

Illustrated Guide to Crossovers, SUVs, Vans, Shuttles, and Small Buses for Vanpools

Introduction: Under the “Commuter Highway Vehicle” laws (26 U.S.C. Sec. 132 (f)) vanpools are defined as any highway vehicle that has seating capacity of at least seven adults including the driver. Vehicle appearance does not matter, nor does the name “van” have to describe the vehicle as long as seven adults can be seated. Vanpools can utilize minivans, crossovers, SUVs, traditional vans, and even body-on-chassis minibuses. To avoid commercial drivers license (CDL) requirements, vanpool vehicles must have seating for no more than 15 (including the driver) passengers, and must weigh less than 26,000 lbs. (To provide perspective, a typical 26,000 lb. bus can seat approximately 45-passengers and would normally be built on a Freightliner or International medium-duty commercial truck chassis).

Many vanpool agencies utilize multiple vehicle types to accommodate special needs: smaller vehicles when they must park inside garages; larger vehicles when an ADA passenger is a pool participant; larger vehicles when a pool outgrows its original vehicle; and smaller vehicles when a larger pool loses some passengers.

There are multiple variables to consider when choosing the most appropriate vanpool vehicle for any particular situation:

Driver comfort. Drivers are critical volunteers that help sustain the vanpool. Drivers should enjoy driving the vehicle. Drivers should feel safe and confident while driving the vehicle. If drivers are required to store the vehicle at their homes they should not be embarrassed by the vehicle’s appearance. If vanpool drivers are allowed a certain amount of personal miles in compensation for volunteering, the vehicle should be desirable to drive and to be seen in. Minivan sales have slipped drastically, while sales of crossover vehicles are soaring. One reason for this change is the perception that minivans are “uncool” while crossovers are “cool” and “hip”.

Passenger comfort. Passengers should be thought of as customers in vanpools. Customer comfort is important for transit agencies and should also be important for vanpool providers. Just because a vehicle is advertised as seating ‘X’ number of passengers doesn’t necessarily mean that ‘X’ number of adults would be comfortable for a one-hour commute. Passenger comfort is not just seating comfort but ride comfort, entry and egress comfort, and should even include the perception of safety and absence of claustrophobia.

Passenger Capacity. Vanpool passenger capacity varies from 7 to 15 (including the driver). Some vehicles advertised as seven-passenger will comfortably seat six adults, and vans advertised as 15-passenger will comfortably seat only 11 or 12 adults. Body-on-chassis minibuses have advertised seating capacities that are accurate because they feature individual seats for each passenger rather than bench-type seating that yields a more subjective seating capacity.

All things being equal, more vanpool vehicles are preferable to fewer vanpool vehicles for two reasons. First, two seven-passenger vanpools will generate 100% more FTA Section 5307 earnings than one 14-passenger vanpool. Secondly, two vanpools can potentially provide more choices in departure and arrival times, and can allow for riders who have missed the earlier van to catch a ride in the second vanpool, if space permits.

Passenger capacity is a critical factor in the design of a vanpool system. A vanpool system that utilizes only minivans with a capacity of six adults will have less flexibility than a vanpool system that utilizes nine-passenger vehicles. Flexibility can be an important selling point for potential riders: if the vanpool system has the flexibility that empty seats provides, it can accommodate riders who may have missed their earlier pool, or who need to stay at work later than their usual pool allows. Some vanpool agencies own or lease vehicles with different seating capacities in order to “right-size” each pool. A vanpool system that only utilizes 15-passenger vans will not start a new route if it cannot fill the van to its requirements (frequently 9 passengers plus the driver). If a vanpool agency has access to a variety of vanpool sizes, it can use one that fits the immediate needs of a new pool. Typically, vanpool agencies will start a new pool with four or more riders (including the driver) if the pool can be placed in a seven-passenger vehicle. If the vanpool agency has only 15-passenger vehicles, they typically require ten or more riders before starting a new pool.

Vehicle Dimensions. Vehicle dimensions are directly related to vehicle passenger capacity, and vehicle dimensions are critical when parking in garages. Minivans and crossovers will easily fit into parking garages, full-size vans and extended-length vans may fit into a few garages, while body-on-chassis minibuses will never fit into garages.

Types of Possible Vanpool Vehicles

Minivans: a mid-size automobile with sliding door(s), a low roof, and three rows of seating for up to eight passengers including the driver. Examples are Honda Odyssey and Dodge Caravan. Eight passengers are only possible if two passengers are very small children. Some models feature a narrow “jump seat” between the second row seats. Such seating is only appropriate for a ten-year-old child or younger. Access to the third row is always challenging, requiring some degree of contortions and also inconveniences one of the second row passengers. The third row is always narrow due to the seats being wedged between the rear wheels. Third row seating for three is only appropriate for abnormally small adults and/or smaller children. Refer to Photos 2, 3, and 4. Everyday seating capacity should be limited to six adults. Gas mileage for minivans is frequently in the 24-25 mpg range for expressway driving, and 17-18 mpg for city driving. Interestingly, there are no longer any minivans manufactured in the United States. Domestically-badged minivans are manufactured in Canada. FTA has been asked by numerous agencies to grant waivers to exclude minivans from its “Buy America” requirements.



Photo 1.



Photo 2.

Photos 1 and 2: Chrysler Town and Country minivan, and its 2-2-3 seating arrangement. Photos 3 and 4: Three adults in the third row of a Honda Odyssey minivan. Note extreme crowding of passengers' shoulders and hips. Third row seat is 48.5" across, or 16.7" per passenger when seating three.



Photo 3.



Photo 4.

Crossovers: a new category of passenger vehicles that combine styling and features of SUVs with construction and handling of passenger cars. See Photo 5. Examples include Ford Flex, Chrysler Pacifica, Dodge Journey and Honda CR-V. Some models offer comfortable seating for up to seven adults. See Photos 6 and 7. Access to the third row is always challenging, requiring some degree of contortions and also inconveniences one of the second row passengers. Second row seating features approximately 55" of hip room and 58" of shoulder room, which is 2" wider than a 3-person coach seating on a standard airliner. Third row seating has approximately 41" of hip room and 51" of shoulder room which accommodates two adults comfortably (all dimensions are for a 2010 Ford Flex). Rather than body on frame construction found in trucks and SUVs, crossovers and passenger cars share monocoque/unibody construction. Passenger safety in crossovers is typically superior to regular SUVs and full-size vans due to lower propensity to rollover accidents. Handling and passenger comfort are usually superior to regular SUVs and full-size vans due to independent rear suspension found in crossovers. Gas mileage of crossovers is similar to minivans, 23-24 mpg expressway, and 16-17 mpg city.

Pictured: (clockwise) Ford Flex crossover. Third row seat in Flex showing comfortable seating for two adults. Seating arrangement in Flex showing 2-3-2 seating combination for 7 adults.



Photo 6.



Full-size SUVs: a vehicle based on a full-size truck chassis with four side doors and a rear door, three rows of seating for up to nine passengers including the driver. See Photos 8, 9, and 10. Examples are Ford Expedition and Chevy Suburban. Seating arrangements will vary based on maximum seating capacity, from 3-3-3, to 2-3-2, to 2-2-2. The second row can be configured with two individual “captains” seats, or a 40-20-40 split bench. The third row can be configured as a two-person or three-person bench. Access to the third row is problematic and requires that one of the second row seats be

folded down and slid forward. Since these are very large vehicles, second row seating for three is comfortable with approximately 60" of hip room and 64" of shoulder room. Third row has approximately 50" of hip room and 52" of shoulder room which accommodates two adults comfortably (all dimensions are for a 2010 Ford Expedition). See Photo 9. Gas mileage ranges from 15 city to 20 highway.

Pictured: (clockwise) Ford Expedition XL SUV. Second row seat in Expedition XL showing comfortable seating for three adults. Expedition XL 2-3-3 seating arrangement showing comfortable seating for 8 adults.

