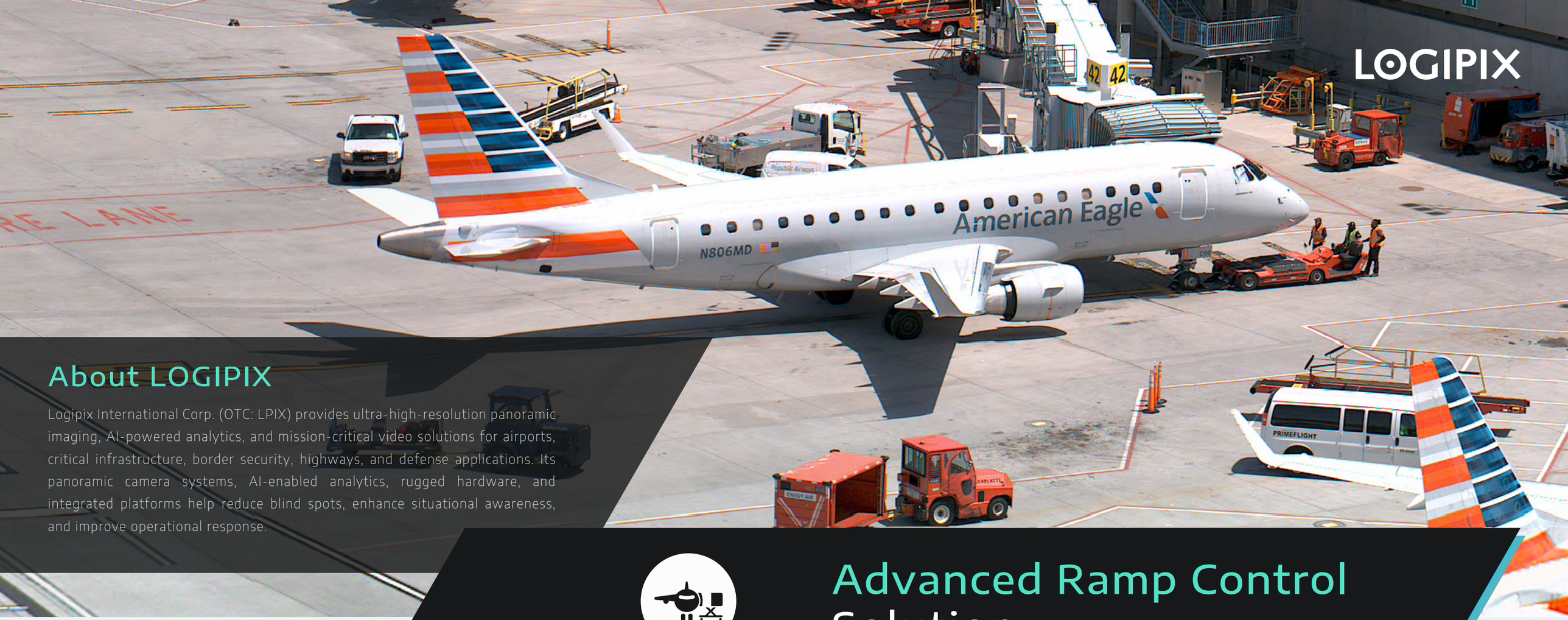

About LOGIPIX

Logipix International Corp. (OTC: LPIX) provides ultra-high-resolution panoramic imaging, AI-powered analytics, and mission-critical video solutions for airports, critical infrastructure, border security, highways, and defense applications. Its panoramic camera systems, AI-enabled analytics, rugged hardware, and integrated platforms help reduce blind spots, enhance situational awareness, and improve operational response.

Advanced Ramp Control Solution

AR/EN/26/1

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Operational Challenges

The rapid growth of air travel, combined with evolving operational pressures and unexpected disruptions, continues to challenge airports worldwide. Meeting increasing demand while streamlining operations and reducing operational costs requires strategic adaptation. Expanding airport infrastructure or assets is often not a viable option, making the optimization of existing resources essential. In this dynamic environment, airports must maintain efficient, predictable, and safe operations – even with limited personnel and increasing complexity.

To address these challenges, airports must turn to innovative, advanced technologies. AI-powered monitoring, intelligent data analysis, and integrated operational systems enable greater visibility and control over turnaround processes. These solutions help refine workflows, reduce delays, improve resource allocation, and ensure seamless ground operations while maintaining the highest safety standards.

ARCS (Advanced Ramp Control Solution) was developed specifically to meet these directives.

Advanced Ramp Control Solution

The Logipix Advanced Ramp Control Solution (ARCS) is an intelligent, video-based turnaround management system designed to provide comprehensive oversight of aircraft stand operations. By supporting the registration and monitoring of ground handling activities, the solution delivers a clear, high-resolution view of turnaround progress while generating valuable operational data for analysis and reporting.

The system helps airports, ground handling companies, and operational teams improve coordination, increase process transparency, and identify bottlenecks before they impact operations.

By transforming visual information into actionable operational intelligence, ARCS enables more efficient stand management, optimized resource allocation, and continuously improving turnaround performance.

ARCS is the right solution if you aim to...

