CAMBRIDGE SYSTEMATICS

Think Forward

FY 2017 Short Term Model Improvements Task Order

Status Update

presented to

Travel Forecasting Subcommittee

presented by

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Task Order 17.2 Short-Term Model Improvements

- Non-Motorized Model Enhancements
- Mode Choice Model Enhancements
- Managed Lane Modeling

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Work Plan

- Key Dates
  - January and February – Data processing and integration
  - March – Model estimation
  - March/April – Model implementation in Cube
  - April to mid-May – Model calibration and validation

Key Recent/Current Activities

- Integrated survey data and socioeconomic data
- Initiated non-motorized model enhancements
- Updated transit skimming/assignment procedures
- Established VOT segmentation procedures
- Revised volume delay functions
- Updated highway skimming/assignment
- Model estimation underway

Non-Motorized Model Enhancements

- Approach: Enhance existing binary modal split applied in trip generation step using a disaggregate model estimation, with the objective of making the model
  - More responsive to planning variables
  - Seamlessly integrated with the existing framework
- Data:
  - HTS data (2007-08 plus the 2011, 2012 Geo-Focused Surveys)
  - Socioeconomic and built environment variables at block and TAZ level

Non-Motorized Model Enhancements

- Variables for testing:
  - Trip-maker socioeconomic characteristics
  - Built environment variables (floating land use density, land use diversity (entropy and Simpson's diversity index, urban design such as intersection density by types)
  - Accessibility (access to transit stops/station)

Transit Path-Building and Assignment

- Comparison of Estimated Boardings of Existing and New Transit Skimming Processes
- Both processes use identical trip table inputs.
- Unlinked trips

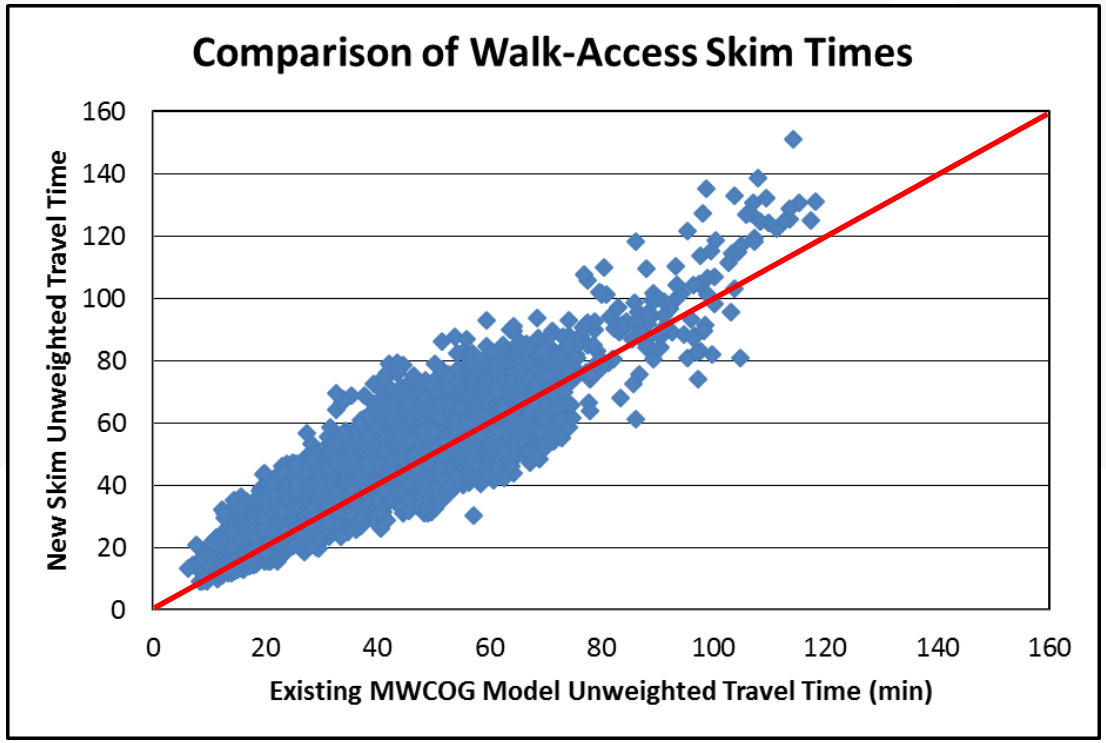
Main Transit Mode	Trips – Existing Procedure	Trips – New Procedure	Difference	% Difference
Local Bus	603,227	582,553	-20,674	-3.4%
Express Bus	83,562	88,680	5,118	6.1%
Metrorail	997,821	1,019,597	21,776	2.2%
Commuter Rail	29,535	36,942	7,407	25.1%
Total	1,714,145	1,727,772	13,627	0.8%

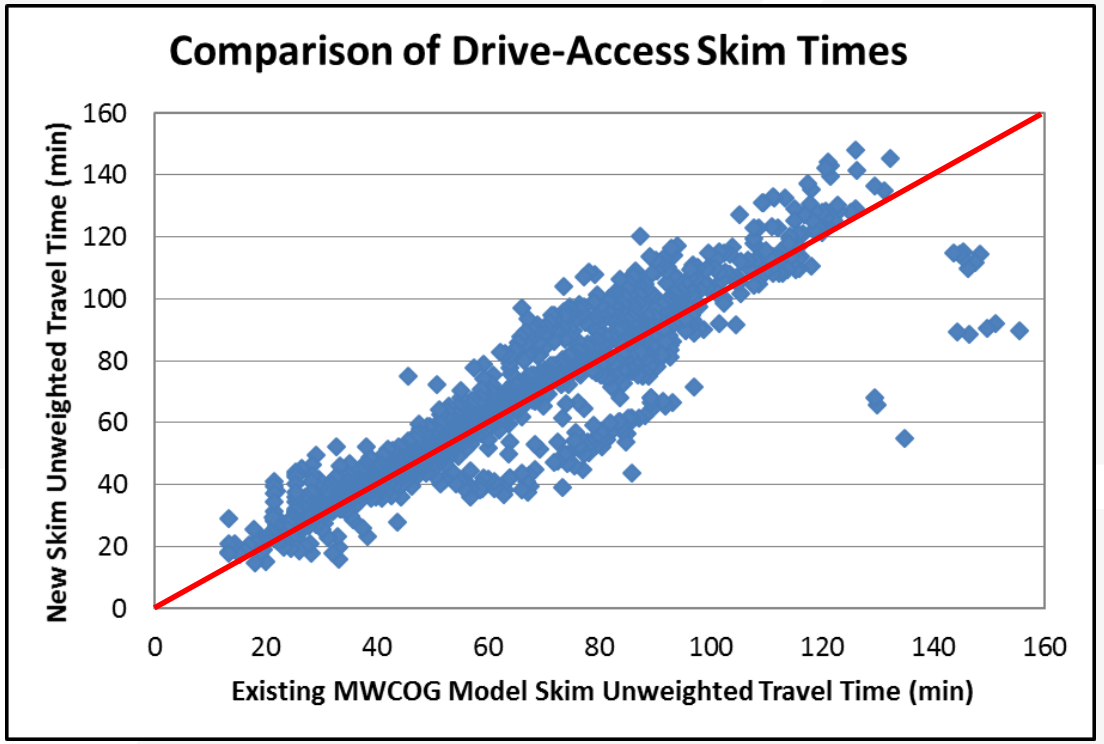
Transit Path-Building and Assignment

- O-D Pairs with Transit Path Connections: New PT Skim Process versus Existing TRNBUILD (TB) Skim Process

O-D pairs w/ transit…	AM Peak Walk-Access	AM Peak Drive-Access	Off Peak Walk-Access	Off Peak Drive-Access
… in both PT and TB skims	5,320,581	5,958,728	4,562,615	5,470,656
… in PT Skims Only	604,270	2,194,134	1,004,204	2,849,698
… in TB Skims Only	743,170	336,467	626,527	419,873
… in neither	7,185,263	5,363,955	7,659,938	5,113,057
Share of O-D pairs w/ matching transit or no-transit	90%	82%	88%	76%

Transit Path-Building and Assignment





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Value of Time Segmentation

- One recommendation was to implement value of time (VOT) segmentation in the model
- Primarily added to support managed lane enhancements
- The VOT segments and average VOTs are used by the model in two ways:
  - Average VOTs for each VOT segment are used in highway skimming procedures
  - VOT segment composition informs how trips by income category get assigned to each VOT segment (low income households tend to fall into lower VOT segment)

Value of Time Segmentation

- Traveler VOT cannot be observed directly, and must be inferred
- We developed a methodology to derive the composition of VOT segments and average VOTs for each segment from several data sources

Value of Time Segmentation

- Derive assertions for mean VOT for HBW and non-HBW trips:
  - BLS wage statistics
  - Literature relating average wages and VOTs
- Derive estimates of the mean incomes for each income category:
  - Detail income data from Census and ACS
  - This is particularly important for highest (unbounded) income category

Value of Time Segmentation

- Develop average wage rate and VOT estimates for each income category
  - » Based on the analysis above
- Borrow continuous VOT distributions developed for the BMC ABM
  - » These are not used directly, but inform the distributions assumed here

Value of Time Segmentation

- Derive VOT distributions for each income category
- Develop VOT segmentation
  - Requires analyst to assert breakpoints in the VOT distributions
    - Values of $4/hr and $15/hr served as breakpoints
  - Avg. VOTs by segment of $2.70, $8.29, and $27.36

Value of Time Segmentation

- For each income category and trip purpose, shares to assign trips to VOT segments were derived, e.g., for HBW trips:

VOT Segment	Lower Bound of VOT	Share – All Incomes	Share - $0-50K	Share - $50-100K	Share - $100-150K	Share - $150K or more
VOT1	$0.00	12.0%	34.2%	14.3%	7.8%	1.2%
VOT2	$4.00	52.6%	57.0%	61.3%	55.7%	30.2%
VOT3	$15.00	35.4%	8.8%	24.4%	36.5%	68.6%
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Mode Choice Model Estimation

- Model estimation is underway
- Dataset is a merged dataset of…
  - HTS data (2007-08 plus the 2011, 2012 Geo-Focused Surveys)
  - Transit On-Board survey data (for bus, Metrorail, and MARC)
    - VRE data was not directly usable for model estimation
- VOT segmentation is implemented and those assumptions are being tested with the survey data in context of mode choice

Mode Choice Model Estimation

- A number of key variables are being looked at
  - IVT discounts for Metrorail and commuter rail
  - Boarding penalties by transit mode
  - Density/diversity measures and transit accessibility measures at production and attraction trip ends

Next Steps

- Model estimation
- Model implementation
- Model calibration and validation