

North American Simmod User Group

Washington Dulles Intl. Airport

Presented to: NASUG

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**Federal Aviation
Administration**



Model Status

- *FAA's Airport & Airspace Simulation Model* status
 - Version 3.4 released March 2010
 - Model changes sent to ATAC
 - Windows and Linux version

- Received 7 requests for the FAA's engine since last release (Sept 2009)

Model Maintenance - Dynamic Taxiing

Background

To avoid ground congestion, an aircraft that is taxiing can have its taxi plan re-evaluated (using TAXICHECKPT) to take an alternate path.

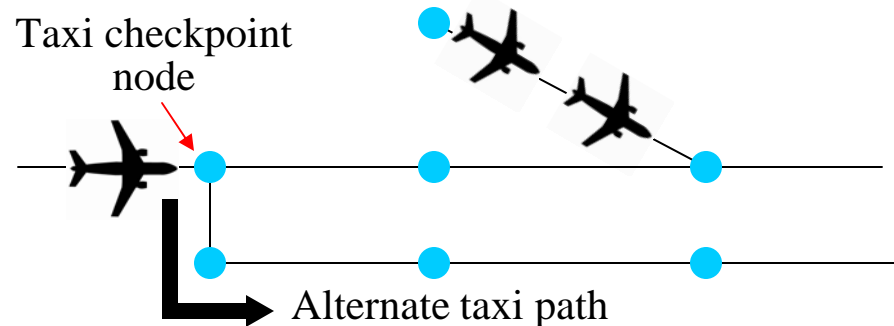
Prior 2008:

Originally, an aircraft at a Taxi checkpoint node could only evaluate ground congestion in the aircraft's current taxi path (the next N links looking ahead).

Added in 2008:

Aircraft at a Taxi checkpoint node can check for ground congestion at :

- any ground link
- any departure queue
- any airspace link or node



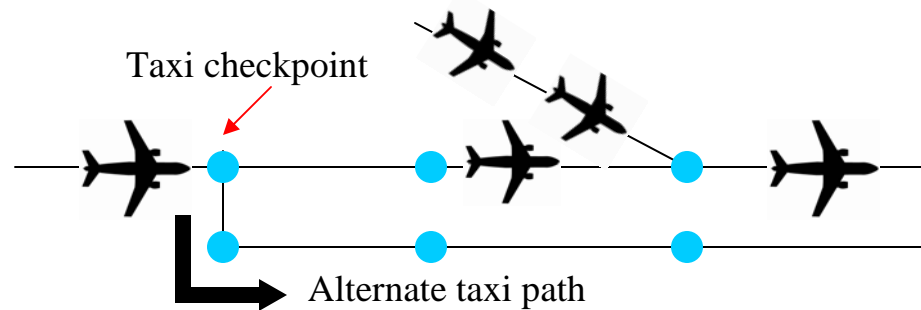
Added in 2009 :

3 new enhancements

Dynamic Taxiing

Previously, could only check one ground link, one departure queue, or one air link/node for ground congestion.

Enhancement #1 : The Taxi checkpoint logic can now check multiple ground links, multiple departure queues, or multiple air links/nodes for ground congestion.

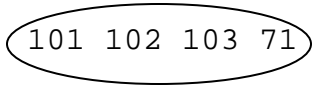


Example:

TAXICHKPT 1

1 TC6 12 GNDLINK (101 102 103 71) ; ALT-TAXIPATH-B 3 ;

List of links



aircraft threshold
alternate taxi path

"If 3 or more aircraft occupy the list of ground links, then re-evaluate the taxi plan using taxi path ALT-TAXIPATH-B, for aircraft that roll over the taxi checkpoint node 12."

Dynamic Taxiing

Previously, all aircraft that roll over a taxi checkpoint node are subject to have their taxi plan re-evaluated.

Enhancement #2 : Filter types may be defined to determine which aircraft are permitted to have their taxi plan re-evaluated. Filter keywords and data:

MODEL and list of aircraft model numbers
TAMPS and list of TAMPS group numbers
AIRLINE and list of airline names
ARRIVAL
DEPARTURE

Example:

TAXCHKPT 1
1 TC6 12 AIRLINE DL US AA ; GNDLINK 101 102 103 71 ; ALT-TAXIPATH-B 3 ;

Filter type and airline names

"An aircraft of airline DL, US, or AA will have their taxi plan re-evaluated if 3 or more aircraft occupy the list of ground links."

Dynamic Taxiing

Enhancement #3 : More than one filter type may be used to further restrict which aircraft are permitted to have their taxi plan re-evaluated. Any of the five filter types may be listed one after another.

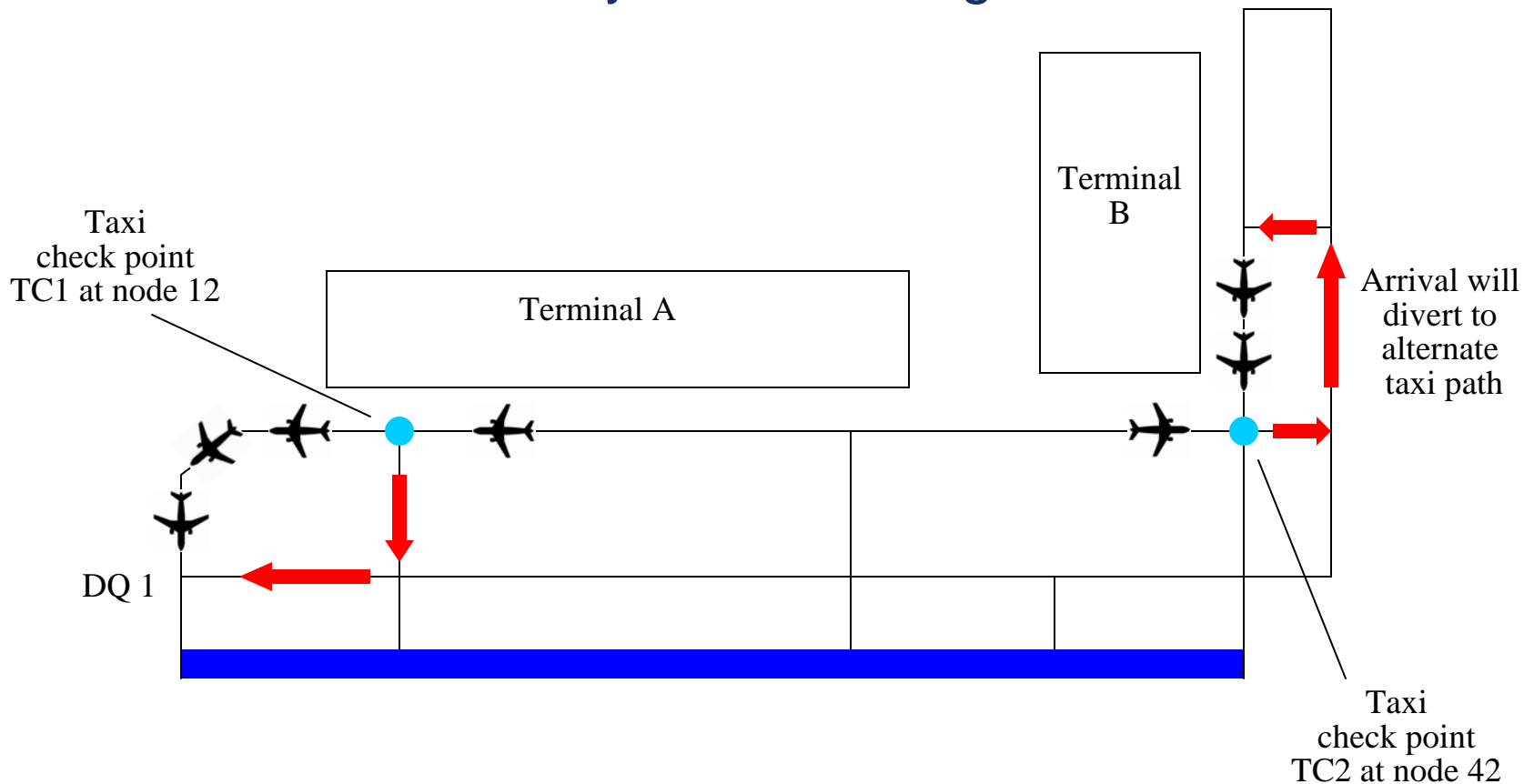
Example:

Three filter types

```
TAXICHKPT 1
1 TC6 12 ARRIVAL MODEL 36 37 38 AIRLINE DL US AA ;
  GNDLINK 101 102 103 71 ; AVOID-TERMINAL-B 3 ;
```

"An aircraft that is arriving, of model type 36, 37, or 38, and of airline DL, US, or AA will have its taxi plan re-evaluated if 3 or more aircraft occupy the list of ground links."

Dynamic Taxiing



TAXICHKPT 2

1 TC1 12 DEPARTURE ; GNDLINK 15 16 17 ; TAXIPATH-B 3 ;

2 TC2 42 ARRIVAL ; GNDLINK 71 72 73 ; TAXIPATH-EAST-BYPASS 1 ;

Model Maintenance

- Corrected taxi planning logic. A departing aircraft erroneously taxied across its runway, and then proceeded to its departure queue. An initialization error caused a very low cost to be assigned to a runway exit link. Fixed.
- SIMU10 enhancements, delays and travel times summarized by runway:
 - When using a runway in the primary and reverse direction, results are now listed separately for each runway direction.
 - When using dynamic airspace re-routing to move arrivals or departures to an alternate runway, the flight delays and travel times were not being assigned to the correct runway. Fixed.

Model Maintenance

- Enhanced output file SIMU38. A user reported there was unknown data in output file, no documentation existed to define the columns of data. Added column headings and a description of the data.
 - SIMU38 lists the air travel times for each flight
- Enhanced output messages:
 - Engine produced a vague “gate not found” error message. User spent several hours trying to locate input error. Added user friendly message that tells user the specific GATEUSE record that had a non-existent gate.
 - Engine crashed with no error message, user was unable to locate error. Added error message to tell user a non-existent procedure was listed in the AIRPORTS record.
 - Engine crashed without producing an error message. The number of data entries in LINKBLOCKING did not match the global data value. Added user friendly error message.

Model Maintenance

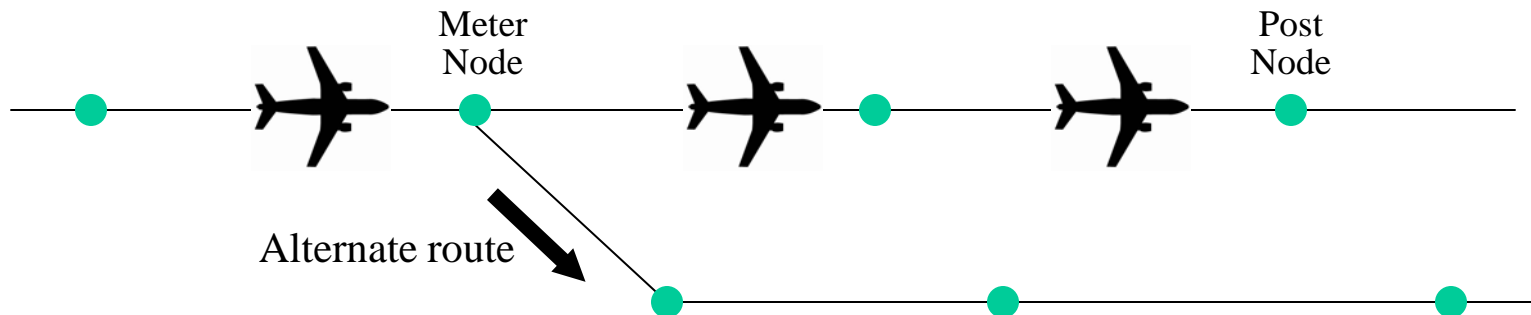
- Enhanced departure sequence logic
 - new input option allows aircraft at a departure queue to have departure priority over aircraft holding at other departure queues.
 - For airports that do not always use a FIFO method
 - New input “Departure priority strategy” added to DEPARTQ record has 2 options:
 - Strategy 1 : to have departure priority over all other departure queues at the airport
 - Strategy 2 : to have departure priority over other departure queues at a runway
 - Departure queue priority can be limited (“turned off”) with a threshold value. When the number of aircraft (in a low-priority) departure queue reaches a threshold limit, the engine will return to its regular FIFO logic to determine the next departure.

Model Maintenance

- Enhanced gate power-back/push-back record (GATE_MDL_PP_TIME). Previously, could not explicitly list which aircraft models push-back and which power-back (per gate). Also, relied on other confusing records (PPTIME,PPBACK).
 - New input entry allows specific models to be defined for either power-back or push-back for each gate.
 - Use with gate type 3 (new option)
 - To reduce input processing times, option to use a “wildcard”. Any model not defined for power-back will automatically push-back.
- Corrections to gate power-back/push-back logic:
 - When using GATE_MDL_PP_TIME record, engine terminated in gridlock. A unit conversion error computed very long pushback times. Fixed.
 - Indexing error when reading the GATE_MDL_PP_TIME record caused engine to crash.
 - A gate defined as push-back only (gate type 1) was using power-back times. Engine was not indexing the correct PPTIME record. Fixed.
 - When using PPTIME record, engine would incorrectly store the push-back time, which would subsequently be used by another aircraft. Fixed.

Model Maintenance – Dynamic Airspace Re-Routing

- Enhanced dynamic airspace re-routing by allowing flights to be diverted to an alternate route at any air node.
 - Previously, could only switch routes near runways for runway balancing (using METERING)
 - Flight diversions are triggered based on number of aircraft heading to a post node.
 - Arrivals as well as departures can be re-routed to alternate route.

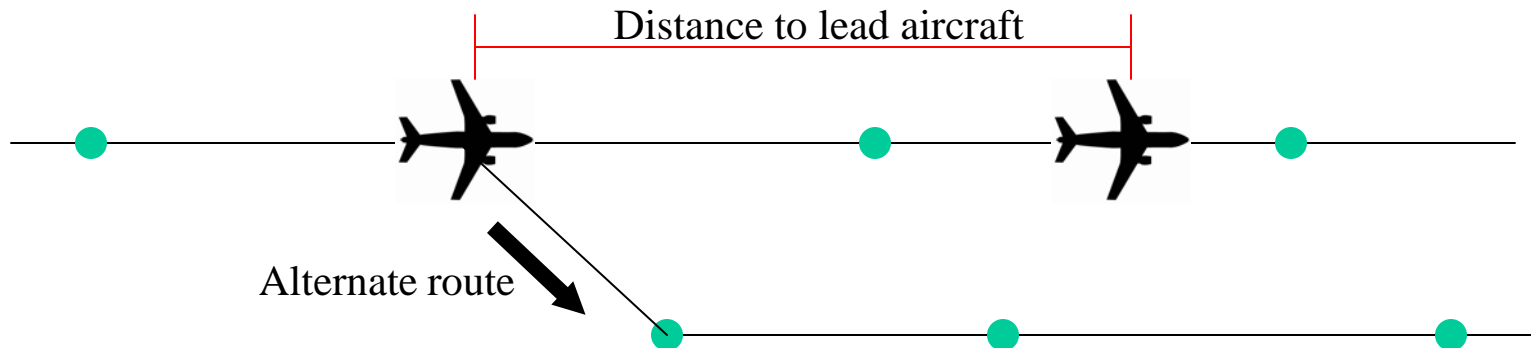


Dynamic Airspace Re-Routing

New input record: **DYNAMIC_REROUTING**

Has 3 strategies to re-route aircraft to an alternate route.

- Re-route strategy #1: Separation distance to lead aircraft. If the distance between the aircraft and its *lead* aircraft is less than the re-route parameter value, then the aircraft will divert to an alternate route.