- Optimize ground handling management and explore operational bottlenecks.
- Make all airplane stands visible for ground operators in high-resolution, both in real-time and in historical mode.
- Shorten turnaround times and create useful statistics on ground handling efficiency.
- Have relevant information for KPI calculations to make effective plans and decisions.
- Create statistics on stand occupancy based on precisely recorded and organized data.
- Improve overall airside efficiency by monitoring and analyzing turnaround processes.
- Facilitate incident investigation and get irrefutable visual evidence in already occurred cases.
- Increase the safety of passengers, employees and assets at the airside.
- Clarify billing procedures based on accurately registered and traceable service times.
- Track important turnaround milestones and assist ACDM.

Financial Impact and Cost Optimization

- **Supporting strategical decisions**
  The system supports KPI calculations by providing accurate data on actual turnaround times and delays

- **Optimizing stand occupancy**
  Various airside statistics and calculations can be created on stand occupancy, which helps realize explicit business benefits.

- **The system increases operator's efficiency**
  Far less personnel is needed to manage multiple turnarounds simultaneously and keep all services on track.

- **No need for frequent maintenance using human resources**
  Logipix hardware components are capable of self-maintenance, thanks to their built-in self-cleaning and deicing systems.

- **Optimizing manpower**
  Operators can manage several stands simultaneously, therefore less manpower is needed to manage all stands at the apron.

- **Adaptable system structure**
  We always consider the specific structure and characteristics of airports to best adapt the system for the current project. Moreover, ARCS has a flexible hardware structure that can be easily rearranged in case of future apron developments.

- **Designed for long-term**
  Our engineers developed leading-edge technologies, which ensure the system avoids both physical and technological obsolescence for a long time.

- **Maximized system uptime**
  Logipix provides uninterrupted system availability as all their components are developed to operate with high MTBF (Mean Time Between Failures).

Operational Efficiency Benefits

- **Enhanced vision at the aircraft stands**
  The Logipix system allows to cover all aircraft stands and their surrounding areas from multiple angles. This way operators have real-time visual information on all stands at the apron and they can check the progress of the turnaround processes.

- **Real-time stand allocation management support**
  The system calculates the end of turnaround services, alerts delays and time conflicts, which make stand allocations and re-allocations easier for operators.

- **Convenient turnaround registration**
  Operators have a user-friendly interface to register turnaround processes real time, or use the historical mode to search the exact time when the processes have started.

- **Increased operational efficiency**
  The solution makes it possible to register turnaround processes at a higher level, assisted by Video Content Analysis (VCA), and therefore increase ground handling management efficiency at the apron.

- **Real-time Decision Making Support**
  ARCS functions as an RTDMS system that always highlights the most relevant information on screen.

- **Undoubted visual evidence in questionable situations**
  Any situation can be thoroughly investigated with Logipix, down to the smallest details. For instance, in cases when it is unclear whether an airplane has been damaged at the airport or prior to landing. Logipix sensors provide undoubted visual evidence upon request.

What Makes ARCS Unique

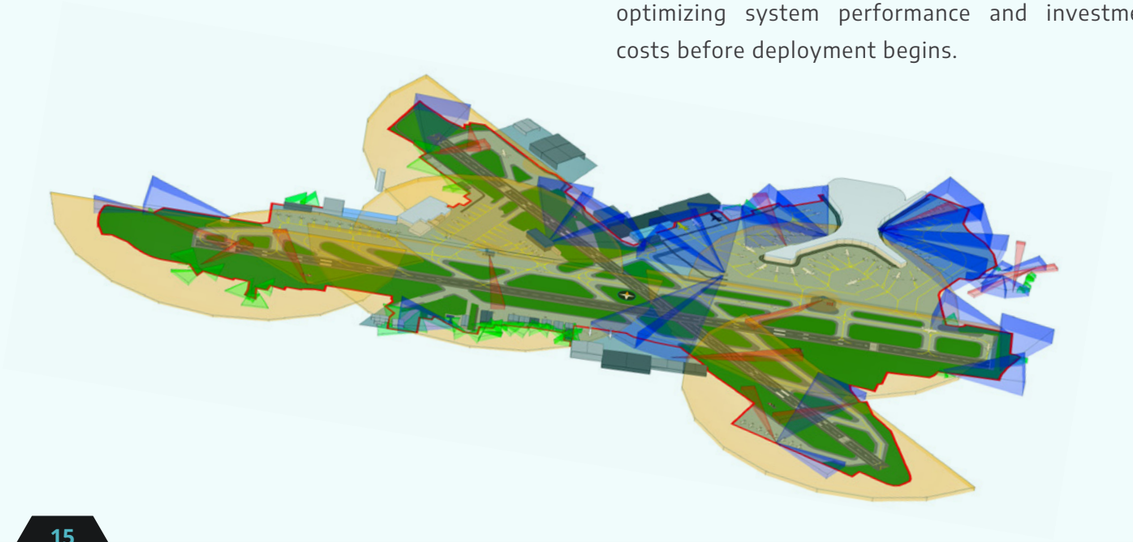
- **Comprehensive Apron Visibility**
  High-performance image-sensor technology delivers complete situational awareness across aircraft stands and surrounding operational areas.
- **Full Apron Overview**
  Maintain real-time oversight of concurrent turnaround activities across the entire apron.
- **Multi-Stand Operational Awareness**
  Monitor and manage multiple turnaround operations simultaneously with high-resolution visual feedback and instant stand switching.
- **Live & Historical Operations Management**
  Review, validate, and complete turnaround registrations retrospectively with precise timestamps and easy access to recorded events.
- **Seamless Operational Continuity**
  Combine live monitoring and retrospective analysis within a single workflow for maximum operational flexibility
- **Integrated End-to-End Platform**
  A fully unified hardware and software solution, enhanced by optional AI-driven process detection and automatic event registration.
- **Data-Driven Performance Optimization**
  Generate actionable operational statistics from turnaround data to improve efficiency and support continuous improvement.
- **Reliable Incident Verification**
  Access high-resolution visual evidence for investigations and determine whether damage occurred before or during turnaround operations.
- **Extended Video Retention**
  Intelligent storage management enables long-term footage retention while maintaining fast and reliable access.