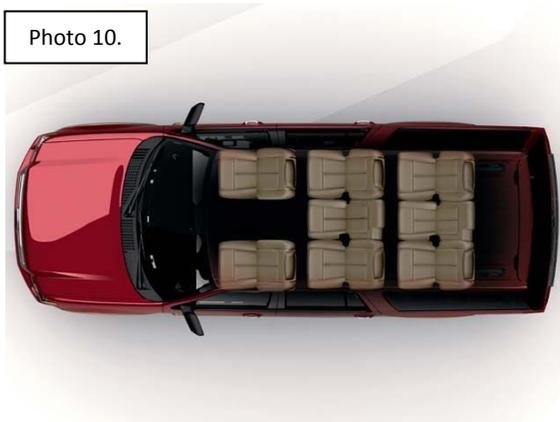
Photo 8.



Photo 9.



Photo 10.



Full-size vans: a vehicle based on a full-size truck chassis with double swinging or single sliding door that creates a wide entry for the passengers, a low roof, single rear wheels, and four rows of seating for up to 12 passengers including the driver. See Photo 11. Examples are Ford F-150, F-350, GMC Savana and Chevy Express. Since these vehicles have large flat cargo floors their seating arrangements are very flexible. The fourth-row bench may be configured to seat three or four passengers, while the second and third-row benches may be configured to seat two or three passengers. Individual seats may be substituted for benches as well. The best van seating layouts provide ample space to enter and exit the van, provide ample aisle space to access the third and fourth row seats, and provide an aisle between the last row to access the rear doors in case of emergency. Such proper design limits the seating to eight or nine passengers including the driver. See Photo 12. Without such niceties, these vans can be unsafe, uncomfortable and claustrophobic.

A stock van with bench seating for 12, in a 2-3-3-4 seating arrangement, see Photos 13 and 14, presents a difficult path for passengers in the third and fourth rows. Note the low ceiling height that necessitates

stooping, the narrow 8" aisle, and the obstacle-course aisle encumbered with hanging seat belts. When these vehicles are used as vanpools, passenger egress requires that bench seat-mates must exit the vehicle first.

Full-size vans have changed little over the last 40 years. Passenger seating and safety have remained an afterthought. Actually it appears as if van manufacturers have engineered passenger vans to be as unsafe as possible. Rollover accidents are the deadliest type of accident, and fully occupied passenger vans are by far the most prone of all vehicles to deadly rollovers. Two factors are critical to ensure vehicles do not rollover in an accident: center of gravity and track width. In order to accommodate the weight of 13 to 15 150-pound passengers (1 1/8 tons) van manufacturers responded with raising the springs an additional 2 to 3 inches which in turn raises the vehicle's center of gravity to dangerous heights. Ford even narrowed the wheel track (distance between left and right wheels) on their 13 and 15-passenger capacity vans from 70.3"/67.1" to 69.4"/66.6" (front/rear distance on 8 and 9-passenger Ford vans). Ford has so little regard for van passenger safety that they don't widen the track of the rear wheels to at least equal the track of the front wheels.

Unloaded full-size vans typically get 16-17 mpg expressway and 12-13 mpg city. Loaded vans get significantly less mileage.

Photo 11.





Extended-length van: a subset of full-size vans in which the vehicle's length is extended. The Ford F-350 XL adds 20" to the cargo/passenger area which makes room for a fifth row of passenger seating. Ford leaves the van's wheelbase at 138" in both models. Chevy Express and GMC Savanna vans increase the XL wheelbase from 135" to 155" to achieve the same 20" overall vehicle length increase. These vans advertise seating capacities of 15 passengers, the maximum allowed without a CDL. These vehicles can be designed to accommodate 10 passengers in reasonable comfort. See Photo 15. This design allows sufficient space to enter and exit the vehicle, space to walk down the aisle (while stooping), and space to access the rear doors in case of emergency. If seating for more is designed, see Photo 16, normal load should be ten passengers, to decrease danger of rollover accidents, with extra seating space for infrequent use.

Photo 15.

