Runway and taxiway systems analysis

Simulation

Content

Purpose statement

The contracting authority is aiming to gain the assessment of the runway and the taxiway system´s capacity and throughput, which are defined by the historical and expected traffic demand and future airport layout. The elaboration and outcomes of the analysis shall also include the recommendations for improvements as described within this document.

Problem statement and objective

The enhancement of airside capacity, especially the realization of additional runway and taxiway infrastructure, requires lengthy planning, negotiation and approval processes prior to construction. Part of the approval process lies in evaluation of the suitability of projected expansion plans against future traffic flow. In other words, a standalone study shall be made to prove that increased capacity stands for a prerequisite for accommodation of future traffic volume.

Only by employing a simulation approach, the required results can be delivered. The simulation results shall show operational efficiency of the future runway and taxiway layouts. The study shall start with the runway capacity calculation (incl. combination of all compass bearings), where estimates of capacity utilization, congestion delays and overall throughput on the design day shall be showed.

Once the runway capacity is concluded, the focus shall be placed on the taxiway system to see whether the future taxiway network layout has the ability of delivering the necessary flow to and from the runways.

Main objective lies in identification of potentially efficiency decreasing parameters, critical situations such as traffic flow bottlenecks considering the whole set of operational assumptions and input data. Subsequently the provision of recommendations on operational and safety improvements shall also be provided. For the simulation purposes two traffic schedules are provided.

Runway system capacity and throughput

The runway layout shall be tested for the traffic forecast contained in the Schedule A. The calculation shall be conducted always for both runway directions.

Expected output of the runway simulation and evaluation process shall cover:

1) **RWY (hourly) capacity calculation under nominal weather conditions for the parallel RWY operations in Semi-mixed mode:**

Arrivals and departures served separately on the parallel RWYs in:

Mode	RWY 06L/24R	RWY 06R/24L
Semi-mixed mode	Departures	Arrivals + Departures*

* Departures of GA/BA flights from AREA South

Duration of operation for this mode is from 5:30 till 22:00 LT.

2) **RWY (hourly) capacity calculation under nominal weather conditions for the single RWY operations of RWY 06R/24L:**

Arrivals and departures served together on a single RWY (f. e. RWY 06L/24R inoperable due to maintenance or snow removal)

Mode	RWY 06R/24L
Mixed mode	Arrivals + Departures

Duration of operation for this mode is H24.

3) **RWY (hourly) capacity calculation under Low Visibility Procedures (LVP) for the parallel RWY operations in Semi-mixed:**
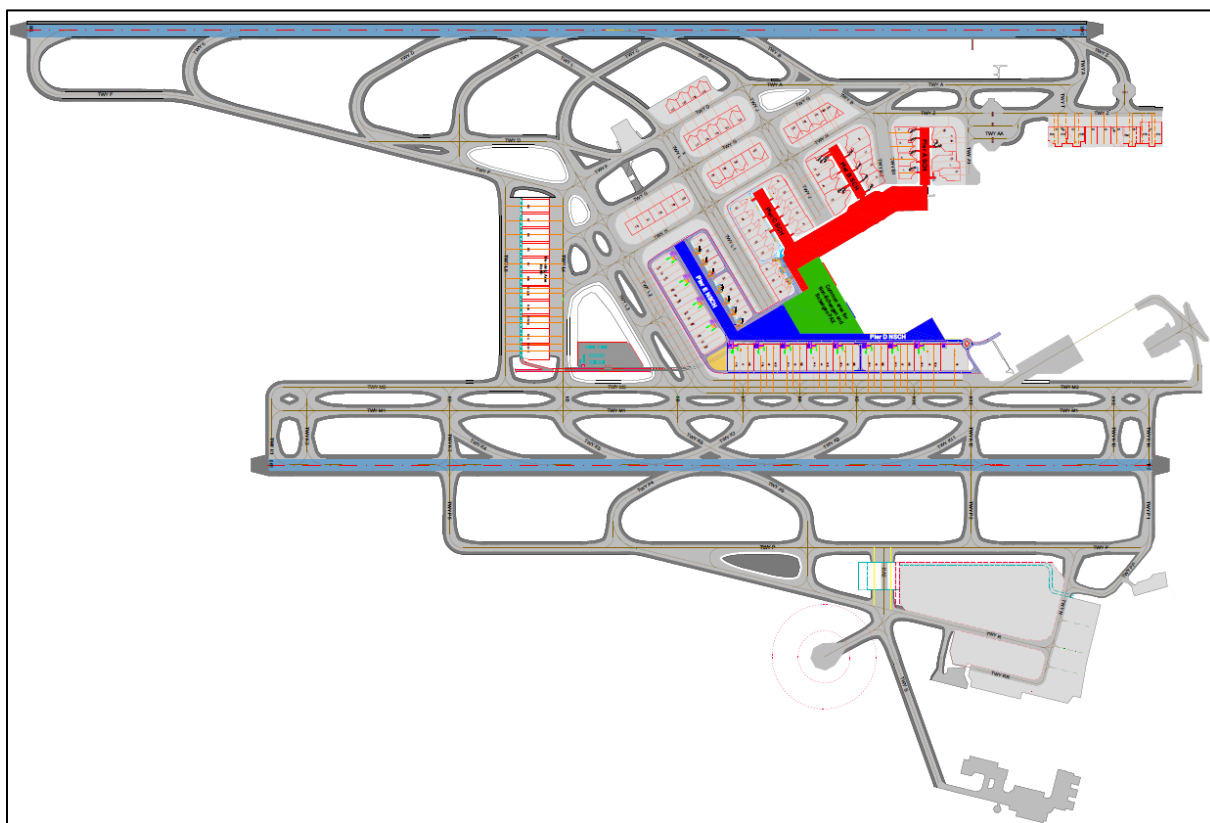
Arrivals and departures served separately on the parallel RWYs in:

Mode	RWY 06L/24R	RWY 06R/24L
Semi-mixed mode	Departures*	Arrivals + Departures*

* Departures of GA/BA flights from AREA South

Duration of operation this mode is from 5:30 till 22:00 LT.

Letiště Praha, a. s.
K letišti 1019/6
P.O.Box 89
161 00 Praha 6

T +420 220 111 888
informace@prg.aero
information@prg.aero
www.prg.aero

Obchodní rejstřík • Commercial Register
Městský soud v Praze oddíl B, vložka 14003
IČ 28244532
DIČ CZ699003361

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For the simulations under Points 1, 2, and 3 the following final RWY layout shall be used:

4) RWY (hourly) capacity calculation under nominal weather conditions for the parallel RWY operations in Semi-mixed mode considering different RWY06R/24L layout - missing RETs and portion of TWY network in the AREA South

Arrivals and departures served separately on the parallel RWYs in:

Mode	RWY 06L/24R	RWY 06R/24L
Semi-mixed mode	Departures	Arrivals + Departures*

* Departures of GA/BA flights from AREA South

Duration of operation this mode is from 5:30 till 22:00 LT.
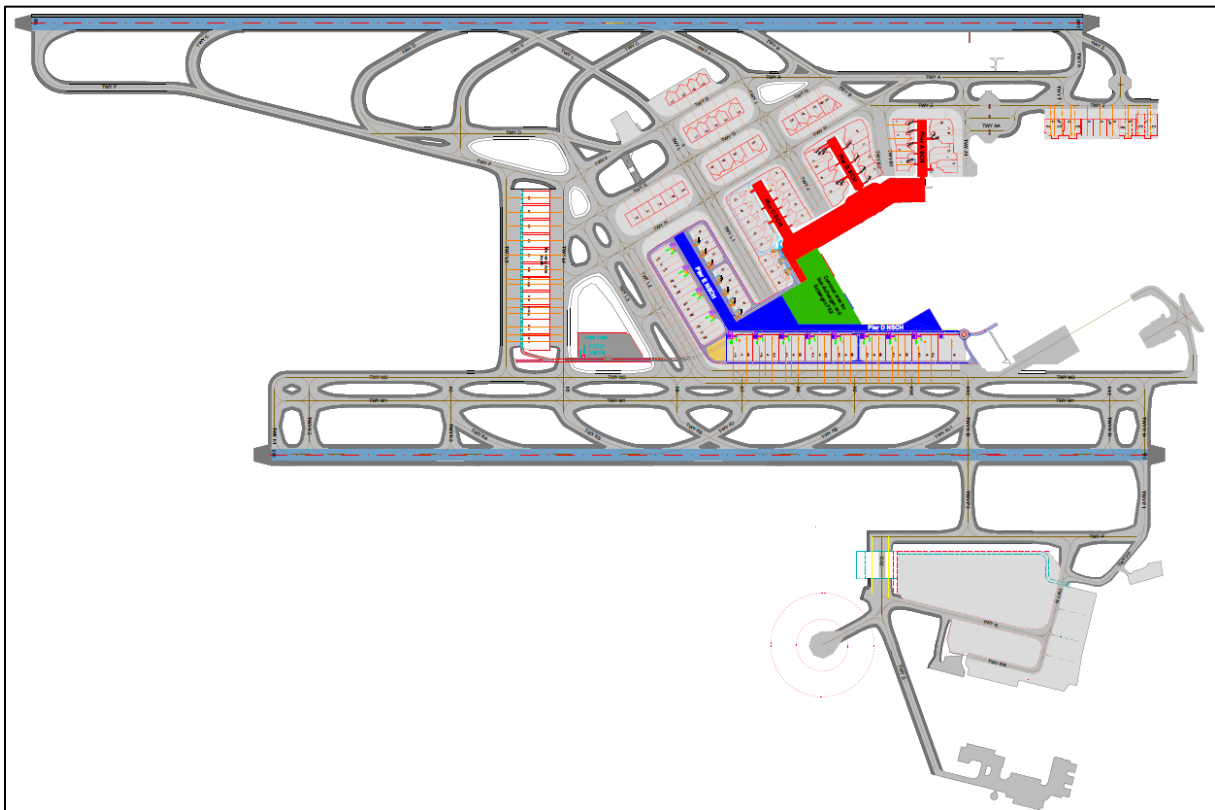
Reduced taxiway network in the AREA South is a result of land acquisition process that might not be concluded by the time of RWY06R/24L commissioning.

Taxiway system throughput

1) TWY system throughput assessment for the parallel RWY operations in Semi-mixed mode with focus on aircraft ground operations

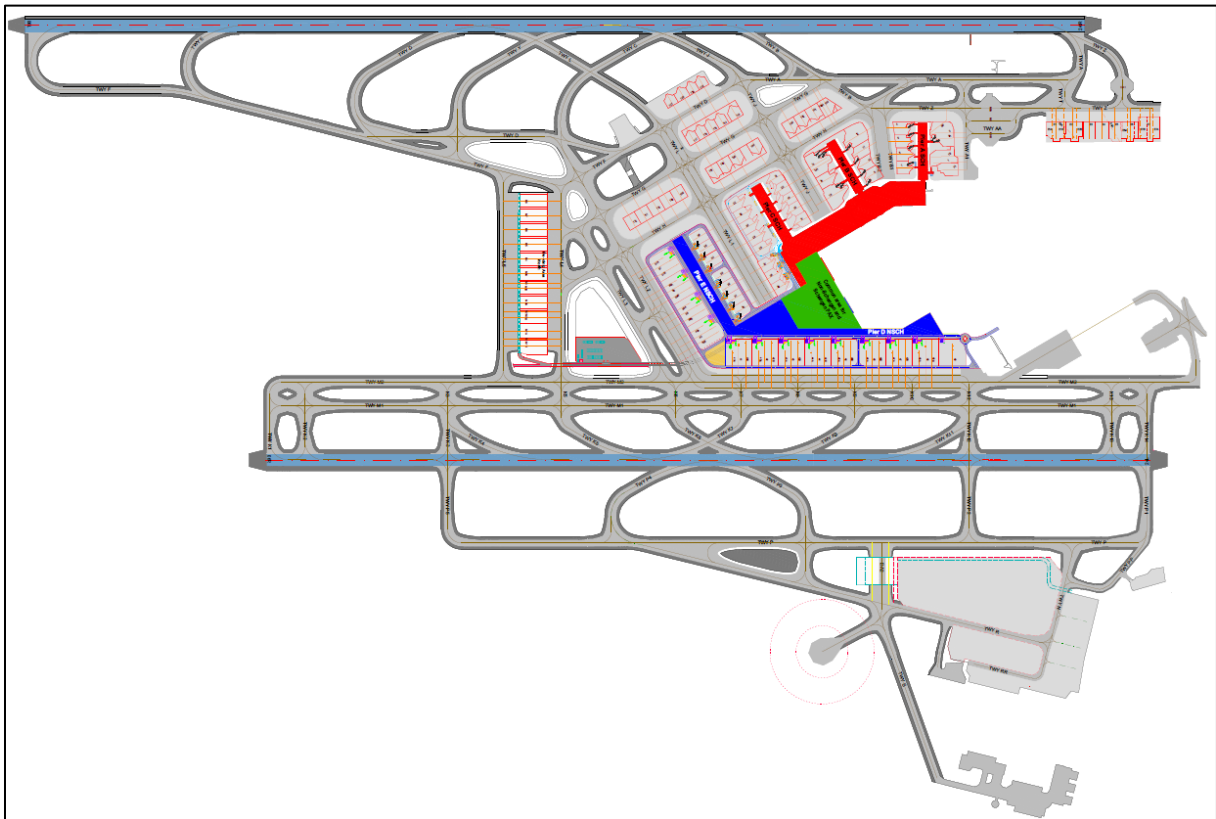| Mode	RWY 06L/24R	RWY 06R/24L
Semi-mixed mode	Departures	Arrivals + Departures*

