



ROUTING SERVICE

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ROUTING SERVICE

- Saab routing service closely follows:
 - Eurocontrol A-SMGCS specification
- Being implemented for:
 - Singapore Changi Airport
 - Istanbul New Airport (IGA)
- Near future:
 - Upgrade Saab A-SMGCS systems for existing customers

EUROPEAN ORGANISATION
FOR THE SAFETY OF AIR NAVIGATION



EUROCONTROL

Enclosure 1

**EUROCONTROL
Specification for
Advanced-Surface
Movement Guidance and
Control System
(A-SMGCS) Services**

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ROUTING SERVICE

- Routing service generates routes for individual mobiles.
- Based on
 - Flight data
 - Known aerodrome parameters and constraints
 - Clearances
- Is key enabler for:
 - Guidance:
 - Follow the Greens
 - Junction control
 - Deadlock prevention
 - New A-SMGCS alerts / Improving some existing A-SMGCS alerts
 - Providing taxi times for:
 - Controller
 - A-CDM / DMAN

ROUTING FUNCTIONS

- Generate route (Automatic)
- View route
- Generate route (Manual)
- Modify route
- Route deviation monitoring
- Calculate taxi times
- Alerting

GENERATE ROUTE (AUTOMATIC)

- Routes are automatically generated for aircraft and tows.
- Typically 30 minutes before expected push-back / landing time.
- The planned route must be the most logical route
 - Seen from a controller perspective
 - Routing calculation can be tuned to comply to the taxi rules that are used at the airport.

ROUTE START / END POINTS

- For outbound traffic:
 - The route start point: planned push back position of the assigned stand.
 - The push back position is proposed by the system.
 - The controller can update push back position whenever needed.
 - The route end point: planned departure runway
 - Using the default runway holding point
 - Or better: Use the assigned runway holding point (as input on the electronic flight strip system)
- For inbound traffic:
 - The route start point is the default runway exit of the assigned runway.
 - Default runway is determined based on A/C type
 - When the aircraft determines to use another exit, the route start point is automatically adjusted.
 - This is not regarded as a route deviation.
 - The route end point is the assigned stand.

ROUTE CALCULATION RULES/CONSTRAINTS

- The planned route is calculated based on operational rules/constraints:
 - By default the system chooses the shortest route
 - However the system can be tuned in order to apply to local rules.
 - Avoid taxiways that are marked as closed.
 - Avoid taxiways that cannot be used in a certain direction.
 - Avoid taxiways that cannot be used due to the current visibility mode.
 - This requires that the AGL system informs A-SMGCS with this status
 - Avoid taxiways that have a restriction for this aircraft type.
 - Limit the number of turns.
 - Avoid taxiways that are marked as 'not usable'
 - As indicated by the airfield lighting system
 - E.g. when taxiway has a lighting alarm)
 - Use remote de-icing bays that have been defined for a flight.

AUTOMATIC ROUTE MODIFICATIONS

- After a route has been defined, it is automatically modified when:
- Flight data is changed (that is used to calculate the route):
 - the system will automatically change the route based on the new flight data.
 - Assigned stand, runway, de-ice position, runway holding point, etc.
- In case of infrastructure changes:
 - When taxiway segment is closed or gets a restriction based on A/C type
- Note that this only applies to planned routes and to the pending part of the route.
 - The cleared part of the route can only be changed manually by the controller.

VIEW ROUTE

- The system textually visualizes the route which has been assigned to an aircraft.
 - Example: D-Y-B5.
 - This field can be shown in the flight data lists or in the label.
- Additionally the controller can highlight the route graphically.
- The graphical route presentation differentiates between:
 - Planned, cleared and pending route parts.
 - Highlight taxiway segments that are currently not usable for this flight
 - (e.g. are closed or have other constraints)

DEP						
C/S	TYPE	W	SSR	RWY	SID	STAND ROUTE
THA955	B77W	H	7037	19R	MASEV9D	53 F-J-Z-P-N-A9
SAS267	B738	M	0233	19R	ATLAP6D	26 G-Y-P-N-A9
SAS1469	B738	M	6021	19L	OKSAT4C	42 G-Z-W-S-B9
SAS4516	B736	M	3704	19R	EVTG6D	175 K2-E-N-A9
AKK2	BE20	L	2523	19R	STD	
NAX940	B738	M	0425	19L	OKSAT4C	43 L1-S-B9
NAX346	B738	M	3764	19R	NUVSA6D	20 G-Y-P-N-A9
NAX754	B738	M	0405	19R	NUVSA6D	15 K1-E-N-A9
ICE319	B752	M	0257	19L	EVTG2C	46 G-J-W-S-B9
WIF328	DH8C	M	7035	19L	VIB3COK	85 G-R-Z-P-S-B9



