GROUPE ADP

PERFORMANCE AND SAFETY NET WITH A-SMGCS ON THE APRON:

MAY THE FORCE OF THE DIGITALIZATION, ARTIFICIAL INTELLIGENCE AND A-VDGS BE IN YOUR SMART AIRPORT !

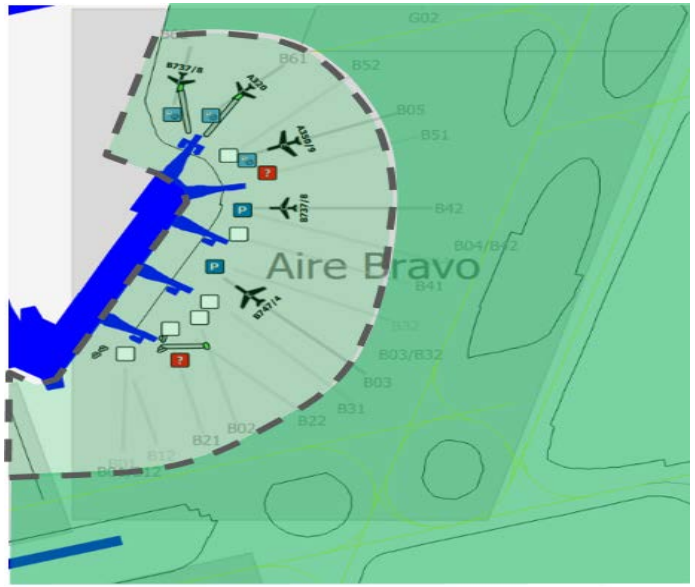
Co-financed by the European Union
Connecting Europe Facility

DOCUMENT CONFIDENTIEL

CONTEXT

- **A-SMGCS tools has been developed mainly for ANSP with planning/routing and guidance services on taxiways and runways**

- **But the surface movement also include the apron!**



CONTEXT

Are the apron significant on the surface movement ?

- **GROUPE ADP has more than 560 stands (440 for CDG/ 120 for ORY)**

- **Real challenge for GROUPE ADP and all stakeholders**

⇒ ***One of the reasons why GROUPE ADP is engaged in the project 150 – EASMSN as a SESAR Implementing Project to enable gap filling on the apron***

WHAT ARE THE LIMITS OF ACTUAL A-SMGCS TOOLS WHEN IT COMES TO THE APRON?

- low accuracy on Aircraft position, direction and movement
- No information on stand readiness (PBB/Obstacles)

- No alerts for :
  - PBB in wrong position
  - Stand with obstacles
  - Pushback without clearance (in first meter)
  - Aircraft not parked correctly
  - Pushback on wrong direction

- Guidance cannot be managed until the final stop position (even with « Follow the Green »)

- good calculation of taxi times but no automatic prediction for departure times
- Information provided only to the pilot and mainly through RTC

WHAT WE DON'T WANT TO SEE ON OUR APRON ANYMORE :

- **Aircraft / Aircraft Ground collision on a parking stand**

This situation has already occurred in CDG in 2011 & 2019

- **aircraft / Obstacle collision with a PBB while docking**

This situation has already occurred in CDG (June 2018) and ORY (2018)

ROUTING / PLANNING => WHAT IS THE BEST ROUTE AND WHEN?

- To manage RWY/TWY capacity and network synchronization requires to :
  - Have the best route
  - Make sure it will leave at the chosen time
  - Know when the A/C will start to move
  - Recalculate if needed

But…

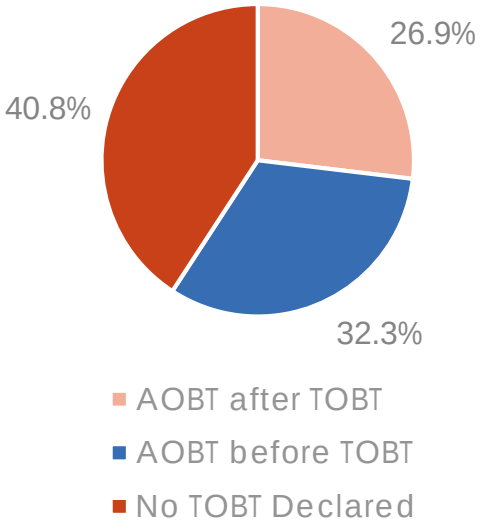
- Are all the stakeholders informed of the TSAT/CTOT?
- Are the TOBT reliable and accurate?
- Best route may differ considering the time of departure
- knowing the workload of departure facilitate the capacities management and synchronization

⇒*To be more efficient A-SMGCS tools need :*

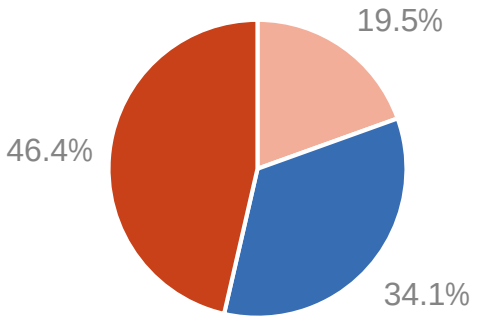
⇒ *an automatic and accurate generation TOBT system*