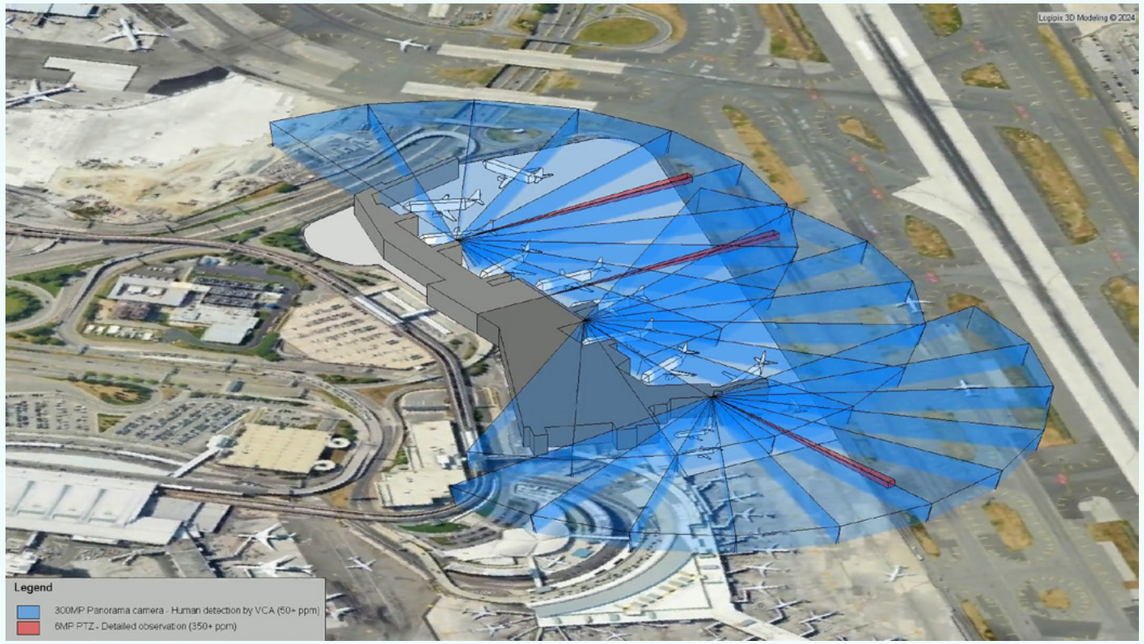
Designing Your Project

3D Model of Visual Coverage

Each Logipix project begins with a detailed 3D coverage model of the airside environment. This planning phase provides a complete visualization of the operational area, enabling the precise design of camera placement, resolution requirements, and coverage zones based on the airport's specific operational needs and stand layouts.

Using this model, Logipix defines the optimal system configuration to ensure comprehensive situational awareness, and meet operational, safety, and performance objectives. For maximum visibility, aircraft stands can be monitored from multiple angles using a combination of panoramic and single-sensor cameras. This approach ensures efficient coverage while optimizing system performance and investment costs before deployment begins.





System Extension

The Logipix solution is built on a modular and scalable architecture that supports seamless system extension. Apron coverage can be expanded by adding cameras and sensors, while additional ARCS functionalities can be easily unlocked through software upgrades.

This approach enables the activation of new analytical, monitoring, and AI-enabled automation features without hardware replacement or system downtime, ensuring long-term adaptability to evolving operational and regulatory requirements.

System Architecture

Technology Overview

Main Functions

Apron Overview

Operators and supervisors can monitor all aircraft stands across the apron through a centralized overview interface, providing real-time visibility into the progress of daily turnaround operations. The system automatically highlights delays and potential time conflicts through warnings and alerts, enabling operational teams to respond proactively. With instant access to accurate turnaround information, operators can efficiently adjust schedules, reallocate resources, and prevent disruptions before they impact airport operations.

Turnaround Registration

Operators can select any aircraft stand to monitor turnaround activities in detail and track the progress of each service step from arrival to push-back. The system enables accurate registration of events in real time or retrospectively through archive review, automatically creating comprehensive turnaround reports with precise timestamps and supporting visual evidence.

Turnaround History

In Turnaround History previously saved worksheets can be reviewed with automatically saved reference images.

Turnaround Statistics

Valuable statistics can be created based on the registered operations, which help improve the efficiency of turnarounds.

