Minutes of the 23 March 2007 Meeting
of the North American SIMMOD Users Group

1. Welcome

The meeting convened at 9:00am at the Virginia Tech — Northern Virginia Center in Falls Church, Virginia. Dave Holl welcomed everyone to the meeting, and each participant introduced her- or himself.

2. Agenda

The order of the presentations was changed; however, all the agenda items were retained.

3. Minutes of the Previous Meeting

The minutes of the September 2006 NASUG meeting were approved.

4. Challenges in Modeling Advanced Aviation Systems with Standard Modeling Tools

Toni Trani presented an overview of the difficulties encountered when using modeling tools to analyze aviation systems. He presented data showing that the aviation world is stochastic and complex. For example, there is wide variation in the runway exit distributions for landing rolls, exit speeds, threshold inter-arrival times, etc. Capacity is difficult to define or measure. Predicting demand is a challenge — forecasts are 25-30% off five years later.

General observations:

- Challenges exist at all levels
- We make modeling assumptions
- Is it good enough?
- Need to be optimistic and keep trying

Toni then offered two case studies to illustrate these challenges. The first case examined the benefits of using data communications and surface management. He showed the conceptual framework about how to address this analysis. His second case examined an effort to reduce turnaround time as part of the NextGen initiative.

He then addressed the difficulty in modeling human behavior. As an example, he showed that distance is a significant variable in determined passenger demand. There is often a greater change in the number of short-haul trips (less than 1000 miles) because people may prefer to drive.

Matt Lee commented that since 11 September 2001, 30 minutes of screening has been added and that he has observed that traffic demand has reduced for distances up to 500 miles.

5. FAA SIMMOD Status

John Zinna presented the current status of FAA Tech Center's work on their SIMMOD engine. The current version is 2.8 — available for both the Windows and Linux platforms. There have been six requests for the engine since the last NASUG meeting in September 2006.

The changes are as follows:

- Corrected runway exit logic. Infinite loop occurred when a large number of records in the RUNWAY_EXITS_LINKS card were defined.
- Fixed runway exit logic. Allowed exits were being ignored.
- Corrected runway exit logic. Prohibited exits were being selected.
- Corrected airspace logic. Aircraft holding at a node perpetually due to computer precision error.
- Corrected stagger logic. Engine was crashing due to an aircraft that was being erroneously referenced after it had left the system.
- Corrected input logic. The global allow_alnk_depq_inv_blk was not being read correctly.
- Corrected taxi logic. Two aircraft were passing each other on ground links defined with no passing.
- Fixed DSDPath logic. Two aircraft were head-to-head on a DSDPath.
- Corrected taxi planning logic. Arriving aircraft's estimated time of arrival to each ground node was overestimated, causing gridlock on a DSDPath.
- Correction to gate pushback logic. An aircraft was taxiing on a gate's blocked links when aircraft at gate started pushback.
- Added a new output table that lists the success for each iteration of a model run.
- The engine crashed when gridlock was detected. Fixed.
- Warning and error messages have been enhanced.

6. ATAC SIMMOD Status

Eric Boyajian presented the current status of ATAC's SIMMOD-related activities. An update to version 7.2.3 of Simmod *PLUS!*/*PRO!* is planned in May 2007.

Changes to the Network Builder and Animator include:

- The SETSTAGGER table has been added to the database.
- The SIMU26 HB for code groundlink/groundlink holding was not correctly processed in the output reports and Animator. Fixed.
- The DEPARTURE_Q_GROUP: WAIT_DQTHRESH field was not properly written to SIMU07. Fixed.
- The RUNWAY_TAKEOFF_OCCUP entries are now sorted so that entries that aircraft model entries take precedence over entries in the ground group entries to will allow users to specify a hierarchy of occupancy times.

Changes to the ATAC engine since the last NASUG meeting include the following:

- Corrected taxiplanning logic.
    - The estimated times of arrival at each node of a taxiplan were not correct for towing aircraft if the towing speed was different than the taxi speed.

    - If a towed departing aircraft rolled over a taxi checkpoint, the resulting taxiplan would not properly cause the aircraft to be towed to its gate.
- Enhanced towing logic. If the gate of a towed departure was occupied, the departure would wait at the tow node until that (or another feasible) gate became available before performing the towing movement.
- Corrected groundlink/groundlink blocking input logic. A flaw was fixed in the portion of the AFLINKBLOCKING input logic that automatically discards duplicate combinations.
- Enhanced runway exit logic. If no gates are specified in an entry in the RUNWAY_EXITS_LINKS and RUNWAY_EXITS_PROHIBITED_LINKS inputs, the entry will now apply to all gates for that entry.
- Modified gate selection logic. By default, when choosing a gate, a flight will prefer gates that used by a fewer number of airlines. This bias can be disabled by setting the new global variable disable_gate_airline_bias to 1.
- Modified departure logic. Aircraft that were blocked (SIMU26 PD code) from pushing back due to occupied ground links would not necessarily begin to move immediately after the blocking ended.
- Corrected stagger logic. Internal variables associated with the stagger logic were not re-initialized with each iteration or when an aircraft left the simulation. Fixed.
- Corrected arrival re-routing. It was possible for a flight to re-route even though the new route did not pass through the same meter post node. Fixed and trace 70 will provide a warning.
- Corrected SIMU14 output. In some cases, the gate use and delay fields were incorrect for flights that were towed.

7. Airspace Node Holding Strategies

Eric Boyajian presented a review of the Simmod node inputs that affect the way aircraft hold. Specifically, three inputs govern the holding behavior:

- Holding capacity
- Holding strategy
- Separation strategy

These inputs often appear to not behave as expected. The holding capacity of a node is only used as a check to determine if an aircraft my fly towards it. If the capacity is met or exceeded, an upstream aircraft will hold. However, it is possible that the number of aircraft traveling toward a node will exceed its capacity — the node holding capacity does not affect the number of aircraft that are released to fly toward it.

There are four holding strategies:

1. Hold if any aircraft are holding at the next node. (Default)
2. Hold if the next node is filled to capacity.
3. Hold if the number of aircraft approaching the next node plus the number holding fill it to capacity.
4. Hold if the number of aircraft approaching the next node fill it to capacity.

The holding strategy can also be confusing because the analyst must understand that the strategy of the destination node governs whether or not an aircraft can leave its current node. So, in the

four strategy definitions above, the next node refers to the destination node whose strategy is being used. Strategy 1 may not be the best choice and may yield excessive delay in models that have lower levels of traffic or long airspace links. In these cases, strategy 3 may be the better choice.

The separation strategy governs whether or not the in-trail and wake turbulence separations will be applied for aircraft arriving to and departing from a node. The strategy consists of four digits in which the first two digit code defines the "departing from" strategy and the second two digit code defines the "arriving to" strategy. The two digit code allows the analyst to decide if two aircraft should be separated based on whether the aircraft use common links, different links, any links, etc.

A demonstration of the effects of these inputs was made. While demonstrating the use of this, a bug was detected in the engine.

Update: Three places were found in the source code in which the SIMMOD logic was using the "arriving to" strategy when it should have been using the "departing from" strategy.

During this discussion, several members noted that some of the default values in SIMMOD may not reflect the best value — for example, the node holding strategy value of 1 is often not be best option. Belinda Hargrove noted several other default values, such as the route separation, that cause users grief. Eric suggested that a process be devised by which the user community can decide collectively what the best default values should be.

Action: Members to identify default values that they consider to be inappropriate.

8. Capacity Study for 2014 Olympic Winter Games Bid, Sochi, Russia

Johannes Ehmanns presented work performed by himself and Hochtief for the Russian bid to host the 2014 Winter Olympic Games in Sochi, Russia. Sochi was a popular holiday destination for Soviet and Eastern-block citizens prior to the dissolution of the Soviet Union. However, Sochi has seen a significant reduction in demand since Mediterranean destinations are now less expensive for even Russian visitors.

There are currently 4 million passengers per year; however, the terminal can accommodate 30-40 million passengers per year. There are two runways, yet only one is used with a capacity specified as 6 operations per hour. By using the other runway in an independent fashion, 46 operations per hour should be achievable. The Russian government has pledged €15.5 million for enhancements.

Johannes showed a video illustrating the flows of passenger traffic through the terminal with specific detail on how the facility would accommodate the one-time traffic surge resulting from the Winter Olympic Games.

9. Airport Quick-Check

Johannes then described "Airport Quick-Check" which is a process that he developed as part of his consulting business Aviation Consultants Ehmanns. He first developed this approach when he was working as an essentially 1-man planning department for Cologne Airport.

The process uses only documentation and requires the input from one or two members of the airport's senior management. Six areas are examined:

- Business areas of expertise
- Ratio (economic) analysis — comparison with similar airports
- Organizational structure
- Existing structure
- Existing service point capacity
- Market share — types of clients (business or leisure, or both)

Johannes then provides recommendations to the client on how to improve in these various areas.

He noted that airports are always striving for a cost/revenue balance. European airports are hoping to get at least 50 percent of their income from retail.

10. BWI Update

Matt Lee provided an update of work conducted by Landrum & Brown at Baltimore/Washington International Airport (BWI). He showed a layout of the airfield and described some of its unique operational characteristics. BWI has intersecting runways that are operated in either a west flow (runways 28 and 33) or an east flow (runways 10 and 15). BWI has experienced about 2% growth per year, and operations by Southwest Airlines, the dominant carrier, have stayed flat during 2000-2005 period.

The study examined the possible improvement in the capacity by decreasing the arrival spacing over the threshold from 4.0 NM to 3.0 NM. Three scenarios were run in which the spacings were 4.0, 3.5, and 3.0 NM. While the 3.0 NM spacing did result in increased capacity, current delay levels at BWI are particularly high and the resident air traffic managers were comfortable in maintaining the current 4.0 NM arrival spacing.

Matt, assisted by Gregory Bradford of AirportTools, then demonstrated the capability of the VisualSIMMOD Animator to display deflected flight tracks. Matt explained that the SIMMOD model routings defined the optimal flight track and that, with optional VisualSIMMOD inputs, an analyst can define sub-nodes that define a maximum-deflected flight track for the same route. As a post-processing step, VisualSIMMOD then calculates for each flight a deflected track that lies between the optimal and maximum-deflected tracks such that the deflected track absorbs the delay incurred by that flight.

Matt showed that the resulting visual display has an appearance that more closely resembles a radar scope, and that this has proved very useful when discussing the model with BWI air traffic controllers.

12. Other Business

Johannes reminded everyone that the next European SIMMOD Users Group meeting will be in Berlin on 19–20 April.

Toni Trani was elected as the new NASUG chairperson and Eric Boyajian agreed to continue to as Secretary.

13. Date and Location of the Next Meeting

Whereas the Washington, DC, area affords the most convenient meeting location for most of the attendees, Belinda offered to look into the possibility of hosting the next meeting at TransSolutions' offices in Crystal City. Toni offered the Virginia Tech facility in Falls Church as a backup. September 20 or 27 was tentatively selected as the date.

Eric Boyajian
Secretary, North American SIMMOD Users Group

List of Attendance at the 23 March 2007 Meeting of the North American SIMMOD Users Group

Mr. Norm Arnold		
Mr. Kalyan Balasubramaniam	HNTB Corporation	
Mr. Eric Boyajian	ATAC Corporation	Secretary
Mr. Gregory Bradford	AirportTools	
Mr. Johannes Ehmanns	Aviation Consultants Ehmanns	
Mr. Don Guffey	FAA – ATO-P	
Ms. Belinda Hargrove	TransSolutions	
Mr. David Holl	ATAC Corporation	Chairman
Mr. Matt Lee	Landrum & Brown	
Ms. Jennifer Morris	FAA – ATO-P Tech Center	
Ms. Lori Pagnanelli	FAA – Planning and Environment	
Mr. Samir Patel	Landrum & Brown	
Mr. Robert Samis	FAA	
Mr. Fariborz Shahzamani	HNTB Corporation	
Mr. Scott Simcox	ATAC Corporation	
Ms. Lisa Spencer	TransSolutions	
Mr. John Zinna	FAA Tech Center	