NIRICSON

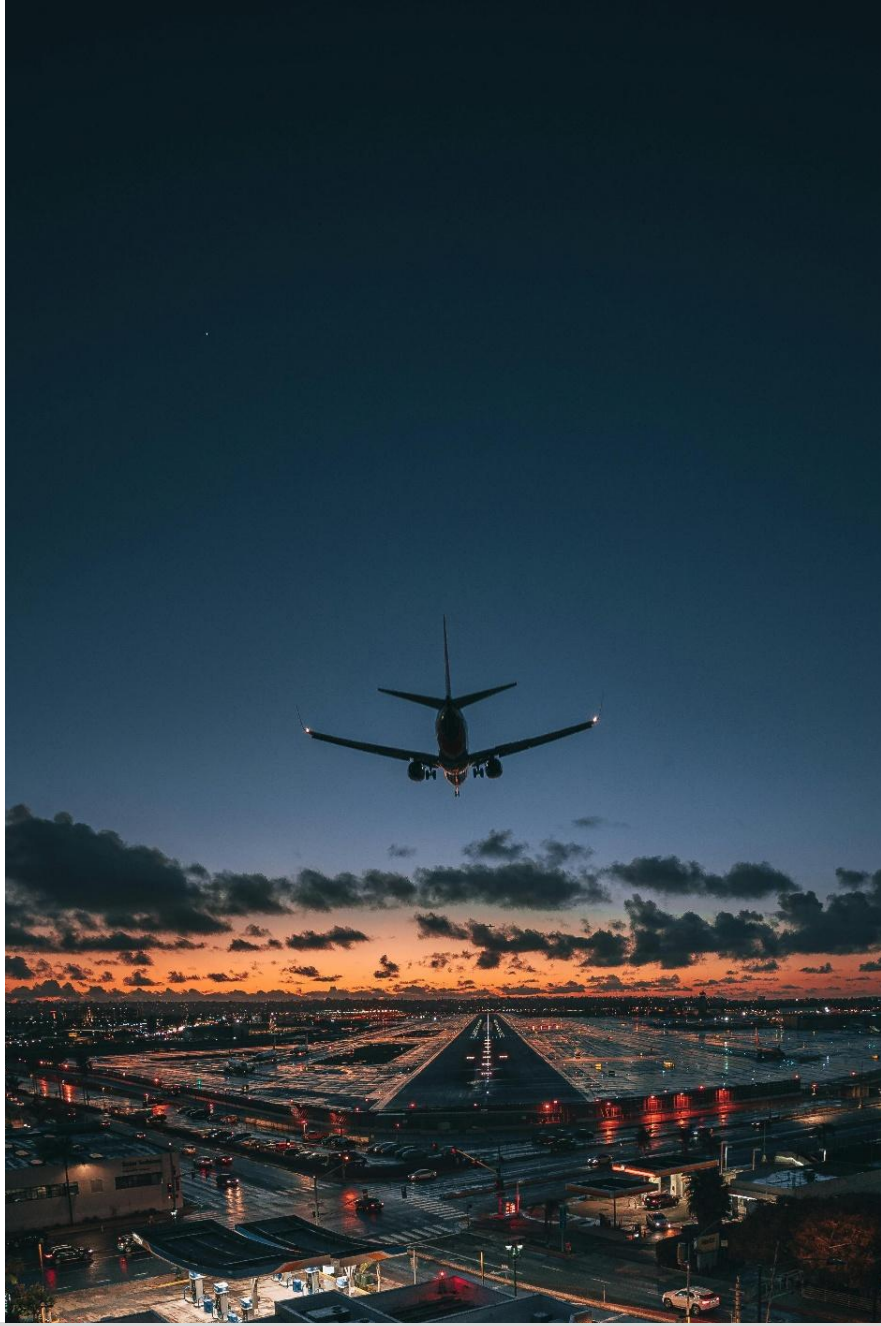
Automating the Pavement Distress Mapping Using Robotics and Computer Vision

