**Determining Whether Unmanned Aircraft Systems (UAS) Will Have Environmental and Energy Influences at Airports**

**ACRP Staff Comments:** If funded, the proposed research should consider the initial UAS research from ACRP Project 03-30, Unmanned Aircraft Systems at Airports: A Primer.

**TRB Aviation Group Committees Comments:** ENVIRONMENTAL IMPACTS OF AVIATION: Support as a low priority or as a synthesis. Obtaining a better understanding of the energy and environmental impacts of UASs at airports is very timely. However, as stated in the problem statement, the scope seems broad for the available funds and length of a typical ACRP period. In particular, development of a methodology to estimate noise, emissions, and fuel burn from UAS may be onerous depending on data availability. Narrowing the scope to just developing a methodology to estimate the environmental impacts of UAS would be appropriate. That said, the literature review suggested in the problem statement is a good candidate for a synthesis project.

AIRFIELD AND AIRSPACE CAPACITY AND DELAY: Not supported. Not significant enough on its own, but could be combined with problem statement 14-10-01 potentially.

**Review Panel Comments:** Recommended.—This is a potentially growing issue for airports, and research is needed to address public concerns.
I. PROBLEM TITLE

Determining Whether Unmanned Aircraft Systems (UAS) Will Have Environmental and Energy Influences at Airports

II. RESEARCH PROBLEM STATEMENT

As we explore the integration of UASs within the National Airspace Systems (NAS), there is a need to evaluate which types will be utilized at the local airport and whether these will have additional environmental effects that must be considered. While current assessments supporting the integration of UASs in the NAS focus mostly on safety and requirements (e.g., formulation of new standards), there is the need to also investigate the potential Environment & Energy (E&E) benefits/impacts (i.e., climate, fuel burn, air quality, and noise effects) of UAS operations.

As demand for air travel continues to grow, airports are facing increased pressure to reduce their contribution to local emissions. The integration of UASs within the NAS could have environmental consequences for airports depending on the size and type of UASs that may operate from an airport. The operation of UASs may provide an overall net E&E benefit to an airport by replacing larger manned aircraft. There is therefore the need for airports to be pro-active and anticipate the potential E&E benefits/impacts of UASs.

This project aims to determine if UASs will have environmental and energy influences at airports.

III. OBJECTIVE

This project will result in a qualitative assessment of the E&E consequences of UAS introduction at airports. This project will consider fuel burn, climate and air quality emissions, and noise effects.

IV. RESEARCH PROPOSED

The following tasks are envisioned to achieve the objective stated in section III:

1. Conduct a literature review on UAS in airports to (a) determine the current list of airports where UASs currently operate and (b) assess the anticipated airports that UASs are expected to operate; this evaluation should include the UAS types that are anticipated

2. Conduct a literature review on UAS environmental and energy consequences to provide (a) an estimate the noise signature for UAS types envisioned from Task 1, (b) an estimate of the emissions and fuel use for UAS types envisioned in Task 1, and (c) an estimate of the typical operating envelope for the UAS types envisioned in Task 1
3. Prepare an interim report discussing the findings in #1, and #2.
4. Leveraging the literature search from Tasks 1 and 2, develop methodology to quantify noise, fuel burn and emissions due to UAS operations. Use these results to determine the relative contribution of UASs on each of the identified airports with regards to noise and emissions footprints as well as energy requirement.
5. Prepare a draft ranking of the top 10 candidate airports that have the greatest potential to experience an environmental influence (positive/negative) resulting from potential UAS operations; this listing should be based on the analysis in #2.
6. Prepare a final report and recommendation for candidate airports to consider in order to reduce the environmental and energy footprint of UAS operation. The report should also describe the methodology used for determining the relative contribution of UASs on each of the identified airports with regards to environmental and energy consequences and be presented in a form that can be used as a framework for future analyses.

V. ESTIMATE OF FUNDING AND RESEARCH PERIOD

The estimate of funding is $400,000. The research period is 18 months.

VI. URGENCY OF PAYOFF POTENTIAL

UAS are being examined for a wide range of applications within the NAS but the environmental consequences of this introduction have not been investigated.

VII. RELATED RESEARCH

- ACRP 03-30: Unmanned aircraft Systems (UAS) at Airports – A Primer
- ACRP 11-03: Synthesis of Information Related to Airport Problems
- ACRP 02-12: Environmental Optimization of Aircraft Departures: Fuel Burn, Emissions, and Noise
- ACRP Report 43: Guidebook of Practices for Improving Environmental Performance at Small Airports, p. 120, 2011
- ACRP Synthesis 9- Effects of Aircraft Noise: Research Update on Selected Topics, 2008
- DOT/FAA/TC-TN12/45, Multi-UAS Operational Assessment: Class D Airspace
- FAA Advisory Circular 20-130A: Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigating Sensors
VIII. PERSONS DEVELOPING THE PROBLEM

Pat Moran  
Office of Environment and Energy  
Federal Aviation Administration  
Washington, DC  
(202) 267-8548  
pat.moran@faa.gov

IX. PROCESS USED TO DEVELOP PROBLEM STATEMENT

Developed statement within the Office of Environment and Energy (AEE) based on previous research results, preliminary internal analyses, and discussions with stakeholders.

X. DATE AND SUBMITTED BY

Catherine M. Lang  
Deputy Associate Administrator for Airports  
FAA