⇒ *to involve all stakeholders to ensure TSAT adherence*

ORY



CDG



GUIDANCE : MAKE SURE THE A/C CAN FOLLOW THE DEFINED ROUTE UNTIL THE END

- Today Guidance is covered by the ATC from the runway until the entrance of the apron where the guidance can be managed by a A-VDGS or a marshaller
- Aircraft can not enter the apron if there no marshaller or launched A-VDGS (=> taxiway occupation and fuel consumption)
- Follow the green can not ensure guidance automatically until the final stop position

EXISTING PERSPECTIVES FOR IMPROVING A-SMGCS ON APRON

- **Actual A-SMGCS tools can be completed :**

  - By improving the accuracy of the position when it comes to deal with the apron
  - By ensuring that the stand is clear of PBB / FOD / vehicles…
  - By predicting an automatic departure time
  - By extending Guidance functionalities until the final stop position of the aircraft (even if the airport is equipped with the follow the green)

And you?

What would you do to make your apron more efficient and safer?!

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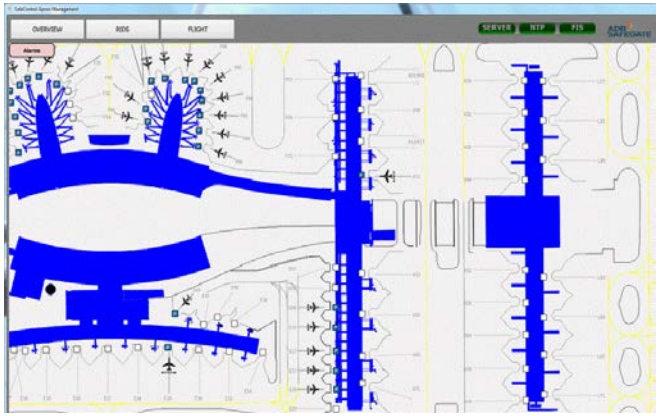
WHAT DO WE NEED ?

DOCUMENT CONFIDENTIEL

VDGS AND DISPLAY SCREENS AND INTELLIGENCE!

- **A-VDGS as sensors**
  - Accurate aircraft position and speed in apron
  - Guidance functionality (azimuth and distance both for pilot and copilot on an unique equipment)
  - Cameras
  - Automatic on block and off block detection
  - Safety functions : aircraft type confirmation, obstacles detection ...
  - Interlock functionalities with Passenger Boarding Bridge
- **Display screens to provide widely information to all stakeholders**
  - Classical large LED display with 3 colors and high definition
  - Easy to install
  - Information providing : A-CDM information
  - Flight information
  - Smart and scalable display strategy
  - Contribute to Planning adherence
- **Intelligence => Apron Management System**
  - HMI to manage the apron (stand status)
  - Provide alerts
  - Automatic management of A-VDGS
  - Interface for other system (AOP / A-SMGCS / SMAN VEHICULE...)



VIDEO CAMERAS AND ARTIFICIAL INTELLIGENCE FOR A SMART AIRPORT

- **ORY and CDG benefit a High camera coverage :**
  - + 1000 cameras available airside
  - Cameras cover especially :
    - ✓ Stands
    - ✓ Taxiways
    - ✓ PBB

- **Multiple Eyes waiting for intelligence to perform :**
  - Automation
  - Safety support
  - Predictability
  - Digitalization
  - Performance monitoring

- **Complementary with A-VDGS to improve the position of aircraft, pushback direction, stand status, flight information and alerts**

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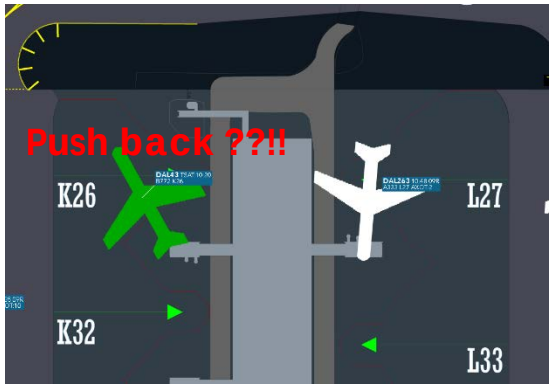
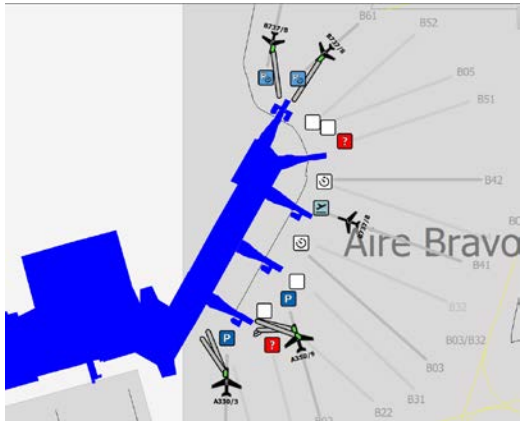
TO DO WHAT?!


