



Guidance for Preparing Problem Statements

INTRODUCTION

The Airport Cooperative Research Program (ACRP) is an industry-driven, applied research program that develops near-term, practical solutions to problems faced by airport operators. ACRP is managed by the Transportation Research Board (TRB) of the National Academies, a private, nonprofit research institution. ACRP is sponsored by the Federal Aviation Administration (FAA). The program is governed by the ACRP Oversight Committee (AOC).

Nearly all of the research projects ACRP undertakes start as *problem statements* submitted from one or more airport industry practitioners. A problem statement is essentially a justification for funding a research idea.

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Because the program has limited funding, it is essential that these funds go to research projects that the industry believes will give the greatest benefit to airports; therefore a well-thought-out and a well-written problem statement is important. While anyone can submit a problem statement to ACRP, authors will find it helpful to have both a good understanding of the airport industry and of how ACRP conducts research.

This document provides guidance to help you turn a research idea into a good problem statement. This guidance first describes how problem statements are reviewed and selected and then helps you determine whether or not your research idea is appropriate for ACRP. Finally, the guidance provides an outline to help you prepare a problem statement that effectively communicates your research idea to maximize its chance of receiving funding.

HOW PROBLEM STATEMENTS ARE SELECTED FOR FUNDING

The first step in developing good problem statements is to gain a good understanding of how they are used to select research projects for funding. The ACRP conducts a thorough, comprehensive review process to ensure

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funding is directed toward the most promising and worthwhile research ideas. This section summarizes the key steps of the problem statement review process.

ACRP program officers conduct an initial review of each problem statement to check for potential overlap with other ACRP projects and comment on the suggested funding amount. The problem statements are then reviewed by one or more TRB aviation-related standing committees (communities of individuals who share an interest and expertise in air transportation) who provide feedback on the merits of each problem statement. Next, ACRP convenes several review panels consisting of industry practitioners to evaluate each problem statement and to make a recommendation to the AOC as to which should be funded. The industry practitioners who volunteer their time to serve on these panels possess expertise in one or more of the research fields listed above and are familiar with the ACRP. The problem statements are then grouped into two sets: those recommended for funding by the review panels and those not recommended for funding. ACRP staff then transmits the problem statements and the recommendations for funding to each AOC member, along with the input received from staff, the TRB standing committees, and the review panels. AOC members review the problem statements and consider all comments and meet to select which problem statements will address the most pressing issues and would produce the most useful research results for the airport community.

Each newly approved project is then given a project number (replacing the original problem statement number) and is assigned to an ACRP program officer. The program officer assembles a panel of technical experts and practitioners who will create a Request for Proposals from the original problem statement, select a contractor, review periodic deliverables and provide technical oversight of the research, and, finally, review and comment on the final deliverable(s).

IS YOUR RESEARCH IDEA APPROPRIATE FOR ACRP?

The aviation industry is very dynamic and broad-reaching, resulting in many challenges and opportunities for

One reason problem statements are not approved by the AOC is that the ACRP may not be a good vehicle for conducting the proposed research.

research. Nevertheless, *not all research ideas can be appropriately addressed by ACRP*. This is one of the two most common reasons a problem statement may not be selected by the AOC. Answering the questions below will help determine whether or not your research idea is suitable for ACRP.

Does your proposed research idea directly benefit the airport community?

The AOC places the highest priority on research ideas that will benefit numerous airports or groups of airports (e.g., general aviation airports, international airports, airports with parking garages, airports in hot climates). A research idea benefitting only a few airports, or whose primary audience is another stakeholder (e.g., airlines, passengers, manufacturers) is less likely to be selected.

Can the proposed research result in recommendations that airports can put into practice?

The ability of airports to implement recommended changes to practice is limited by many factors, including design standards, safety and security protocols, and cooperation with stakeholders. The AOC therefore considers these factors to ensure that it selects projects that will likely result in research findings airports will be able to successfully implement.

Can your research idea be implemented without changes to policies or regulations?

