

Advanced Aviation Simulation Techniques

Multiple Departure Queues / One Runway

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Document Contents

This document presents the following topics:

- Multiple departure queues assigned to one runway using SIMMOD.

Problem Description

In many instances airports have configured their runways such that each end of the runway might have two or more departure queues situated there.

The arrangement of queues in this manner allows for:

- Longer runways for heavy aircraft, shorter runways for light aircraft.
- More control over crowded departure queue apron areas, thus creating space to pass, if necessary.

SIMMOD can model this type of operation. But, it does require potentially significant “extra” data inputs to the model. Specifically, the following data will need to be provided:

- Rudimentary changes to the airfield link/node structure (required).
- Definitions for the additional departure queues (required).
- Duplicate definitions for many airspace routes (required).
- Separate procedures for each of the additional departure queues (optional).
- Accurate assignment of routes to flights.

What SIMMOD Does Not Do

While multiple queues for a particular runway in SIMMOD are advantageous, in SIMMOD they do not:

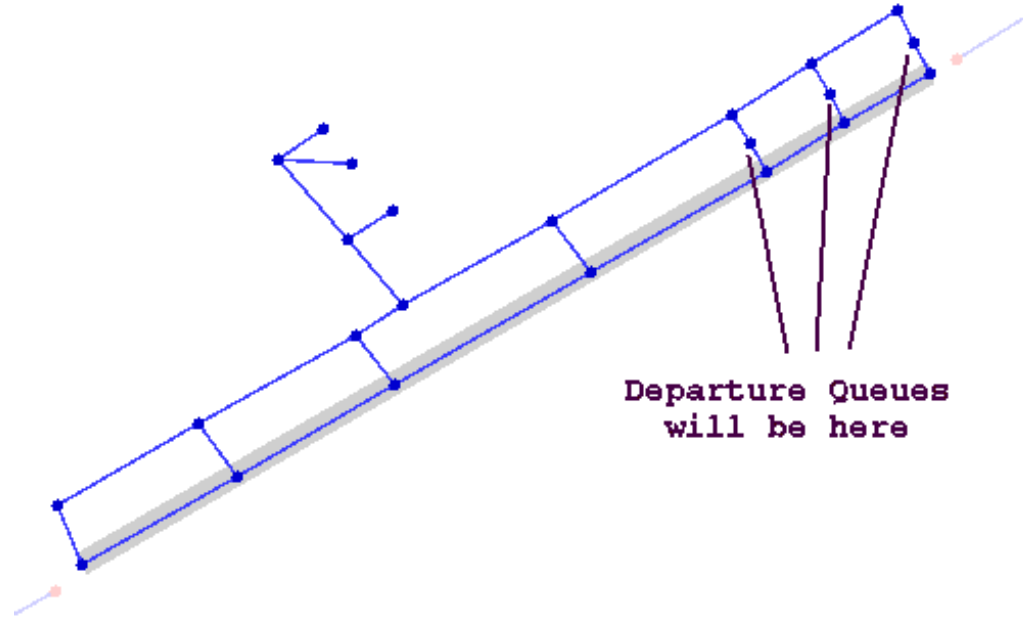
- Work as one departure queue, thus passing by aircraft in the queues of a particular runway is not modeled. The runway is served on a first come, first served basis.

If you need to model multiple queues physically on multiple apron areas that have passing then you have two options:

- Model only one departure queue at the end of a runway and permit passing within this one departure queue. The visual impact of multiple departure queues is obviously lost using this technique.
- Use the more advanced model Aeroscript. This model can perform a wide variety of advanced aviation concepts while maintaining data compatibility with SIMMOD.

The Link/Node Structure

To continue the tutorial, please create an airfield link and node structure similar to the following at the end of your runway(s):