* Departures of GA/BA flights from AREA South

The taxiway layout shall be tested for the traffic forecast contained in the Schedule A. The calculation shall be conducted always for both runway directions. The assessment shall include analysis of the level of potential average delays / waiting times and other critical situations (hotspots/bottlenecks/opposing traffic) within:

1.1 Towing operations across RWY06R/24L and to/from Hangar F

1.2 De-icing operations

1.3 Push-back operations with focus on the traffic flow around Pier D and Pier E (west facade)

2) **TWY system throughput assessment for the parallel RWY operations in Semi-mixed mode with regard to reduced TWY network layout**

Mode	RWY 06L/24R	RWY 06R/24L
Semi-mixed mode	Departures	Arrivals + Departures*

* Departures of GA/BA flights from AREA South

It is expected that taxiway network will be developed in time. Therefore, it would be an advantage to divide the construction project into phases and increase throughput in several steps as the demand arises. The simulation approach shall therefore indicate the minimum taxiway network needed to accommodate the traffic forecast contained in the Schedule B. In other words, the simulation shall provide proposal for the TWY network project phasing based on the traffic schedule evolution. The calculation shall be conducted always for both runway directions.
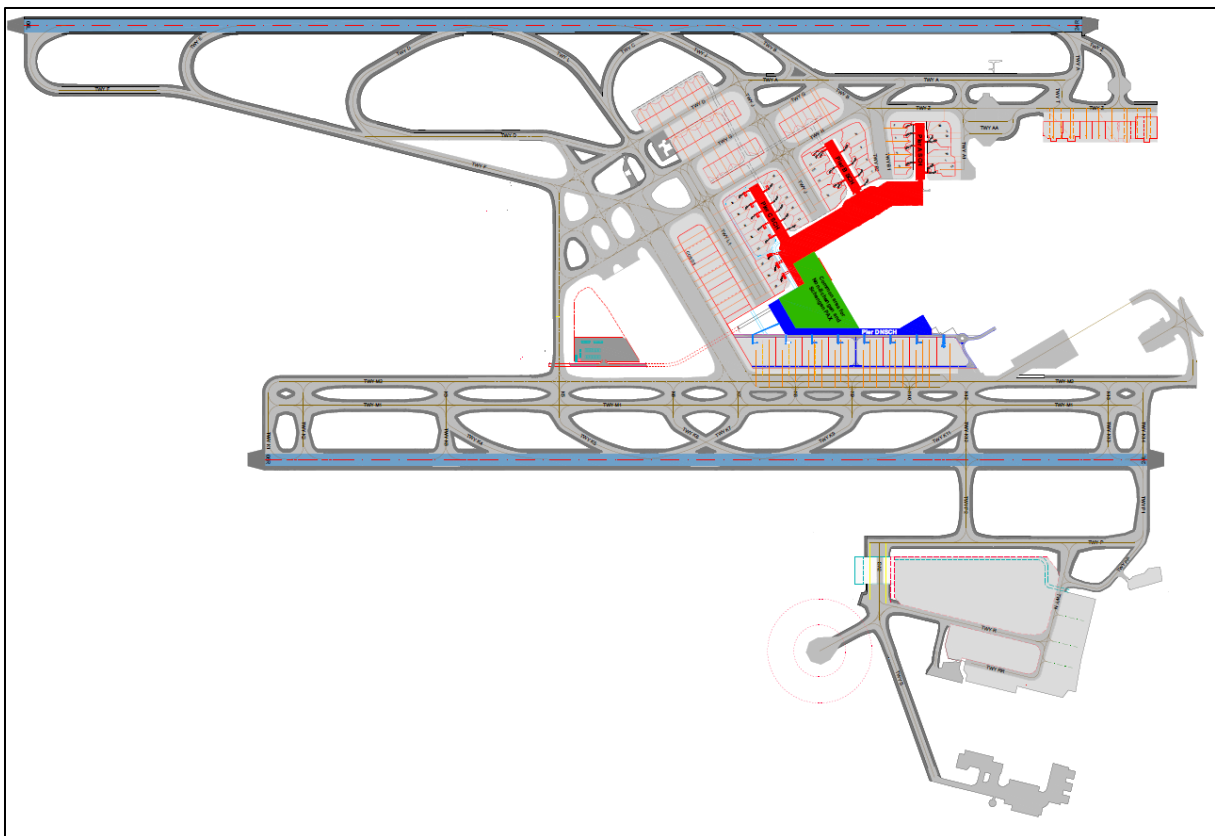
Reduced taxiway network analysis shall include an impact of towing and de-icing operations. The assessment shall further contain a special operational assumption when De-icing stand in the AREA South is inoperable (f.e. due to lack of De-icing resources).

