

Florida's New Horizons in Transportation Modeling

FDOT Systems Planning Office

Background

The Florida Model Task Force is spearheading a major effort to move the state-of-the-practice of transportation modeling in Florida into the 21st century through an evaluation of modeling methods and software available in the market today. This effort is motivated by emerging planning needs facing the state and new technologies and tools that are now available to the modeling community.

The Model Task Force initiated the effort in April 2002 by convening a meeting of a specially constituted blue-ribbon panel. The panel, consisting of seven distinguished national leaders in transportation modeling, was asked to provide advice and guidance on emerging planning needs, modeling methods, and the approach that should be followed to undertake a model evaluation process. The April 2002 panel deliberations may be found in the Blue-Ribbon Panel Report available at <http://www11.myflorida.com/planning/systems/stm/mtf/02docs/BluRibPn.pdf>.

Following the blue-ribbon panel meeting, the Model Task Force met to discuss the panel's report. The task force recommended that a model evaluation study be undertaken to identify new and improved modeling programs that should be included in the FSUTMS process. In response to the task force recommendation, the FDOT Systems Planning Office initiated a research study in August 2002 with the University of South Florida Department of Civil and Environmental Engineering to conduct an evaluation of alternative modeling packages available in the market and identify those that merit consideration for inclusion in FSUTMS.

The Model Task Force then established a study steering committee to provide guidance and oversight for the study. The study steering committee was divided into three "teams" to help facilitate coordination and task assignments: the consultant team, the FDOT district team, and the MPO team.



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Steering Committee Members	District Team	MPO Team	Consultant Team
Danny Lamb, FDOT District 7	X		
Dennis Hooker, Metroplan Orlando		X	
Shi-Chiang Li, FDOT District 4	X		
Frank Baron, Miami-Dade MPO, Freight Subcommittee		X	
Mike Neidhart, Volusia MPO, Trip Distribution Subcommittee		X	
Imran Ghani, FDOT District 2, Trip Generation Subcommittee	X		
Gary Kramer, West Florida RPC, Transportation Land Use Subcommittee		X	
Kevin Feldt, Jacksonville Transit Authority, Transit Subcommittee		X	
Scot Leftwich, FDOT District 5 (Consultant)	X		
Suraya Teeple, FDOT District 2	X		
Bill Olsen, FDOT Turnpike District	X		
Paul Larsen, Palm Beach County MPO		X	
Bud Whitehead, Hillsborough County MPO		X	
Ossama Al-Aschkar, Broward County MPO		X	
Ken Kaltenbach, The Corradino Group			X
Dan Macmurphy, URS Corporation			X
Mike Doherty, URS Corporation			X
Tom Rossi, Cambridge Systematics			X
Wade White, Gannett Fleming			X
Rob Schiffer, Cambridge Systematics			X
William Roll, Tindale-Oliver			X
Arturo Perez, Leftwich Consulting Engineers			X
Dane Ismart, Louis Berger Group			X

The steering committee held its first meeting in Orlando on August 27, 2002. At this kickoff meeting, the steering committee defined the study approach, outlined the roles and responsibilities of steering committee members, and specified how vendor participation would take place in the model evaluation process.

Vendor Workshops

To ensure the study would benefit from the latest developments in transportation modeling, an invitation to transportation modeling vendors was published in the October issue of the Urban Transportation Monitor. The invitation asked vendors interested in participating in the Florida Model Task Force model evaluation study to submit product literature, demonstration CDs, and other materials describing their products to the task force for possible inclusion in the study. In response to the invitation, two entries were received. The first was the INDEX-4D software from Criterion Engineers and

Planners and the second was B-node, a procedure often used in the Northern Virginia District of Virginia DOT. Upon a careful review of these products, the steering committee felt that both of these are special-purpose tools addressed to specific applications outside the scope of the current study that is focused on comprehensive transportation modeling packages. However, the steering committee asked that such special-purpose tools be considered for possible inclusion in the FSUTMS toolbox, perhaps as part of a subsequent research study.

The steering committee expressed a desire to use a Florida transportation model for studying, demonstrating, and evaluating the alternative software packages. The steering committee agreed to use the 1999 Broward County Planning Model as the common test against which the performance of the software packages would be evaluated and compared.

Florida's New Horizons in Transportation Modeling *Continued*

committee members also had access to all of the product literature provided by each vendor. Several committee members were able to offer additional information about the capabilities of the software packages based on first-hand experience gained from using the software in real project environments.