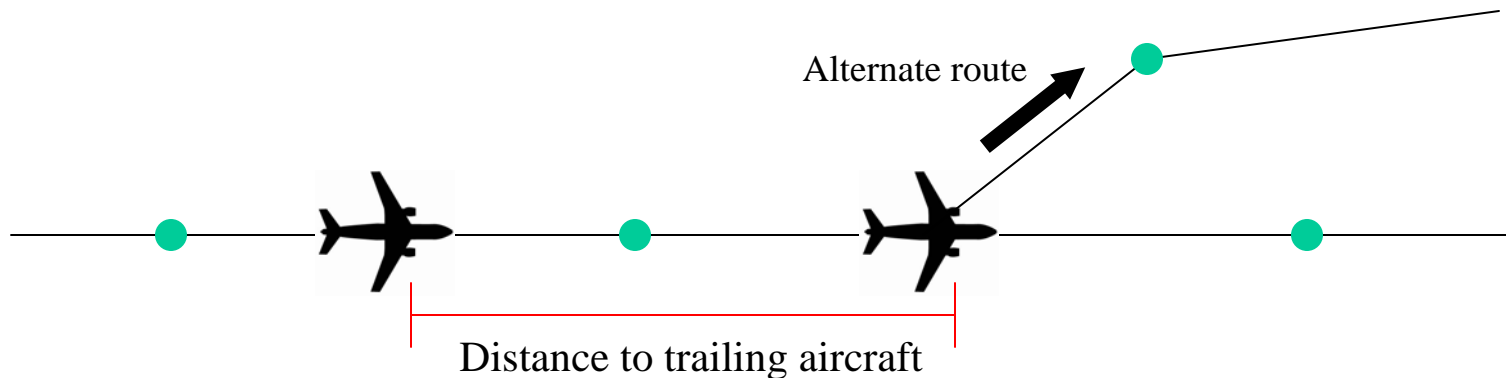
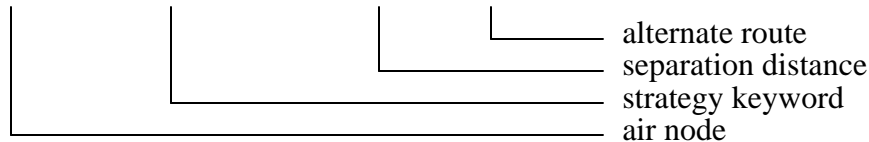


Dynamic Airspace Re-Routing

Re-route strategy #2: Separation distance to trailing aircraft. If the distance between the aircraft and its *trailing* aircraft is less than the re-route parameter value, then the aircraft will divert to an alternate route.

DYNAMIC_REROUTING

```
1 27 SEPARATION-T 10 ; 35 ;
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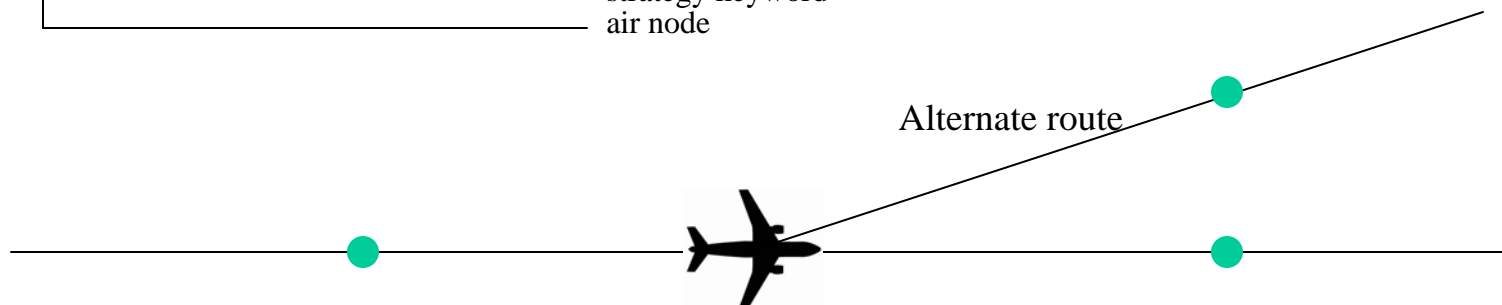
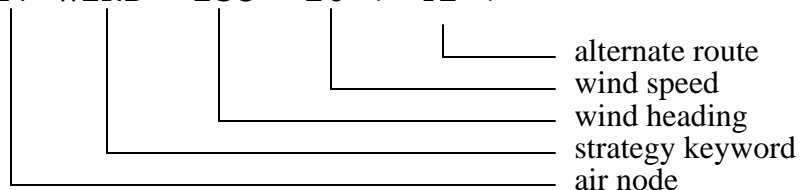
Dynamic Airspace Re-Routing

Re-route strategy #3: Wind

If the wind direction and wind speed (in SETWIND) matches re-route parameters, then the aircraft will divert to an alternate route.

DYNAMIC_REROUTING

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1 17 WIND 135 20 ; 41 ;
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Questions?

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