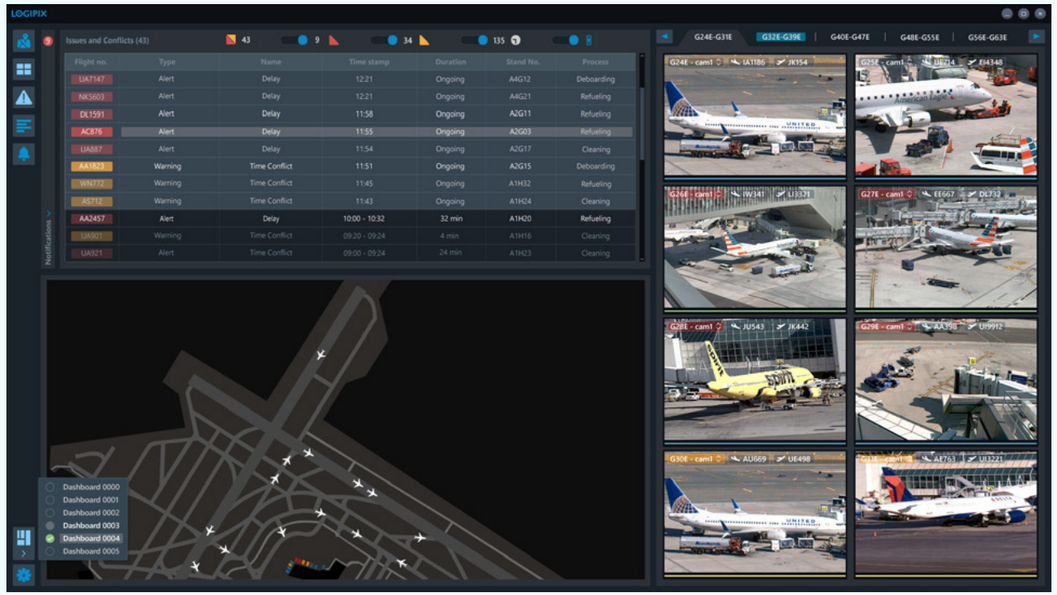
Manual and AI-Enabled Operation Modes

The Advanced Ramp Control Solution is available in two configurations to meet different operational requirements. The standard version relies on operator-driven monitoring and registration, providing full control over turnaround process tracking and reporting. The advanced version incorporates AI-powered Video Content Analysis (VCA), which assists operators by automatically detecting, tracking, and registering selected turnaround activities.

Using advanced computer vision algorithms, the Logipix can detect and classify a wide range of objects, including aircraft, ground support equipment, and service vehicles. It continuously tracks their movements and interactions across the apron, providing valuable operational insights in real time. Depending on camera positioning and image resolution, the system can identify not only individual objects but also complex turnaround processes, further increasing automation, reducing operator workload, and improving the accuracy and consistency of process registration.

Apron Overiew

The Apron Overview was developed to provide operators with a clear, real-time summary of all aircraft stands across the apron. By combining live camera feeds with daily flight schedules — which may include hundreds of stands and turnaround events — the system enables operators to quickly understand the current operational situation. Aircraft stands and turnaround statuses are color-coded to provide instant visual feedback, helping operators identify active processes, delays, or irregularities at a glance. The interface also allows easy filtering by stand groups or individually assigned stands, ensuring fast access to the most relevant information.
Designed for rapid situational awareness, the interface includes an interactive map displaying aircraft movements and stand statuses in real time. Operators can zoom in, pan across the apron, and focus on specific areas of interest. By hovering over a stand, an information panel appears, showing aircraft allocation details and the current turnaround progress.



In the event of delays or operational changes, operators can immediately assess the situation and quickly share information with Airport Operations and Ground Handling Agents. This supports faster decision-making and more efficient rescheduling of aircraft stand allocations.

When the Logipix system receives transponder data, information from a vehicle management system, or support from the Logipix VCA, the interactive map can display the real-time positions of aircraft across the apron. By clicking on aircraft icons, operators can view additional information, including aircraft identification and allocated stand details.

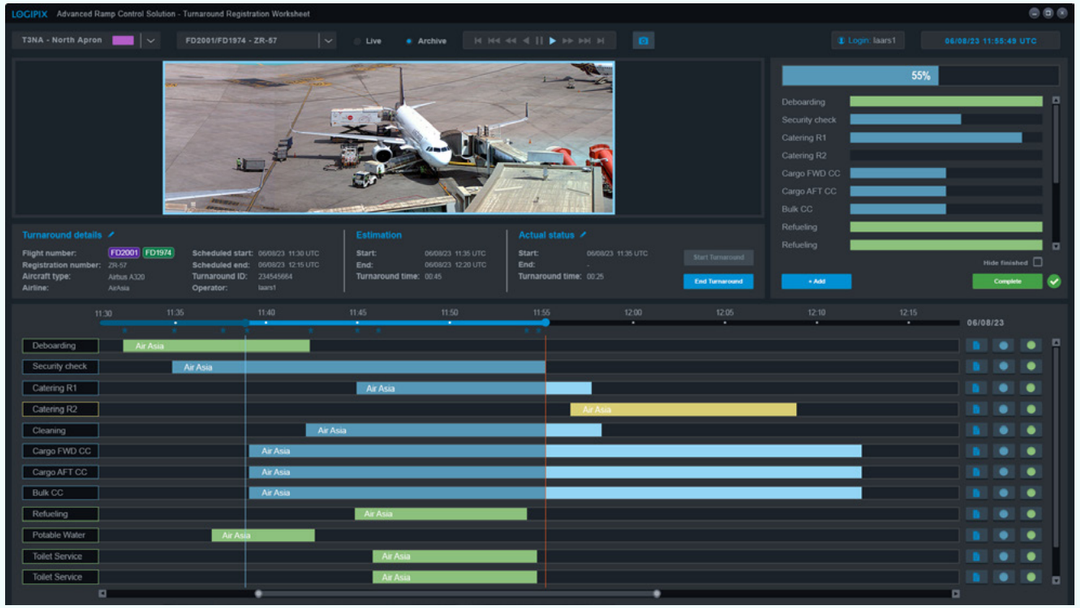
A key source of operational information within the interface is the daily flight schedule. Each stand is displayed with its own timeline, showing color-coded turnaround phases based on imported schedule data. If a turnaround exceeds its planned duration, the system automatically generates warnings or alerts, enabling operators to react quickly and maintain operational efficiency