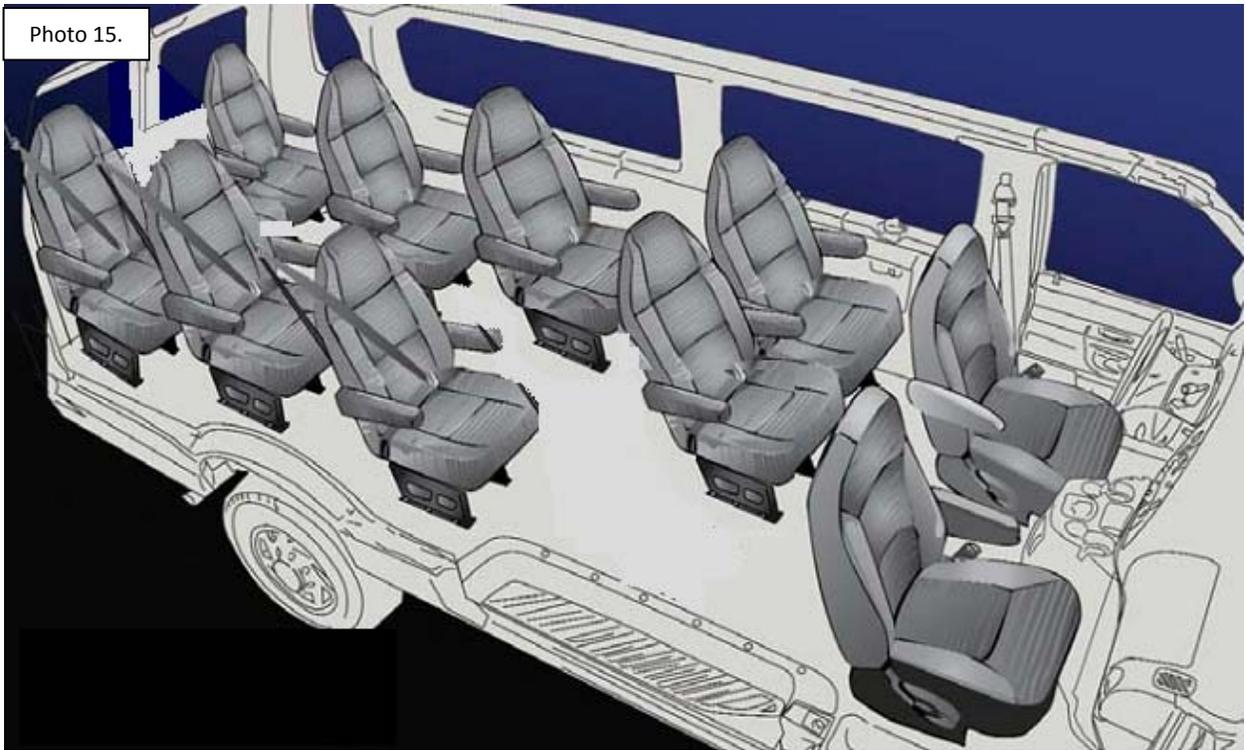
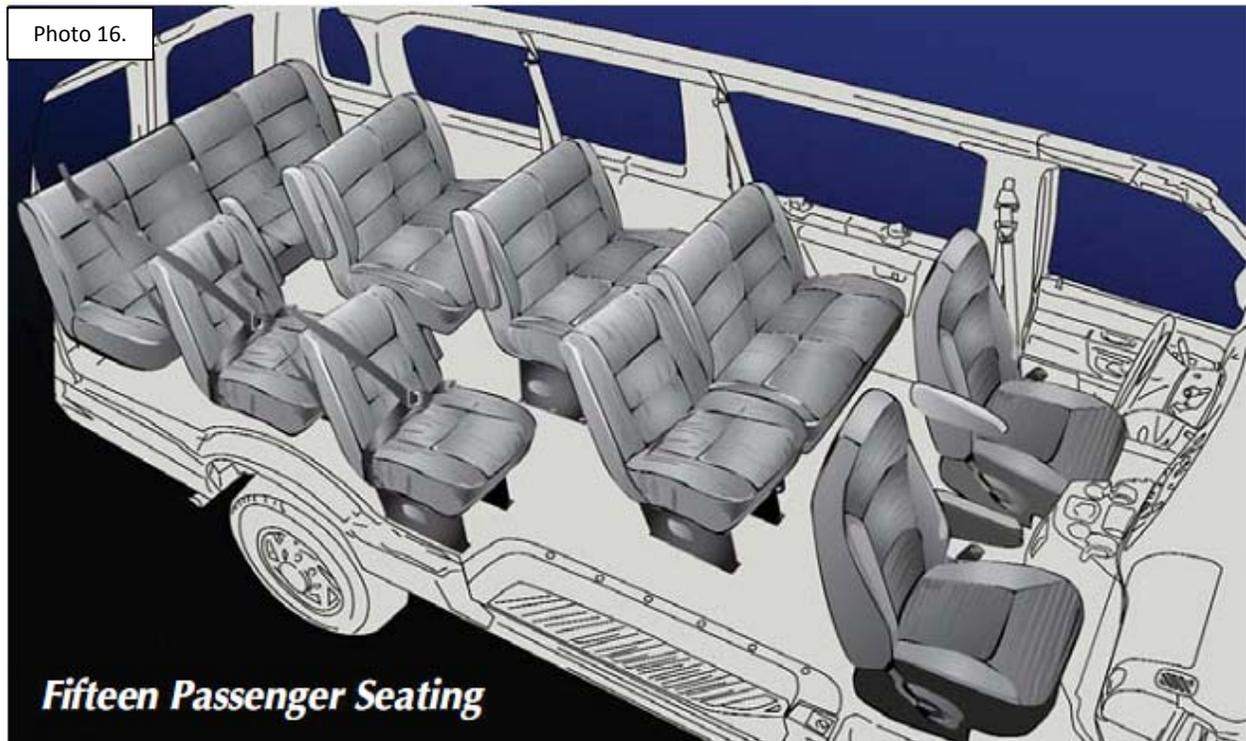