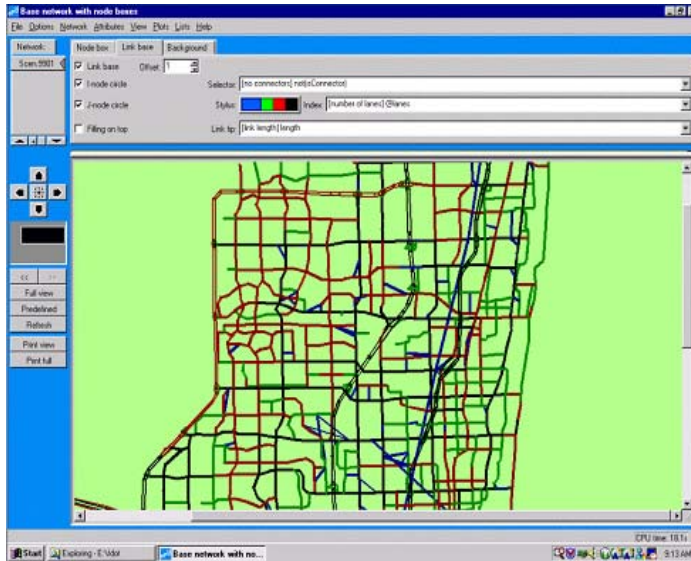


Figure 3. ENIF (EMME/2) Screen Capture

Following the open discussion, steering committee members worked together to define the approach for additional software evaluation that would be undertaken in the study. To focus the work efforts of the consultant team, the steering committee voted to prioritize the four software products based on a vote of steering committee members. Each member was asked to rank-order the four software packages. All of the rankings were then summarized to prioritize the software for the first round of detailed evaluation that would be undertaken as part of the study. The rankings indicated the following prioritization:

- TransCAD
- CUBE/TP+/Voyager
- VISUM
- EMME/2

Following the tally of votes, the steering committee voted to proceed with additional detailed evaluation of two modeling programs: TransCAD and CUBE/Voyager. They instructed the consultant team to develop the evaluation methodology and scope. The consultant team offered to implement the 2025 Broward County

model in each of the two packages to evaluate the software on their varied strengths and capabilities. The steering committee endorsed the approach and asked that the vendors be notified of their participation in the detailed evaluation stage of the study. The steering committee noted that VISUM and EMME/2 should be retained in the list at this time as additional evaluation may be undertaken on those packages at a later time.

In addition, the steering committee recommended that a survey be administered to several MPOs and State DOTs to assess their experiences with the modeling software packages under study. The consultant team agreed to design and administer a telephone survey to obtain information that might help the steering committee in its deliberations about the relative merits and strengths of the alternative software packages.

Additional Evaluation and Agency Survey

Caliper Corporation and Citilabs were informed that additional evaluation of their respective software packages was being initiated and that they should provide any additional information, products, databases, procedures, etc. by January 17, 2003. ITC, Inc. and INRO Consultants were informed that the steering committee is proceeding with the detailed evaluation of modeling software packages and that they will be notified if and when additional information about their respective software packages is needed.

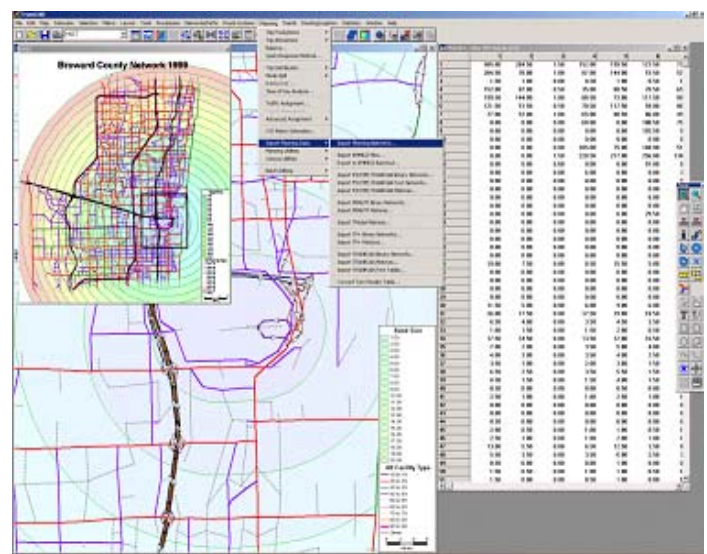


Figure 4. TransCAD Screen Capture

New Horizons in Transportation Modeling in Florida *Continued*

At this time, the consultant team is focusing on the implementation of the 2025 Broward County Planning Model in TransCAD 4.5 and CUBE/Voyager. The consultant team is making excellent progress in this evaluation effort. Meanwhile, a telephone survey instrument is being administered to about a dozen agencies across the country to learn more about their experiences with the modeling software packages.