Surveillance
Safety
BLOCK
at 47m
ROUTE DEV
A-SMGCS
Planning /
Routing
VMP795
BEL4DL
25R A319 M
Guidance

IMPROVE SURVEILLANCE AWARENESS (1/2)

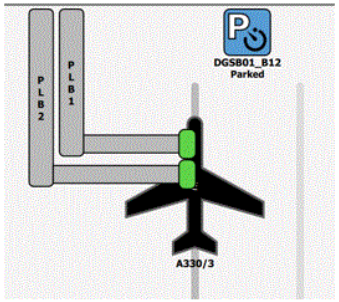


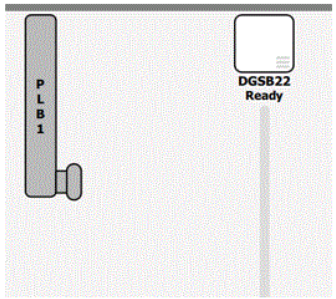
- **Accurate position of the aircraft on the aprons :**
  - Upon arrival, A-VDGS can inform if the docking is finalized and if the aircraft is at its final position
  - Upon Departure, A-VGDS can detect a movement of the aircraft with a high accuracy. Cameras can detect and check pushback direction
  - asterix data with position can be provided when A/C is within the range of the A-VDGS
  - Shadow mode can be enabled to get real time position, speed, distance and alert during the docking even it is not started with A-VDGS



- **A-VDGS or Cameras can inform and check the position of PBB as well as FOD monitoring and detection**

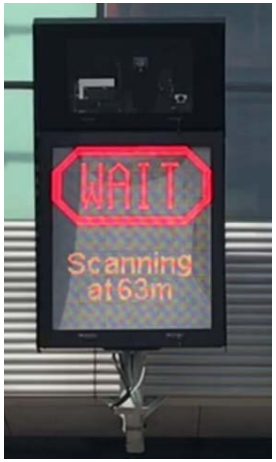
⇒ **To ensure that the aircraft can taxi safely until its stop position**



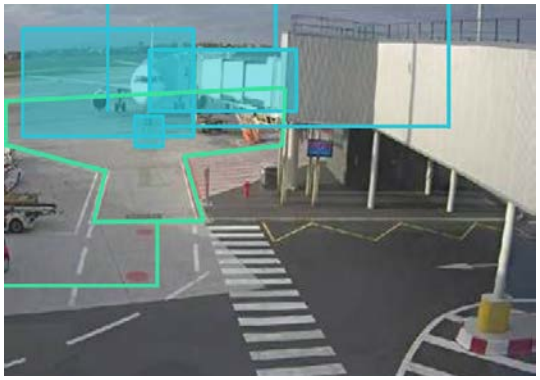


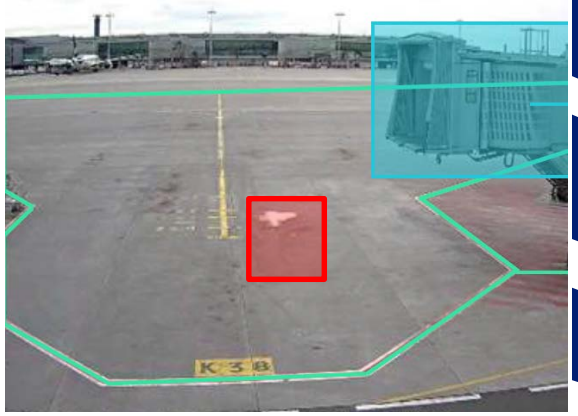
IMPROVE SURVEILLANCE AWARENESS (2/2)

- **A-VDGS apron scan**
  - Laser perform a scan of the restricted area
  - Status of the apron is reported in the management tool



- **Video detection**
  - Camera can cover a wider area than VDGS
  - Virtual fence functionality

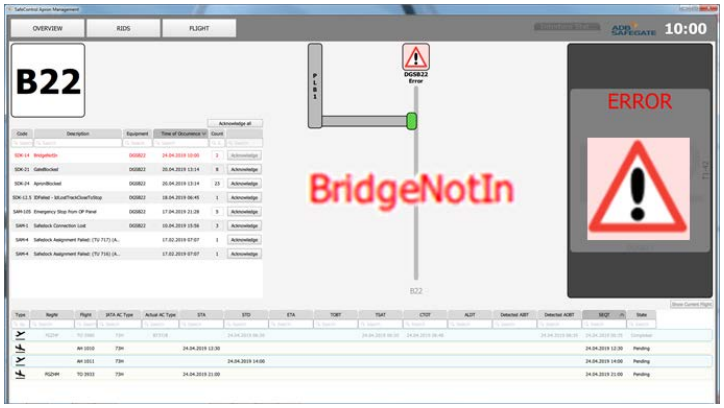





Surveillance
Safety
BLOCK
at 47m
ROUTE DEV
DLH890
A-SMGCS
Planning /
Routing
VMP795
BEL4DL
25R A319 M
Guidance