Photo 16.



Fifteen Passenger Seating

Mercedes Sprinter Van:

The most important development in vans in the last 40 years is the Mercedes Sprinter Van. See Photos 17 and 18. Notable features are: unibody construction which decreases weight and lowers step-in height; 65" inch interior height which is fully 17" taller than Ford or GMC passenger vans; a five-speed automatic transmission that improves fuel efficiency over the four-speed automatic transmission found in Ford and GMC vans; a more aerodynamic profile which improves fuel efficiency; a 3.0L turbo-diesel that is rated as an Ultra-Low Emissions Vehicle (ULEV); and gas mileage that is 33% better than Ford and GMC vans. Professional automotive reviewers consistently rave about the Sprinter's drivability, comfort, and quality. FTA's Altoona facility has certified the Sprinter as a 7-year medium-duty vehicle as compared to Ford and GMC van certifications as 4-year light-duty vehicles. The Sprinter's extra longevity and greatly improved fuel efficiency reduces the lifecycle costs compared to Ford and GMC vans, to \$0.57 per revenue mile from \$0.73 per revenue mile, or an improvement of 22% (see Table 1).

Photo 17.



Photo 18.



Table 1. Lifecycle Cost, Cost per Revenue Mile, and Cost per Passenger Mile Comparisons

Vehicle	Estimated Price	Seats	Interior Height (in.)	Interior Width (in.)	Altoona tested to:	Estimated Miles at EOL	Estimated MPG (loaded)	Estimated Value at EOL
Ford Flex	\$ 32,000	7	NA	NA	NA	150,000	22	\$ 6,000
GMC 3500 Extended Body Van, 4-speed auto, Individual luxury seating for 11 passengers, 18.5' length, secondary rear A/C	\$ 38,000	10	48	68.9	4 years and 100,000 miles	125,000	12	\$ 7,000
Mercedes Sprinter Passenger Van, 19.3' length, unibody construction, 3.0 L Mercedes-Benz clean diesel, individual luxury seating for 12 passengers, center aisle, 5-speed automatic Mercedes-Benz transmission, Ultra-Low Emissions Vehicle (ULEV) rated, ultra-low sulfur fuel rated	\$ 43,000	10	65	70.1	7 years and 200,000 miles	200,000	16	\$ 12,000

