

Model Task Force

Modeling Mixed-Flow Transit Travel Times in FSUTMS Voyager

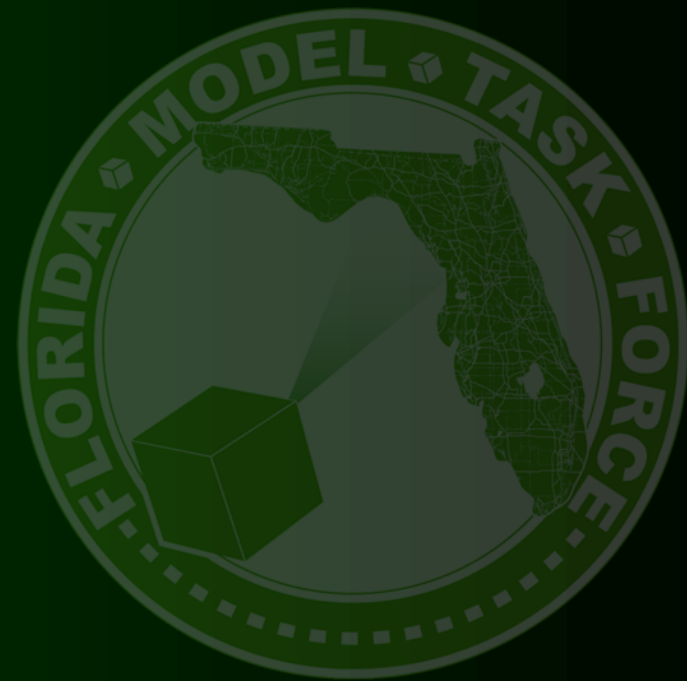
presented to

MTF Transit Committee

presented by

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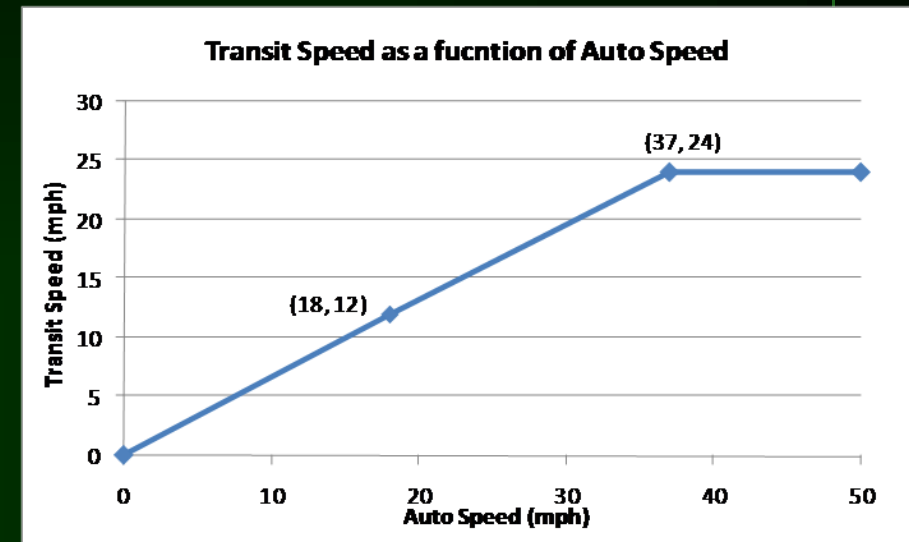


Transit Travel Time

- **Why is transit travel time important?**
 - Used to calculate the transit impedances in mode choice
 - In Small/New Starts evaluation, almost all of the user benefits come from transit travel time savings
- **Mixed-flow transit travel time is a function of:**
 - Auto travel time
 - Acceleration/deceleration of the transit vehicle
 - Number of stops/stations
 - On/off activities at stop/station
 - Other elements

Review of the Existing Practice

- Used by most FSUTMS models
- Transit speeds are a piecewise linear function of the auto speeds based on:
 - Facility type
 - Area type
 - Transit mode
- Different “curves” used for various combinations of FT, AT and mode



Shortcomings

- **Extremely challenging and time consuming to calibrate route travel times; near-omniscience required**
 - **Assessment of each route's travel time estimation**
 - **Knowledge of facility/area type combinations commonly used by each route**
 - **Detailed understanding of curves as currently defined**
 - **General sense of curve adjustment impacts**
- **Extremely challenging to collect observed data**
- **Recent transit speed/delay survey indicated that the transit speed is a linear function of auto speed ***
- **The curves are insensitive to transit demand**



