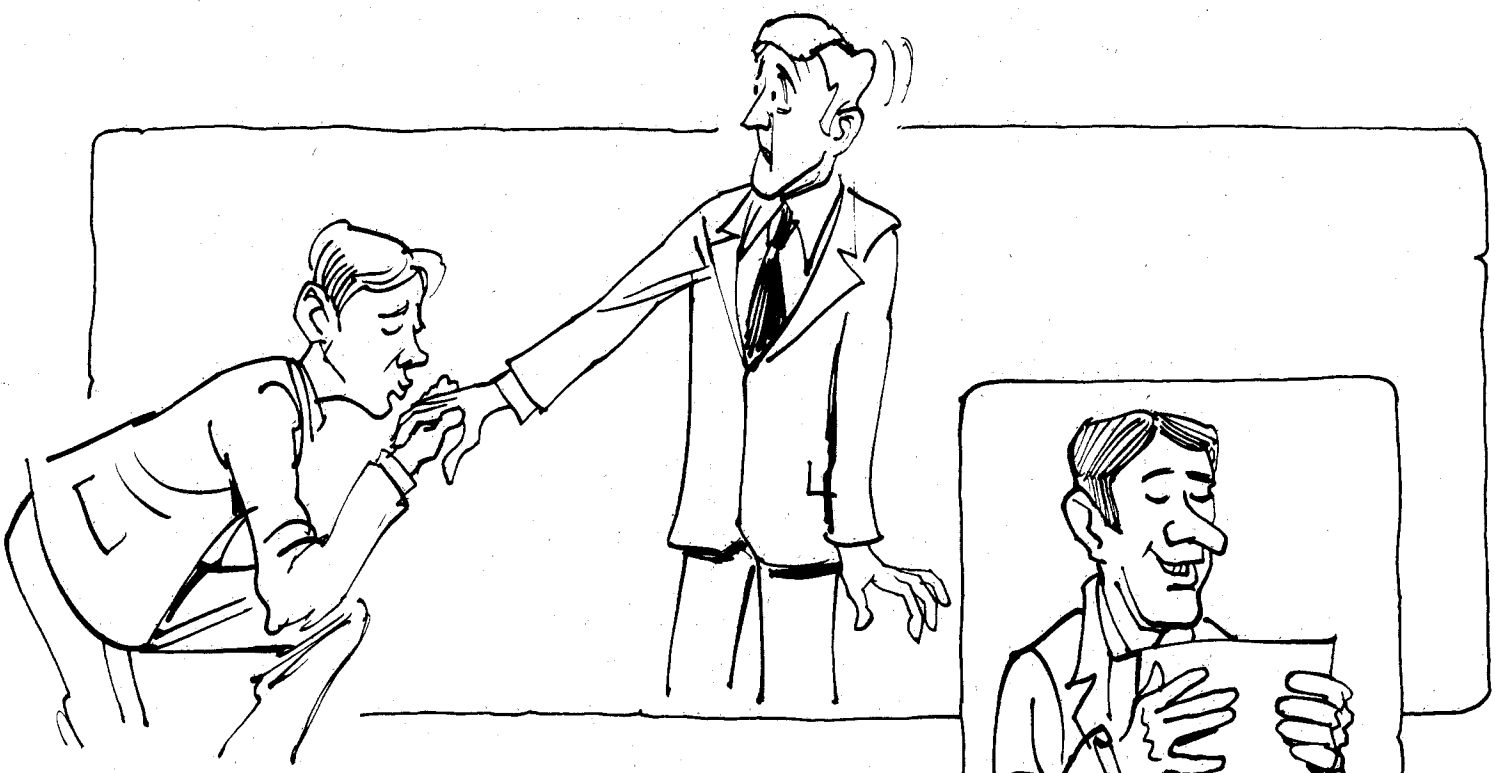
1) Here's where every engineer does his best work. He's on home territory, and communicates well. Here are a few hints.

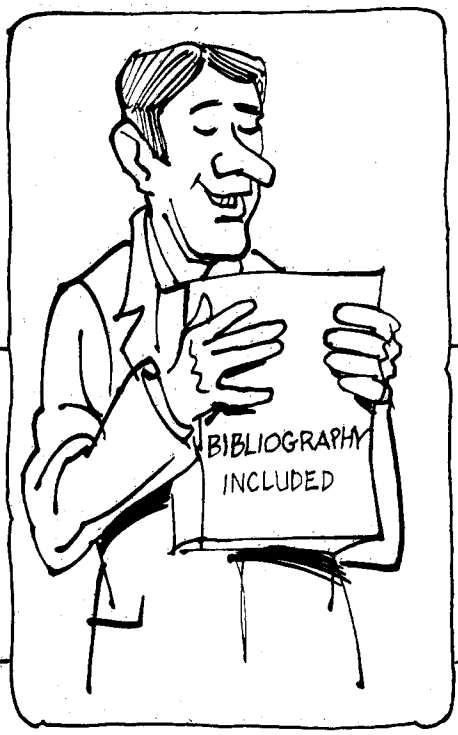
2) Hold back on referring to a figure/table until you've told the reader whatever he should look for. Once you hand him the number, he's gone, and you may never get him back to explain further. Whatever you do, *never* start a paragraph with a figure/table number.

3) Don't expect the typist to improve your product. It won't happen. You have to do your own spelling and punctuating.

4) Along with the Acknowledgments and Reference worksheets, start a style sheet at the outset, where you list special words and definitions with exact form and spelling. In that way you'll have a better chance of achieving consistent usage. And here's one place where the typist can help you—that style







sheet will be a boon in final typing. This technique is especially important in the case of multiple volumes and/or multiple authors.

5) The more care you take in structuring paragraphs, introducing your ideas, transitioning logically, etc., the better your chances of holding the reader.

FIGURES AND TABLES

1) Every reader I've talked with prefers that each figure/table immediately follow the first reference to it in the text or (ideally) face the corresponding text.

2) Put figures/tables on pages separate from the text, otherwise retyping or repaging may create a painful dilemma.

3) Make the figure/table first, and write the text with the figure/table lying in front of you. Be sure you use the same words, and be sure you don't say the figure/table indicates something that it doesn't.

4) Put the figure/table number beside its title, and put all the titles in a standard location so that the reader can locate them instantly.

ACKNOWLEDGMENTS

1) Here's an unparalleled opportunity to solidify relationships, win friends, and enlist advocates.

2) At the first realization that you are going to write a report, label a sheet of paper "Acknowledgments" and start keeping notes. You'll be amazed at the substantial or marginal help you received and want to acknowledge.

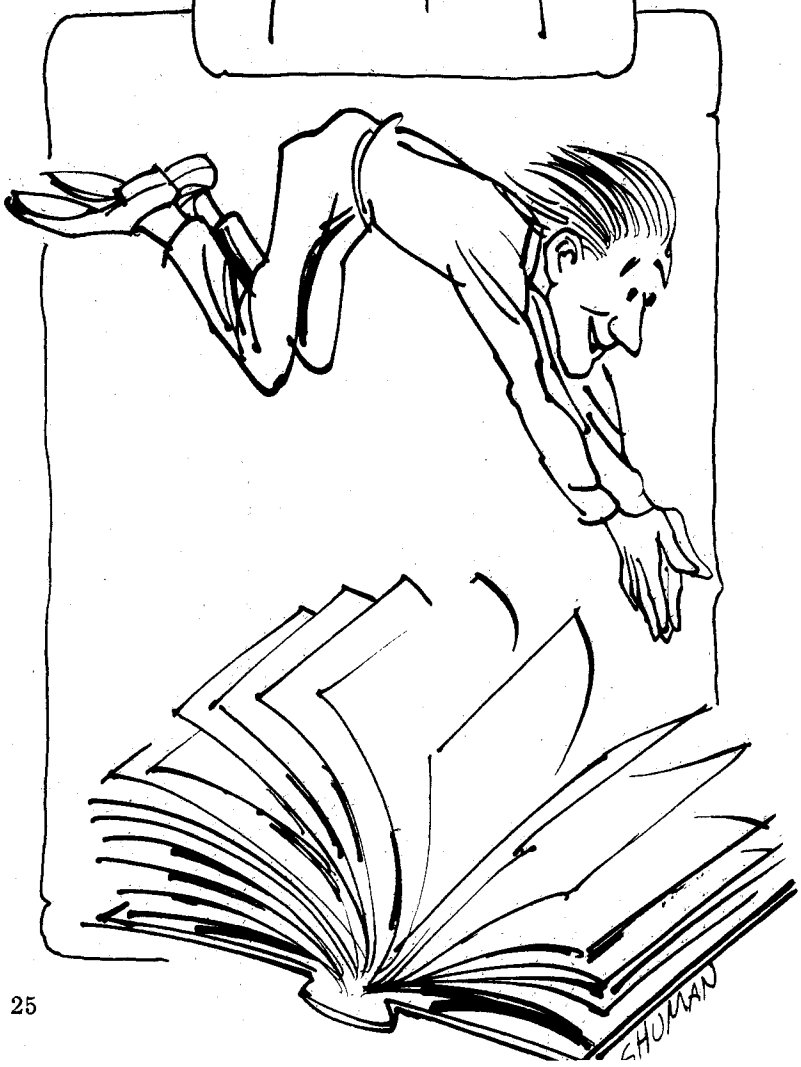
3) Follow this sequence: a) your sponsor; b) outside sources (companies or agencies); c) other departments; and d) your co-workers.

4) Avoid cliches such as "without whose help . . . ." Be specific, or keep it simple.

5) Never acknowledge secretarial support unless it's obviously critical to the format, or some special case. The reader will be turned off.

REFERENCES

1) Various formats have been developed to make retrieval easy. Pick one you like, and *stick to it.* Be sure it includes author, date, classification.



2) Decide on a sequence. I prefer to list them in the order in which they occur in the text. An alternative is chronological, which shows the scholarly reader that you've done your homework. If you can make the two coincide, all the better.

3) Some editors prefer that references be shown in the text as footnotes. However, that practice reduces your flexibility and introduces typing problems. It's safest to show them as superscripts or as "(Reference *N*)."

4) As with Acknowledgments, start a list of references at the outset of work. You'll be surprised how many you use.

5) Consider a separate bibliography of related reading. It adds extra value to the document and therefore increases the likelihood that the reader will retain it.

THE ENDING

Don't stop when you've once presented your message. Think carefully as to how you wish to end your report. Remember that there are some readers who jump directly to the final pages. And every reader wants a crisp review that wraps up what he's read and that confirms the impression he's already drawn. The structuring of Results, Conclusions, and Recommendations is generally governed by the work content, and so there's no universal formula. However, there's one suggestion I'd like to offer.

When all is done and ready to go to the printer, reread the very last sentence and ask yourself whether it leaves the reader with the impression you want him to carry away. □

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