HIGH RESOLUTION **3D MODEL** IN AUTOSPEX®

MAKING **INFRASTRUCTURE** SAFER

Agenda

- Overview of **Niricson** & the **Airport Project**
- The **Airport's Challenges** with Pavement Management
- **Scope of Work** & **Objectives**
- Project **Challenges** & **Solutions**
- **Development** in Data Collection
- Applications for **Digital Twins**
- Developments in Distress Mapping
- **Asset Management** Applications from the Project
- Implications for the Future **Pavement Management**



Niricson- A Trusted **Global Leader** in Digital Infrastructure Condition Assessment & Asset Management

Operating in

10 Countries Over 4 Continents

Canada, USA, Australia, New Zealand, India, UK, Belgium, Chile, Mexico and Netherlands

Serving

3 Major Critical Asset Classes

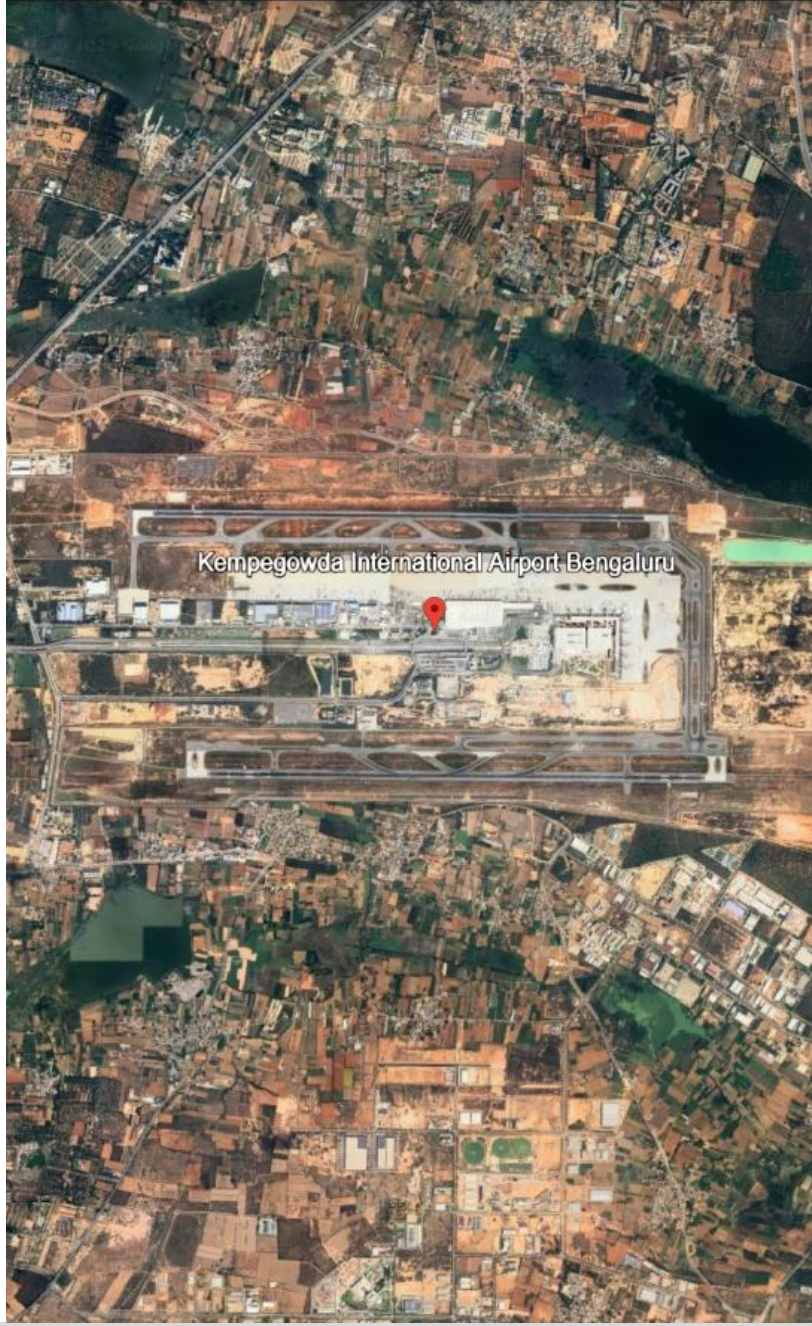
Proven technology and demonstrated growth in **Dams**, **Transportation**, and **Airfield** market.