Turnaround Registration

The Turnaround Registration interface enables operators to monitor and register the progress of turnaround processes at any stand, from aircraft parking to push-back. Through the overview interface, operators can quickly navigate between stands and select a specific turnaround for a more detailed view.

Once a turnaround is selected, the registration interface provides a comprehensive overview of all ongoing activities, allowing operators to verify whether services are being performed within the planned operational time frames. By registering events with precise timestamps, the system automatically builds a detailed turnaround report.

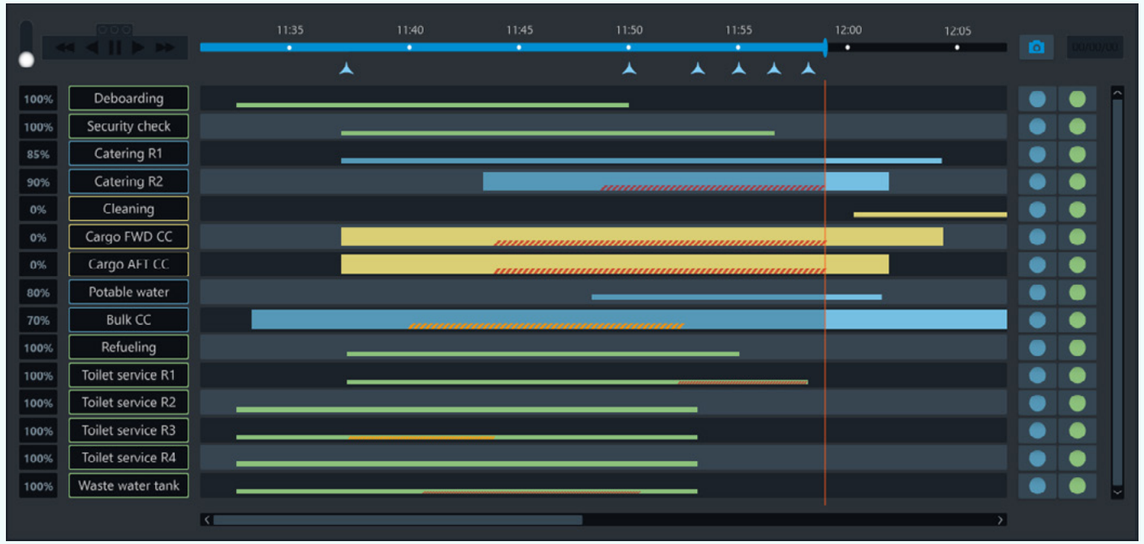
As each stand is continuously monitored from multiple camera angles, operators have constant access to high-resolution visual feedback of activities around the aircraft. In parallel, the interface displays turnaround information in text format, including estimated turnaround times



calculated from predefined operational parameters. The turnaround schedule is automatically populated using imported flight data or predefined service templates containing the required sequence of ground handling tasks. Based on real-time operational progress, the system continuously updates the estimated completion times. Time frames are adjusted automatically according to aircraft and stand types, ensuring more accurate process tracking. In manual operation mode, operators can register services in real time or use archive mode to review and register completed activities afterward. The archive interface allows fast rewinding, forwarding, and timeline-based searching, enabling operators to manage multiple turnarounds and stands efficiently at the same time.

In AI-enabled operation mode, computer vision algorithms automatically monitor and register turnaround activities, significantly increasing operational efficiency and reducing operator workload. The range of detectable processes depends primarily on camera positioning and image resolution.

Whenever a service event is registered — either manually by an operator or automatically by the VCA — the system saves reference images automatically. Operators can also capture additional images at any time. All recorded images remain accessible throughout the configured storage period for later review and analysis.

