

MTF Transit Committee meeting highlights

April 7-8, Tampa

Two pressing issues face transit modelers in Florida. First, the Federal Transit Administration (FTA) has instituted new analysis requirements for “New Starts” transit funding applications. Second, the transition to a new FSUTMS powered by TransCAD requires changes in how transit networks are coded—but the transition also provides the opportunity to “start from a clean sheet” and make significant improvements in Florida’s mode choice and transit assignment models.

On April 7-8, 2004, the Florida Model Task Force Transit Committee held a workshop in Tampa to identify specific transit modeling needs and formulate strategies to address the new federal analysis requirements. Over 50 transportation planners and engineers from throughout Florida participated in the two-day workshop. On hand to present transit modeling requirements was Jim Ryan, the workshop’s headline speaker and one of the key reviewers at FTA involved with approving and rating New Starts transit projects.

Warren Merrell, Manager of the FDOT Systems Planning Office, informed everyone that FDOT Secretary Jose Abreu has been actively pursuing measures to allow for better implementation of transit projects. From an organizational viewpoint, a restructuring has taken place, which allows public transit to be in the same group with planning. This facilitates a more streamlined process for the implementation of transit projects.

A statewide Transit Plan has been developed with the intent to secure State funding for transit projects in order to attract more Federal matching funds. The Secretary is working closely with the congressional delegates and FTA to ensure that Florida is implementing the right technical and administrative procedures to allow for the implementation of transit projects.

New Starts Projects

The New Starts program provides federal grants to fund major capital investments of fixed-guideway transit projects throughout the United States, including extensions to existing transit systems. New Starts is FTA’s largest discretionary funding program, with a budget of between \$1.2 billion to \$1.5 billion. Every year, Congress decides how to spend the money, considering reports FTA writes on the merits of each of the proposed projects.

Demand for New Starts funding increasingly outpaces the availability of funds, resulting in stiffer competition for funding every year. Consequently, FTA has revised the cost effectiveness formula used for rating these transit projects. More importantly, FTA has shifted their focus away from just the travel forecast numbers to the modeling process used to arrive at those numbers. FTA planners now require more detailed analysis, allowing them to examine the mode choice model inputs and verify whether the uncertainties contained in the inputs are within acceptable ranges. The revised application procedures require FTA involvement in transit model development, execution of a program called “Summit,” and submission of a three-page report analyzing the Summit outputs.

Maintaining a Level Playing Field

Transit models produce travel forecasts for proposed transit facilities, and these forecasts determine how favorably the benefits of the projects compare to their costs. To ensure these ridership forecasts are accurate, FTA has begun evaluating the mode choice equations to determine whether the model coefficients and constants are justifiable. With the wide-ranging transit modeling procedures used throughout the country, the new strategy is designed to establish a level playing field for all applicants. This new approach will ensure that ridership forecasts—and the resulting predicted benefits—are not unfairly inflated for some projects compared to others. An analysis of 19 completed New Starts projects revealed that only about half of the projects' actual ridership was within acceptable range of the original travel forecasts. FTA is currently determining whether these discrepancies can be traced to overestimated socio-economic data or to inappropriate mode choice equations.

The new procedures require early communication between all applicants and FTA in the alternatives analysis phase of transit planning. Early federal involvement will allow for changes in modeling procedures without jeopardizing the project schedule.

Summit Program

To aid in transit model evaluation, FTA has developed a computer program called Summit. The program reports user benefits (the changes in travelers' mobility caused by a project) directly from the local mode choice model. The program also produces summary tables and color-themed maps identifying anomalies in travel patterns inherent in the model. FTA requires applicants to submit the Summit output reports, together with a three-page analysis of Summit results focusing on five areas:

- Problems the MPO is trying to address
- Causes of the problem
- Specific ways the proposed transit project would address the problems
- Reason that the project is preferable to lower-cost options
- Other considerations

Evolving Process

The New Starts requirements for more modeling analysis and federal involvement in model development represent a sea change from the way transit projects were prioritized only a few years ago. To continually improve the accuracy of travel forecasts, the Federal Transit Administration is expected to fine-tune the new application process over the next few years. Soon FTA will add two new chapters to their Alternatives Analysis Guidelines. FTA's participation in local model development activities is likely to increase in the future. Nearly all transit modeling research in the U.S. has been conducted by state and local governments in the past. But for the first time in decades, the federal government will sponsor major mode choice modeling research. This \$1.2 million of research will begin to add new insight into the acceptable values and transferability of modeling constants and coefficients.

Other Presentations and Group Discussions

- Steve Polzin, Transit Research Director at the Center of Urban Transportation Research (CUTR) related the experiences and pitfalls often encountered in transit forecasting.
- Ike Ubaka of the FDOT Public Transit Office described his office's ongoing and past research initiatives in transit modeling.
- Jeff Bruggeman of AECOM Consult presented the equations and other technical underpinnings behind quantifying user benefits in the Summit program. The Model Task Force tri-chairs requested that the Systems Planning Office provide training on the Summit program.
- Mr. Ryan noted that Florida would benefit from a comprehensive onboard user survey of Miami's transit system. The survey data could be used to calculate mode choice constants for other proposed fixed guideway systems in Florida.

Group Discussions

The group discussions were organized by topic; mode choice model, transit network, transit path building, transit assignment and transit performance evaluation. The purpose of the discussions was to bring the current transit modeling shortcomings to light and to discuss possible solutions. The solutions/approaches will be prioritized during the May 4th Transit Committee meeting to be held in Daytona Beach.

It was the consensus of the group that at this point Florida will continue using the four-step modeling process. Once the transition to TransCAD has been completed, the MTF might start investigating the possibility of transitioning into another modeling approach such as disaggregate tour-based models.

Mode Choice Model

The first topic of discussion was the mode choice model. The moderator for this topic was Jim Ryan with the Federal Transit Authority. As part of his discussion, the group received a handout, which the moderator referred to as a mode choice check off list. The check off list was organized around,

- the model form itself,
- the travel choices considered by the model,
- the impedance measures used,
- the socio-economic variables considered,
- Izone Jzone adjustments made,
- non-network issues,
- the constants used,
- the type of reporting
- and model development and testing.

Model Form

There are two basic model forms, the multinomial logit and the nested logit structure. The decision to use multinomial versus the nested logit structure should be based on the number of line haul services operating in the area. Once the decision is made to use the

nested logit structure, a determination needs to be made as to how many nests are necessary to obtain an accurate forecast. This decision is in turn directly related on how the transit paths are build.

Theoretically, the path builder chooses the best path. The reason the modes are defined in the mode choice model is to aide the path builder in selecting the core mode. In a dense network where the transit path builder does not sort out the mode correctly, the mode choice model will aide in the selection of the correct competitive modes, e.g. urban rail versus light rail.

However, it is important to realize that there are trade offs when the path builder selects the mode instead of the mode choice model. In Florida, the express bus service is typically a peak hour service to park and ride lots. The un-included attributes include: span of service, no midday service. In this instance, one constant for rail and express bus is not a good representation of the mode.

From FTA perspective, a level player field is needed. Anything that distorts the analysis process needs to be eliminated or compelling supporting evidence needs to be submitted. Simplicity and transparency are of importance to the FTA. Too many nests will complicate the ability to accurately develop the constants for the nests.

On a side note it was pointed out that, when developing the “standard mode choice model” it would be important to develop it in such a way that the introduction of a new mode would not entail having to change the application code.

A discussion took place about the different path building options available, basically to build them sequential versus parallel, and how to combine the paths of different modes. It was decided that research/testing would be necessary in order to develop the best path building set up.

Travel choices considered by the model

Not much discussion took place on this topic. The basic issue with travel choices used by the model would be to include non-motorized travel or to model motorized travel only. The importance of this issue would differ by urbanized area.

Impedance measures

The current impedance measures used in Florida seem to be typical. In Florida each mode has a coefficient that is applied to the impedance. As part as their updated guidelines, the FTA has established a range into which the coefficients need to fall. If the coefficient is outside the range, documentation will be required explaining the development of the coefficient.

Socio-economic variables

In Florida the income variable is represented through automobile availability. These are typically 0 cars, 1 car and 2+ cars (some models stratify by 2 cars and 3+ cars). In the mode choice model the person trips are stratified by the automobile availability market.

On the household side the automobile availability data is obtained from the Census, but no information is available on the employment side. The accuracy of the distribution of the person trips in the zero car households' category is very questionable since it is based on the highway network travel times. In order to correct this problem, the same stratification of car availability that is applied to the household side should be applied to the employment side of the data.

Izone Jzone Adjustments

The most typically adjustment is referred to as the CBD flag. The CBD flag allows for an adjustment to the number of trips attracted to a CBD destination. The adjustment is made to reflect the pedestrian friendly setting and the attractiveness of mixed land uses. It is important to include this adjustment in the model and perhaps there are other areas within the urban area that have sidewalks etc. and should be included.

In some urban models other trip end measures have been implemented. These include such approaches as the scoring of the pedestrian friendliness of the area and applying a scaled factor. Another measure could be the number of local street intersections in the zone. Other measures have been tried and proven useful. More testing/research should occur to implement these adjustments

Non-network

The non-network discussion focused on the coding of the access modes. The coding of the walk access code is very cumbersome, while the automated process is not very accurate. A more accurate automated approach to transit access calculations for walk and auto is needed. However, it is important that manual adjustments are made to the automated process.

Constants

One of the biggest problems FTA has with the Florida models is the development of the constants in their models. The constant should be the reflection of those characteristics of the mode that cannot be expressed through time or money. The calibration of constants should not result into a correction factor for inaccuracy caused by other elements within the model. It was pointed out that there is a need to develop instructions on how to calibrate mode constants.

The development for the constant of a new mode was discussed. If the mode already exists in the area, then you can conduct a survey to obtain the ridership numbers and develop the constants based on the data. You will need to have a good trip table in order to be able to develop a good constant.

If the mode does not exist yet, you can analyze an existing system, calculate the benefit of the mode and apply that to your model. FTA will then request that you make the forecast with and without the special effect of the new mode and analyze the difference.

Reporting

Two types of reports are needed to conduct two different types of analyses. One set of output reports should provide the user insight into the logic/reasonability of the numbers. Another set of report should provide the user with the ridership numbers, etc. to analyze the particular alternative.

Both sets of reports should be used to provide quality control of the analysis.

Model Development and Testing

Under this topic time-of-day modeling was discussed. The key issue with regard to the time-of-day model is to decide where in the model stream it should be initiated. There is a strong movement to move it up in the model stream resulting in a time-of-day trip distribution and mode choice model.

In conclusion, Jim Ryan summarized the three top issues in Florida. He stated that it is imperative that constants in the mode choice models for “New Starts” projects are reasonable. The FTA can only analyze “New Starts” projects, which are developed using a fixed trip table. It is also important to develop good reporting routines that will allow for the analysis and quality control necessary to compare the results among the alternatives and to other similar studies.

Transit Network

The second topic of discussion was the transit network. The moderator for this topic was Ken Kaltenbach with the The Corradino Group. Ken outlined the typical structure of the route card file and pointed out some of the changes that will occur due to the fact that the State is transitioning from Tranplan to TransCAD. Several important issues tied to the change in software are:

The selection of the line database used for the network

At the previous MTF Working Group meeting the discussion was made to use the Caliper Statewide network as the line database for network coding.

Transit travel speed

The discussion focused on the pros and cons of using speed curves based on the highway network or using route times. The use of the actual route times will result in an accurate base year simulation, however it will not take into account any future year highway congestion. In order to preserve the link between highway travel time and transit travel time and ensure more accurate transit time would require more accurate highway times. In order to accurately reflect the highway travel times in the base year, other variables than speed should be used for the validation/calibration of the highway side of the model.

More network details in order to automate transit access

Currently the highway networks are not detailed enough to be used for the walk access network. If an automated process for walk access were to be developed, it would be imperative to increase the level of detail in the network. The possibility of developing an additional line layer for a walk network was brought up.

The coding of stops is an important issue

As more detail is added to the network, it becomes very important that the actual bus stops are coded on the network and not some network approximation.

Good network editing tools

A major issue is the relationship between the highway and transit network layers. The importance of an automated updating process of the transit network when changes are made to the highway network was pointed out.

Transit Path Building

The third topic of discussion was the transit path building. The moderator for this topic was Tom Rossi with the Cambridge Systematic, Inc. Tom discussed the different path building options available in TransCAD 4.7. and highlighted some important issue surrounding the path building model.

Consistency with the mode choice model

As was pointed it out during the discussing of the mode choice model, it is imperative that the mode choice model and the path building routine are consistent with each other. Not only concerning the number modes in the nesting structure versus the number of paths build in the path builder, but also as far as the variables used and the weights applied in the path building routine in relationship with the mode choice utilities.

Non-transit links

The non-transit links, such as the walk and auto access should have their own path building routine. A more detailed highway network is needed for auto access.

Other considerations

The use of weights on links used by certain modes was discussed to ensure the path builder is building the “correct” path. Currently, a weight is applied to the preferred mode in the path builder routine.

The need to eliminate limits in the path building routine was pointed out. Most of these build in limit cause inaccuracies when alternatives are compared to each other.

The use of non-linear functions or piecewise linear functions (as is used in the 1st wait versus 2nd wait time) was discussed.

Transit Assignment

The fourth topic of discussion was the transit assignment. The moderator for this topic was David Schmitt with the AECOM Consulting. David pointed out that the transit assignment process itself was the product of the previous steps. Several important items were pointed out.

Production-Attraction versus Origin-Destination Format

Transit person trips are reported in production-attraction (pa) format. The assumption is made that the reverse of the AM peak trip is made in the PM peak. In Florida typically the AM peak and the midday period is modeled. Changing to an OD format would

require changes to be made in the path building routine. No real benefits were perceived by making this change.

Work trips versus Non-work trips

Currently, the Florida models are set up to assign the work trips to the AM peak while the non-work trips are assigned to the midday period. This structure was originally used in an effort to overcome limited computer resources. This no longer being the case, a different assignment process should be developed that more accurately stratifies the trip purposes across the transit service periods provided.

Reporting

Simple and standard reporting procedures should be developed to allow the user easy access to the boardings by station, link loadings, ridership number by line, by direction, etc.

Transit Performance Evaluation

The fifth and last topic of discussion was the transit performance evaluation. The moderator for this topic was Frank Baron with the Miami-Dade MPO. The discussion focused on the ability to accurately forecast the transit system and the tools necessary to reach this goal.

Reporting

Transit performance evaluation reports should be informative on the performance of the model as well as on the performance of the particular alternative. To obtain information on the performance of the model, there should be reports indicating whether the transit validation falls within acceptable ranges as it relates to the performance of the transit system. This would require the availability of transit data. A good reporting system needs to be developed when setting up transit modeling standards for FSUTMS-TransCAD.

Data

The discussion focused on the lack of data and the difficulties associated with obtaining good data. The development of a good on-board survey is difficult. The greatest difficulty is geo-coding the correct origin and destination of the transit trips. Guidelines should be developed on how to set up a good on-board survey.

A good test of the model would be to obtain on-board survey data, geo-code it, build the trip tables, assign trips to the transit paths, and analyze if actual travel patterns are being replicated.

As a final note, Jim Ryan from the FTA remarked that perhaps the FTA should implement the requirement: that a transit project is not allowed to move into P.E. without a on-board transit survey that has been conducted within the last five years.

Transition Strategy/Action

Transit Committee Chair Kevin Feldt stated that the discussions of the meeting will be summarized and forwarded to attendees, along with the power point slide presentations. Kevin announced that the next Transit Committee meeting will be held in the morning of May 4, prior to the Model Task Force meeting in Daytona Beach. The May 4th meeting will focus on the development of strategies for migrating the Florida's transit models to FSUTMS-TransCAD, in light of all the issues discussed at the April 7-8 meeting.