Alaska Aviation System Plan

Western Alaska Airports Resiliency Study

Work Plan
December, 2022

BUILDING RESILIENCY · ALASKA DOT&PF
for ALASKA

The **Western Alaska Airports Resiliency Study** is a component of the

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Resiliency is an airport's preparedness for changing conditions and capacity to recover from disruptive events. Investments in an airport should improve the airport's preparedness and recovery capacity by creating infrastructure that is physically, financially, and environmentally sustainable[1].

Many areas across Alaska have similar issues that afflict airfields, such as coastal erosion, embankment failures, extreme weather, vegetation overgrowth, and airport lighting failures. These issues all contribute to the deterioration of runways, taxiways, aprons, buildings, visual aids, and other infrastructure required to operate a safe airport system. Resilient infrastructure can recover from disruption and continue functioning even if some elements of the existing infrastructure do not survive. Resilience takes the focus of total protection by balancing vulnerability with risk.
This study will examine select airports in western Alaska to document those experiencing these issues, compare them to similar airports that appear more resilient, and document factors that may contribute to building more resilient infrastructure.

This work plan outlines general methods for accomplishing the study and provides a timeline of completion.

Deliverables:

- Matrix of airports considered for evaluation
- Spreadsheet airport comparison of data
- Analysis of factors affecting the long-term performance of airports
- Proposed changes to implement in planning, design, specifications, and construction
- Summary report of maintenance funding
- Analysis of M&O equipment needs and affiliated storage requirements
- Summary of cold region best practices among similar airports
- SWOT matrix
- PESTLE matrix
- Draft Resiliency Study Report and Recommendations
- Draft Resiliency Study Report and Recommendations Review Meeting
- Final Resiliency Study Report and Recommendations

Target completion date: June 30, 2024

[1] Definition based on a combination of FAA and FHWA definitions

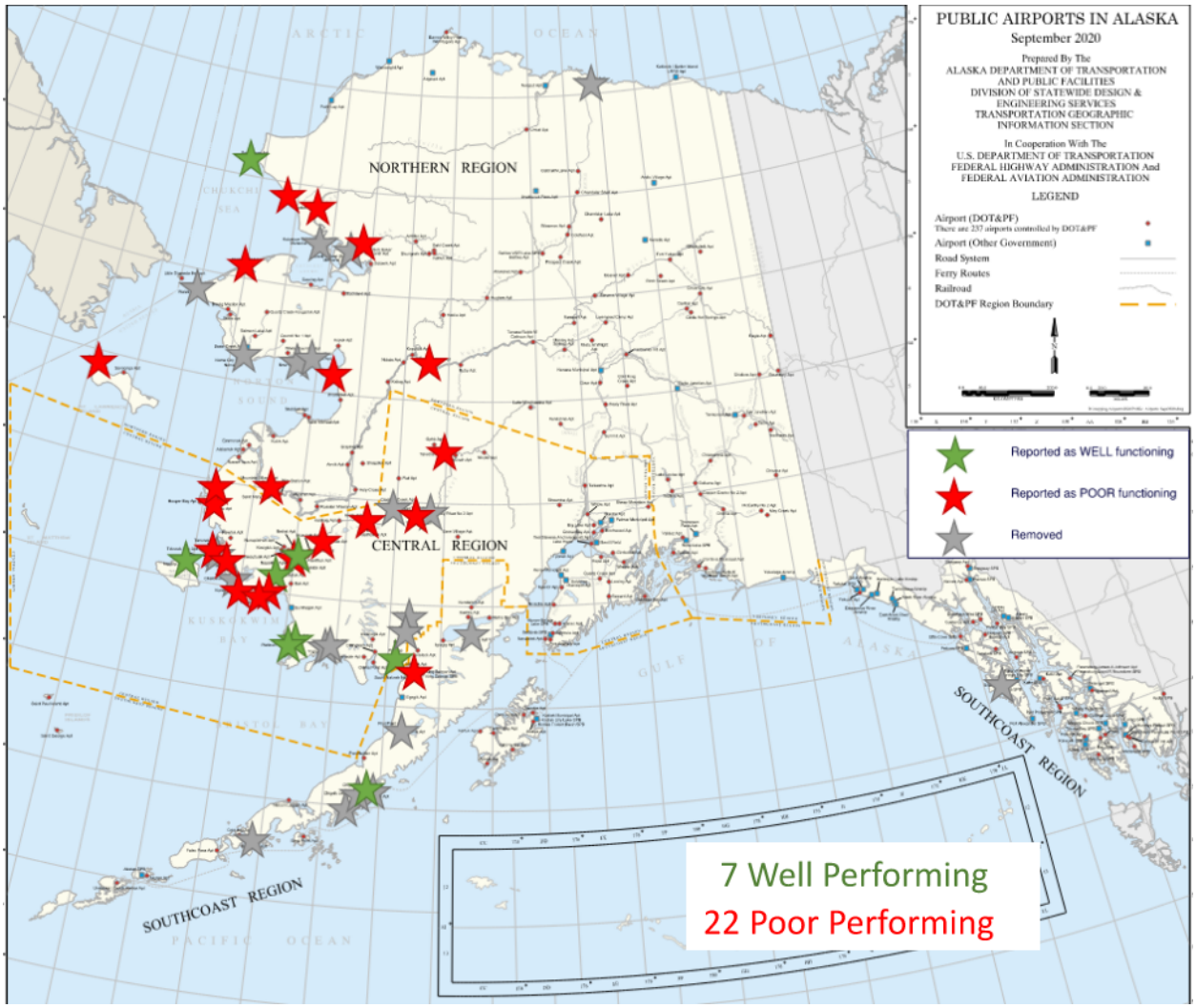

Figure 1 - Proposed Airports for Study

Bethel Gravel Strip
Chevak
Chuathbaluk
Goodnews
Kipnuk
Kongiganak
Kwigillingok
Mekoryuk
Napakiak
Nightmute
Platinum
Scammon Bay
Sleetmute
Takotna
Tuluksak
Tuntutuliak
Tununak
Galena
Gambell
Kiana
Kivalina
Noatak
Point Hope
Shaktoolik
Shishmaref
St. Mary's
Chignik Lagoon
South Naknek

Task 10.1C Administration and Collaboration

Task objective: provide transparency and open communications; coordinate efforts across multiple tasks to maintain schedule; keep Aviation Advisory Board engaged and informed

The Contractor and Contracting Agency will have brief, weekly check-in calls and collaboration meetings as needed to review study progress and findings and discuss schedule, agency participation, and any other issues to successfully complete the project.

Weekly and collaboration meetings will include the following:

- A brief agenda, which will be in the meeting invitation
- An explanation of why any activity is off schedule or likely to become so

- An explanation of what corrective actions are being taken
- A discussion of approaching events and milestones to be achieved and Agency review dates.

Attendance at the meetings will be limited to the following:
- Contracting Agency project management staff and guests
- Contractor project manager (as needed), assistant manager (as needed), task lead, and staff.

Collaboration meetings and check-in calls are informal and will require documentation only when agreed to in advance by the Contractor and Contracting Agency.

Task 10.1.1C Desktop Review, Summary, and Recommendations

Task objective: gain an understanding of the factors influencing an airport's resilience and provide data-informed recommendations for planning, design, construction, and funding

The desktop review will determine how to build resiliency into the aviation system to ensure long-term viability and stability in the face of changing climate, economy, and technology.

The Contractor will conduct a desktop study that will review as-built drawings, geotechnical reports, materials and stabilization methods used in construction, 5010 data, CIMP data, and differences between regions; weather; lighting type. Based on the completed desktop analysis, as many as five airports from the initial 29 (see Figure 1) will be selected to highlight best practices and potential failures and assist with recommendations. Additional geotechnical analysis may be considered in a project amendment. The Contractor will summarize findings and present recommendations. The desktop study will investigate the following:
- Endurance of investments in the aviation system
    - What factors contribute to long-term stability of airports?
- Optimization of available funding
    - What is the most economical way to invest funding?
    - How can funds from different programs be leveraged?
- Sustainable designs
    - Which design choices provide stability in the long-term?
    - How can design choices today improve resiliency in the face of a changing climate?
    - Are there best practices being developed in other regions of the US?
- Contract requirement changes to include postmortem project review with Contractor and construction warranties
    - How can we capture lessons learned from a construction project?
- Improvements to construction and material standardizations.
    - Are certain construction techniques related to long-term stability of airfields?
    - Which materials provide long-term stability?

To answer the questions above and identify patterns in the long-term stability or early failure of airport infrastructure, we will compile a spreadsheet-based database of factors that contribute to an airport's long-term stability. Developing the criteria will be an iterative process. The largest limiting factor is likely the availability of data at the study airports.

Based on the data available, the TAC will select up to five airports for further analysis. Ideally the final selection of airports will include paved and gravel surfaces.

Geotechnical Analysis, Bidding, As-Built Drawings, Post-Construction Survey, and Weather

A desktop review of the soil conditions, bidding information, structural section and baseline conditions, and weather will be conducted. Aerial photographs will also be reviewed. This review aims to determine an optimal facility design by reviewing both well-functioning airports and those with challenging issues. The review will focus on erosion, embankment, weather, vegetation management, and airport lighting. Additional historical information to review will include maintenance efforts, past material sources, changes in environment and weather conditions, past and current planning studies, construction practices, changes during construction, material stockpiles to determine if these stockpiles were provided for management and operations (M&O), and M&O vegetation clearing cycles.

Collaboration With Subject Matter Experts

RESPEC will interview:

- DOT&PF geotechnical engineers
- DOT&PF construction engineers
- DOT&PF M&O staff and airport managers

Cost/Benefits Analysis of Different Material Sources

The desktop review will include an analysis of the different material sources used during construction of each airport and if the quality of materials was met or changed during design or construction. The study will also include an evaluation of the cost of stockpiling materials for M&O during improvement projects versus buying materials when a failure arises.

The selected airports will be reviewed based on two main construction approaches—Bethel sand/local material and platinum rock—to determine long-term function, and a lifetime cost analysis will be performed to investigate the consequences of higher capital costs versus long-term maintenance costs.

We will collaborate with construction teams to collect positive and negative lessons learned on recent and past projects. These lessons learned will help with selecting airports to study.

Review of Long-Term Performance

The trend in performance will be studied in relation to reported lessons learned and experience of the construction staff. A review of maintenance projects and equipment available to M&O staff will investigate the ability to maintain the infrastructure.

If available, current conditions will be reviewed with the geotechnical and construction engineers to determine the embankment construction performance, airport lighting, bedding and surrounding soils, changes in drainages, and vegetation growth.

Task 10.1.2C Funding Review and Summary

The Contractor will review past funding sources, regional studies, and agency reports to identify any correlations between funding and the long-term stability of an airport. The Contractor will summarize the findings. The funding review will investigate the following:

- Historical sources of funding
- Funding amounts
- Research and present history of past federal and state funding.

Deferred Maintenance Versus Nonparticipating Funds

The Contractor will review a deferred maintenance white paper prepared by DOT&PF and summarize the findings of this study.

Maintenance and Operations Equipment

The increased prevalence of unusual weather events (e.g., more rainfall) has burdened many airports with maintenance needs that cannot be accommodated with the current equipment. Likewise, federal funding does not allow construction of snow removal equipment buildings that are needed to house the additional equipment. This study will investigate the types of equipment, storage needs, and potential funding sources necessary for combating changing weather conditions.

We will collaborate with M&O staff and airport managers to investigate vegetation growth and maintenance by performing a desktop review of the selected group of airports. We will also collaborate with DOT&PF M&O staff and airport managers to review current vegetation management schedules and conditions. The 5010 and CIMP inspections will be reviewed to evaluate obstructions and growth trends.

We will review the DOT&PF airport lighting study to determine if lighting choices influence the long-term stability of an airport's lighting system.

Task 10.1.3C Cold Regions and States Research and Summary

The Contractor will review studies and best practices that other cold-region states and countries successfully use to achieve a safe and reliable aviation system. The Contractor will summarize the findings. The following topics will be researched during the desktop study:

- Methods that other cold-region states and countries are using
- Studies that have been done for similar environments

Other cold-region areas to be investigated include:

- Canada
- Norway
- Sweden
- Finland
- Iceland
- Greenland
- Minnesota
- North Dakota
- Maine
- Montana

Task 10.1.4C Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

The key element of a SWOT analysis is to assess the current strengths, weaknesses, and threats, as well as opportunities of the airport system related to construction practices, maintenance practices, and climate impacts. In addition to a standard SWOT analysis, the planning team recommends conducting a Political, Economic, Social, Technological, Legal, and Environmental (PESTLE) analysis, which is a tool designed to analyze and monitor the external environmental factors that have an impact on an organization. A PESTLE analysis adds elements not found in a SWOT analysis and breaks down some of the strengths and weaknesses into more defined and climate-relevant categories. For example, the consideration of economic, environmental, and social factors of a PESTLE analysis integrates well with the resiliency approach of this study. The additional evaluation of political, technological, and legal factors will help accurately determine what is possible within the political context and legal requirements of the funding sources and established project development frameworks while considering technologies applicable to western Alaska. The planning team will work closely with the Technical Advisory Committee established for the project in evaluating the SWOT analysis and PESTLE analyses. RESPEC will schedule

a work session with the Technical Advisory Committee early in the project to coordinate the framing of these analyses.

The SWOT analysis will include a typical SWOT matrix and an analysis narrative, which will include the DOT&PF's capabilities and capacity, assets, how the DOT&PF's strengths can be used to turn weaknesses into strengths, and how the aviation system's opportunities can mitigate climate change. The SWOT and PESTLE will help:

- Leverage existing research to define climate impacts at the selected airports.
- Propose mitigation and adaptation strategies for DOT&PF project design and M&O to address a changing-climate impact on infrastructure.
- Establish strategies, implementation plans, and metrics for measuring success.

Major trends identified in the desktop analysis, funding review, and cold regions/states research will be considered and recommendations on how to address western Alaska airport issues in future planning and design efforts will be prepared.

Summary

The *Western Alaska Airport Resiliency Study* will provide valuable insights on factors and decisions contributing to the long-term stability and resiliency of airports. Applying the insights from this study to future airport development projects will maximize public investments in the Alaska aviation system and provide communities the vital connection that airports provide.

Task breakdown

Task # - Deliverable	Task Lead	Deadline/Review
Task 10.1.1C - Analysis of factors affecting the long-term performance of airports Comparison spreadsheet White paper summary of findings Maps Presentation to TAG	Royce – technical analysis of airports • Construction techniques • Material Pat – interview and travel coordination Marie – mapping Megan – weather data/history	Final list of airports – June 15, 2023 Spreadsheet – September 15, 2023
Task 10.1.1C - Proposed changes to implement in planning, design, specifications, and construction Sustainable design Construction & material standardizations Optimized funding	Pat – overall lead Royce – technical inputs on design and standards Natalie – funding recommendations	Draft recommendations – December 15, 2023 Final recommendations – February 1, 2024
Task 10.1.2C - Summary report of funding Summary document • Maintenance • Construction New funding opps	Natalie – funding research + compilation Royce – deferred maintenance memo review	Draft summary September 16, 2023 Final summary November 15, 2023
Task 10.1.3C - Summary of cold region best practices among similar airports Best practices summary	Annotated bibliography – Megan	Draft Submitted 9/15/23
Task 10.1.4C - SWOT & PESTLE matrix		Draft - November 15, 2023 Final – December 15, 2023

Task # - Deliverable	Task Lead	Deadline/Review
Task 10.1.6C - Draft & Final Resiliency Study Report and Recommendations		Draft chapter – May 1, 2024 Final chapter – July 1, 2024