Any research that may be expected to result in significant recommendations for federal agencies or may involve change to federal regulations and/or policies must follow a specific process outlined in the Federal Advisory Committee Act (FACA). Because ACRP does not follow FACA requirements, it cannot recommend changes to federal policies or regulations. Should policies and governmental organization be a key component to your research idea, your problem statement may be redirected to another part of TRB such as the Policies and Special Studies Division that does comply with FACA. Such proposals should recognize the distinction.

Will your proposed research idea lead to a near-term solution?

The goal of ACRP is to provide airports with practical guidance with near-term benefits, typically, within 5 years. Important research needs address the longer term, but these are not the usual focus of ACRP.

Does your proposed research idea seek to close existing knowledge gaps?

Problem statement authors should be aware of related literature to determine whether their proposed research has been (or is being) addressed. Recognizing the dynamic nature of the industry, however, it may be that your research idea updates or addresses the impact of recent changes. It is important to consider what your research idea would actually contribute to the state of knowledge and to be able to explain that as part of your problem statement.

Can the proposed research be carried out within the typical project funding and timing constraints of the program?

Your research idea should be able to be completed with a budget of between \$300,000 and \$500,000, and within 12 to 24 months, although it is possible that important research can be conducted with a smaller budget or more quickly than is typical for an ACRP project, the resources associated with your proposed research should generally fall within these funding and time ranges. The preferred ACRP projects, therefore, are those that focus on small, solvable problems. If your research idea suggests a sweeping, multi-faceted, and lengthy research effort, consider breaking it down into two or more stand-alone projects that would each produce valuable results and indicate what follow-on work could be performed to provide even greater value.

Is there a high likelihood that the research tasks needed to address your idea can be carried out successfully?

The AOC gives significant attention to the likelihood that a feasible research approach exists and can be successfully executed to produce the desired results (i.e., there is a high likelihood that a method exists to gather and analyze relevant data and that the industry will be willing to participate in the research as needed). The practitioners on our standing committees and review panels usually have a good understanding of whether or not the timing is right to undertake proposed research; they also have a sense of what it would take to carry out the research associated with your problem statement, so if you are in doubt, submit a problem statement—perhaps there is a research approach you may not be aware of.

Does your research idea avoid promoting a particular practice or product?

While many ACRP projects result in recommendations for best practices, these recommendations are the result of balanced, unbiased, and thorough research. Your problem statement cannot, therefore, be designed to promote a practice or a product.

PROBLEM STATEMENT DEVELOPMENT GUIDANCE

If you conclude that your research idea is well-suited for being undertaken by ACRP, the next step is to communicate your idea in the form of a problem statement. *The other common reason the AOC may not select a problem statement for funding is that the statement did not effectively and succinctly communicate a research idea.*

The AOC may not approve a problem statement that does not effectively and succinctly communicate the research idea.

Keep in mind that your problem statement is your only means to communicate the need for and benefit of your research idea. The AOC selects projects solely on the contents of the problem statement and the comments provided by staff, standing committees, and review panels.

Writing an effective research problem statement is not a simple matter, even to aviation practitioners who face serious problems and challenges on a daily basis and are, therefore, very familiar with the issues that research can help address. While the research need might seem obvious to you, it is important to understand that AOC members cannot be experts in all airport-related topics. Your problem statement, therefore, needs to convey enough background and explanatory information about the issue to enable someone who is not well versed in the issue to understand and appreciate what is being proposed and why.

General Considerations

Below are four considerations to keep in mind as you write your problem statement. After reviewing these considerations, proceed to the next section which provides an annotated problem statement outline with specific guidance for preparing each section.

- *The problem statement must clearly describe the industry’s need for and potential benefits of the proposed research to the airport community*—ACRP exists to provide research results that airports can use to help them operate more safely and efficiently. Your problem statement must show how a particular issue could be addressed or solved through your proposed research effort.
- *The research objective must be clearly defined*—The objective describes what the end product of the proposed research will be. What will the research result be and how will it help the industry?
- *The problem statement must be well-written*—Poor grammar, spelling mistakes, punctuation errors, rambling thoughts, excessive text, and disorganized ideas can negatively affect how reviewers respond to your problem statement. It is a good idea to have someone critique a draft before you submit a statement to ACRP.
- *The problem statement must not be too long or too short*—Your problem statement should be about one to two pages long. In general, it is difficult to adequately state the case for the proposed research, describe the research object, discuss related research, and summarize related research in less than one page. A problem statement that is too short may suggest to the reader that it was not well thought out. Conversely, problem statements need to be succinct. You should be able to convincingly communicate your research idea in no more than two pages. A lengthy problem statement may suggest to the reader that the author did not spend enough time distilling the key point, or worse that the author is not entirely clear on what needs to be done. ACRP can receive hundreds of problem statements, and reviewers—who are volunteers—have a limited amount of time to evaluate your research idea.

Specific Problem Statement Development Guidance

The following instructions should help you complete each section of the problem statement outline. *You should focus most of your effort on the first three sections of your problem statement: the title, the background, and the research objective.*

1. PROBLEM STATEMENT TITLE

The title should briefly and immediately convey what the proposed study is about. It does not have to capture every element, nuance, and expected task of the research. Like the title of a book, it should attract the attention of readers and make them want to read what’s inside.

Often, the more deeply you are involved in a particular subject, the harder it is for you to step back and see the big picture. You may be tempted to title your problem statement something like this:

Collection, Analysis, and Compilation of Current Best Practices for the Design of General Aviation Facilities, and How Their Design Elements Will Impact Safety, Capacity, and Operational Efficiency and Contribute to Improved Customer Service.

A more succinct title would be:

General Aviation Facility Design.

Below are examples of good titles:

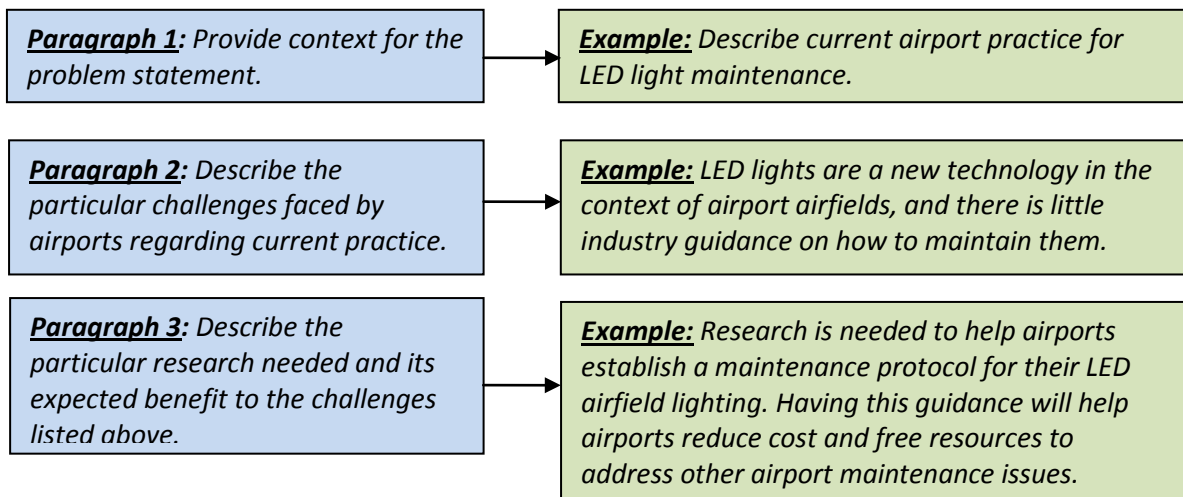
- *Incorporating Sustainability into Traditional Airport Projects*
- *Regulatory Compliance Costs and the Impact on Small Airports*
- *Airport-to-Airport Mutual Aid Programs*
- *Best Practices for Working in or Near Airport Movement Areas*
- *Being Prepared for IROPS: A Business Planning and Decision-Making Approach*

Hint: Look at every word in your title and ask yourself if it's necessary. Most problem statement titles can be 10 words or less.

2. BACKGROUND

The background section is your opportunity to convince the reviewer that your problem statement addresses a significant issue and therefore merits funding. The background section should set the context and relate the issue to larger national or regional goals and objectives. If the problem statement is about evaluating various technologies that could improve safety, begin with statements about the overall importance of airport safety. Consider including a brief discussion of economic and societal costs under current conditions and the industry's goal to improve safety. Then describe how the particular subject of this problem statement relates to those goals.

One option for laying out your background statement is the three-paragraph model presented below.



Hint: When writing the background section, keep thinking, “Why should my CEO care about this problem?”

3. OBJECTIVE

The objective should be a very short, concise, and accurate description of what the expected product of your proposed research will be. Unless some new or innovative research methodology is the key element of the research, those details can be described in the section outlining the proposed tasks (see below). So if your objective currently reads, “...to develop guidelines for maintaining airfield LED lighting, including considerations for predicting resource needs and scheduling, estimating cost savings, and reliability improvements,” you should shorten it to, “...develop guidelines for maintaining airfield LED lighting.”

Hint: Review the guidance on titling your problem statement. A very reasonable object statement is, “To develop (insert your title).” Often your objective can be summarized in one short sentence.

4. PROPOSED TASKS

If you have identified specific tasks that absolutely need to be part of the project work plan, include them in the problem statement in this section. However, do not let your own biases determine the research plan. Focus on providing a full and accurate description of the final product. This will give proposing research teams flexibility to describe a research plan they believe will accomplish the project objective. Many requests for proposals (RFPs) issued by ACRP focus on specific interim and final deliverables, instead of a prescribed list of research tasks, to encourage proposers to identify innovative approaches for achieving the research objective.

Hint: The more detail you include in the proposed tasks section, the less opportunity a researcher has to show initiative and innovation, and the more every proposal will come in looking the same. Avoid the temptation to be too prescriptive.

5. ESTIMATED FUNDING

If you do not have research experience in the academic or private sector, it may be difficult to estimate funding needs. Here is some general guidance:

- Personnel time will most likely make up the majority of the budget. Develop a rough list of the research tasks (steps) needed to accomplish the objective, and ask yourself what a reasonable amount of time to accomplish these tasks is. In general, field work or laboratory testing are more expensive than “desktop” analysis. Data-gathering tasks, such as surveys or field work, are labor-intensive and often require extensive coordination. Do not forget to include time for administration, coordination, and quality assurance and quality control (QA/QC).
- Become familiar with not only direct rates but also “loaded” or “burdened” labor rates (i.e., rates that include direct salaries, overhead, and profit).
- Consider contractor travel costs, including the cost of at least one meeting at the National Academies, and travel that may be needed to undertake particular research steps.
- Include the cost of specialized equipment or software that must be purchased or developed.
- Include other direct costs, such as printing and reproduction.

Hint: Seek input from those familiar with consultant and academic cost structures to ensure your budget estimate is reasonable. A few rules of thumb are: (1) one year of labor is about 2,000 hours; (2) loaded labor rates (including salary, overhead, benefits, and profit) typically range from two to three times the direct labor rate; and (3) typical project expenses, such as travel, shipping, and printing, frequently add 10 percent to a budget.

6. ESTIMATED RESEARCH DURATION

Estimate the number of months required to accomplish the proposed tasks needed to meet the research objective. General guidance is provided below:

- Consider whether tasks can be conducted concurrently or need to be undertaken sequentially.
- Research that includes a large amount of data-gathering or stakeholder interaction will take significantly longer than research that does not.

- Consider whether the research is dependent on seasonal factors (e.g., gathering stormwater runoff having deicing fluids).
- Include time for documentation and contractor internal QA/QC as well as at least 3 months for ACRP and panel review and revision of draft deliverables.

Hint: Most ACRP projects, once under contract, take at least 12 months to complete. A more complex project may take 18 to 24 months.

