ACRP Problem Statement 18-08-02 **Recommended Funding Amount: --**

Guidelines on Runway strip and RESA Bearing Capacity and Altimetric Levelling to Meet International Standards

ACRP Staff Comments

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TRB Aviation Committees Comments

AIRCRAFT/AIRPORT COMPATIBILITY COMMITTEE: It's not clear the research could be applicable to US airports. The FAA evaluated RSA at all Part 139 airports and found them to be compliant after a 10-year program and a billion dollars of construction. This research could create unnecessary regulatory risk for already compliant airports (should guidance become accepted as regulatory practice) and if pursued, sufficient testing of the guidance would need to be accommodated in the research.

Association Committee Comments

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Review Panel Comments

Not recommended. Problem statement is unclear. FAA already has load-bearing standards for runways, taxiways and safety areas. May be more appropriate for ICAO to do this work. Good concept but a bit concerned about the projected cost. It appears high for the development of a guidebook. This project will need extensive FAA input. Something that is not mentioned in the proposal. This project somewhat crosses the gray area between recommendation and requirements. The FAA may not be supportive of the project. If they are not, does it have applicability?

AOC Disposition

There was no discussion. No funds were allocated.

18-08-02

ACRP Problem Statement – FY 2018

1. Problem Statement Title

Guidelines on Runway strip and RESA Bearing Capacity and Altimetric Levelling to Meet International Standards

2. Background

Airports must comply with national and international regulations on runway strip and Runway End Safety Areas (RESA) as part of the airport design norms. When building or renovating the strip area or RESA, the main challenge for airports is complying with the bearing capacity and altimetric levelling requirements, which are the most important for those areas given their function. In fact, their ability to minimize damages to aircraft overrunning the runway is due to their bearing capacity; in addition, these areas need to allow the deceleration of the incident aircraft and be able to withstand the access of the emergency vehicles.

For these reasons, airports have to comply with international regulations from ICAO that define the limits of how much an aircraft's landing gear can sink into the soil in the strip and RESA. Therefore, all kinds of construction work within the strip and RESA need to meet these strict requirements (e.g. new construction or renovation). Like all airport construction work, operations disruption and safety implications are a major concern and it is important to limit their duration, especially in critical areas such as the strip and the RESA.

Although the national and international regulations define in detail the requirements for the strip's and the RESA's bearing capacity and altimetric levelling, they do not indicate what types of tests and density of measurements should be conducted; in addition, there are no independent guidelines that could help airports and practitioners. As a result, airports face significant uncertainty on several aspects of runway strip and RESA work, including:

- Which tests are needed to asses STRIP and RESA bearing capacity (e.g. plate test, standard vehicle passing, FWD, or tests on soil characteristics such as HRB classification, etc.) and what special density (e.g. 1 sample every 1,000, 10,000, or 50,000 square foot or different?).

- The density of the altimetric level measurements (e.g. every 100 ft x 100 ft, or 1,000 ft x 1,000 ft, or different?). This has significant consequences as an arbitrary altimetric measurements density may neglect local altimetric irregularities.

- How to analyze the results from the survey (e.g. elastic or plastic? Considering the behavior of the soils? Which loads should be used to estimate the displacement? And more).

- How to select what soils' characteristics improvement to use (e.g. deep or surface stabilization, soil removing and substitution with better soil, etc.).

More importantly, airports need to decide how to test and certify the compliance of the strip or RESA work on the aforementioned regulations. Once again, they face uncertainty on which test to use, which frequency choose, etc. For example, a truck could be used to test the displacement, but there is a risk to ruin the strip due to the tracks left by the heavy vehicle.

These guidelines will provide significant savings to airports when working on runway strip or RESA through critical technical information that is currently not available to the airport community. As a result, the time necessary for testing and the overall construction or renovation could be reduced, thus reducing as well the operational disruption and related costs.

Given the relevance of this topic, as construction work in the strip and RESA areas are common for airports in the USA and globally, it is recommended that the airport community could access guidelines that would make their work more economical and reduce the risk of rework due to not meeting the regulation requirements.

3. Objective

Summarize current state of the practice in terms of testing conducted by airports during runway STRIP and RESA work. Identify common challenges and practices. Identify the type of tests needed for meeting the bearing capacity required by the regulations and the frequency of altimetric measurements when constructing a new runway STRIP or RESA or requalifying an existing one.

4. Proposed Tasks

Task 1 Literature Review – Review and summarize the current regulations on runway STRIP and RESA bearing capacity requirements, altimetric regularity, and soil characteristics; review the literature on soil testing related to runway STRIP and RESA.

Task 2 Summarize previous experiences from airports where runway STRIP and RESA were recently constructed or requalified.

Task 3 Based on the findings of Task 2, compare the testing methods used and the results obtained. Highlight what methods worked best and what did not provide the expected results.

Task 4 Conduct laboratory and field testing to compare the bearing capacities obtained using different testing methods and special frequencies. Conduct testing using different frequency of altimetric measurements. Some of these tests could replicate the tests from Task 3.

Task 5 Based on the findings of Task 4, compile and compare the results. This should include insights on the "why's" of the results obtained from a technical standpoint.

Task 6 Develop guidelines for airports and practitioners working on runway STRIP or RESA in order to allow them meeting the regulation requirements in terms of bearing capacity and altimetric leveling.

5. Estimated Funding

Considering the costs of travel, laboratory and field testing, the funding requirement is estimated at $500,000.

6. Estimated Research Duration

It is estimated that 18 months would be required to conduct this research project.

7. Related Research

There was some research conducted recently, including by Professor Crispino and his research team.

M. Crispino et Al. "Soil Improvement of Runway STRIP and Runway End Safety Area (RESA) through an Innovative Methodology." Proceedings of the First Congress of Transportation and Development Institute, 2011.

M. Crispino et Al. "Improving Runway Strip Performance to Fulfill International Requirements Through Eco-Efficient Soil Treatments: Case Study Of A Major Italian Airport." Environmental Engineering and Management Journal, 2014.

Furlan, M., Bolis, L., Crispino, M. "Airport Regulations on Safety Areas Near the Runway." Master thesis, 2015.

8. Process Used to Develop this Problem Statement

This problem statement was developed as a result of the professional experience of professor Crispino, who worked on STRIP and RESA requalification projects for major airports, including Milan Linate (LIN). The lack of norms or guidelines on STRIP and RESA bearing capacity required Professor Crispino to design and conduct extensive testing, including a full-scale testing area to ensure proper performance of the RESA at Milan Linate Airport.

9. **Persons Submitting Problem Statement and Date**

March 20, 2017

Professor Dr. Maurizio Crispino – maurizio.crispino@polimi.it

Full Professor of Road and Airports, Politecnico di Milano, Milan (Italy)

Member, TRB AV070 Aircraft/Airport Compatibility Committee

Member, TRB AF10 Pavement Management Systems

Mr. Antonio Massidda – antonio.massidda@gmail.com

Independent Aviation Researcher

Member and Communications Coordinator, TRB AV070 Aircraft/Airport Compatibility Committee

Incoming Member, TRB AV040 Aviation Economics and Forecasting Committee

Past Member, TRB AV090 Aviation Security and Emergency Management Committee