SAFETY NETS : ALERT FOR AIRCRAFT TO OBSTACLES COLLISION RISK

- **The system must check that the PBB are in a safe position prior the aircraft enter the apron. If it not the case it has to place an alert :**



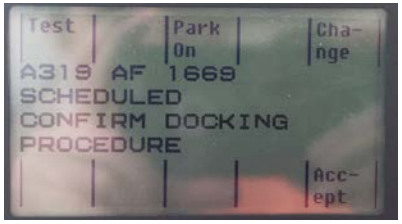
- **Alert for an obstacle :**

SAFETY : AIRCRAFT CHECK ALONG WITH ADJACENT STAND OCCUPATION

Ensure that expected aircraft can be docked safely :

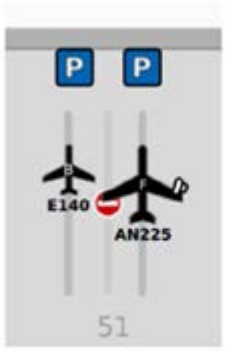
◆Automatic preparation for expected aircraft

- A/C type is set up automatically by AODB
- Docking procedure can initiated :
  - Locally
  - Remotely (through Management tool)
  - Automatically



◆Check with adjacent gates

- Adjust the stands and adjacent stands capacity (reduced, closed, etc.) and alert
- Get blocking rules from ADP RMS
- Distinguish clearly a partial reduction from a total one on SAM.