The Departure Queues

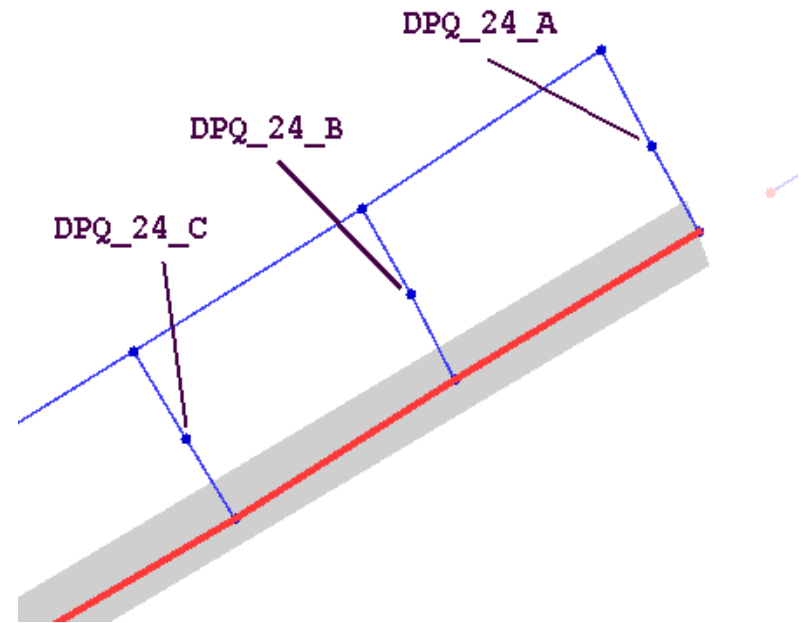
Create the departure queues at the locations desired.

It should be noted that you should use a consistent naming convention for your queues.

In the case shown, AirportTools uses the following departure queue identifiers:

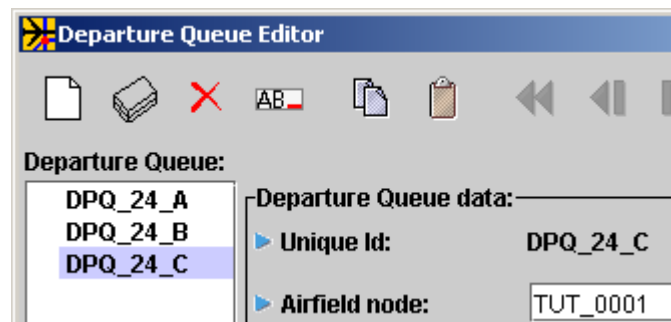
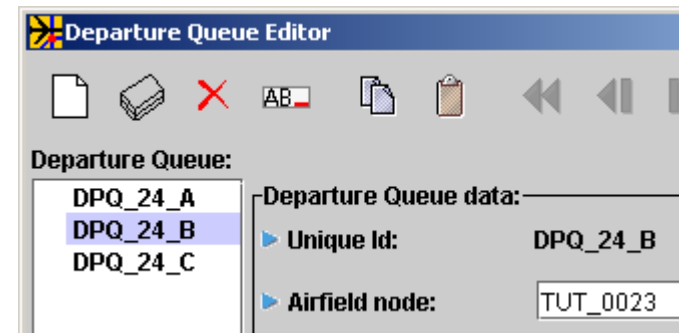
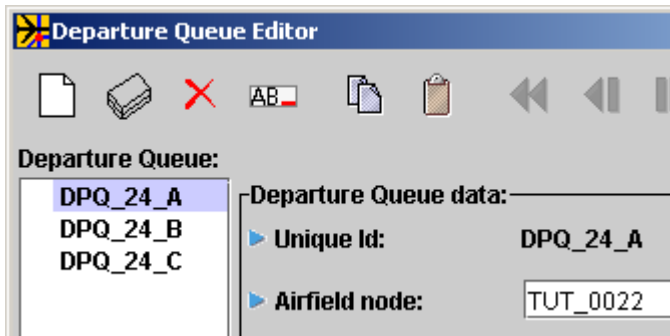
- DPQ_24_A
- DPQ_24_B
- DPQ_24_C

The departure queue identifier closest to the runway end always utilizes the letter 'A'.