7. RELATED RESEARCH

Most problem statement reviewers will have at least a general knowledge of your topic, and they will likely be reminded of (or at least wonder if there is) related research. They may think that your proposed research is duplicative of work already done. You need to anticipate this and explain “knowledge gaps” and how your project will address them by building on the existing body of research, providing new methodologies or expanded data sets, or by pulling together existing work into an implementable product. You should list specific studies by name and summarize their findings relative to your proposed project, including the lead agency and status (i.e., completed, ongoing, or proposed).

Hint: There are several steps you can take to quickly identify related research. First, an initial, general web search will generate potential literature. Next, visit the ACRP website and review completed and ongoing studies. TRB also has an online database of research literature, the Transport Research International Documentation (TRID) you can access. Finally, ask practitioners if they are familiar with any studies related to your problem statement.

8. PROCESS USED TO DEVELOP THE PROBLEM STATEMENT

State how this problem statement was developed. For example, state if it is the product of an individual, multiple individuals, a formal committee, or other entity.

Hint: While you may have expertise and passion about your research idea, it is often beneficial to collaborate with others in the industry. Collaboration provides an opportunity to incorporate other perspectives (e.g., large airport perspective vs. small airport perspective, airport operations and airport planning, airport operator and consultant or academician). Collaboration also affords the chance for critical review. Finally, collaborating on developing a problem statement suggests to the reader that the proposed research has merit because it reflects the views of multiple stakeholders.

9. PERSON SUBMITTING PROBLEM STATEMENT AND DATE

Provide the name, title, and contact information of the lead individual submitting the problem state. Include the submission date.

Hint: Because ACRP exists to help airports, the AOC desires problem statements that are submitted by practitioners directly working for airports.

IF YOUR PROBLEM STATEMENT IS NOT SELECTED FOR FUNDING

ACRP recognizes the effort required to develop a well-written problem statement and the resulting disappointment that may result if it is not selected. We therefore provide problem statement authors with all the comments received during the review process in hopes that the authors will benefit from the critique.

Be receptive of the comments offered by reviewers of your problem statement—such comments will help you write a better problem statement in the future.

If you have previously submitted a problem statement that did not get approved, do not get discouraged. Sometimes projects undertaken by ACRP are based on problem statements that were refined and resubmitted. (To be reconsidered, a problem statement must be formally resubmitted for review.) Also, if one

of your research ideas presented in a problem statement was not approved, a different problem statement, containing a different research idea, may be successful.

SUMMARY AND CONCLUSIONS

There are many research needs in the aviation industry. Some of these address long-range and/or theoretical needs; others address significant, near-term challenges directly affecting day-to-day airport operations. If you

If your problem statement is well-written and addresses a significant near-term challenge affecting airports, there is a high possibility that it will be undertaken by ACRP.

believe your research idea falls into this latter category, there is a strong possibility that it could be undertaken by ACRP. To maximize the chance of your problem statement being selected, use the guidance we have provided in this document. You are also encouraged to contact ACRP if you have any questions or need assistance in developing your problem statement.

Thank you for your interest in our program and good luck!

**APPENDIX A:
OUTLINE FOR ACRP PROBLEM STATEMENTS**

1. **Problem Statement Title:** No more than ten words.
2. **Background:** In no more than three paragraphs, provide context for the problem statement, a description of the problem or challenge requiring research, and the expected benefit of the research results to the industry.
3. **Objective:** Include a clear, concise statement of the objectives (anticipated products) that are expected to be met by this research.
4. **Proposed Tasks:** Provide a statement of the specific research proposed and how it relates to the research problem statement.
5. **Estimated Funding:** Include an estimate of the funds necessary to accomplish the objective. A detailed budget is not needed in this problem statement.
6. **Estimated Research Duration:** Provide an estimate of the period of time needed to complete the research, including 3 months for review and revision of a draft final report.
7. **Related Research:** If known, provide information on other research—completed, in progress, or pending—that is closely related to the proposed problem.
8. **Process Used to Develop Problem Statement:** State whether this problem statement is the product of an individual, a formal committee, or another entity.
9. **Person Submitting Problem Statement and Date:** Provide the specifics for the person(s) who submitted the problem and the date of submission.

Submit to:

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