**Research Report Writing Best Practices**

# The Writing in Our Reports Should Reflect the Scientific Methods that We Used in Our Research (i.e., the Method is as Important as the Results)

Tracking the scientific method closely when presenting information from reports (i.e., this is the hypothesis, this is the test design, these are the test results, and here are the observations) helps to ensure that research reports present the most useful information (i.e., the data and how the research produced the data). Focusing on the data and the methodology rather than the conclusions also helps us avoid making statements that could be construed as expressions of agency policy. In addition, explicitly focusing on the data and the methodology helps us to limit the breath of our conclusions (i.e., by showing how we arrive at our conclusion, the reader can better understand what the conclusion does/does not apply).

# Limit Conclusions to Observations that are Closely Tied to the Data

Conclusions are an important part of the research output. However, our desire for meaningful conclusions needs to be balanced against our responsibility to avoid giving the impression that the agency is setting policy in the research report. Thus, avoid stating broadly applicable conclusions. Instead state conclusions that are closely tied to the data observed. For example:

* Conclusion limited to the data observed: “The dummies in Vehicle A with technology X measured less crash forces than the dummies in Vehicle A without technology X.”
* Overbroad conclusion: “Vehicles with technology X are safer than vehicles without technology X.”

Other ways of accomplishing this goal is to make sure that the writing clearly distinguishes between what is an observed fact in the research and what is a hypothesis/conjecture based on that research. Avoid simply stating opinions (unless the opinion is from a subject matter expert and the report is documenting the expert’s opinions as interview results). In addition, explaining the areas where information was insufficient to draw conclusions helps to avoid the impression that the agency is setting policy (e.g., by explaining the questions that were out of the scope of this research, etc.). Such statements help reinforce the understanding that the agency is continually refining its thinking on the subject and the research is not yet final.

# Avoid Policy-Setting Words (e.g., “must,” “need,” “require,” “propose,” “should,” “recommend,” etc.).

Such words can be misconstrued as representing agency policy choices. When we are using these words to prescribe (even if we do not intend to) rather than describe, we inadvertently convey agency policy. Thus, examine any use of words such as “must,” “need,” “require,” “propose,” “should,” “recommend,” et cetera. If we are using those words to talk about future action or to talk about something generally applicable, we are often prescribing policy rather than describing our research. However, because there are legitimate situations where these words appropriately describe what is happening in our research, we need to carefully consider the context of each use of these words. Here are two hypothetical examples:

* Descriptive use of the word “require” that is permissible: “The automated system ECU that we examined in this research *requires* sensor input from X, Y, and Z sensors to function.”
* Prescriptive use of the word “require” that is not permissible: “Automated system ECUs *require* sensor input from X, Y, and Z sensors to function.”

The first sentence is describing how the system that we looked at in our research works. It does not attach any conclusions or value judgements to that method of making the system work. However, the second sentence is not limited to the system that we examined in our research. Thus, it appears to be a generally applicable policy statement or agency opinion. While there are correct and incorrect ways to use these “policy-setting words,” it might be a good general practice to reword sentences to avoid those words altogether. For example, we could reword the descriptive sentence hypothetical example (above) as follows:

* The above descriptive sentence without the word “require”: “The automated system ECU that we examined in this research *uses* sensor input from X, Y, and Z sensors to function.”

# Sparingly Use the Passive Voice

Using the passive voice is appropriate under certain circumstances. However, our reports should do so sparingly. The passive voice emphasizes the object of a sentence rather than the subject (i.e., it deemphasizes who is doing the action to promote the thing that is the recipient of the action). For example:

* Active voice: “The researcher observed the data.”
* Passive voice: “The data was observed [by the researcher].”
* Better yet: “An examination of the data showed……” (no need to bring the “researcher” into it at all)

While this is appropriate in some circumstances, frequently obscuring the person who (or thing that) is doing the action will confuse the reader. We often like to use the passive voice to promote the importance of the data in our research reports (i.e., I don’t want to say that the researcher observed X because X is what’s important and the researcher is not important). However, doing so excessively will confuse the reader.

One easy way to solve this problem is make the data the subject of the sentence. This way we emphasize the importance of the data without leaving the reader wondering about the subject of the sentence (or confused about what’s going on). For example:

* Emphasizing the data in active voice: “The data show that X occurs when Y condition happens.”

# Prefer Shorter Sentences over Longer Sentences

Longer sentences also contribute to the reader losing track of the message we’re trying to convey. Two easy ways to mitigate reader confusion is to (1) avoid using more than one dependent clause per independent clause; and (2) be careful when writing lists within lists.