Trusted by

Industry Leaders

Kempegowda International Airport in Bangalore, India

- International airport serving Bengaluru, the capital of the Indian state of Karnataka
- It is owned and **operated by Bengaluru International Airport Limited (BIAL)**
- The airport is the **third-busiest in India**, behind the airports in Delhi and Mumbai
- In FY2024-25, the airport handled over **41 million passengers** and **500,000 tonnes of cargo**



Challenges the Bangalore Airport is Facing

- High operational demands with limited shutdown windows as a 24/7 Airport
- Decisions often based on incomplete datasets
- Safety & compliance pressures from regulators
- Rising costs of maintenance and rehabilitation
- Limited visibility into deterioration over time

Project **Scope of Work**

- Collect imagery data from the aprons, taxiways, and runways at 1mm Ground Sampling Distance (GSD) using ground-based collection equipment
- Data to be collected in a few days without any interruptions, delays or adjustments to operations
- Data processed to create a resolution 3-D twin model
- Data further processed to 2-D defect maps with automated defect identification, quantification and labeling
- Distress map with 3rd party validation

Project **Objectives**

BIAL Identified their Main Objectives for using their dataset from this project:

- To Create Data-Driven Maintenance Schedule
- Track Maintenance Performance to then Conduct Preventive/Predictive Maintenance in the Future
- Prioritize Rehabilitation/Maintenance Budgets according to Deteriorations Rates

Challenges Encountered and **Solutions Implemented**

Operation Challenges - Limited downtime in a busy 24/7 airport, with particular constraints during day hours

- Increased Speed through Upgrades & Innovation

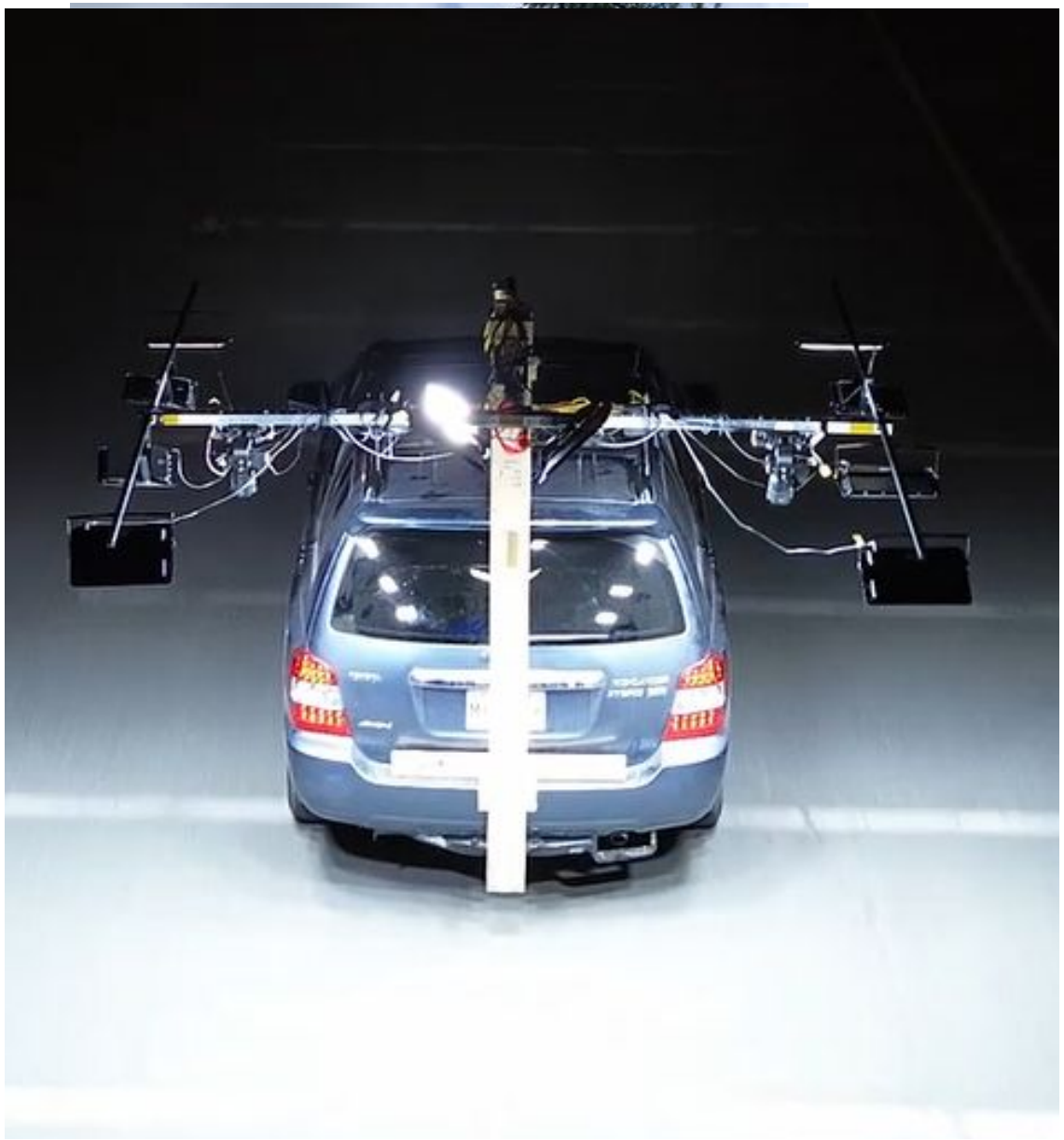
Processing Challenges – Processing terabytes of data when collecting large pavement spaces at a high resolution