Vehicle	Oil Change Interval	Annual Insurance	Annual Maintenance @ \$0.15/mile	Total Lifecycle Cost	Total Passenger Miles Capability	Cost per PM	Cost per RM	Age at EOL, at 25,000 miles/year
Ford Flex	6,000	1,800	3,750	\$ 80,755	1,050,000	\$ 0.077	\$ 0.538	6
GMC 3500 Extended Body Van, 4-speed auto, Individual luxury seating for 11 passengers, 18.5' length, secondary rear A/C	6,000	1,800	3,750	\$ 90,833	1,250,000	\$ 0.073	\$ 0.727	5
Mercedes Sprinter Passenger Van, 19.3' length, unibody construction, 3.0 L Mercedes-Benz clean diesel, individual luxury seating for 12 passengers, center aisle, 5-speed automatic Mercedes-Benz transmission, Ultra-Low Emissions Vehicle (ULEV) rated, ultra-low sulfur fuel rated	10,000	1,900	3,750	\$114,500	2,000,000	\$ 0.057	\$ 0.573	8

Shuttle van: a full-size or extended-length van modified with a high roof, a center aisle, and sometimes a higher door and a lowered first step. Shuttle vans provide premium seating for 10 or 13 passengers in four or five rows. Examples are CommTrans, Accubuilt Tuscany, and Mercedes Sprinter 2500 High Roof. Shuttle vans are frequently used as hotel shuttles. Better shuttle vans include heightened entryways that resolve the stooping necessary to enter and exit regular vans, lowered first steps and handholds or stanchions that facilitate easier and safer entry and exit. See photos 17, 18 and 19.

Photo 19.



Photo 20.



Photo 19.



ADA van: a full-size van modified with a high roof, and a rear or side ADA wheelchair lift. ADA vans provide seating capacity for one wheelchair and 3 passengers including the driver, or two wheelchairs and two passengers including the driver.

Mini-bus (cut-away van): a vehicle based on a full-size van or truck chassis, with a tall and wide fiberglass, aluminum or steel passenger compartment attached to the frame, a manual or power operated folding door, a high roof, single or dual rear wheels, and center-aisle seating for 12 to 24 passengers depending on wheelbase. Example manufacturers are StarTrans, Goshen, Champion and TurtleTop. Example cut-away chassis are Ford F-350 and F-450, and Chevy E-Series. Cut-away vans are frequently used as airport parking shuttles, car-rental shuttles, and small transit buses. These vans may have rear or side-mounted wheelchair lifts for ADA-compliance. Advantages of cut-away vans over regular vans includes a heavier-duty suspension, dual rear wheels which widens the vehicle's stance and lessens that chance of roll-over, smaller diameter wheels that lower the vehicle's center of gravity, and the ability to have a longer, wider, and higher passenger compartment than would otherwise be possible. See Photos 19 and 20. Photos 21 and 22 shows a Turtle Top VanTerra 12-passenger luxury shuttle. Note the attractive exterior of the vehicle, and the electrically-operated 68" tall passenger door. The interior of the mini-bus has a generous aisle, stand-up ceiling height, and premium passenger seating.



Summary and Recommendations

- Any vanpool agency should plan to acquire different vanpool vehicles for different needs. A combination of smaller seven-passenger vehicles that will fit inside parking garages, and shuttle vans or mini-buses that will hold nine to eleven passengers would be the ideal mix to maximize 5307 earnings, maximize passenger comfort, and to maximize flexible passenger space. See Diagram 1.
- Minivans will hold only six adults and should be eschewed for better designed and more attractive crossover vehicles like the Ford Flex that can seat seven adults.
- Chevy, Ford, and GMC vans with bench seating should be avoided for passenger comfort concerns. Filling unmodified Chevy, Ford, and GMC vans with 15 passengers must be avoided for passenger safety concerns.
- If full size vans are selected, each passenger should have their own individual high-quality seat, and a center aisle should be provided.
- Raised-roof shuttle vans that can comfortably and safely carry nine to eleven passengers should be the goal for passenger comfort in larger vehicles. Such vehicles could be legitimately branded as “Luxury Commuter Shuttles”, rather than run-of-the-mill vanpools.
- Mini-buses that can comfortably and safely carry up to 15 passengers could be used but they come with a penalty – a 58% loss in Section 5307 earnings that should be avoided.
- Vehicles with a capacity of ten passengers are ideal: when passenger demand increases to nine or ten, the pool could be split into two five-person pools in two seven-passenger Ford Flex vehicles giving a total seating capacity of 14. When the pool is split into two vehicles there arises the possibility of offering a different pool schedule, perhaps leaving 15 or 30 minutes later in the AM and PM, depending on passengers’ needs and desires. Different pool schedules serves to increase passenger flexibility – a passenger that misses her earlier pool could catch a ride in the later pool if space permits. See Diagram 1 to see there is always a supply of flexible passenger space.