The project steering committee is scheduled to meet next in Orlando on February 19-20, 2003, to discuss the results of the consultant team evaluation of TransCAD 4.5 and CUBE/Voyager and the agency telephone survey. At this meeting, the consultant team will present the findings of their evaluation effort and steering committee members will have an opportunity to learn more about the capabilities and features of each software package. The discussions at the February meeting will help shape the nature of additional software evaluations that may be undertaken as part of this study

and aid in the development of recommendations that will be taken forward to the full Model Task Force for its consideration.

The Final Stretch

The full Model Task Force will be meeting on March 26-27, 2003 in Orlando to discuss any recommendations brought forward by the model evaluation study steering committee. Depending on the need to perform any additional evaluation of one or more software packages and the deliberations of the Model Task Force, it is envisioned that a new era in transportation modeling in Florida may be ushered in during late spring or early summer of this year. As the FSUTMS toolbox is revolutionized into a 21st century marvel of technology, the project steering committee and the Model Task Force will work hard to ensure that the transition is smooth and seamless, the support and training are plentiful, and the modeling tools meet the planning needs of Florida well into the future.

FSUTMS Users' Group News

The next meeting for the **Northeast Florida Transportation Applications Forum** is set for Wednesday **May 14, 2003**. The Applications Forum meets at the FDOT-District 2 Jacksonville Urban Office-Training Facility. The meeting starts at 2:00 PM and runs until approximately 4:00 PM. For additional information, please contact *Imran Ghani (904)360-5682*

The **Tampa Bay Applications Group** will hold their next meeting on March 6, 2003. The meeting will focus on Multi-modal Planning and Corridor Studies. This brown bag lunch meeting will be held from 12:00 PM to 2:00 PM at the FDOT-District 7 office. For more information, please contact *Danny Lamb (813) 975-6437*.

The **Southeast Florida Users' Group** has scheduled their next meeting on May 1, 2003. Jim Fennessy will make a presentation on new modeling practices, which will include a Q & A session for TRANPLAN. The meeting will be held at 1:30 PM at the FDOT-District 4 "New Auditorium." For additional information, please contact *Shi-Chiang Li (954) 777-4655*



The **Southwest Florida Users' Group** next meeting has been tentatively scheduled for February 27, 2003. The progress made by the MTF steering committee on the software evaluation process will be the focus of the meeting. All Users' group meetings are held at the Charlotte County Airport (2800 A-6 Airport Rd., Punta Gorda, FL). For additional information about the group, please contact *Jim Baxter (863) 519-2562*

The **Central Florida Users' Group** will hold their next meeting in April. The exact date and time will be announced. The meetings are held at FDOT District 5 Urban Office. For additional information about the group, please contact *Dawn Bisplinghoff (407) 482-7879*

Comparison of HBW Trips from Lifestyle Models by Permanent Households in Three Urban Areas

By Fang Zhao, PhD, P.E., and Imran Ghani, P.E., AICP

Lifestyle models have been used to estimate trip generation rates based on lifestyle variables such as presence or number of workers/retirees and presence of children in a household instead of the traditional variables such as household size and dwelling unit type. In Florida, a number of MPOs have adopted lifestyle models, with more MPOs interested in using them. The lifestyle models implemented in Florida include the Southeast Florida Regional Model and the Tampa Bay Regional Model. The Southeast Florida model uses two separate sets of variables. For home-based work (HBW) trips, the variables are number of workers, presence of children in households, and household vehicle ownership. For home-based non-work trips (HBNW), household size, presence of children, and vehicle ownership are used. In the Tampa Bay lifestyle model, trip rates are defined for three major household categories: households without children, households with children, and households with retirees. Retired households are defined as those that include at least one retired household member and no full-time workers in the household. Working households are those other than retired households.

There have been questions regarding which MPOs may benefit from a lifestyle model, which lifestyle model should be adopted by a given MPO, and whether it is possible to develop standard sets of trip rates for lifestyle models that can be applied in urban areas that are not able to develop their own trip rates due to lack of data. These questions are being answered through an on-going FDOT sponsored project at Florida International University.