- Server upgrades for faster processing

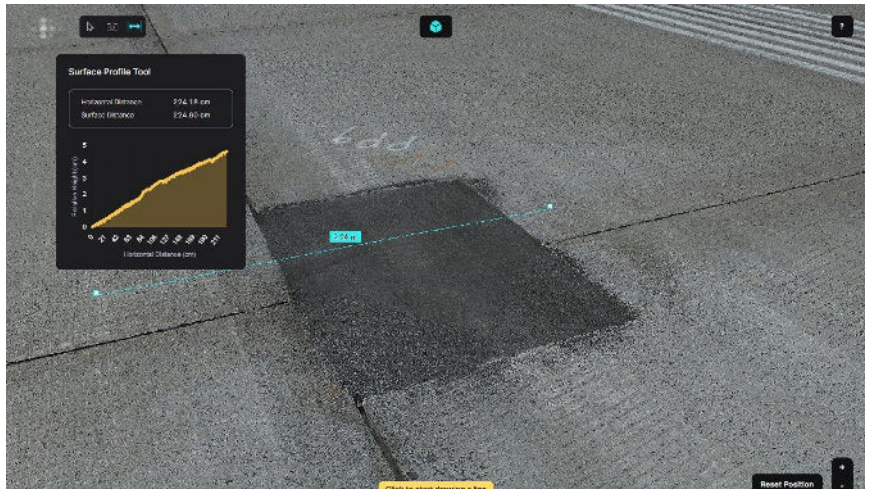
Innovations in Data Collection for BIAL

Changes in Data Collection Options

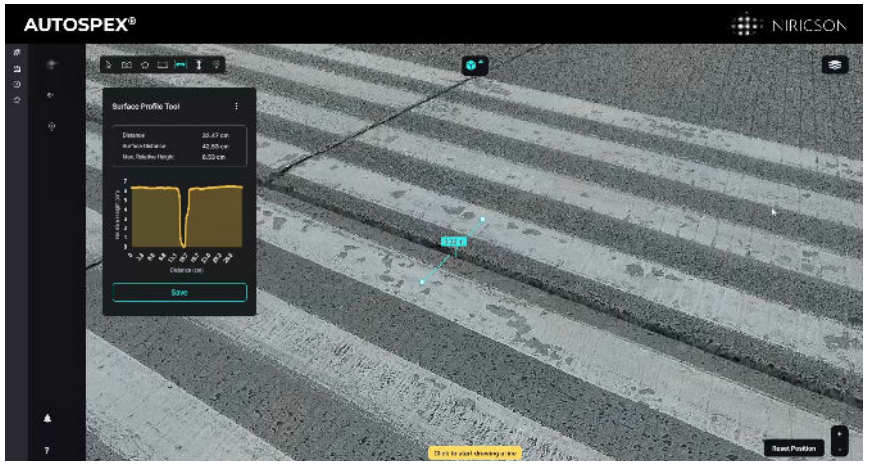
- Traditional inspections, walking the pavement
- Drone-based collection
  - Automated flights
- Rover-based scans
  - Automated ground based collection
- Vehicle-mounted sensors
  - Rapid airfield coverage