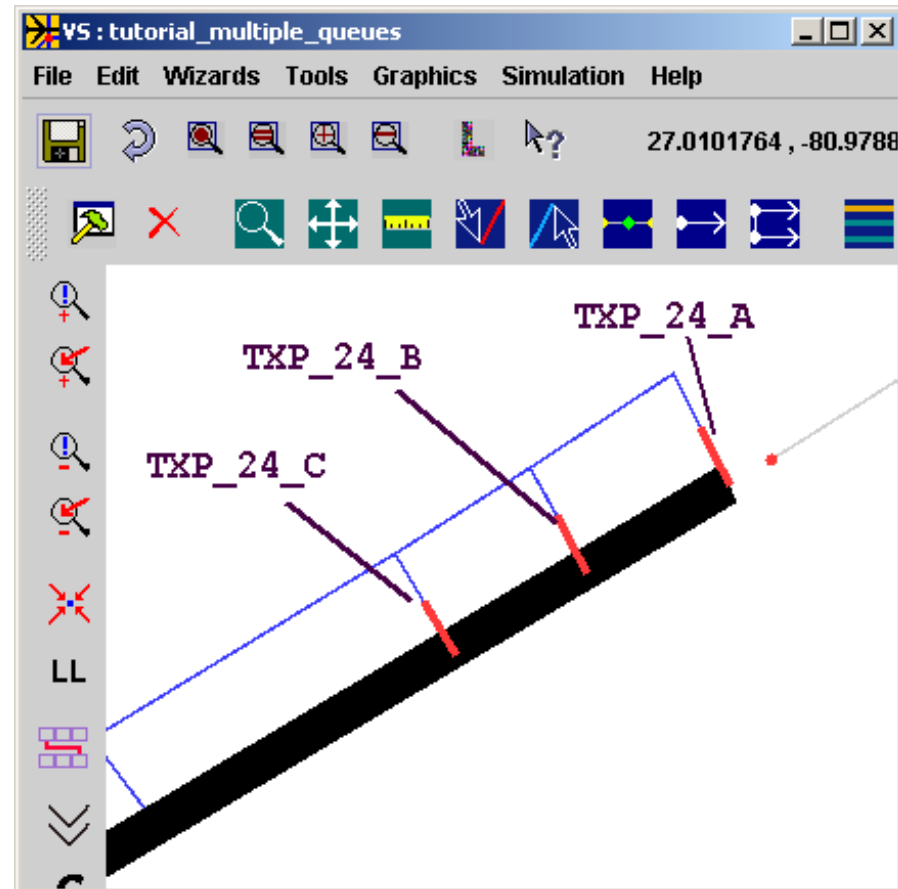
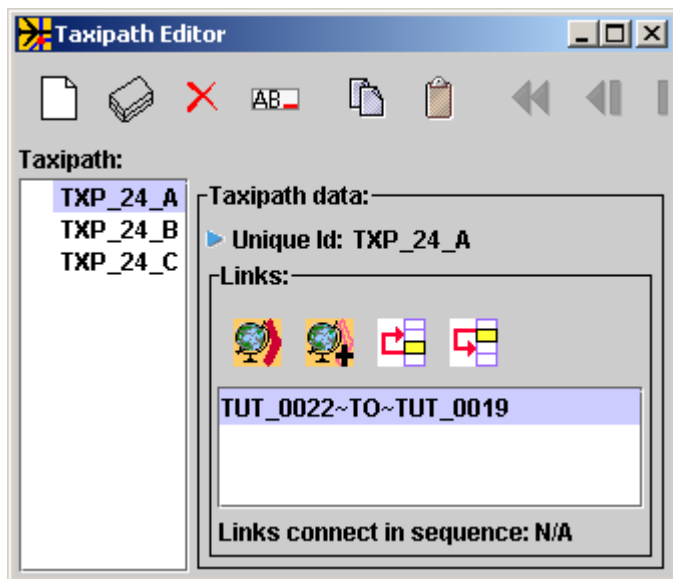
The Departure Queues

After creation of the departure queues you should have data similar to the following in the Departure Queue Editor:



Taxipaths

For each departure queue you create you should create a taxipath which connects the queue to the first node of the runway where the runway operation should begin. The taxipaths in this example are as follows:

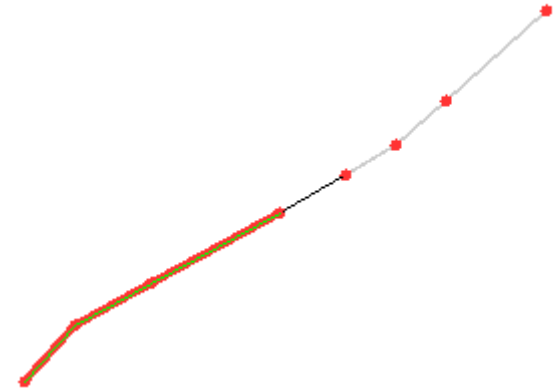


The Routes

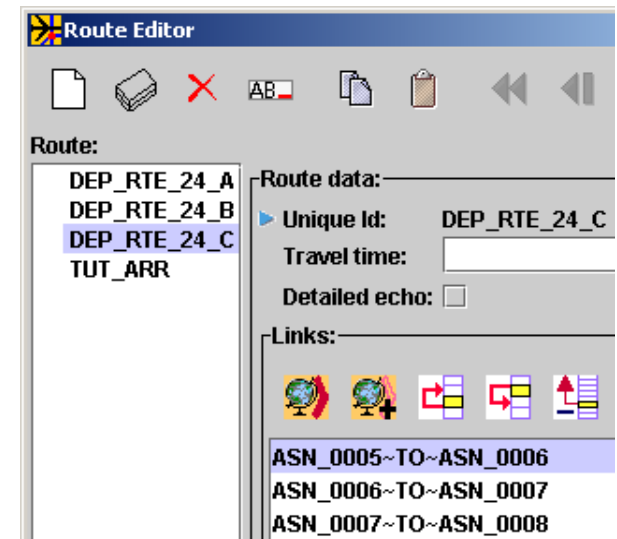
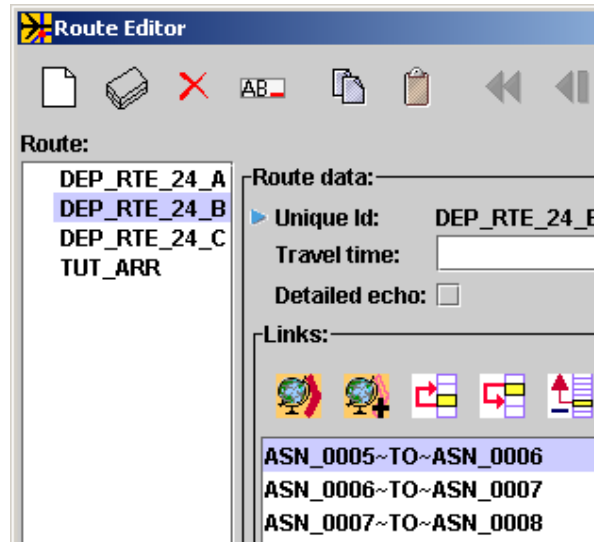
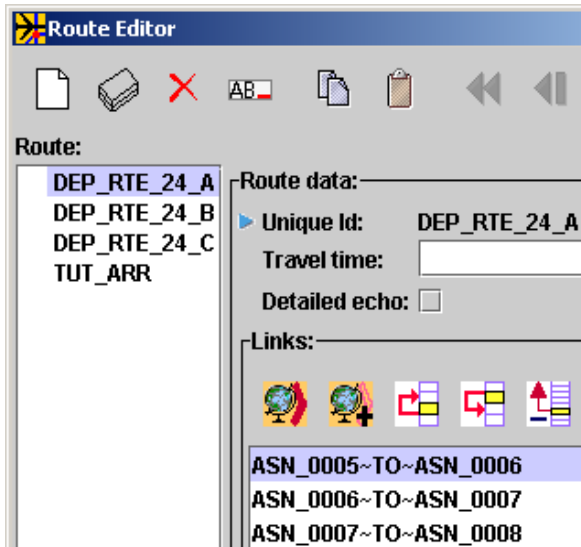
Next, create the necessary routes. The basic rule is as follows:

To accommodate multiple departure queues (in this case three) you will need to duplicate each departure route for each departure queue.

Thus, to program SIMMOD for three departure queues off runway 24, you will need to duplicate the particular departure route two times for a total of three routes which utilize exactly the same link/node structure.

