Chapter 1—Stages of Report Preparation

Research information has limited value unless it is collected and published in a usable form and presented to those who may apply it. For these reasons never assume that your job is finished when the experimental or analytical phase has been completed. It is also your responsibility as an engineer or scientist to show promptly that your results are worthwhile and that you have reason to believe the field will be advanced by your efforts. The only way to convey these thoughts is by writing a good report.

The five major stages of report preparation are

1. [Gathering](http://grcpublishing.grc.nasa.gov/editing/CHP1.CFM#Gathering) the data (or developing the theory)
2. [Analyzing](http://grcpublishing.grc.nasa.gov/editing/CHP1.CFM#Analyzing) and sorting the results
3. [Outlining](http://grcpublishing.grc.nasa.gov/editing/CHP1.CFM#Outlining) the report
4. [Writing](http://grcpublishing.grc.nasa.gov/editing/CHP1.CFM#Writing) the rough draft
5. [Revising](http://grcpublishing.grc.nasa.gov/editing/CHP1.CFM#Revising) the rough draft

**Gathering the Data**

Report preparation begins with planning the research program. An orderly investigation is a requisite for an orderly report. Report planning and program planning should be considered one and the same. To become a successful technical writer, you should develop the ability to foresee the general content of the report before the program begins. In most cases you should be able to prepare a preliminary report outline at the beginning of the program. Outlining should benefit both the report and the program, for obviously a well-prepared outline requires a carefully planned program.

During the course of the program keep the future report in mind. Maintain orderly records as the data are gathered. The little extra time required to record the results carefully can be of great value later. Report writing is difficult enough without having to recollect misplaced or unrecorded data. Write out your opinions as soon as the data are obtained. Comparing these opinions with those based on hindsight will often help you to interpret the data properly.

During the data-gathering stage consider how the data should be presented in the report and record the results in this manner. Any need for additional data will thus be revealed before the program is completed.

**Analyzing and Sorting the Results**

The second stage of report preparation, data analysis and sorting, is probably the most difficult because it requires considerable mental effort to decide what you want to tell your readers. The beginning of this stage overlaps the data-gathering stage, for data analysis should begin as the data are collected. But the bulk of data analysis must be done near completion of the program. At this time reexamine the pertinent data and review your earlier opinions with respect to subsequent results.

During this data review the program conclusions should be drawn. This is the most important step in report preparation because the conclusions are the reason for the report and the basis for report preparation: They dictate what to include in a report and how to organize it. Trying to organize and write a report without knowing the conclusions is like starting an automobile trip without knowing the destination. You will not know where you are going, and you will never know when you get far enough to stop. Therefore choose your report destination early by drawing and clearly defining the program conclusions before you begin to organize and write the report. This is best done by first writing down all significant results in no particular order and then sorting them so that the results pertaining to a common factor are grouped together. Once the conclusions are drawn, list them in descending order of importance.

Selection of the data to be used in the report is another important part of this step. Choose only the data necessary to help your readers reach the conclusions you are drawing. Excessive data or data only loosely related to the conclusions will obscure them and confuse your readers. Of course, do not hide contradictory results. When definite contradictions exist, clearly alert your readers to this fact.

The next step in data analysis involves organizing the selected data into illustrations for the report. Sometimes the figures and tables prepared during the program can be used with only minor modifications. But usually these data-book illustrations contain extraneous information. And they seldom are arranged to emphasize the significance of the data and the corresponding results. For example, although data tabulated during a program are commonly arranged chronologically, that is not necessarily the best way to present the data to the reader.

New figures and tables usually must be prepared. Their organization should be carefully considered because illustrations are one of the best means of emphasizing and supporting conclusions.

After the illustrations have been prepared, write the significant points about each on an attached sheet of paper. What is the figure (table) supposed to show? How were the data obtained? Are there any qualifications to the figure (table)? This information will be useful when you begin writing the report.

Before beginning to outline your report you may find one additional step useful—writing a limiting sentence. This is a single sentence that states the subject, scope, and purpose of the report. It is an additional tool to help define the report's direction and limit its scope. As an example, the following limiting sentence could be written for this guide:

|  |  |
| --- | --- |
| SUBJECT |   The Glenn Research Center guide “Technical Report Writing” |
| SCOPE |   covering the fundamentals of organizing, writing, and reviewing NASA technical reports, |
| PURPOSE |   was written to improve the writing skills of Glenn technical authors and the overall quality of their reports. |

Preparing a limiting sentence is not simple. It takes additional time and effort. But it is a worthwhile exercise because it forces you to focus your attention on exactly what you expect the report to do.