To evaluate lifestyle model performance, household survey data from Lee County, Volusia County, and Jacksonville Metropolitan Statistic Area (MSA), which comprises of Clay, St. Johns, Nassau, and Duval counties, were used to develop HBW trip rates for both lifestyle models and FSUTMS standard models. Because Jacksonville survey data provide adequate samples for most cells in the household classification structure, the data were used to evaluate three trip rate calibration methods: Multiple Classification Analysis (MCA), adjusted MCA, and cell-by-cell averaging. After trying all three methods, it was determined that the MCA method gave the best results for all three model structures (including FSUTMS model structure). Subsequently, MCA method was used to calibrate and evaluate the models.

Procedures for Calibration of Trip Rates and Evaluation of Models

The procedure of applying and evaluating lifestyle models to the three MSA/MPOs involved two main steps: (1)

calibration of HBW trip generation rates using the two lifestyle model structures and the standard FSUTMS model structure based on the survey data; (2) calculation of total HBW trips based on the calibrated HBW trip rates and the number of households in each of the classification cell; (3) evaluation of lifestyle models' performance by comparing the HBW trip productions estimated from the lifestyle models to those expanded from the survey data and to the estimates from the FSUTMS standard model. The household data used in the Step (2) and (3) were from a 1990 census special product, STP 266, that provided the number of different types of households as classified in the Southeast Florida and Tampa Bay lifestyle models and the FSUTMS standard models.

Comparison of Model Performance

To evaluate the lifestyle model performance, the differences in the total HBW trip productions produced from the lifestyle and standard FSUTMS models and estimated from expanded survey data are compared at both the regional level and at survey district level (Lee County did not have survey districts and zip code areas were used as substitutes). Jacksonville MSA, Lee County, and Volusia had eight, five, and six districts, respectively. The results indicated that for all three Florida urban regions, applying lifestyle models would improve the accuracy of trip production estimation to various degrees. The level of improvement was dependent on the demographics of the area and the lifestyle model structure.

For Jacksonville MSA, the Southeast Florida lifestyle model outperformed the standard FSUTMS model as well as the Tampa Bay lifestyle model.

For Lee and Volusia County, the Tampa Bay lifestyle model performed better than the Southeast Florida lifestyle model as well as the standard FSUTMS model.

This is not surprising since the Jacksonville MSA shares similarities in demographics with Southeast Florida while Lee and Volusia County demographics are similar to Tampa Bay area. According to the 2000 census, the counties in Jacksonville MSA and Broward County (for which the Southeast Florida model was originally developed) shared some similar demographic characteristics such as having below average percentage of population of 65 years or older and a close to or below the state average percentage of seasonal households. At the same time, the percentages of labor population (ages 16 – 64) were all above the state average. On the other hand, the Tampa Bay area (with the exception of Hillsborough County), Lee County, and Volusia County had similar percentages of senior and labor populations, both being above the state averages.

Comparison of HBW Trips from Lifestyle Models by Permanent Households in Three Urban Areas *Continued*

Table 1 gives the total HBW trips expanded from survey, those estimated from the lifestyle models with the best performance, and those from the standard FSUTMS models. The differences between the model predictions and estimates from expanded surveys are also provided at the regional level as well as for the district with the largest share of trips.

Table 1. Improvements Brought by Lifestyle Models at Regional and Subarea Levels

Urban Area	Lifestyle Model	Area	Expanded Trips	Lifestyle		FSUTMS		Improvement	
				Diff	%Diff	Diff	%Diff	Diff	%Diff
Jacksonville	SFL	Regional	571,841	21,138	3.70%	30,465	5.33%	9,327	1.63%
		District 3	394,193	-11,344	-2.88%	-21,520	-5.46	10,176	2.58%
Lee County	TAMPA	Regional	148,279	8,803	5.93%	10,025	6.76%	1,222	0.82%
		District 2	43,705	86	0.20%	-4,295	-9.83	4,209	9.63%
Volusia County	TAMPA	Regional	149,309	4,811	3.22%	13,253	8.88%	8,442	5.65%
		District 1	70,636	1,272	1.80%	8,511	12.05%	7,239	10.25%

It is interesting to observe that the lifestyle model seemed to result in a small improvement for the Jacksonville MSA at both regional and district levels. For Lee County, while improvement at the regional level was small (0.82%), it was significant for certain districts (9.63%). For Volusia County, improvements at both regional and district levels were significant.

Spatial Transferability of Trip Rates

For reasons such as lack of resources to collect lifestyle data or conduct household survey, some MPOs may not be able to calibrate their own trip rates. They may still be able to benefit from lifestyle models if they can borrow trip rates from “similar” areas. For this purpose, the spatial transferability of the lifestyle models was tested by comparing the trip rates of Lee County, Volusia County, and Jacksonville MSA. The trip rate in each cell between two regions was tested using the Wilcoxon Rank-Sum test, also known as the Mann-Whitney test. The results showed that at a significance level of 0.05, the trip rates of Lee County and Volusia County were close while they differ from Jacksonville’s in most of the cells as shown in Table 2 (only cells with greater than a 10 percent difference were tested). Although the results cannot be used to claim spatial transferability of the lifestyle models, they indicated replicability between counties with similar demographics. Therefore, urban areas without lifestyle models may consider adopting HBW trip rates from a calibrated lifestyle model provided they share similar demographics on seasonal households and retired population. For example, Lee County can adopt HBW trip rates from Volusia but not from Jacksonville.

Table 2. Comparison of Trip Rates between the Three Urban Regions Number of cells with trip rates different (significance level = 0.05)

Model	Number of cells with trip rates different (significance level = 0.05)		
	Lee vs. Volusia	Lee vs. Jacksonville	Volusia vs. Jacksonville
Southeast Florida Model Structure (16 cells)	0 out of 15 cells	2 out of 15 cells	5 out of 14 cells
Tampa Bay Model Structure (12 cells)	0 out of 11 cells	2 out of 12 cells	4 out of 12 cells

Conclusions

The research results indicated that lifestyle models performed better than FSUTMS models for HBW trips, although the degree of improvement varied. While improvements from lifestyle models at the regional level may be only a few percentages of the total trip productions, lifestyle models may bring significant improvements to some of the subareas due to uneven distribution of retired or seasonal households. MPOs may also adopt a lifestyle model or borrow HBW trip rates from an urban area that share similar demographic characteristics. For detailed information on the project, please contact Dr. Fang Zhao at zhaof@fiu.edu.

The project is continuing to compare lifestyle models’ performance for other trip purposes and determine if seasonal households have different trip productions compared to other types of households, particular retired households. A final report is expected at the end of March.

Workshops and MTF Meeting Schedule

Land Use Modeling Workshop

Hotel: Homewood Suites
 Dates: February 24-26, 2003
 Rate: \$89.00 Single/Double
 Address: 8745 International Drive Orlando
 Phone: 407.248.2232
 Starting: Monday 1:00 PM
 Ending: Wednesday 11:30 AM
 Reservation Deadline: February 3, 2003

GIS-TM Modeling Workshop

Hotel: Embassy Suites
 Dates: May 12-15, 2003
 Rate: \$95.00 Single/Double
 Address: 8250 Jamaican Court Orlando
 Phone: 407.345.8250
 Starting: Monday 1:00 PM
 Ending: Thursday, 11:30 AM
 Reservation Deadline: April 28, 2003

DRI Analysis and Modeling Workshop

Hotel: Homewood Suites
 Dates: April 22-24, 2003
 Rate: \$89.00 Single/Double
 Address: 5500 Blue Lagoon Drive Miami
 Phone: 305.261.3335
 Starting: Tuesday 8:30 AM
 Ending: Thursday, 4:30 PM
 Reservation Deadline: April 8, 2003

FSUTMS Basic Workshop

Hotel: Homewood Suites
 Dates: June 2-6, 2003
 Rate: \$89.00 Single/Double
 Address: 8745 International Drive Orlando
 Phone: 407.248.2232
 Starting: Monday 1:00 PM
 Ending: Friday, 11:30 AM
 Reservation Deadline: May 19, 2003

Registration can be completed on-line at: www11.myflorida.com/planning click on "Training" and "Modeling Workshops." **Be sure to notify us if you are a P.E. needing professional development hour credits.**

Florida Model Task Force Meeting

March 26-27, 2003

From Wednesday 8:30 AM until Thursday, 4:30 PM

Embassy Suites Hotel

8978 International Drive Orlando

Phone: 407.352.1400

\$89.00 Single/Double

Reservation Deadline is March 5, 2003

Florida Transportation Modeling is published under contract to the FDOT Systems Planning Office in Tallahassee. All information and materials contained in the newsletter are contributed by FSUTMS users and Model Task Force members. Please contact the editors to submit articles for future issues or to get on the mailing list.

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