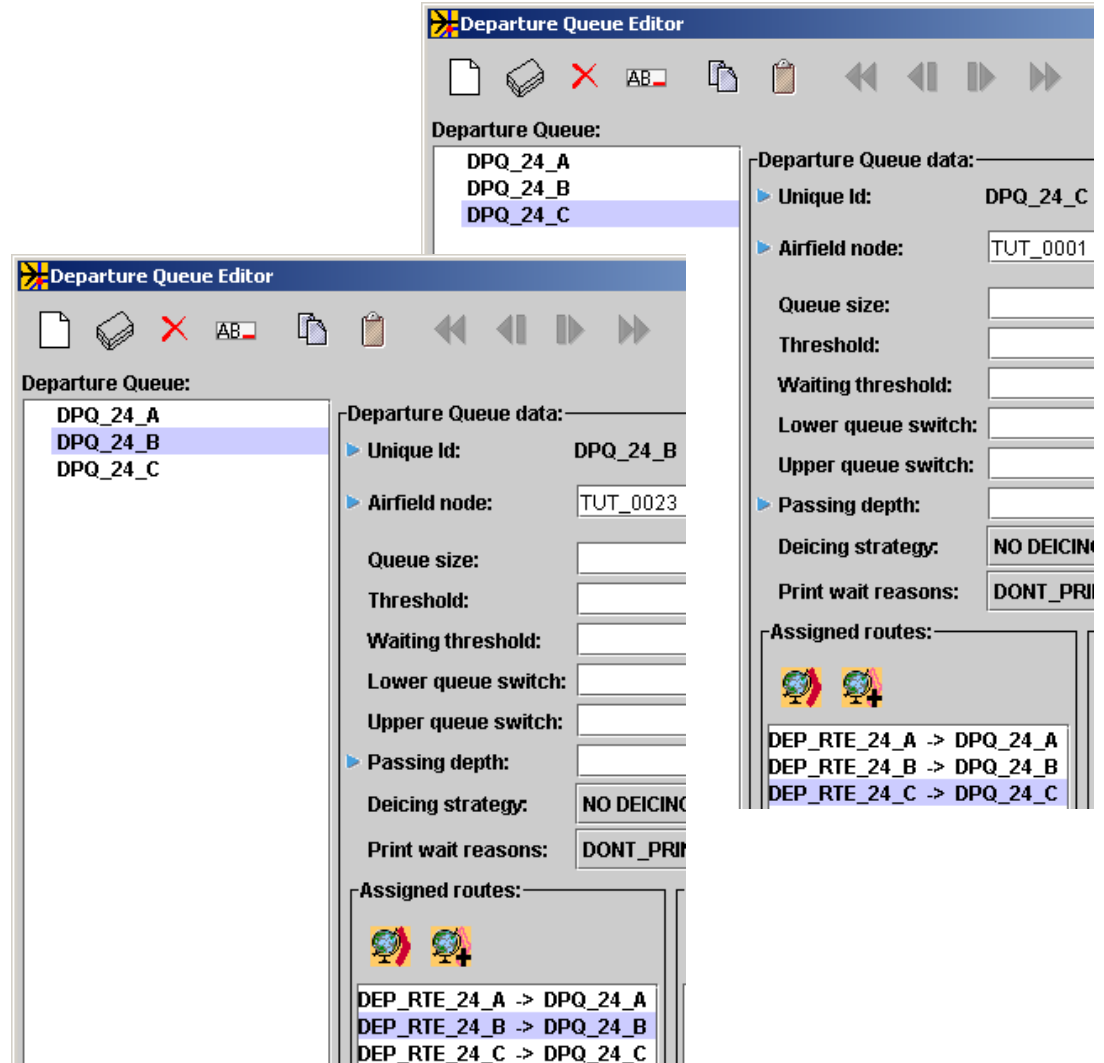
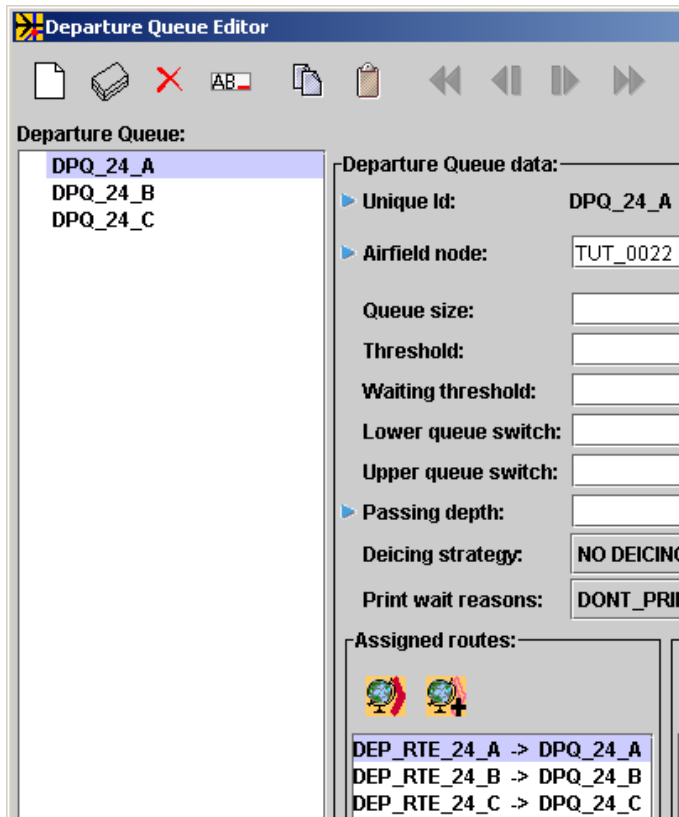


The routes after duplication look like the following:



Departure Queues Revisited

After duplication of the departure routes (i.e. a duplicate route for each departure queue) you should now assign the routes in the Departure Queue Editor:



Procedures

Procedures must be built for each departure queue, runway, and initial runway node combination.