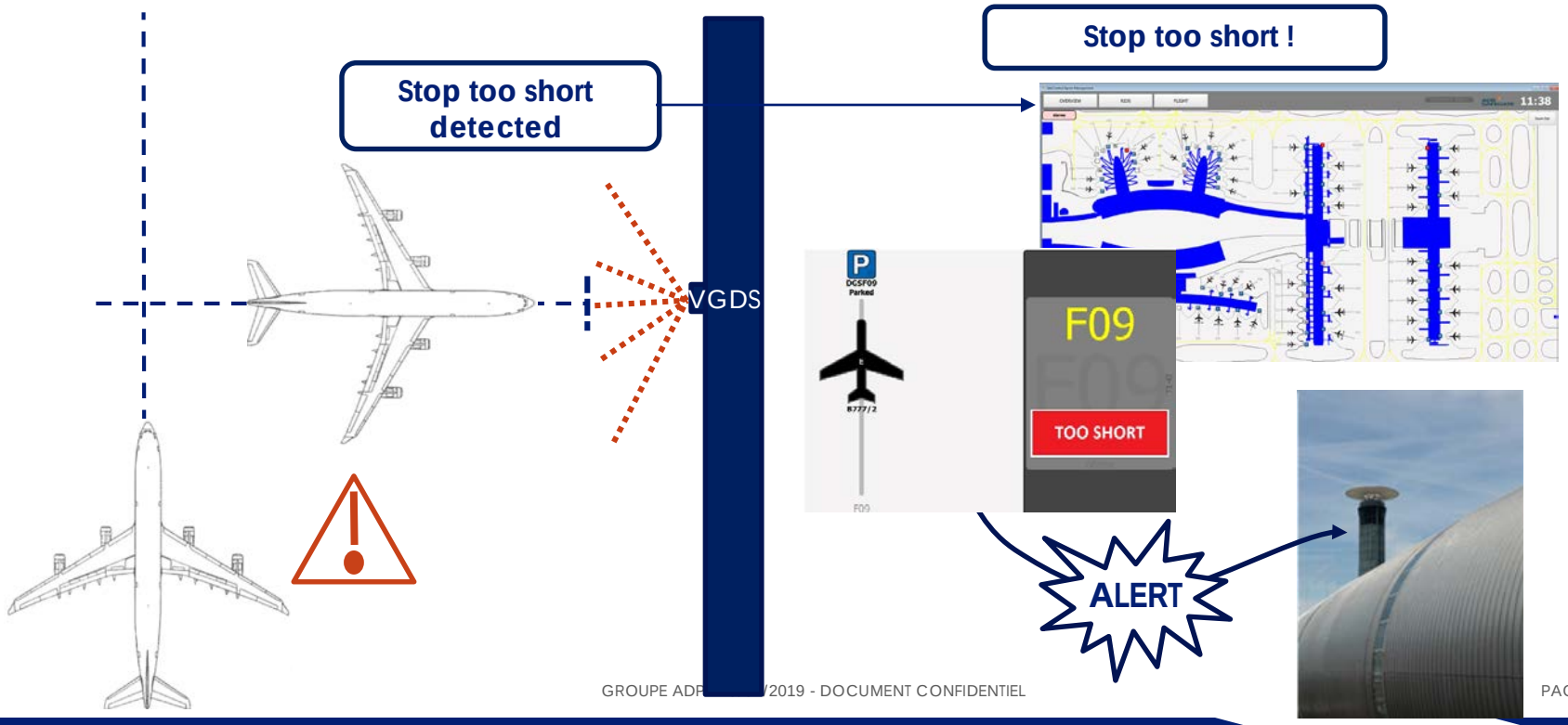
◆Aircraft type checks

- Display aircraft type
- Alert and stop the docking if an error is detected

SAFETY : ALERT IF AIRCRAFT IS NOT ARRIVED AT THE EXPECTED STOP POSITION

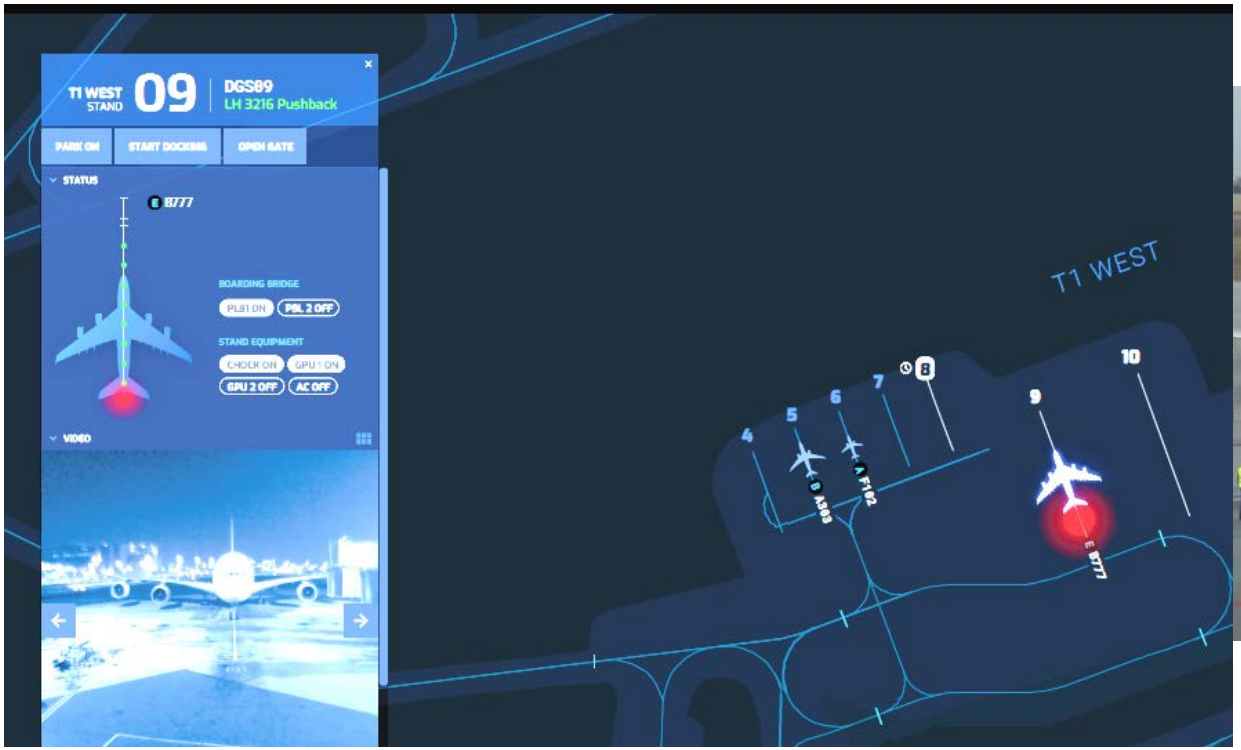
- A-VDGS can detect during docking if the Aircraft has reached the expected stop position or alert if it has stopped too short (or too far)

- The information/alerts can be displayed on the stand management HMI during docking phase & the aircraft position during push-back phase and shared with other systems



SAFETY NET : HELP TO PREVENT AIRCRAFT TO AIRCRAFT COLISION

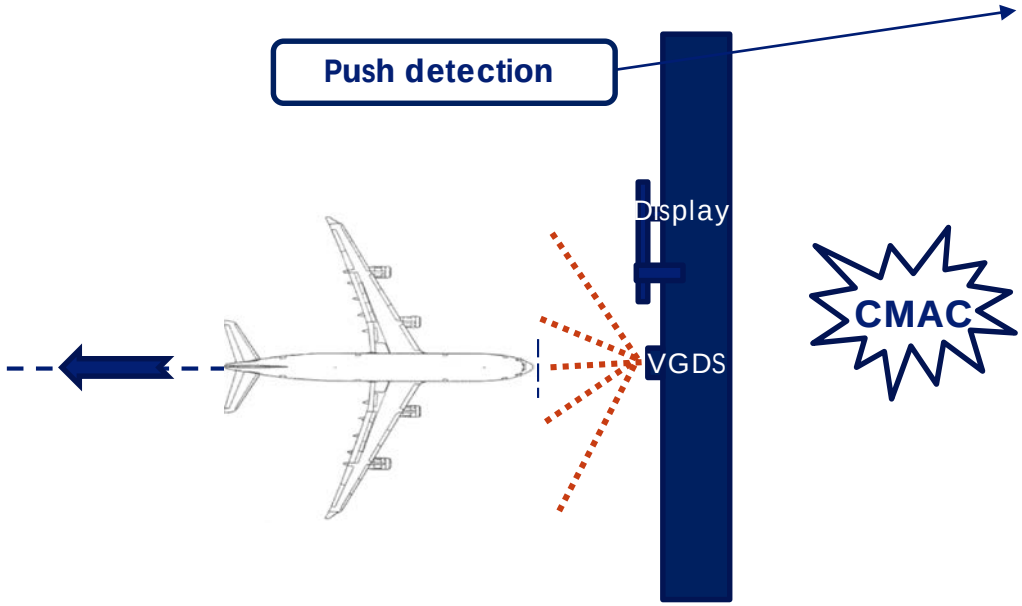
- **Push back alert and docking alerts in order to identify the non availability of apron back part**

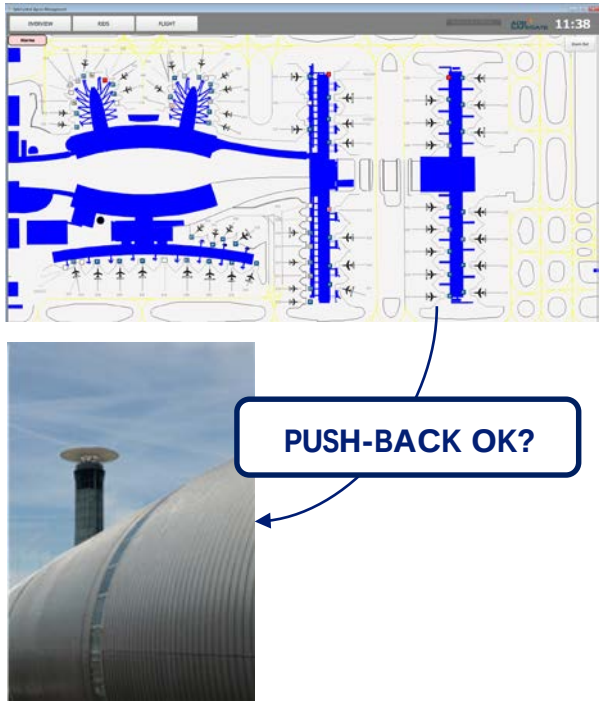


- **Shared with other system, this information could extend the scope of CATC alerts to the apron**

SAFETY : ALERT ON NON AUTHORIZED PUSHBACK / MOVEMENT

- **Stand Management System can enables Conformance Monitoring ATC Clearances on the apron by :**
  - By using the aircraft position knowledge to compare it with clearances
  - Improving the pushback position detection with video
  - Display CMAC alert on A-VDGS/Display screens
    Ex. STATIONNARY/NO PUSH CLR





Information can be shared with other systems that could extend their own CMAC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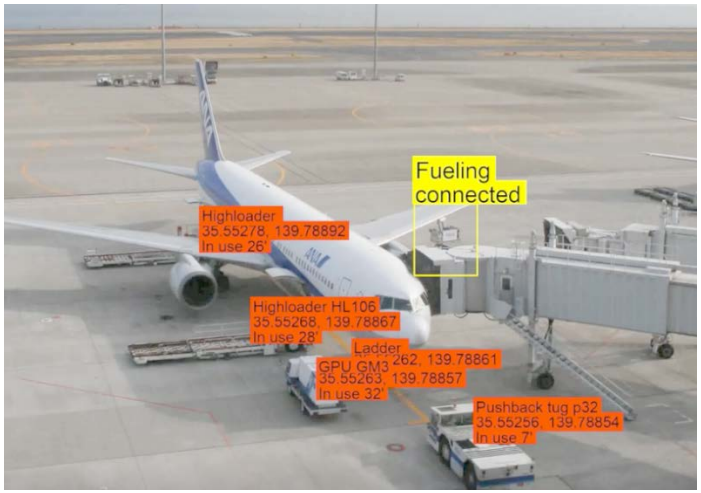
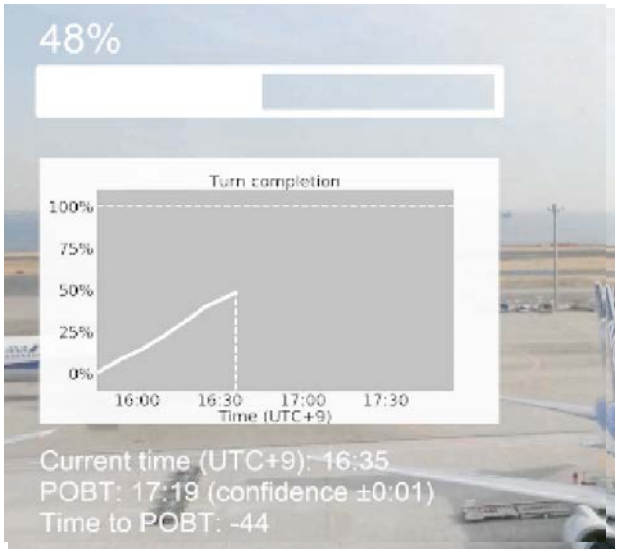
Guidance

PLANNING / ROUTING : IMPROVE DEPARTURE PREDICTABILITY AND PRESSURE

- Camera combined with AI can detect turnaround operations around the aircraft
- Auto detection of milestones can lead to automatic prediction of off-block time and propose it as an automatic TOBT





Improvement in OBT prediction and departure pressure
=> key for departure synchronization and routes calculation

PLANNING / ROUTING : IMPROVE ROUTES CALCULATION

- The A-VDGS may also provide awareness of stand and TWY availability to the Routing Service since the docking progress or stand status may affect the availability of routes close to the parking positions and apron area. (ECTRL)
- A-VDGS (active, docking, pushback, parked, etc.) and stand status (ready, safe?) can improve the taxiway occupation time calculation (by ensure that the Aircraft will taxi until the final stop position without discontinuity)

PLANNING / ROUTING

- **Displaying milestones and environment constraints on the A-VDGS and display screens to improve the pilots and ground handling teams situational awareness on apron area and reduce RT communications**

  - SIBT, EIBT, ALDT, TSAT, count down
  - TSAT, CTOT
  - TSAT OUT call ops, **OK PUSH, HOLD PUSH**
  - Baggage claim for arrival aircraft
  - Weather constraints (wind, de-icing requested, storm, LVP)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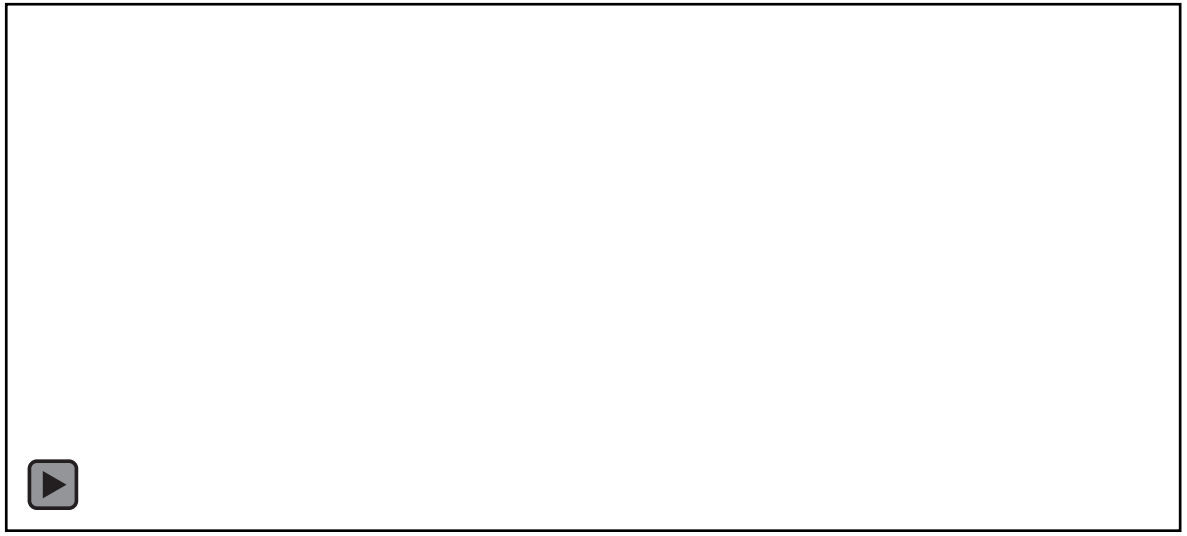
GUIDANCE : A-VDGS TO FINALIZE THE AIRCRAFT MOVEMENT

- **A-VDGS provides a more accurate initiation process and a continuous guidance from the taxiway/apron to the final stop position at the assigned stand. (ECTRL)**



- **Key of success**

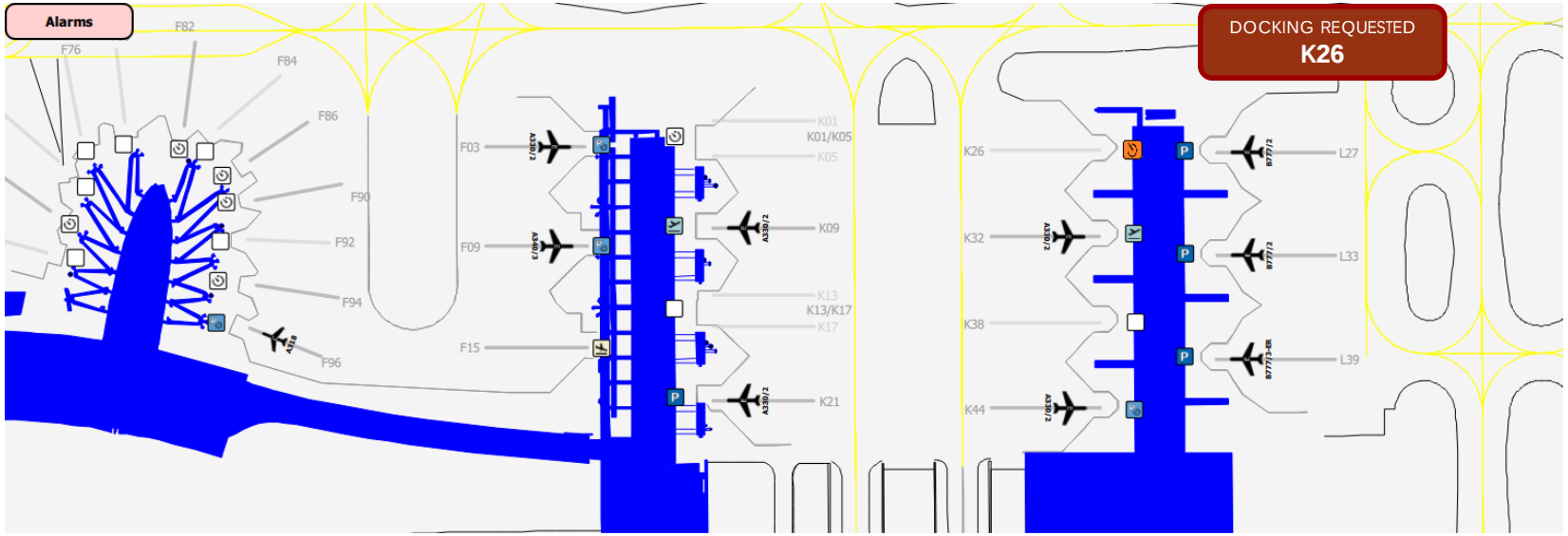
⇒ ***ensure that the VGDS has been launched prior the aircraft arrival***

ECTRL => "The Automated Activation of A-VDGS function shall switch on the AVDGS of an unoccupied assigned stand when the position of the mobile is D meters or T seconds away from the stand."

Not compatible with actual French Regulation that requires a person to supervise docking process and stop it if necessary.

GUIDANCE : HOW TO MAKE SURE THAT THE A-VDGS IS LAUNCHED ON TIME?

- **Alert if the A-VDGS hasn't been launched few minutes before aircraft arrival to the stand – Information shared with stakeholders or automatic docking!**



- **Remote and Automatic docking are a solution if safety is insured through:**
  - **PBB interlock**
  - **FOD detection / Camera and VDGS**
  - **Aircraft type check**

FROM THE APRON TO THE NETWORK : MULTIPLE BENEFITS

Groupe ADP interfaces

SMAN
AOP ...

GROUPE ADP

Groupe ADP database (AOP)

GROUPE ADP

ATC & NETWORK

ATC Network impact through
⇒ better TOBT synchronization
⇒ better TSAT adherence
CTOT impact and departure capacity management

Reducing ATC radio com through automatic messages display

TIMERS

VIDEO + AI

SafeControl Apron Manager (SAM)

A-VDGS

HANDLERS / PILOTS

Reducing taxi time and taxiways occupation through guidance until stop position

AIRLINES, HANDLERS, ADP APOC, STAND SUPERVISORS

Improving safety on the surface movement area through an enhanced awareness of stand status and aircraft position on the apron

CONCLUSION : SENSORS + INTELLIGENCE = THE MUST-HAVE FOR YOUR APRON!

⊕

⊕

- Better guidance until block-on
- Better monitoring and surveillance
- Improved safety
- Advanced OBT predictions
- Improved vision for an optimized work load on global turnaround process

⇒ **Constant improvement of surface management with impact from the apron to the network!**

May the force be with your questions!

GROUPE ADP

Cofinancé par le mécanisme pour l'interconnexion en Europe de l'Union européenne

LAURENT KADDOUCH – GROUPE ADP

- Laurent Kaddouch is an engineer in Aeronautics Materials completed by an advanced Masters with a specialization in Air Transport Management from ENAC (National Civil Avation School) in Toulouse. He joined Groupe ADP in December 2007 as a landside project manager in CDG. In the following years, he was in charge of the management of technical and safety operational teams and contract manager of the automatic train deserving boarding piers in Terminal 2E.

- Since 2015, Laurent Kaddouch is a Senior Manager acting as a PMO for the SESAR deployment activities and as a project manager for the deployment of A-VDGS and display screens in CDG and ORLY.

- Through this project, he has managed the procurement phase, the studies and the deployment of the equipment. He also manages the IT part of the project with the objectives to increase the performance and the safety (A-SMGCS) on the apron.

- As part of his responsibilities Laurent Kaddouch is involved in the EUROCAE Workgroup (on the A-SMGCS) and collaborate closely with other European Airports (e.g : Roma, Nice, Fraport, Dublin, Brussels) especially in the context of the SESAR project EASMSN of the INEA CEF Call 2016.

- Laurent has a private pilot license and fly as a hobby on small aircrafts.

OLIVIER BERCOVITZ – GROUPE ADP

- Olivier Bercovitz joined Groupe ADP in February 2003 as IT project manager. In the following years, he was in charge of several airport application like AODB, FIDS and BRS application for Groupe ADP.

- Since 2016, Olivier Bercovitz is involved as a project manager for the deployment of display screens in CDG and ORLY and the Safedock Apron Management application (A-VDGS management tool).

- Through this project, he has participated to the procurement phase, the studies and the deployment of the equipment. He also defines and manages the IT architecture part of the project.

- In 2019, Olivier Bercovitz has joined the airport operation department as a project manager.