A New Approach

- $\text{Time}_{\text{transit}} = \text{Time}_{\text{auto}} + \text{Factor}_{\text{group}} * \text{NumStops}$
- $\text{Factor}_{\text{group}}$ reflects all types of dwell and delay time incurred by transit vehicle
 - Can vary by mode, agency, geography, etc.
 - Calibrated separately for peak and off-peak periods
 - Incorporated in PT line file using “DWELL_C” sub-keyword
- Individual routes can be precisely calibrated using the TIMEFAC sub-keyword
- This approach has been implemented CFRPMv5, and a similar approach is being implemented in WCFRTM



DWELL_C

- **NODES** sub-keyword, so it is placed inside the node strings for each route
- **Use:** “`DWELL_C = 0.50`”
- For each stop, PT adds the user-specified time (in minutes) to the total travel time of the route
- `DWELL_C` does not vary by time period (unlike `HEADWAY`), so procedures are needed to avoid coding multiple transit line files

CFRPMv5 Implementation

- Create a DBF file with group code, peak and off-peak DWELL_C values
- Assign a group code to each route using USERN5
- Scripted procedures remove USERN5 keyword and insert period-specific DWELL_C value in node string (runs 2x)

Input Transit Line File

```
LINE NAME="LY3 LK MT IB", MODE=21, OPERATOR=1, USERN5=2, ONEWAY=T,  
HEADWAY[1]=60, HEADWAY[3]=0, HEADWAY[2]=60,  
LONGNAME="LYNX-3 LAKE MARGARET INBOUND", N=16582, 16657, 16729,  
16706, 16650, 16625, 16598, 16572, 16535, 16517, 16504, 16555,  
.....  
17012, 17024, 17043, 17059, 17083, 17112, 17131, 17163, 17218,  
17236, 17264, 17259, 17252, 17239, 17232, 17217, 17263, 17270
```

NUMBER	PKDWELL	OPDWELL
1	0.8	0.8
2	0.45	0.5
3	0.55	0.75
4	0.55	0.8
5	0.45	0.45
6	0.35	0.35
7	0.35	0.4
8	0.4	0.5
9	0.2	0.5
		0

Updated Transit Line File

```
LINE NAME="LY3 LK MT IB", MODE=21, OPERATOR=1, ONEWAY=T,  
HEADWAY[1]=60, HEADWAY[3]=0, HEADWAY[2]=60,  
LONGNAME="LYNX-3 LAKE MARGARET INBOUND", N=16582, DWELL_C=0.45, N= 16657, 16729,  
16706, 16650, 16625, 16598, 16572, 16535, 16517, 16504, 16555,  
.....  
17012, 17024, 17043, 17059, 17083, 17112, 17131, 17163, 17218,  
17236, 17264, 17259, 17252, 17239, 17232, 17217, 17263, 17270
```



CFRPMv5 Calibration Process

- Gather observed transit travel times by route by using public time tables, driver run sheets or other sources
- Use 0.50 as initial DWELL_C values for both peak/off-peak periods for all groups
- Run a single PT script to get the estimated travel times
- Compare observed and estimated travel times by group
 - Investigate major differences
 - Solution may be to create new (collapse) groups or vary DWELL_C value
- Make adjustments & iterate until reasonable estimates of travel times are achieved

Example: Peak DWELL_C Values in CFRPMv5

Group Code	Agency	Grouping	Initial DWELL_C	Final DWELL_C
1	LYNX	Northeast	0.5	0.6
2		Southeast	0.5	0.45
3		Southwest	0.5	0.55
4		Northwest	0.5	0.55
6	VOTRAN	Votran	0.5	0.35
7	SCAT	Titusville	0.5	0.35
8		Melbourne	0.5	0.4
9	SunTran	SunTran	0.5	0.2

Example: CFRPMv5 Peak Calibration Results

Agency	Group	%RMSE	
		CFRPM v4.5 (Existing Method)	CFRPM v5.0 (New Method)
LYNX	Northeast	7%	8%
	Southeast	7%	9%
	Southwest	9%	14%
	Northwest	11%	7%
VOTRAN	Votran	8%	8%
SCAT	Titusville	4%	3%
	Melbourne	7%	6%
SunTran	SunTran	3%	6%





Findings & Lessons Learned

- **Straightforward calibration process; easy to put together a semi-automated calibration routine**
- **More realistic and consistent coding of stops needed**
- **Group codes should be defined broadly so that planned routes can use a value from the existing groups**
- **The ability to precisely reflect travel times on individual routes is very helpful for detailed transit studies**
- **Still doesn't fully account for impacts from demand**