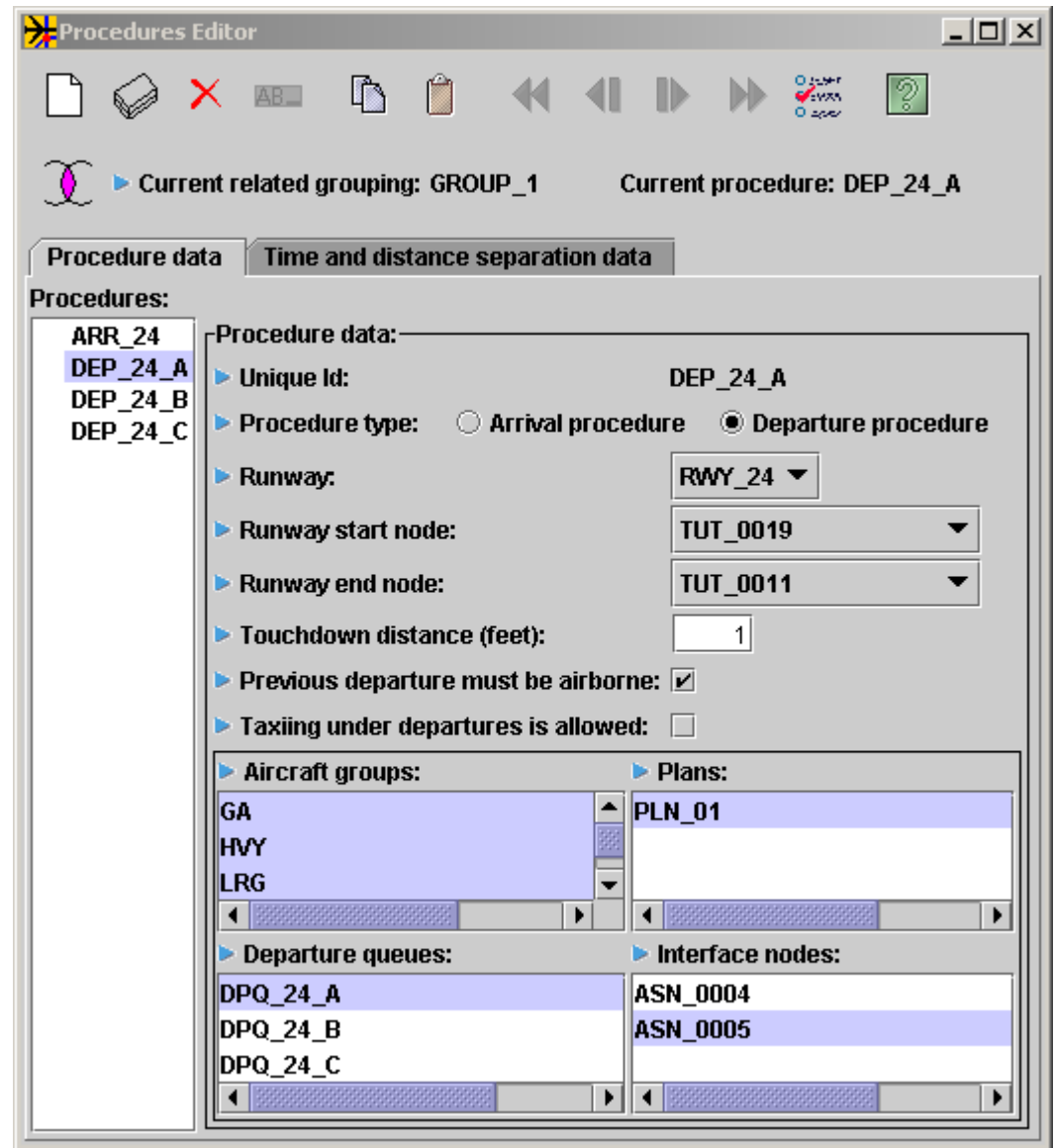
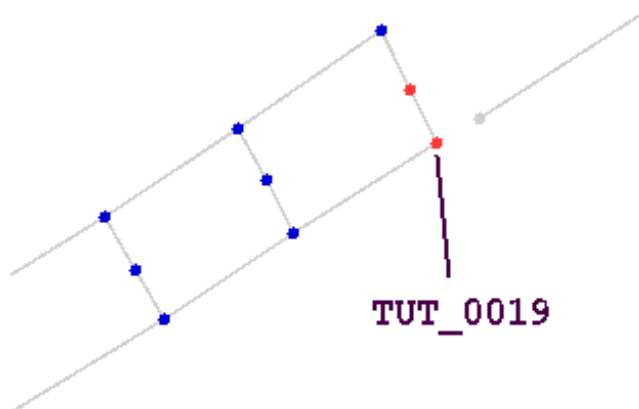
The following three examples illustrate how this is done.