Applications for **Digital Twins for BIAL**

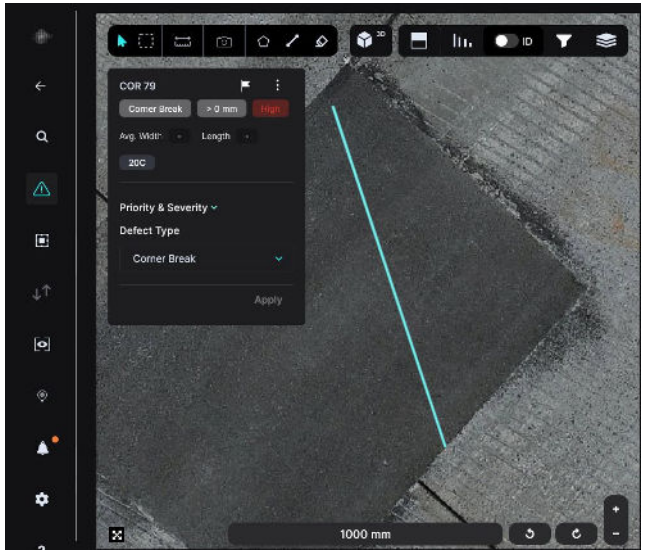


- **High-Fidelity 3D Pavement Models**
- **Practical Use Cases**:
  - Surface Profile tool for gradient/drainage analysis
  - Tracking changes in slab elevation/separation
  - Detection of 3 dimensional distresses
  - Design planning for rehabilitation

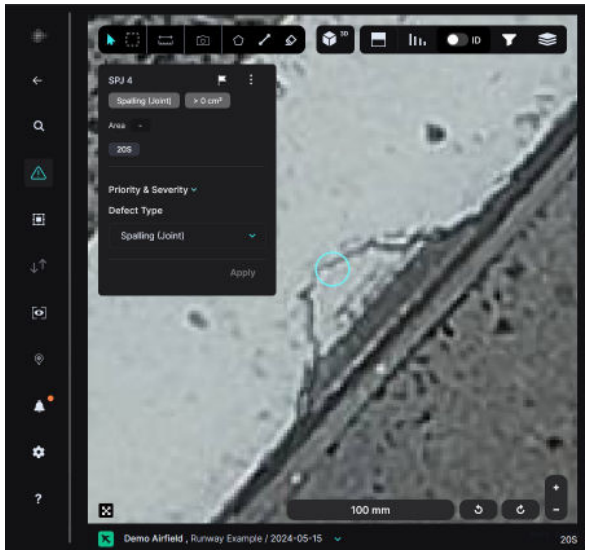


Developments in **Distress Mapping for BIAL**

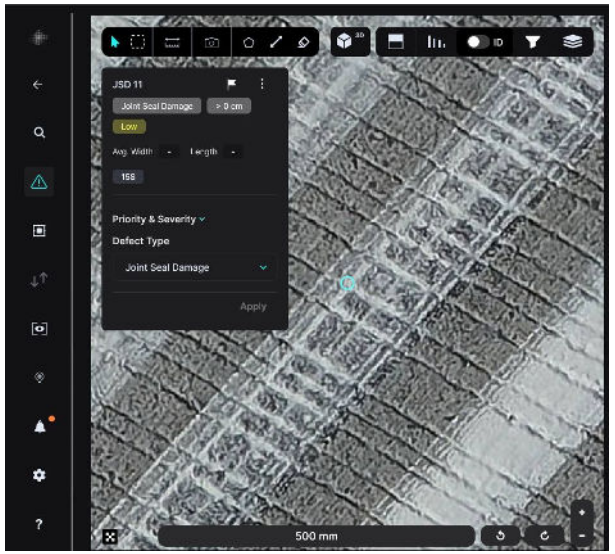
- Distress detection across 100% of the pavement
- Exact locations, measurements for coordinating regular maintenance work & rehab design
- Objective digital tracking allowing for automated change-detection



Corner Breaks



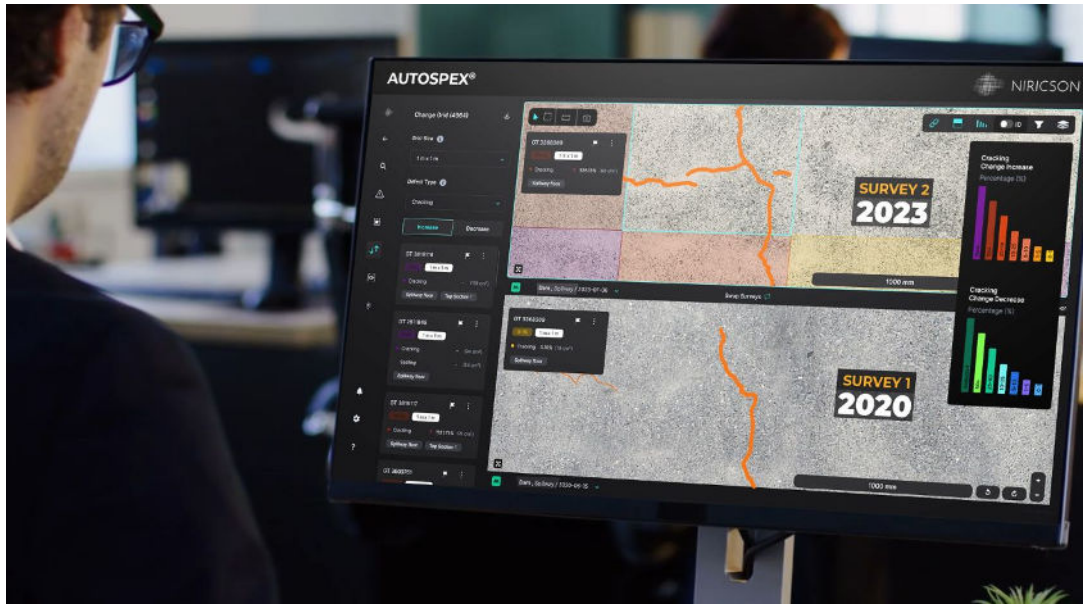
Spalling (Joint)

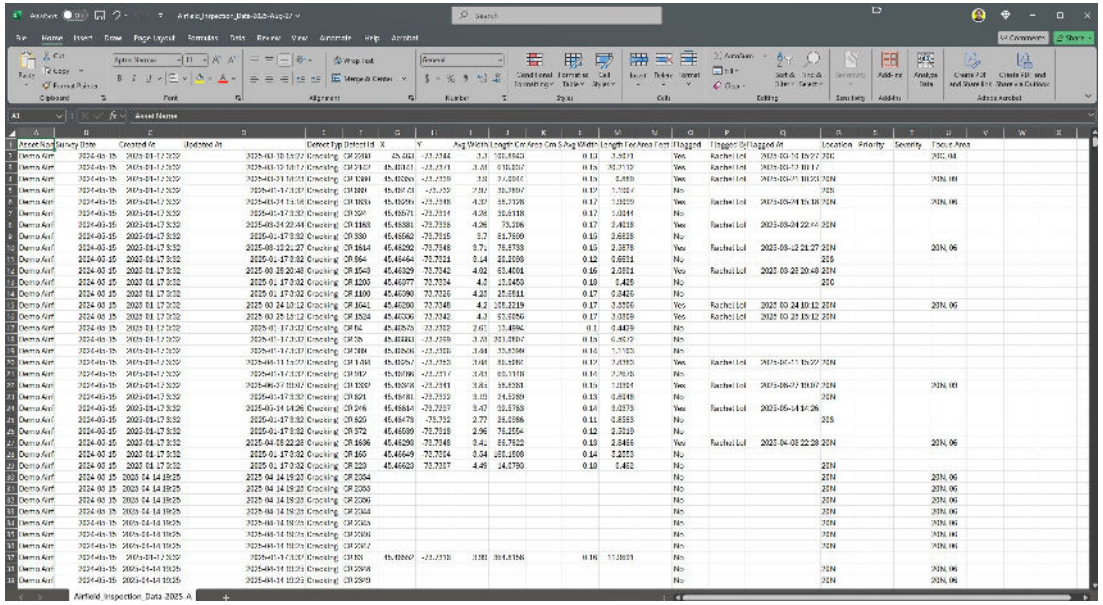


Joint Seal Damage

BIAL's Applications for **Asset Management**

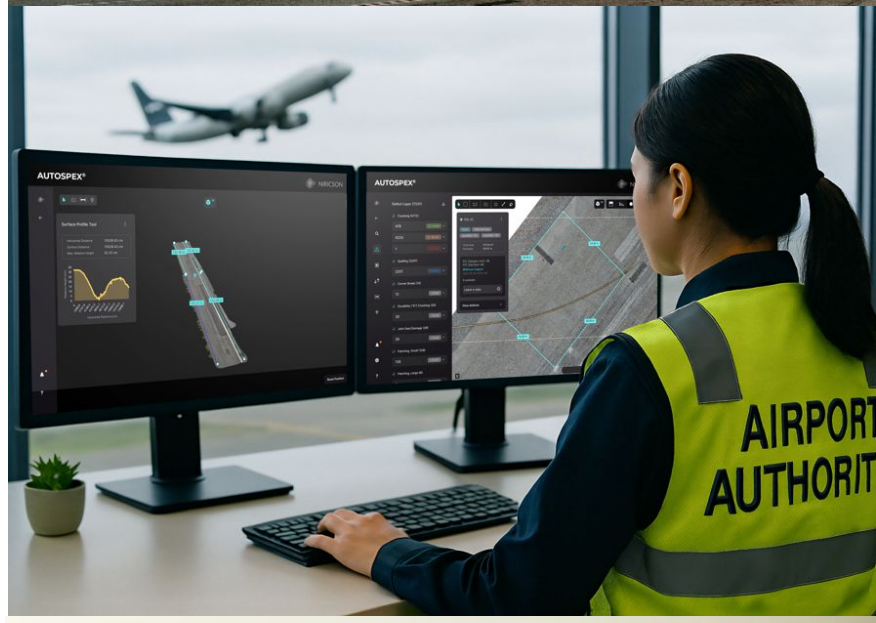
- To Create Data-Driven Maintenance Schedule
- Track Maintenance Performance to then Conduct Preventive/Predictive Maintenance in the Future
- Prioritize Rehabilitation/Maintenance Budgets according to Deteriorations Rates

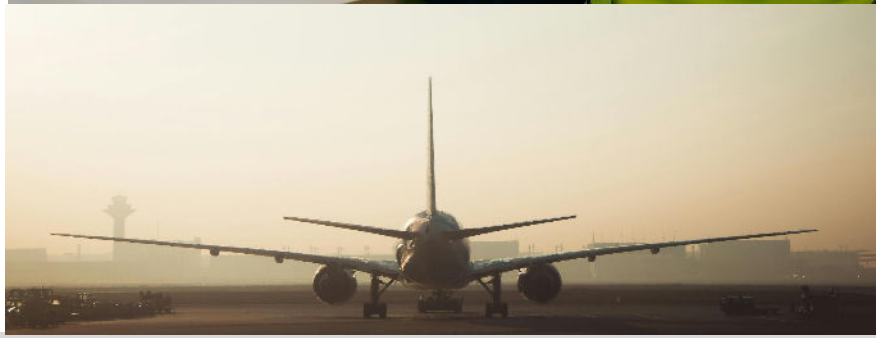




Future of **Pavement Management** at BIAL & Beyond

- Shift toward continuous digital monitoring
- Striking the balance between airside safety and optimization
- AI + predictive analytics for proactive maintenance to optimize maintenance & rehab spending for pavement life extension
- Democratize the data across stakeholders





Thank You