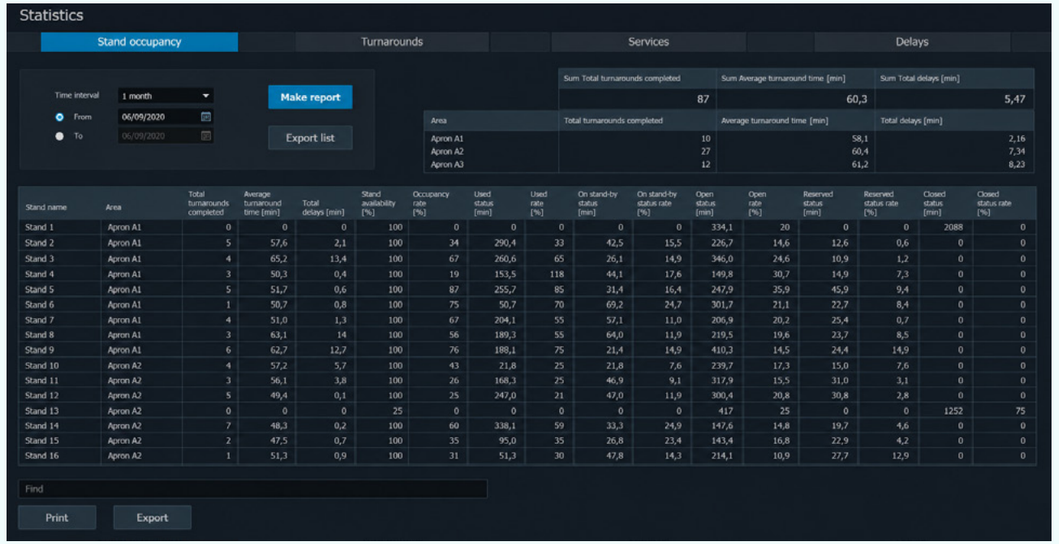


Turnaround History

Using the Turnaround History interface, operators can search and review previously registered turnarounds throughout the storage period whenever needed. The interface is similar to the Turnaround Registration view in archive mode, with an additional search bar for browsing recorded turnaround events. The displayed schedule helps streamline the search process, allowing operators to locate relevant records and reference images within seconds. This enables fast and efficient evidence retrieval for investigations, operational reviews, or any other verification purpose.

Turnaround Statistics

Valuable turnaround statistics can be generated from the recorded data. This functionality enables detailed analysis of turnaround durations and individual ground handling services. Automated calculations help identify bottlenecks, uncover inefficiencies, and support continuous improvements in turnaround performance. Analyses can be performed separately for different aircraft types, flight categories, and individual stands. If required, the performance of different Ground Handling Agents can also be evaluated and compared.



Technologies Behind Logipix Functions

Synchronized Imaging

All Logipix system components are synchronized to each other and all the cameras take their images in sync to guarantee that the moving objects are visible at their correct location. The system records time stamps in all image headers, which allows the system to provide appropriate visual evidences during investigation.

AI-Enabled VCA

Logipix provides the most reliable VCA possible, as the algorithms run on full resolution, uncompressed image streams. This approach ensures accurate detection and tracking. The VCA relies on several advanced method. One of them is the Multidimensional Gaussian Background Model that always adapts to the background and differentiates every moving object from the learnt environment. Our built-in neural network ensures that the system does not loose the relevant non-moving objects. The VCA also applies Object Feature Extraction, Motion Behavior Analysis and Motion Path Estimation algorithms in order to realize an intelligent, self-learning virtual environment.

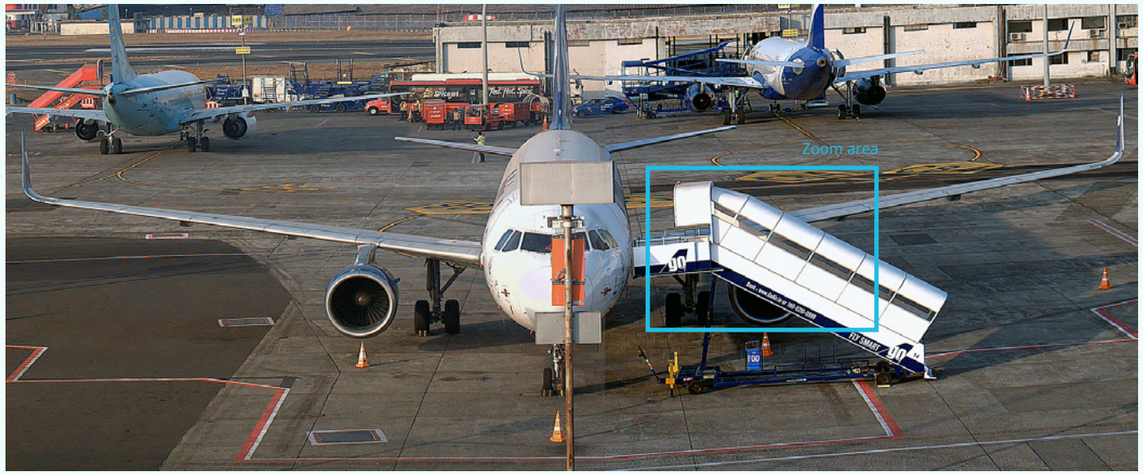
Smart Stotage Management

The system continuously records the videos. Thanks to the Logipix Ageing Technology, storage period of video streams can be greatly prolonged. The system intelligently drops frames from the video stream according to a configured period, and therefore it frees up space on the HDDs. As the JPEG2000 stream consists only intra-frame images, the footage will be still available after video stream ageing, but with reduced fps.

Monitoring in Full Resolution

Displaying the extreme high-resolution image streams at high fps during live monitoring or archive playback is not an easy task. This amount of data can impose excessive burdens on the network infrastructure and also on client computers.
Logipix developed a special technology to overcome this issue. The system stores the full-size images on the NVR, but always transmits and displays onAly relevant pixels. When a full frame image is on screen, its horizontal resolution is equal to the display resolution. When an operator zooms in, the system sends the cropped image in higher resolution. As the zoom value increases, so does the transmitted image resolution.