3) **Recommendations in relation to decreased operational efficiency**

The consultant shall further provide recommendations on proposed changes to taxiway design (f. e. positioning and size of taxiway network) or to local ANS and AO rules (f. e. taxi scheme) to increase operational efficiency and to eliminate detected critical situations (hotspots/bottlenecks/opposing traffic).

Letiště Praha, a. s.
K letišti 1019/6
P.O.Box 89
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www.prg.aero

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Data inputs

1) For the purpose of **the RWY** capacity analysis, the following data inputs will be provided:

   a. Airport model
   b. Flight Schedule A and Schedule B
   c. Existing ATS and AO procedures (separation matrix, mix index, flow constraints, ROTA)
   d. Environmental constraints
   e. Others

2) For the purpose of **the TWY** throughput analysis, the following data inputs will be provided:

   a. Airport model
   b. Flight Schedule A and Schedule B
   c. Existing ATS and AO procedures (taxi speed, taxi/tow routes, flow constraints, characteristics limitations, etc.)
   d. Towing operations in AREA South over the typical busy day S18
   e. Others

Key outputs

- Analysis of simulation scenarios as mentioned in paragraphs above

- Technical report about analysis in editable and non-editable form (*.docx, *.pdf)

- Videos of critical simulation scenarios

Appendix 1

Chart below is an illustrational example of the layout and contents of the flight schedule compatible with GS Planning Stands:

Scheduled date	Scheduled time	Airliner	Trip number	Suffix	Arrival departure flag	Date for flight link	Airliner flight link	Trip number flight link	Suffix flight link	Arrival departure flag flight link	Aircraft type IATA	Routing1	Routing2	Handling type	Schengen	Tail number	Stand	Handling agent
20181101	4:55	3V	89	S	A	20181101	3V	89	S	D	734	EBLG		F	Y	OOTNP	23	MA
20181101	21:50	3V	91	R	D	20181101	3V	91	R	A	734	LKTB		F	Y	OOTNP	12	MA
20181101	7:35	FR	5005		D						73H	LIPE		J	Y		103	MA
20181101	8:00	8Q	956		D	20181101	8Q	955		A	321	LTAI		C	N		43A	MA
20181101	10:00	A3	864		A	20181101	A3	865		D	32A	LGAV		J	Y		101	MA
20181101	10:45	A3	865		D	20181101	A3	864		A	32A	LGAV		J	Y		102	MA
20181103	10:30	OK	759		A						319	LFPG		J	Y		21	MA
20181108	17:50	MU	785		A	20181108	MU	786		D	332	ZLXY	ZSPD	J	N		16	CSA