**Outlining the Report**

Outlining is a necessary preliminary step to report writing. It involves the planning needed to prepare a clear report that is logically organized, concise, and easy to read. Without an outline most inexperienced authors write reports that are confusing and difficult to follow. The outlining stage is a natural progression from the analysis and sorting stage. In the sorting stage concentration is on what results should be presented in a report. In the outlining stage attention is directed to *how* these results should be presented.

Often the preliminary outline prepared at the beginning of the program can be used as a starting point for the report outline. But it should be revised and expanded to emphasize the conclusions drawn in the analysis and sorting stage. The revised outline should contain descriptive headings of each significant part of the report. This expanded outline should show the complete scope of the report, the relation of the various parts of the work discussed, the amount of space to be given each part, the order of treatment, the places for inclusion of illustrations, and the conclusions. Remember, the more detailed the outline is, the more useful it will be to you. Each heading, subheading, subsubheading, etc., should have as much detail as you will need to trigger your thoughts when you later write the corresponding sentences and paragraphs.

NASA reports typically contain a number of commonly used headings:

* [Summary](http://grcpublishing.grc.nasa.gov/Editing/chp6.CFM#sum)
* [Introduction](http://grcpublishing.grc.nasa.gov/Editing/chp3.CFM)
* [Symbols](http://grcpublishing.grc.nasa.gov/Editing/chp4.CFM#sym)
* Theory
* [Analysis](http://grcpublishing.grc.nasa.gov/Editing/chp4.CFM)
* [Apparatus](http://grcpublishing.grc.nasa.gov/Editing/chp4.CFM#format)
* [Test Specimens](http://grcpublishing.grc.nasa.gov/Editing/chp4.CFM#format)
* [Test Procedure](http://grcpublishing.grc.nasa.gov/Editing/chp4.CFM#format)
* Sample Calculation
* [Results and Discussion](http://grcpublishing.grc.nasa.gov/Editing/chp5.CFM)
* [Summary of Results](http://grcpublishing.grc.nasa.gov/Editing/chp6.CFM#concl)
* [Conclusions](http://grcpublishing.grc.nasa.gov/Editing/chp6.CFM#concl)
* [Concluding Remarks](http://grcpublishing.grc.nasa.gov/Editing/chp6.CFM#concl)
* [Appendix](http://grcpublishing.grc.nasa.gov/Editing/chp6.CFM#apps)
* [References](http://grcpublishing.grc.nasa.gov/Editing/chp6.CFM#refs)

All these headings need not be used in any single report. And headings may be combined. For example, Apparatus, Test Specimens, and Test Procedure can be combined into Experimental Methods.

These commonly used headings may be replaced with more descriptive headings, particularly in program summary reports, where details may be subordinated to broad objectives and generalizations. In these reports the more descriptive headings provide a means of ready reference and aid clarity. Descriptive headings usually make a report more interesting to read. But you must exercise originality to make them brief but clear.

The final outline should show the exact form, wording, and value of the headings to be used in the report. The headings, although brief, must serve as a reliable guide to the included material. They should be consistent in grammatical structure and should not contain verbs. Headings are not an integral part of the text but are provided to assist the reader in finding information. Therefore the paragraph below a heading should begin with a topic sentence that does not depend on the heading for clarity.

The whole text of the report should be accounted for under the headings shown in your outline, except for short introductory or transition paragraphs included to make the presentation flow smoothly. Because a subject cannot be subdivided into less than two parts, an outline should have at least two subheadings under a main heading—or none. Exceptions to this rule include an occasional short remark or a single example put in to illustrate a method. In addition to headings the outline may also contain descriptive words and key phrases to serve as reminders.

Several methods can be used to arrange the subject matter that will be represented in an outline. One of the best ways to start is to write down all the points that you want to include without regard to their order. You can then more easily arrange them in a logical order. Some authors use an index card system in which each separate item of the proposed report is tabulated together with a paragraph describing the material that must be treated under that item. Other authors follow a similar method but use full sheets of paper for each subject and give a much fuller description of the material under the subject headings. The latter method puts you in a good position to complete the report in a short time: Each subject has been so fully expanded that the problem remaining is one of combining and rewriting the information contained on the separate sheets of paper. Others choose to do their outlining on a computer. Any of these methods permit you to note thoughts that occur during the course of writing one report section but that should be treated in other sections. Cultivate the habit of going to the original outline to record thoughts for later consideration.

Another useful purpose of the outline is to indicate the relative importance of headings. This relation can be shown by using a numbering system. (The numbers appear in the final report only when there is extensive cross-referencing.) Headings of equal weight, or importance, must be written in the same form. The order and form of the various headings used in NASA reports are

**Main Heading**

**Subheading**

***Run-in heading***.—This heading is indented on the same line as the first line of the paragraph.

*Below run-in heading:* This heading is indented on the same line as the first line of the paragraph.

Three levels of headings should be sufficient; more may disrupt your readers' concentration. The typeface and placement of headings will vary with the type of publication.

Thorough outlining will make both writing and reading the report easier. Study your outline carefully to be certain that each item blends into a logical plan and ordered presentation.

**Writing the Rough Draft**

With a logically organized outline and the necessary illustrations already prepared, writing the rough draft should be much easier than you thought. But do not expect to write the final version in the first attempt. The rough draft should be the last of several versions, each an improvement of the preceding one. This final version is considered a "rough" draft because it still must go through a series of technical and editorial reviews. But it should be as polished as you can make it. From your point of view it should be ready for printing and distribution to a critical audience.

Try to start writing the first version of the draft immediately after completing the outline while the ideas developed there are still fresh in your mind. Write this first version as rapidly as possible. Concentrate on *what* you want to say rather than how to say it. Keep writing down the thoughts as they flow into your mind, following your outline. Avoid going back over what you have written until you are through writing. Then review this version—but only for its technical content. Are all of the ideas you wanted to express included? Have you included irrelevant ideas? Does the report organization still seem logical? Sometimes writing the first version will reveal some unexpected problems that require a change in the outline.

In the second version of the rough draft, writing style becomes important. With the technical content in a well-organized form from the first version, this is the time to concentrate on how you say it. Keep your readers in mind. Remember, your purpose in writing the report is to transmit the information needed to support your conclusions. To make sure your readers understand your conclusions, you must transmit your information clearly, logically, concisely, honestly, and tactfully.

**Revising the Rough Draft**

The last stage of report preparation, rough-draft revision, is just as important as the previous stages, but it is the one most scorned by inexperienced writers. Revising a draft is comparable to painting a house: the appearance is improved without influencing the structure. But a report's "appearance" (readability) may determine whether or not it is read.

Before you can revise your rough draft, you must recognize that it is not perfect. Approach it with a critical attitude. This can best be done by setting the draft aside for a few days, or at least overnight. This time lag should give you a fresh viewpoint and allow you to change to the role of a reader. This change in roles is most important because you must try to see what is actually written rather than what you think you wrote.

Successful technical writers use a wide variety of methods to review and revise. One of the best involves three *separate* reviews of the report:

1. The first review is of the material in the report. In this check ask yourself these questions: Are the conclusions valid? Is sufficient information given to support the conclusions? Is enough background information given to explain the results? Have all irrelevant ideas been deleted? Are the illustrations pertinent and necessary?
2. The second review is of the mechanics and organization. Are the subject and purpose clearly stated? Does the report flow smoothly from topic to topic? Are the relations between topics clear? Is each illustration clear and properly labeled? Are all required parts of the report included?
3. The third review is of [spelling](http://grcpublishing.grc.nasa.gov/Editing/chp2.CFM#spell) and grammar (see [refs. 1 to 6](http://grcpublishing.grc.nasa.gov/Editing/chp8.CFM#ref1)), particularly punctuation (see [ref. 10](http://grcpublishing.grc.nasa.gov/Editing/chp8.CFM#ref10) and [NASA SP-7084](http://stipo.larc.nasa.gov/sp7084/)) and sentence [structure](http://grcpublishing.grc.nasa.gov/Editing/chp2.CFM). Is each sentence written effectively? Are the sentences varied in length and complexity to avoid monotony? Are the words specific rather than vague? Have all unnecessary words been deleted?

Make sure you can truly answer yes to all of these questions before you consider your draft finished. Do not try to make one review do the work of three. Trying to cover too many categories in one review usually results in oversights and errors. Some common faults observed in rough drafts are (1) faulty grammar; (2) clusters of nouns and adjectives modifying a noun and conversely [strings of prepositional phrases](http://grcpublishing.grc.nasa.gov/WordOfWeekArchive/week41.CFM) after a noun; (3) use of abstract nouns instead of [action verbs](http://grcpublishing.grc.nasa.gov/WordOfWeekArchive/week10.cfm); (4) [nonparallel construction](http://grcpublishing.grc.nasa.gov/WordOfWeekArchive/week36.cfm) of words, phrases, and sentences in enumerations; and (5) [more complicated phrasings than required](http://grcpublishing.grc.nasa.gov/WizardArchive/WIZARD8/quirks.CFM). Carefully review your draft to make sure you have avoided these common faults.

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