NAASO
2019 CONVENTION + TRADESHOW
Partnerships at Work.
Air Traffic Control Towers and New Technology to Booster Aviation

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Partnerships at Work.
In Plane Sight

*Every stakeholder at every control facility has different needs, goals, and limitations*

- Identical solution for each facility will not meet stakeholder needs, but a custom solution for each facility is not feasible
- Success of a remote tower program depends on a **common, modular solution** which is **flexible** to accommodate each facility’s needs

All Stakeholders’ Needs Addressed with Common Modular Solution
Raytheon / Frequentis USA Integrated Solution

**Our remote tower solution integrates STARS, smartVISION™, and surveillance**

- **STARS** provides full *airspace situational awareness* in airport vicinity
- **smartVISION™** remote tower provides *digital display of airport operations*, including STARS overlay
- **Surveillance sensors** (Skyler™ radar, commercial ADS-B receiver, remote tower cameras) installed at or near airport for target surveillance

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**An Integrated Solution of Existing Products**

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Solution Component: STARS

STARS for surveillance and air situation awareness

- Uses proven, *NAS certified STARS hardware and software*, the same as is operational at hundreds of TRACONs and towers throughout the NAS
- Fuses a mix of surveillance sensor data for a *single air situation picture*
- Infrastructure is fully *dual-redundant*
- *Scalable and adaptable* to suit any location

Operational Terminal Control NAS-Wide

10/23/2019 | 6

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Solution Component: smartVISION™

smartVISION™ remote tower visualization system

- 360 degree visual and thermal camera array
- PTZ with visual, thermal, and light gun
- Harmonized panoramic view plus augmentation overlays
- Automatic object detection and tracking
- Interface with existing airport systems
- Fully dual-redundant infrastructure
- Operational at 4 locations with another 8 sites in process including:
  - First approved remote tower managing airports with complex IFR/VFR traffic
  - First approved remote tower in the British Isles
  - First military remote tower

Thermal camera for visibility in all situations

smartVISION stitching, harmonized, high dynamic range, SW optimized

Operational for Multiple Remote Tower Uses

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Skyler™ for Airspace Surveillance

Skyler is a low cost, multi-function phased array sensor, capable of providing netted radar coverage

- Aviation surveillance
- High resolution, netted weather products
- Small UAS detection and tracking

Skyler Generation III

- X band (9.0-9.6 GHz)
- Nominal 1 meter aperture
- 90 deg. azimuth, 60 deg. elevation
- Range up to 25 nm for GA traffic
- Less than 225 lbs.

ADS-B to Augment Airspace Situational Awareness

- Commercial ADS-B module and antenna installation receives both 978MHz UAT and 1090MHz ADS-B from aircraft in airport vicinity

Low-Cost Surveillance Solution

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Long-term success of a Remote Tower initiative depends on more than the technical solution

- Essential to have established, robust processes in place for the entire product lifecycle

Strong Lifecycle Plan Manages Total Cost of Ownership
An established, operational Remote Tower is ultimately a gateway to, and platform for, incorporating other technical innovations.
MEASUREMENT OF AIRPORT OPERATIONS USING A LOW-COST TRANSPONDER DATA RECEIVER AND COLLECTION UNIT
• Fewer than 270 of nonprimary GA airports have ATC personnel
• Operations data needed for local and system planning and traffic mix analysis

## Existing Operations Counting Technology

<table>
<thead>
<tr>
<th>Counting Technology¹</th>
<th>Test Airport</th>
<th>Reported Percentage Error</th>
<th>Cost Per Unit²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound-Level Meter Acoustic Counter (portable acoustic counter)</td>
<td>KLAF</td>
<td>5% to 99%</td>
<td>$4,800</td>
</tr>
<tr>
<td></td>
<td>KTYQ</td>
<td>8% to 48%</td>
<td></td>
</tr>
<tr>
<td>Security/Trail Camera (Portable camera with infrared night vision)</td>
<td>KLAF</td>
<td>54% to 100%</td>
<td>$1,000</td>
</tr>
<tr>
<td></td>
<td>KTYQ</td>
<td>0% to 43%</td>
<td></td>
</tr>
<tr>
<td>Stationary Visual Image Detection (VID) with ADS-B Transponder Receiver (stationary)³</td>
<td>KTYQ</td>
<td>10% to 17%</td>
<td>$36,000</td>
</tr>
</tbody>
</table>

Notes:
1. All data in this table were retrieved from ACRP Report 129 (1).
2. The costs are represented as paid for the equipment tested in (1), and do not include any installation time (except for the leased VID equipment) or data retrieval time.
3. The costs decrease to $31,000 without the ADS-B receiver. This is a lease cost and will vary from airport to airport depending on the airport layout.

Bottom Line Up Front

• Developed an automated operations counting system.
• Algorithm used ADS-B signals to calibrate model that incorporated Mode C transponder signal strength and elevation data.
• Data was collected with pre-production prototype developed by cost sharing partner BlueAvion.
• Long-term count errors ranged from 0.6% to 3.0%
Data collection sites across Indiana
FIGURE 4 Airport diagrams of data collection sites (with location numbers as callouts).
FIGURE 5  Aerial photos of data collection sites (with location numbers as callouts).
Very attractive for state DOTs as this can be done without airport access on their right of way.

FIGURE 6 Closeup views of several antenna deployment locations. (KLAF Location 3 is Version II device)
Field deployments of system used at KHUF (Location 5) and KTYQ (Location 6)
Field deployments of system used at KHUF (Location 5) and KTYQ (Location 6)

Version II device deployed at KHUF

Version II device deployed at KTYQ
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