Analysis of Cost Effectiveness for Remote Tower Facilities

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Outline

- Analysis Objective and Highlights
- What is a Remote Tower?
- Modeling the Costs of Conventional and Remote Towers
- Key Findings
Analysis Objective and Highlights

Objective: Estimate cost differentials between conventional towers and remote tower services
- Based on FAA Contract Towers (FCTs) currently owned by the Federal Aviation Administration (FAA)
- Goal of lowering the cost to FAA of providing tower services at these airports

Highlights: Results show that remote tower alternatives evaluated in this analysis are more cost effective than continued use of conventional towered airport services
- Compared to continued use of conventional towers, implementing remote towers has lower upfront capital costs, operations and maintenance costs, and overall lifecycle costs
What is a Remote Tower?
The Basics of a Remote Tower

**WHO?**
Specially-trained air traffic controllers (ATCOs)

**WHAT?**
Provide airport ATC service without an out-the-window view from a tower cab

**WHERE?**
Medium- and low-traffic density airports

**HOW?**
Using visualization tools to gain situation awareness of airport movements

**WHEN?**
2025+

**WHY?**
Reduce cost to provide tower services
Populations of U.S. Airports

- **Airports (~13,300)**
  - **Non-Towered Airports (~12,500)**
    - **Non-Federal Towers (~203)**
  - **Towered Airports (~720)**
    - **Federal Towers (517)**
      - **FAA Contract Towers (FCTs) (253)**
      - **FAA-owned FCTs (105)**
        - Basis of FY 17 Analysis
      - **Sponsor-owned FCTs (148)**
        - Current FAA Strategy
We Evaluated Three Implementation Architectures

- **Legacy Sustainment** – No change to current strategy. All existing towers are maintained or replaced with new construction as needed.

- **Single-Airport Remote Facility** provides ATC services to only one airport, with equipment and displays for that airport.

- **Multi-Airport Remote Facility** - Each of these multi-airport implementation alternatives were studied with cross-trained controllers and without cross-trained controllers.

Note: Supplemental surveillance (ex. radar) was not considered in the cost estimates.
Cost Areas Considered

Remote Tower Cost Estimate for FCTs

Out of Scope
- Surveillance
- Safety
- Multi-Airport Simultaneous Control
Data Transmission Options

- Conventional towers do not require video data transmission.
- Two bandwidth tiers were evaluated for remote towers.

If the remote tower is built onsite at one of the airports, then the first remote tower of the configuration does not incur the data transmission costs.
Remote Facility Construction Options

- Cost estimate considered two remote facility construction types:
  - Remodeling: The remote facility is built in an existing building and can leverage existing resources like equipment rooms, restrooms, and conference rooms.
  - New Construction: The remote facility is built as a new standalone facility.

- Estimate considered costs for high cost, low cost, and government construction.
Remote Tower Equipment

- **Assumed two equipment configurations**
  - Option 1: Single mast with multiple fixed position cameras
  - Option 2: Advanced rotating camera

- **Equipment costs include:**
  - Installation and software costs
  - All tower equipment common to a remote tower or conventional tower
  - Remote transmitter/receiver for off-site remote towers

Sample Remote Tower Configuration
Image Source: MITRE
**Labor Options**

**Non-Cross Trained**
A non-cross-trained controller is only certified to work one of the multiple airports assigned to the RACF.

**Cross Trained**
A cross-trained controller is certified to work multiple airports but will provide services to only one airport at a time.

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Or
Modeling the Costs of Conventional and Remote Towers
# ATCT Facility Lifecycle Cost Model Elements

<table>
<thead>
<tr>
<th>Lifecycle Component</th>
<th>Description</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Labor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controller Costs</td>
<td>The salary and benefits for the controllers working within a tower or a</td>
<td><img src="image" alt="group" /></td>
</tr>
<tr>
<td></td>
<td>Remote Facility</td>
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<tr>
<td>Non-Controller Costs</td>
<td>The non-controller staffing costs for a tower or Remote Facility</td>
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<tr>
<td><strong>Facility</strong></td>
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<tr>
<td>Non-Staff Operating Costs</td>
<td>The annual operations and maintenance for a facility</td>
<td><img src="image" alt="tools" /></td>
</tr>
<tr>
<td>Capital Costs</td>
<td>The capital costs required to build a new facility</td>
<td><img src="image" alt="building" /></td>
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<tr>
<td>Decommissioning Costs</td>
<td>The decommissioning costs for a facility</td>
<td><img src="image" alt="tools" /></td>
</tr>
<tr>
<td>Remote Tower Equipment Cost</td>
<td>The remote tower equipment at an airport and any new equipment required for a Remote Facility</td>
<td><img src="image" alt="camera" /></td>
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<tr>
<td>Data Transmission Costs</td>
<td>The costs of transmitting data to a Remote Facility</td>
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<tr>
<td><strong>Timing</strong></td>
<td></td>
<td></td>
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<tr>
<td>Opening year</td>
<td>The target opening date for the facility</td>
<td></td>
</tr>
<tr>
<td>Decommissioning year</td>
<td>The facility decommissioning date</td>
<td></td>
</tr>
<tr>
<td>Technology refresh</td>
<td>The technology refresh period for key equipment</td>
<td></td>
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</tbody>
</table>

- **Calculate Annual Costs for a Configuration**
- **Assign Costs over Time**
- **Report Cash Flows**
Modeling Approach & Outputs

Model generates all cost combinations using embedded business rules then aggregates the results.

<table>
<thead>
<tr>
<th>Combination</th>
<th>Cost</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
<td>2.1</td>
</tr>
<tr>
<td>C</td>
<td>1.4</td>
</tr>
<tr>
<td>D</td>
<td>1.5</td>
</tr>
<tr>
<td>E</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Inputs

Alternatives: Legacy; Single Airport Remote Facility; 3-, 6- or 12-airport Remote Facility

Embedded business rules

Cash Flows Over Time

Net Present Value Distributions
Key Findings
Lifecycle Cost Findings

All remote tower alternatives cost less than a conventional tower

- Single airport Remote Facilities cost less on average than multi-airport ones because the costs of data transmission outweigh the support staff cost savings from co-location.
- Using Cross-Trained controllers reduces cost compared to using non-cross-trained controllers.
- Increasing the number of airports per Remote Facility did not reduce per airport costs due to the way costs were scaled.
Replacing one conventional tower a year with a single airport on-site Remote Facility could produce immediate savings.
Looking Forward

- **Gain consensus about remote towers**
  - FAA using outputs from cost analysis study to inform their overall remote tower strategy
  - Communicate findings from this study to FAA stakeholders to allow them to form a consensus view about implementing remote services

- **Focusing cost analysis on set of sponsor-owned FCT airports**
  - Sponsor-owned FCTs are primary focus for FAA’s current strategy
  - Evaluating a case study of current sponsor owned FCTs
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