GENERATE ROUTE (MANUAL)

- The controller is able to manually generate a route for a mobile (aircraft/vehicle).
- When is this needed?
 - for aircraft/tows when the flight data is not complete,
 - e.g. the assigned stand or assigned runway are missing in the flight data).
 - for vehicles
- A route can be generated manually by selecting the mobile and its destination.
 - The system will propose a route using the same algorithm as used for automatic route generation.
- In case the mobile is already taxiing, the position of the mobile will be used as start position of the route.

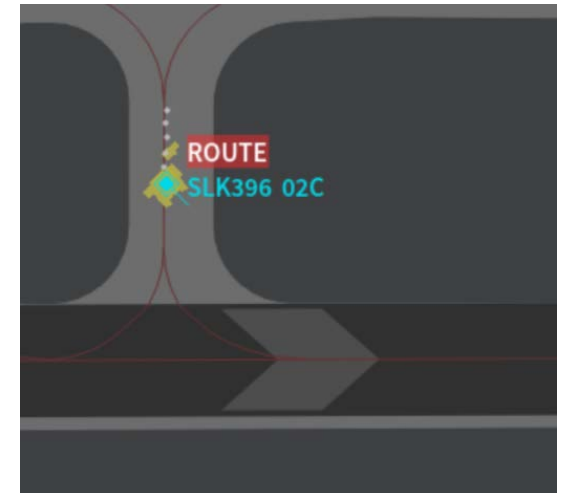
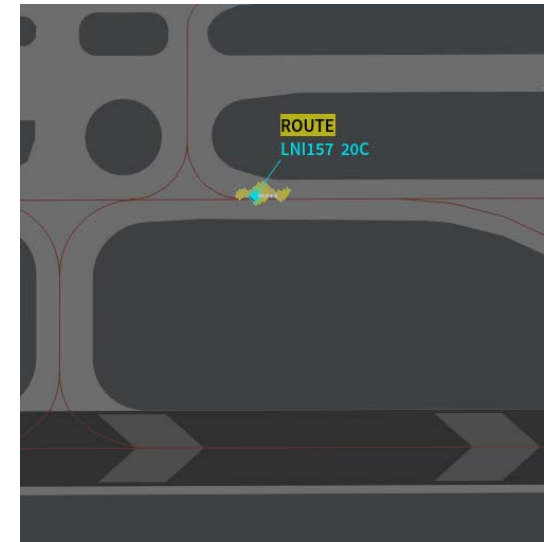
MODIFY ROUTE

- The controller is able to modify routes.
 - This applies to both automatic generated routes and manual generated routes.
- Routes can be modified by:
 - Changing the flight data fields that were used to calculate the route. Examples: Assigned stand, assigned runway, planned push-back position.
 - Dragging route points to a different position (in traffic picture).
- During route modification the system will propose a route
 - using the same rules/constraints as used for automatic route generation.
- Controller can overrule these rules/constraints.
- The system will indicate when rules/constraints are violated.



ALERTING

- Route deviation:
 - The system shall generate an alert when the aircraft deviates from its route.
 - The deviation alert has the following severity levels:
 - Alarm level; When aircraft is deviating a specific distance from and heading towards an active runway.
 - Warning/informational level is used for other route deviation.
 - After a route deviation occurs, the system shall propose a new route on request of the controller.
- Taxiway closed:
 - When the assigned taxi route is planned to go through a closed taxiway.
- Aircraft type:
 - When the assigned taxi route is planned to go through a taxiway that has restrictions for the aircraft type.



TAXI TIMES

- The system calculates:
 - The unimpeded taxi in/out time (EXIT/EXOT) based on the planned route.
 - The unimpeded remaining taxi time from the current position of the mobile till the end of the route
- For calculating the taxi time, the system uses:
 - The current position of the mobile
 - The length of the route
 - Average speed for straight taxiway segments
 - Used for all aircraft categories
 - Average speed for curved taxiway segments
 - Differentiate between aircraft category
 - Visibility mode

Questions?



ROUTE CALCULATION AND OTHER TRAFFIC

- Should route calculation take other traffic into account?
- ASMGCS-[ROUT]-[170] The Routing Service may generate planned routes according to optimization criteria, in particular traffic density on specific taxiways or congested areas.

Thank you!