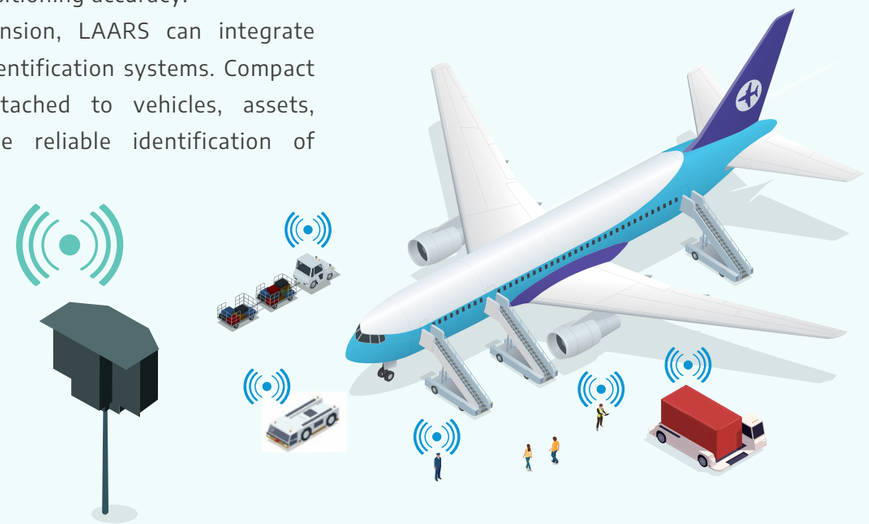
High-resolution image detail



Sensor Fusion

Logipix Sensor Fusion Technology combines information from multiple sensors to deliver highly accurate object detection, tracking, and identification across the airside environment. Logipix has developed proprietary raw data-level and GPS-level sensor fusion technologies. By processing uncompressed sensor data directly, the system achieves maximum accuracy and reliability while minimizing information loss. Originally developed for Logipix sensors, the technology can also integrate data from third-party devices, enabling seamless fusion various sensors. This advanced data analysis improves object detection, classification, tracking precision, and geo-positioning accuracy.

As an optional extension, LAARS can integrate transponder-based identification systems. Compact IoT transponders attached to vehicles, assets, or personnel provide reliable identification of cooperative objects, even in visually challenging conditions. By combining transponder information with video analytics and sensor fusion data, operators can instantly determine exactly which vehicle, piece of equipment, or staff member is present during a turnaround process. This significantly improves operational awareness, traceability, and reporting accuracy, while also enabling a higher degree of automation. The system can automatically recognize the arrival and departure of specific ground handling vehicles and correlate their activities with turnaround events, helping to automate service registration processes and further reduce operator workload.



Cybersecurity

Logipix cybersecurity is designed to meet the strict security requirements of airport environments. The system protects sensitive operational and video data through proprietary encrypted communication, strict access control, and tamper-resistant storage. Full encryption of raw video streams and cryptographic signing of exported recordings ensure data integrity and traceability. Regular vulnerability assessments, penetration testing, daily database backups, and device binding mechanisms provide resilience against evolving cyber threats while supporting secure, uninterrupted airside operations.

System Health Monitoring

Logipix provides continuous remote monitoring of system health through automated health reports, SNMP traps, and a centralized notification center that delivers real-time feedback on hardware and network status. This enables early detection of anomalies and proactive maintenance before issues escalate. Physical maintenance requirements are minimized through built-in self-cleaning and deicing systems, ensuring reliable operation in harsh weather conditions while reducing on-site intervention and maintenance costs.

Main Features and Functions

Monitoring

- 20 MP Video Streams at 20 FPS per Camera
- Zoom Views from 300 MP Panoramic Streams
- Real-Time Monitoring in Full Resolution
- Interactive Airside Map
- Daily Flight Schedule Overview
- Automatic Flight Data Import
- Delay and Time Conflict Alerts

Turnaround registration

- Real-Time Turnaround Monitoring
- Manual & Archive-Based Registration
- Timeline-Assisted Event Navigation
- AI-Assisted Service Detection
- Automatic Process Registration
- Automatic Reference Image Capture
- Comprehensive Turnaround Reporting

Integration

- Positioning systems: ADS-B, MLAT, A-SMGCS, Vehicle Management System
- Data import and export: Airport Information Systems, AIXM

Investigation & Statistics

- Turnaround History
  - Advanced Event Search
  - Reference Image Retrieval
  - Incident Investigation Support
  - Evidence Management
  - Operational Review & Verification
- Turnaround Statistics
  - Turnaround Performance
  - On-Time Performance
  - Stand Utilization
  - Ground Handling Analytics
  - Bottleneck Identification