## Avoid Using More than One Dependent Clause per Independent Clause

An independent clause is a traditional, stand-alone sentence (that’s why it’s independent, it can stand on its own). In other words, it has a subject, verb, and object. A dependent clause does not have all three elements. Therefore, in order for a dependent clause to make sense, it gets coupled with an independent clause (i.e., it’s dependent on another clause in order to form a whole sentence). For example:

* Independent clause: “System A uses data from Sensor B.”
	+ The subject is “System A.”
	+ The verb is “uses.”
	+ The object is “data from Sensor B.”
* Dependent clause: “which is a camera.”
	+ There is no subject in this clause.
	+ The verb is “is.”
	+ The object is “a camera.”

For the dependent clause “which is a camera” to make sense, it needs to be paired with an independent clause. For example: “System A uses data from Sensor B, which is a camera.” However, these sentences get confusing when more than one dependent clause gets paired with one independent clause. For example:

* Too many dependent clauses for one independent clause: “System A uses data from Sensor B, which is a camera, which is pointed forward to detect on-coming traffic.”

In these types of cases, it’s clearer to simply start a new sentence and state the subject to indicate to the reader (in this case) what is pointed forward to detect on-coming traffic. Thus, the rewritten sentences would be: “System A uses data from Sensor B, which is a camera. This camera is pointed forward to detect on-coming traffic.”

## Be Careful Writing Lists within Lists

Often times we need to list a group of items in our writing. Lists are normally not a problem. But listing multiple things within one item in a list can be confusing. For example:

* Standard list: “Our data indicate that Car A is blue, Car B is green, and Car C is yellow.”
* Lists within a list: “Our data indicate that Car A is blue, Car B is green or Car C is green, Car D is yellow or white, and Car E is purple.”

The list within a list in the second bullet is confusing because there are multiple occurrences of “and” and “or” in this list. Everything is separated by commas and it is difficult to quickly discern where one item in the list ends and the next item in the list begins. Unfortunately, we need to use a “list within a list” in the second bullet because it conveys information that is much more complex than our example in the first bullet. In the second bullet, we don’t know if Car B or Car C is green. We also don’t know if Car D is yellow or white. In these situations, using different formatting can significantly enhance readability. For example:

* Numbering the list: “Our data indicate that: (1) Car A is blue; (2) Car B is green or Car C is green; (3) Car D is yellow or white; and (4) Car E is purple.”
* Using bullets: “Our data indicate that:
	+ Car A is blue;
	+ Car B is green or Car C is green;
	+ Car D is yellow or white; and
	+ Car E is purple.”

# Tell the Reader Why Your Research is Valuable in the Executive Summary

Reports should have concise executive summaries. While they should not be long (i.e., the length should be appropriate for the report), they should not be considered a straight “summary” of the parts of the report. An executive summary is an *advocacy piece* for your research. We want to convince potential readers that there is valuable information that they can take away from your work (because there is!). NHTSA’s research is unlike any other research because it is an impartial expert’s view on new and evolving automotive safety concerns. NHTSA research (on its own merits) has the ability to advance automotive safety by producing this type of information for the public.

Thus, our executive summaries should convey this importance and not be a mere list (or summary) of the parts of the research report to come. It should explain to the reader what valuable information the reader will take away once he/she finishes reading the report. If the reader could only remember three things from this report, what should those three things be? Yes, (for example) we used some method to model some crash condition and observe the result. But the important takeaway is . . . what? That information should ideally be the first part of the executive summary so that the reader knows what he/she should be looking for when reading the rest of the report.

# Simple Dos and Don’ts

While the above recommendations may apply differently depending on the situation and require a level of judgement in each instance, the following rules are more straight-forward.

* Do not state that rulemaking or a standard is necessary for any reason.
* Do not use the word “standard” by itself without explaining whether you are referencing (for example) a voluntary standard (such as SAE standard) or an agency standard (such as an FMVSS). Always clearly distinguish the two. Include the title of the standard.
* Do not bind the agency to future research (although, it is ok to *suggest potential* future research separately and directly to the COR).
* Cite all references to other research reports with as much specific information as possible. Do not cite a 300-page report for a specific finding in it. Specify the chapter, page number, figure/table number, etc. along with the report to help the reader identify the reference at its source.
* Include a “List of Acronyms” and define acronyms when you first use each acronym in the report text. Do not create acronyms excessively.
* Do not copy sections verbatim in multiple locations within the report. For example, executive summary and conclusion sections serve different purposes and they should not have the same text.
* Use tense consistently in the report. Do not switch between past, present, and future tense arbitrarily.
* Contractors cannot thank DOT personnel in NHTSA publications.
* Keep spacing after periods consistent throughout the report -- either 1 or 2 spaces, but not both.