Please note the Runway start node is

TUT_0019

and the matching assigned departure queue is

DPQ_24_A.



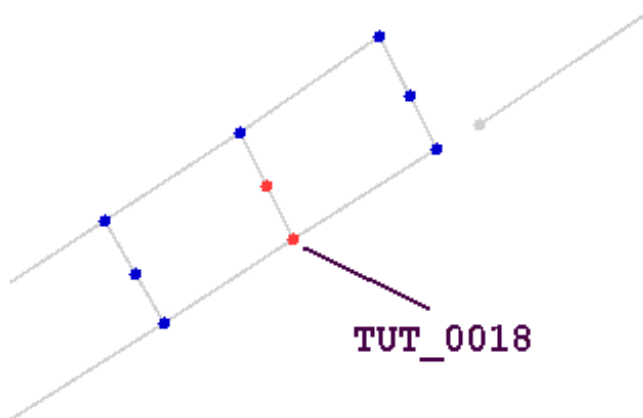
Procedures continued

Please note the Runway start node is

TUT_0018

and the matching assigned departure queue is

DPQ_24_B.



The screenshot shows the 'Procedures Editor' window. The 'Current related grouping' is 'GROUP_1' and the 'Current procedure' is 'DEP_24_B'. The 'Procedure data' tab is active, showing the following configuration:

- Unique Id: DEP_24_B
- Procedure type: Arrival procedure Departure procedure
- Runway: RWY_24
- Runway start node: TUT_0018
- Runway end node: TUT_0011
- Touchdown distance (feet): 1
- Previous departure must be airborne:
- Taxiing under departures is allowed:

The 'Aircraft groups' list includes GA, HVY, and LRG. The 'Plans' list includes PLN_01. The 'Departure queues' list includes DPQ_24_A, DPQ_24_B, and DPQ_24_C. The 'Interface nodes' list includes ASN_0004 and ASN_0005.

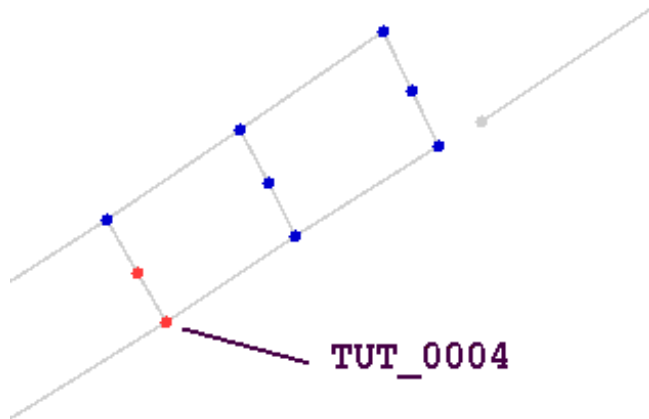
Procedures continued

Please note the Runway start node is

TUT_0004

and the matching assigned departure queue is

DPQ_24_C.



The screenshot shows the 'Procedures Editor' window. The title bar reads 'Procedures Editor'. The interface includes a toolbar with icons for file operations and navigation. Below the toolbar, it displays 'Current related grouping: GROUP_1' and 'Current procedure: DEP_24_C'. There are two tabs: 'Procedure data' and 'Time and distance separation data'. The 'Procedures:' list on the left contains 'ARR_24', 'DEP_24_A', 'DEP_24_B', and 'DEP_24_C', with 'DEP_24_C' selected. The main panel shows configuration for 'DEP_24_C':

- Unique Id: DEP_24_C
- Procedure type: Arrival procedure Departure procedure
- Runway: RWY_24
- Runway start node: TUT_0004
- Runway end node: TUT_0011
- Touchdown distance (feet): 1
- Previous departure must be airborne:
- Taxiing under departures is allowed:

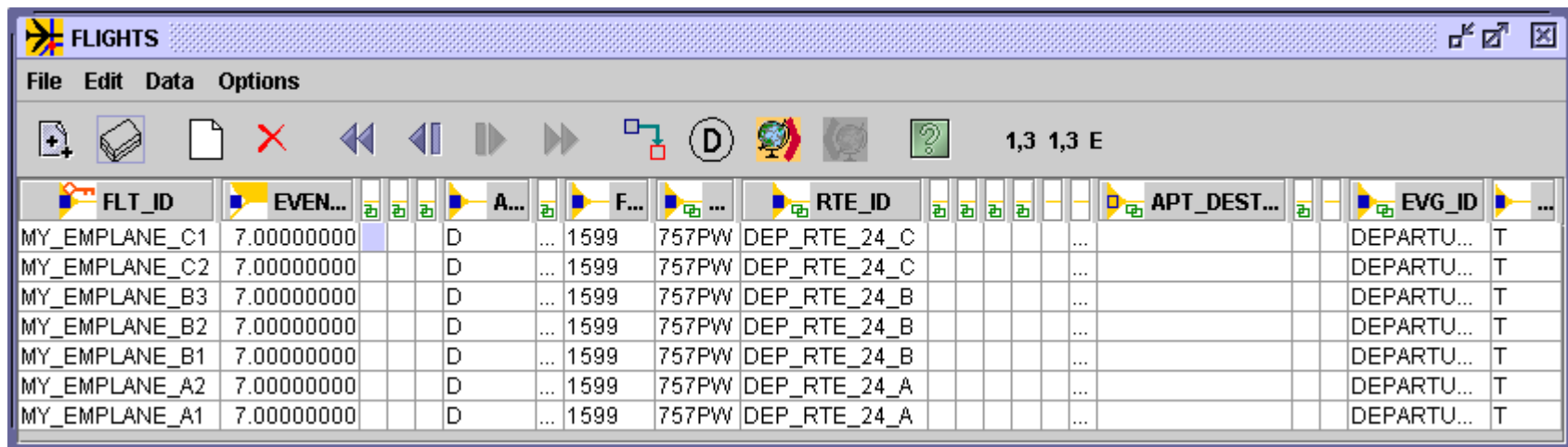
Below these are sections for 'Aircraft groups' (GA, HVY, LRG), 'Plans' (PLN_01), 'Departure queues' (DPQ_24_A, DPQ_24_B, DPQ_24_C), and 'Interface nodes' (ASN_0004, ASN_0005).

Flights

Next you will need to assign the proper routes to your departure flights. Some factors which might influence which departure queue the flight is assigned to are as follows:

- Proximity to the departure queue.
- Size and weight of the aircraft (larger aircraft need longer runways).
- The need to reduce airfield congestion near the departure queues, or to allow aircraft to pass other aircraft at the departure queues.

In this tutorial some example flights are as follows, please notice the RTE_ID column:



The screenshot shows a software window titled "FLIGHTS" with a menu bar (File, Edit, Data, Options) and a toolbar. Below the toolbar is a table with the following columns: FLT_ID, EVEN..., A..., F..., RTE_ID, APT_DEST..., and EVG_ID. The table contains seven rows of flight data.

FLT_ID	EVEN...	A...	F...	RTE_ID	APT_DEST...	EVG_ID
MY_EMPLANE_C1	7.00000000	D	... 1599	757PW DEP_RTE_24_C	...	DEPARTU... T
MY_EMPLANE_C2	7.00000000	D	... 1599	757PW DEP_RTE_24_C	...	DEPARTU... T
MY_EMPLANE_B3	7.00000000	D	... 1599	757PW DEP_RTE_24_B	...	DEPARTU... T
MY_EMPLANE_B2	7.00000000	D	... 1599	757PW DEP_RTE_24_B	...	DEPARTU... T
MY_EMPLANE_B1	7.00000000	D	... 1599	757PW DEP_RTE_24_B	...	DEPARTU... T
MY_EMPLANE_A2	7.00000000	D	... 1599	757PW DEP_RTE_24_A	...	DEPARTU... T
MY_EMPLANE_A1	7.00000000	D	... 1599	757PW DEP_RTE_24_A	...	DEPARTU... T

Results

If you have properly defined your data, as has been demonstrated in this tutorial, then you will have aircraft lined up to use the runway as the following example:

