

Optimizing surface traffic operations through automated ground traffic management

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Need for ASMGCS Level 4 at Dubai Airport



DXB topped with 86.4M passengers in 2019
70.4M passengers in 2014



CAGR 2.5M tones in 2019



Expected growth 40% in next 10 years after recovery of COVID19



Complex and congested Airfield, Staggered Runway, major taxiway in between runway and stands north and south of the runway



Potential Increase in:
Runway incursions
Taxiway incursions
Vehicle aircraft conflicts
Human Error



Huge spacing between Aircraft in LVO. Automated solution required to implement block wise aircraft movements to optimize TXY's

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Surface Operation Challenges



Capacity Constraints

- Influence of complex **Airfield Design**
- **Limited Land** available for expansion
- Airports **bottleneck** for ATM System.

Surface Traffic Optimization

- **Imbalance** of automation support
- **Suboptimal** use of infrastructure.
- **Operational inefficiency.**

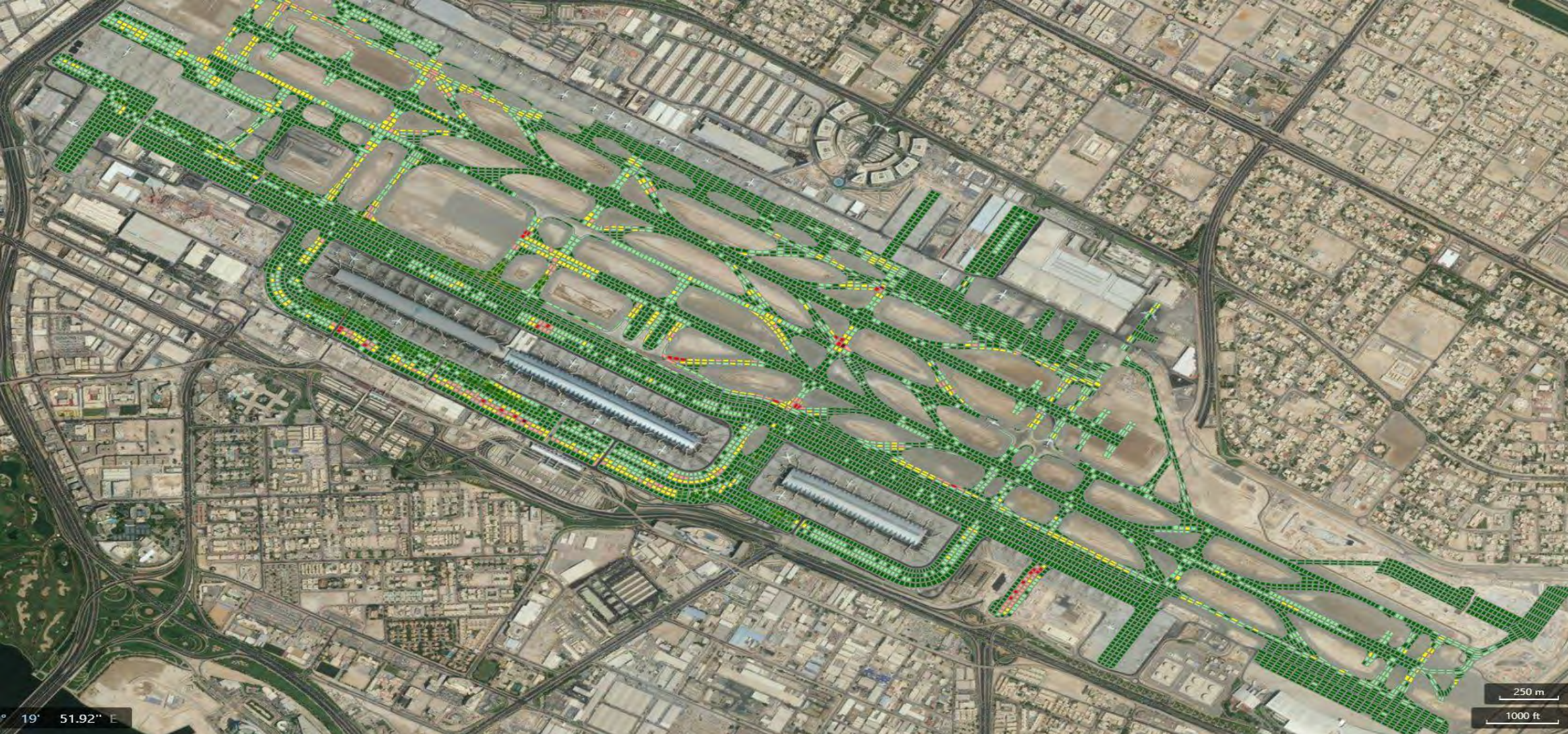
Low Visibility

- Increased **separation** on ground.
- Reduced Traffic Flow.

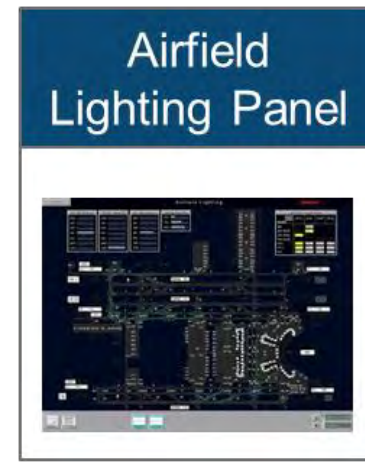
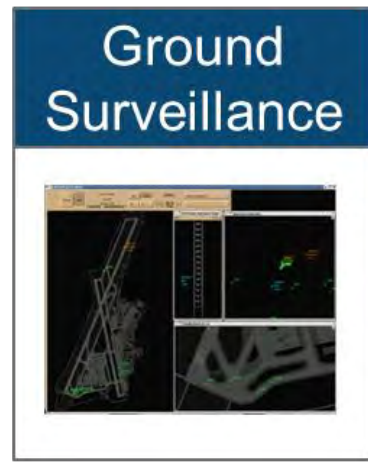
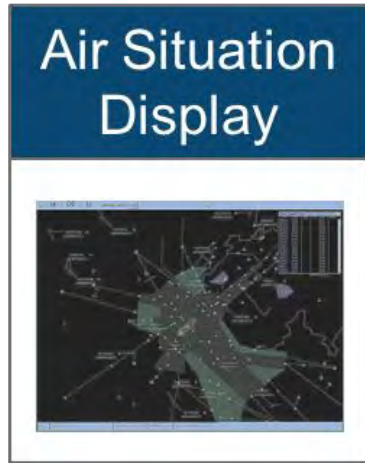
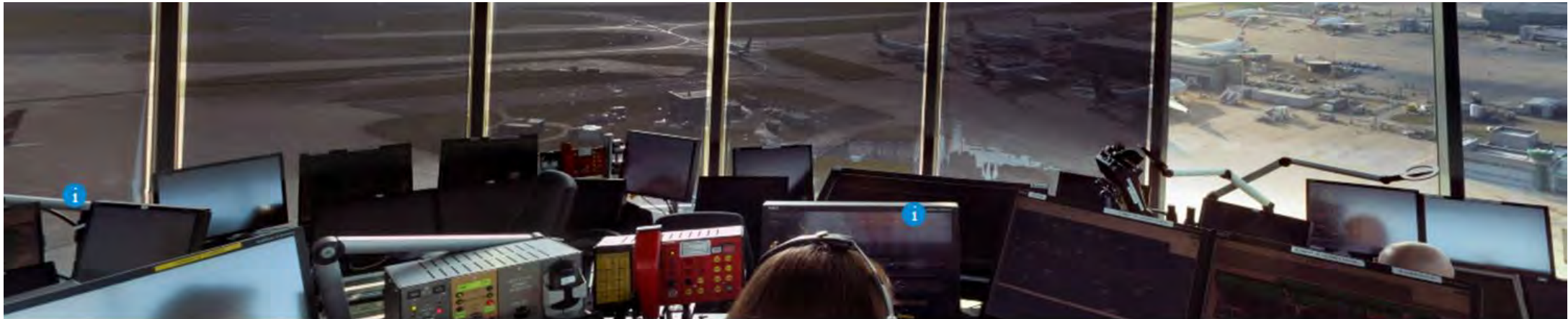
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Complex Airfield



Surface Operation Challenges



Disconnected Systems – All Decisions By Human Controllers

Airfield Delay Behaviors & Mitigations

Airfield Delay Characteristics

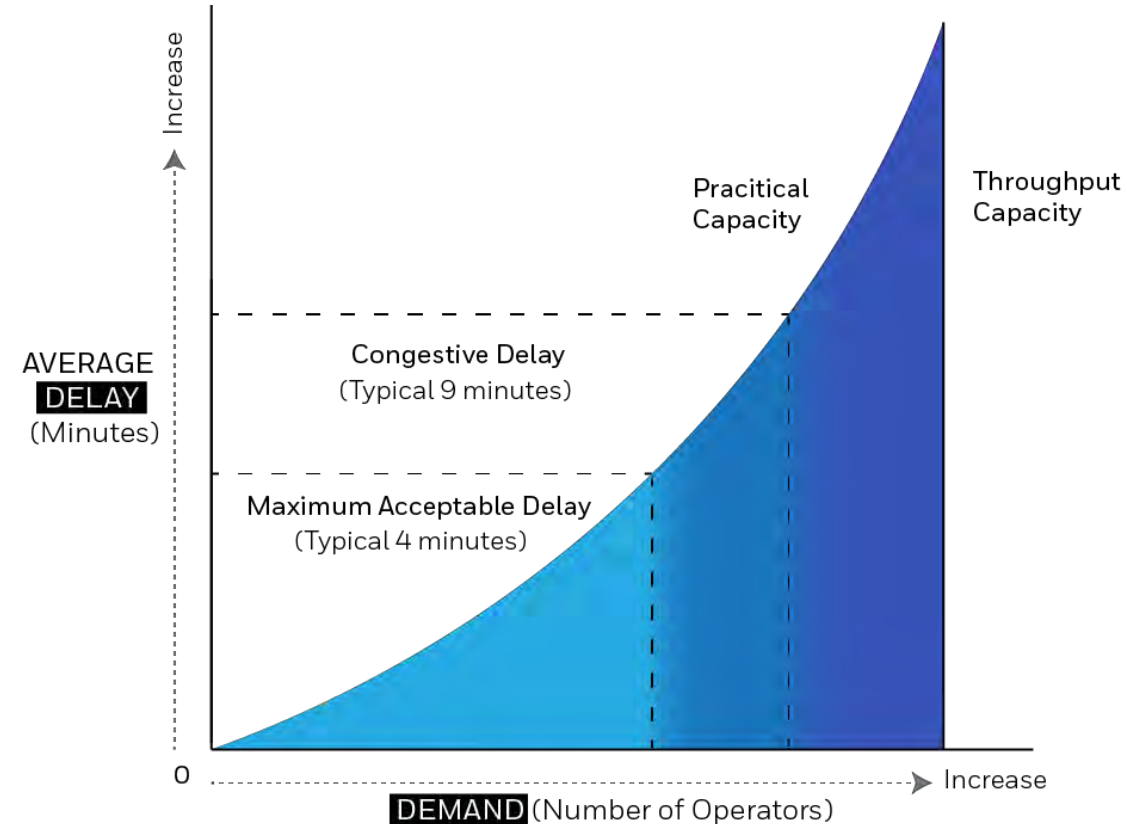
- Non linear, Sensitive, Complex
- **1%** in throughput → **7%** in delay during peak hours.

Reducing Airfield Delays

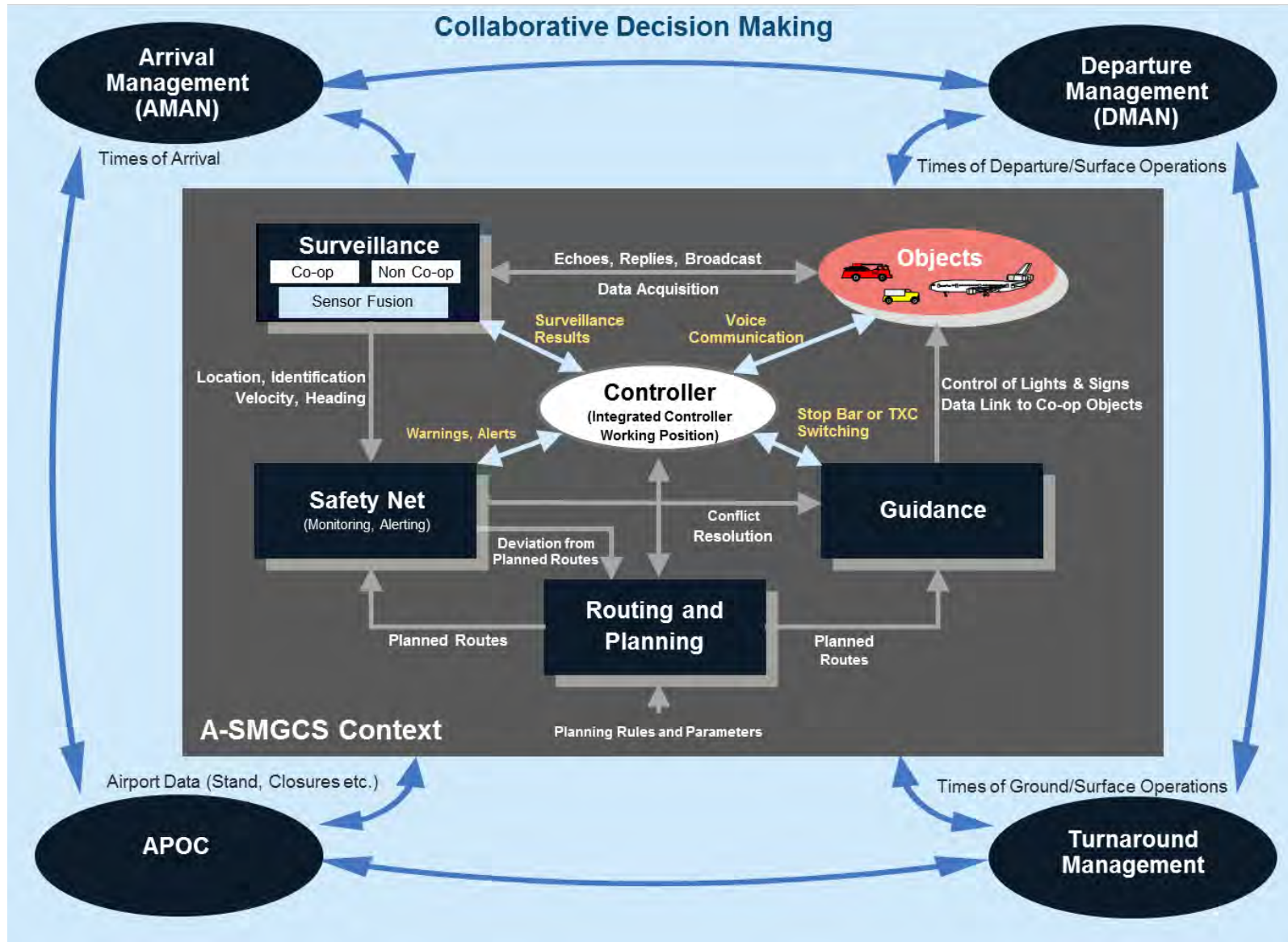
- Increasing System Capacity & Managing Demand
 - Infrastructure Development
 - Technology & Policy

Use Of Technology

- Decision Support System (HF, Artificial Intelligence, Machine Learning)
- Enhance Human Performance
 - Compensate Human Limitations
 - Augment Operator Skills



Integrated Surface Management



Project Kick OFF year 2011

Phase 1 & Infrastructure implementation year 2013

Validation and Operational approval for FTG year 2015

Sea of Greens



Controller:

“UAE11, taxi to B2 via
K, Z6, Z, J2 ,J, U2,U;
hold short of UC”

Pilot:

“UAE11, taxi to B2 via
K, Z6, Z, J2 ,J, U2,U;
hold short of UC”

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Follow The Greens



Pilot:
"KLM427, Follow the
Greens to B8"

Controller:
"KLM427, Follow the
Greens to B8"

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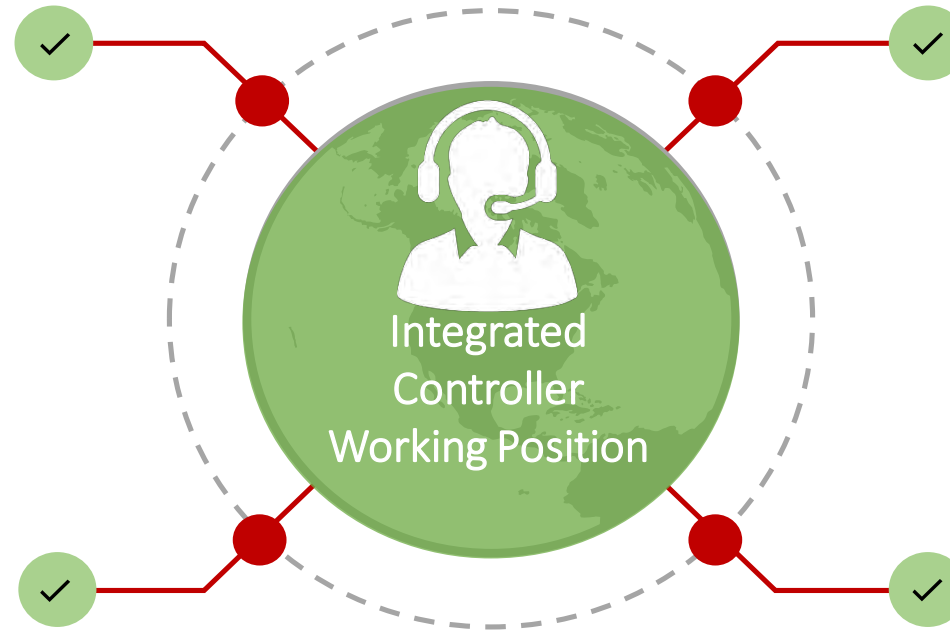
Integrated Ground Traffic Management

Surveillance

- Fused Target Identification
- Traffic Situation Display

Routing & Planning

- Computation & assignment of Individual Routes.
- Consider static & dynamic constraints.
- Auto Adapt to standard routes.
- Dynamic Time Estimates



Safety Net

- Predict & Detect Conflicts
 - Runway Conflicts
 - Conformance Monitoring
 - Conflicting Clearances
- Provide Conflict Resolution

Guidance

- Runway Entry/Exit Guidance.
- Runway Access Control
- Taxiway Guidance
- Intersection Sequencing
- Lat /Long Separation

Decision Support System for Air Traffic Controllers

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Human Centered Design

User Goal Oriented Design

Improve Human Performance
Enhanced Situational Awareness
Reduced Mental Workload

Enhanced Capacity



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Shared Responsibility / Interfaced System

Flight Data
Plan

Ground
Movement
Radar

Electronic
Flight Strip
Data

Instrument
Landing System

Instrument
Landing System

Meteorological
data

Air Navigation Service Provider

Follow The Green Implemented at Dubai International from year 2015 and has been Successfully operated for Low Visibility Operation and 2 hours of nighttime Operation



Integrated Controller Working Position

Surface
Movement
Manager

Airlines data

Airport
information
data

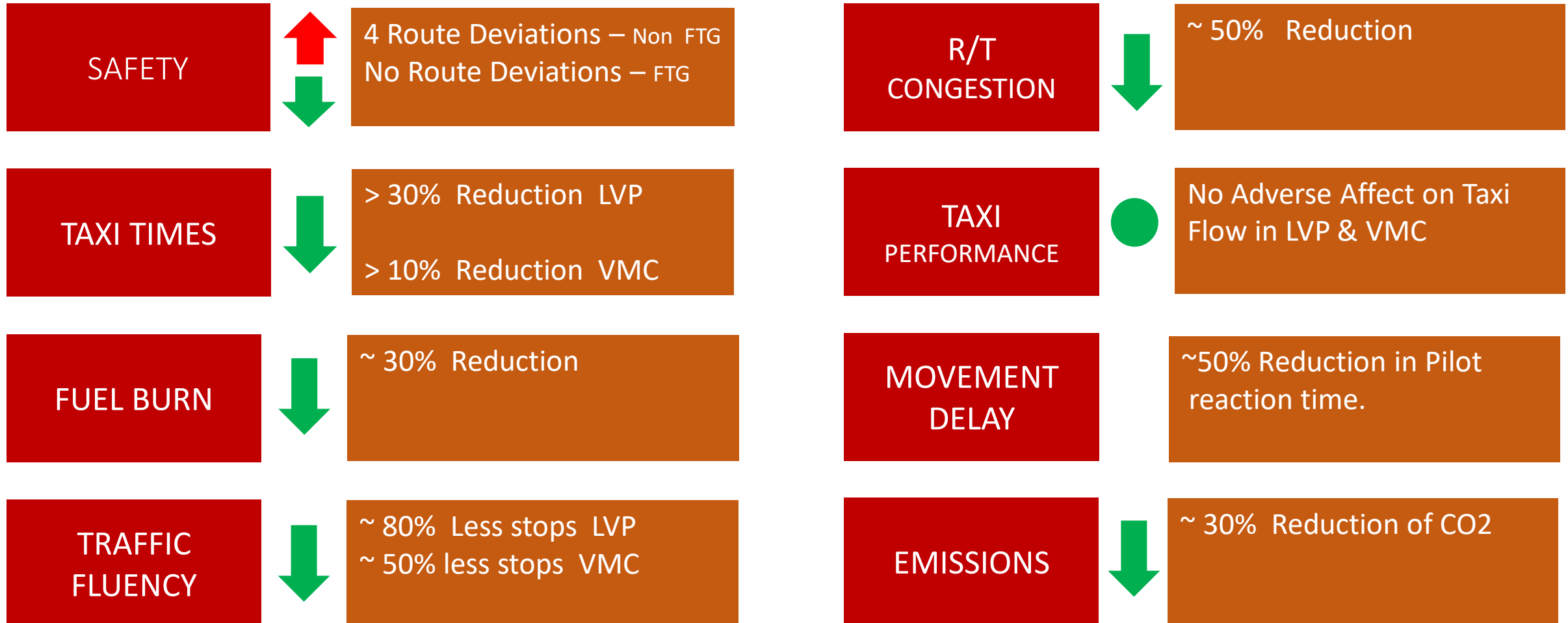
Docking System
Data

Airfield Lighting
system

Stand
Information
Data

Airport Systems

“Follow the Greens” Validation Results



Conclusions

Follow The Greens (FtG) provides optimization support for air traffic controllers.

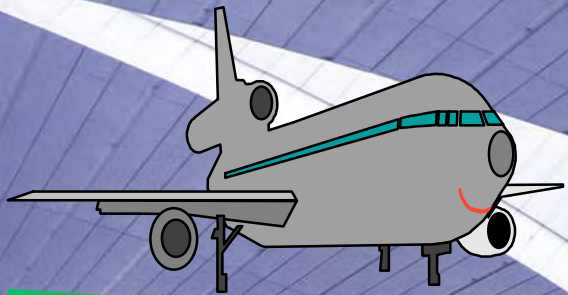
FtG Enablers

- Addressable Airfield Lighting System.
- Surveillance System.
- Standardization of Lighting Interface.

Technology Maturity

- Use of Existing Base Technology
- Decision Support Through Information Sharing
- Proven in Operation.

THANK
YOU




KEEP
CALM
AND
FOLLOW
THE GREENS

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