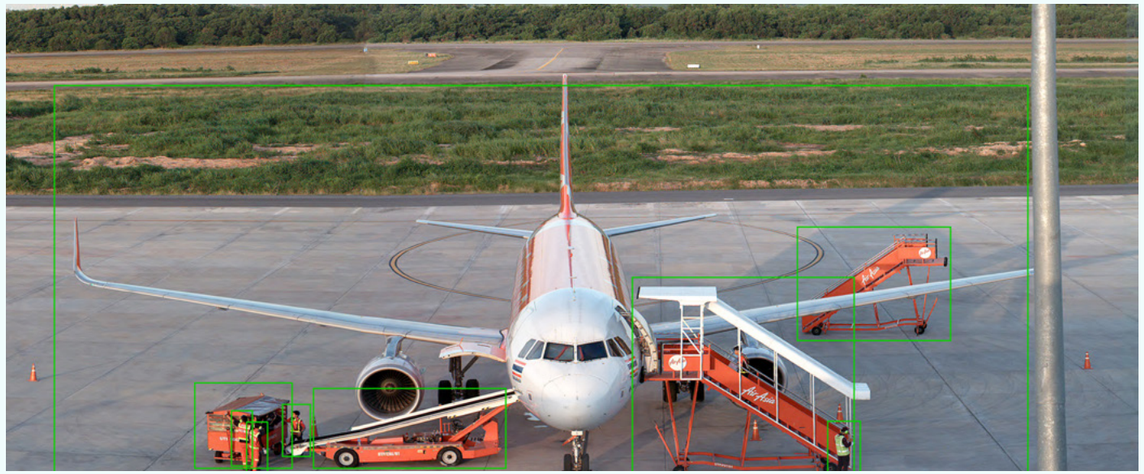
Key System Components

Logipix ONE 20 MP Camera

Logipix 300 MP 180° Panorama Camera

ARCS Client and Server components

Logipix Network Video Recorder 4th gen

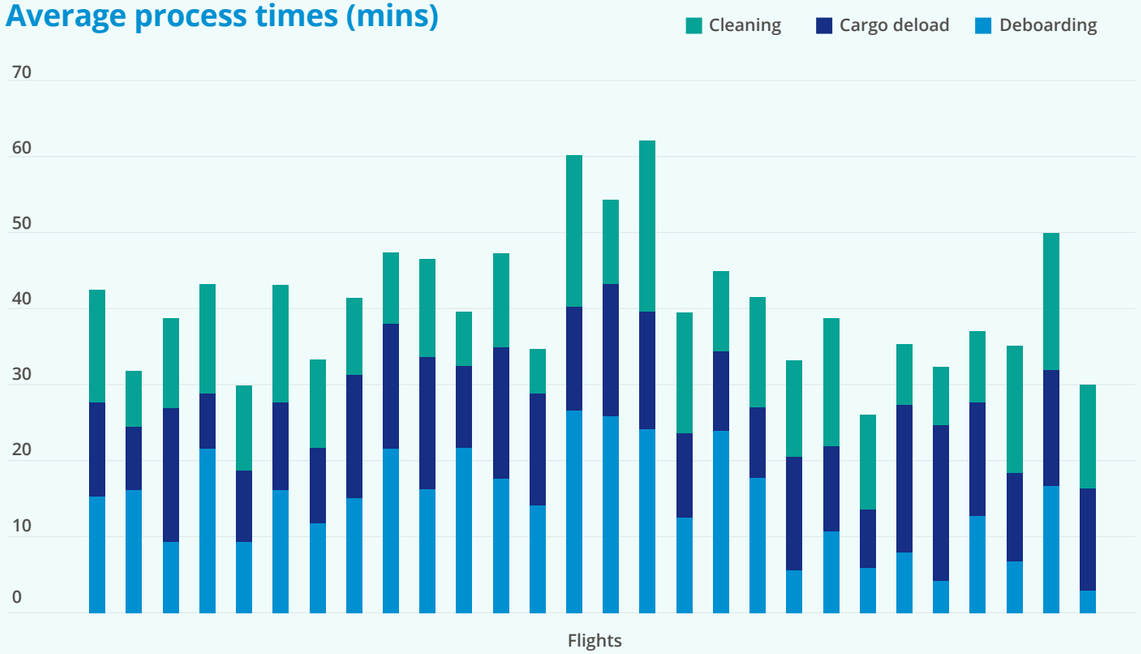


Technological Strengths of the Solution

- High-resolution video coverage of all aircraft stands across the apron for continuous operational visibility.
- Real-time monitoring and registration of multiple turnaround processes through a dedicated user interface.
- Interactive maps and timelines displaying stand allocations, service schedules, and turnaround status.
- Flexible service registration in real time or retrospectively using recorded footage, enabling efficient management of multiple stands.
- AI-powered Video Content Analysis automatically detects and registers the start and completion of selected services.
- Operational data and reports support KPI calculations, process optimization, and the reduction of delays and queuing.
- High-resolution recordings provide reliable evidence for incident investigation and operational review.

Conclusion

Average process times (mins)



ARCS was developed to enhance the visibility, control, and efficiency of aircraft turnaround operations. Using high-resolution imaging technology, the system provides continuous monitoring of aircraft stands and their surrounding apron areas, giving operators a comprehensive overview of ongoing activities. By enabling the rapid identification of delays, operational conflicts, and process deviations, ARCS helps airport personnel take timely corrective actions and maintain smooth turnaround operations. In addition, the system generates valuable operational data and performance analytics, including turnaround durations and service execution times. These insights help airports identify bottlenecks, optimize resource allocation, and continuously improve operational efficiency while reducing turnaround times.