

## APPENDIX C - NAT Simulation Model Description

### *General*

The North Atlantic Traffic Allocation Model (NATTAM) is capable of considering the routes, flight levels, and times of flights in a given schedule against the specified airspace structures and separation minima, either as presently established or as changed to test the effects of proposed changes. Traffic volumes and patterns, the structure of MNPS airspace, the Organized Track System, the availability of given flight levels during given time periods, and the vertical, lateral and longitudinal separation standards can all be varied by the model operator to test the effects of proposed changes on route and flight level allocations. Occupancies may then be calculated from the outputs of the NATTAM program.

The model is able to use an existing Gander OACC daily traffic database (GAATS) summary as the initial list of aircraft, routes, flight levels, times, and speeds. The information on each of the flights listed in the GAATS database is treated as the flight plan considered by the allocation model.

The model considers routes between 50W and 20W, inclusive. If a flight is at all four waypoints (at 50W, 40W, 30W and 20W) corresponding to one of the OTS published tracks and at one of the flight levels for that track during the track times, it is considered as being on that track and is given that track designation. If an aircraft does not meet all these criteria, it is considered "Random"

### *Re-allocation of flights to 100ft VSM Environment*

To determine the effects of 1000 ft VSM on occupancy, 50% of traffic in the base case is re-assigned to even flight levels. In re-assigning traffic to even flight levels, 75% of those eastbound flights which were moved, went up 1000 ft, and 25% went down 1000 ft; for those westbound flights which were moved, 25% were put up 1000 ft and 75% were put down 1000 ft. This was done based on the generally accepted understanding that eastbound aircraft are further into their flights and therefore more able to climb.

### *Concentration of Traffic Towards Core Tracks*

With the addition of more available flight levels on the core routes, the traffic is expected to concentrate laterally towards the center of the Track system. The rules which concentrate traffic towards the core track, after the re-allocation of 50% of flights to even flight levels in a 1000 ft environment are:

1. Determine the waypoint co-ordinates of the most used OTS track (the central track).
2. For OTS Flights
  - 2.1 Move 50% of OTS flights which are one track north or south of the most used track, to the center track.
  - 2.2 For OTS flights which are more than one track north or south of the central track, move:
    - 2.2.1 25% two tracks toward the centre,
    - 2.2.2 25% one track towards the centre, and
    - 2.2.3 leave the remaining 50% where they are.

### 3 For Random Flights

3.1 For flights four or more degrees of latitude from the central track at the start (50° W for eastbound flights and 20° W for westbound flights), leave as is.

3.2 For flights three degrees from the central track at the start of their crossings, move 25% of flights one degree of latitude north or south to a route parallel to its original route so that the start point is closer to the central track.

3.3 For flights one or two degrees from the central track at the start, move 50% of flights to a parallel route one degree of latitude north or south so that the start point is closer to the central track.

#### *Traffic Increases*

Traffic increases may be made either by editing existing or adding new flights, or more simply by duplicating a specified percentage of existing flights. Traffic increases are seen to be more heavily concentrated in the peak periods, making the demand peaks even more pronounced. For a selected daily traffic increase percentage, therefore, the shoulder periods are increased at the specified rate. The rate of increase during the peak is a calculated value which will give the specified overall daily percentage increase in the number of flights.

#### *Conflict Resolution*

Separation standards will be violated and conflicts generated when the airspace structure is changed, when traffic is reallocated to new routes or flight levels, or when increased traffic levels are introduced. In these cases, as the traffic allocation model moves through the day, when it reaches the time a flight enters the airspace (at 50° W for eastbound and 20° W for westbound flights), it will check against previously cleared flights to determine if a separation standard would be violated. If the requested routing and times cannot be granted without imposing on the separations required with other flights, a series of sequential choices if followed until a conflict-free route at all waypoints is found. Often, flights which are re-cleared affect subsequent flights, resulting in a chain reaction and a significant number of additional re-clearances during busy traffic periods.

The re-clearance sequence used for westbound traffic was obtained from the tables of the resolution algorithms used in the UK Flight Data Processing System, as provided by Shanwick Oceanic Area Control Centre.

#### *Estimation of Vertical Occupancies and Passing Frequencies*

Having obtained the revised traffic patterns for the RVSM environment from the simulation model, the program to calculate vertical occupancies and passing frequencies is run in the normal way and these values are used in the Collision Risk Model.