Diagram 1 graphically displays a possible strategy of transitioning to different vehicles as a pool grows. The pool starts small with one driver and three passengers in a seven-passenger Ford Flex crossover. When the pool grows to seven it will be transitioned into an 11-passenger raised-roof shuttle van. When the pool grows to ten it will split into two Ford Flexes. This strategy allows pools to grow continually and immediately as people subscribe to the service, rather than making interested individuals wait until a new pool has sufficient numbers of passengers to begin a route. Diagram 2 shows the **least** optimal method for growing a vanpool service. In this scenario, only 15-passenger vans are utilized. The first pool must wait until 9 people subscribe before service commences, then it has the ability to grow to 15 passengers. The second pool, on the same route, must wait until an additional 9 passengers subscribe before it commences service. This type of service planning should be avoided.

Diagram 1.

Growth of a vanpool route and transitions to different or multiple vehicles to *maximize* both 5307 earnings and seat availability.

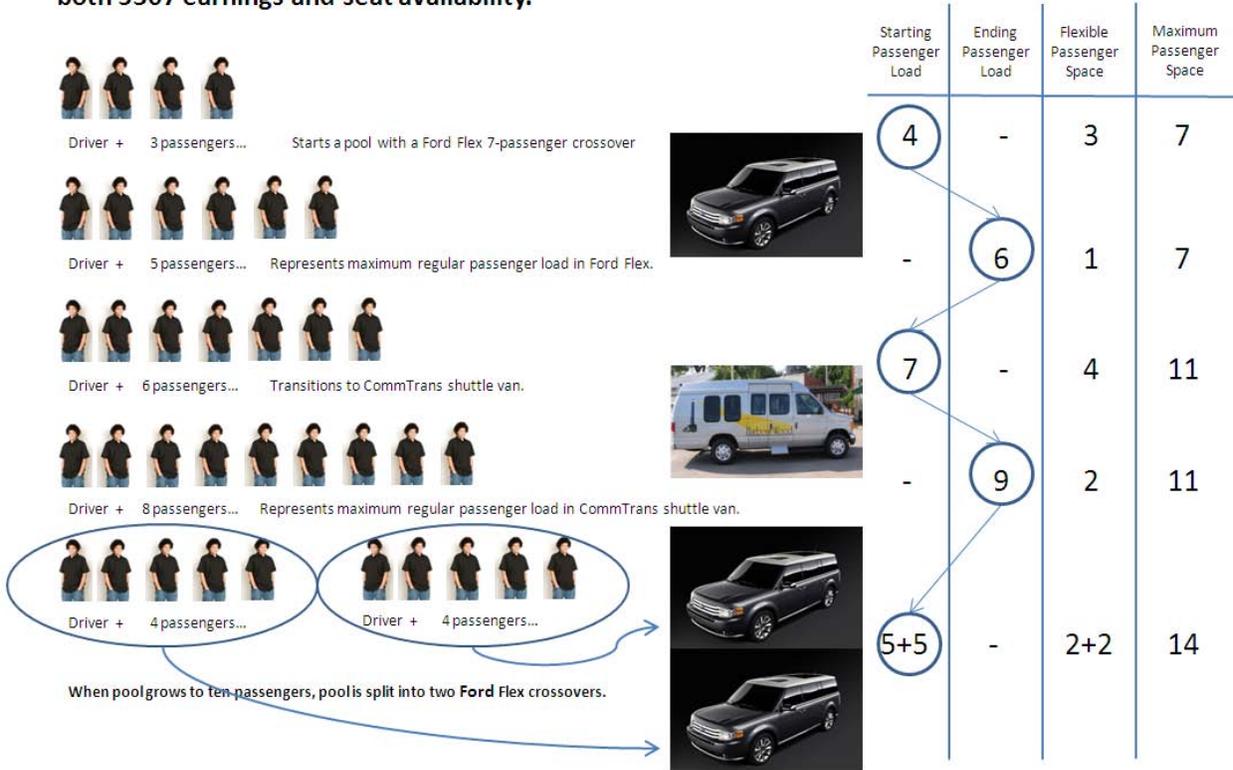
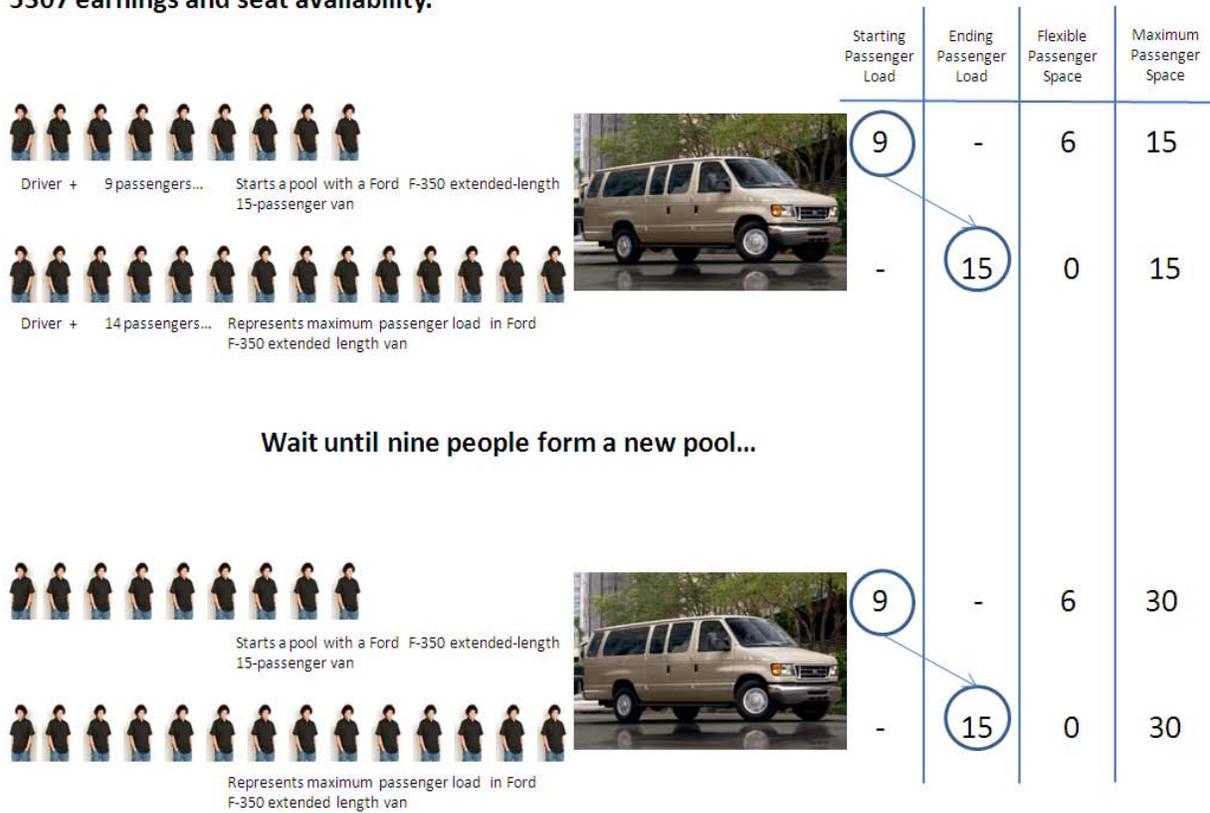


Diagram 2.

Growth of a vanpool route and transitions to additional vehicles to *minimize* both 5307 earnings and seat availability.



***Note on FTA-required Altoona testing**

FTA mandates that any vehicle purchased with FTA funds be thoroughly tested at FTA's Altoona, PA bus testing facility for roadworthiness, structural integrity, fuel economy, sound levels inside and outside the bus, dependability and maintainability. Altoona tests have included all available cut-away small buses, Mercedes-Benz Sprinter, and Ford F-350 full-size vans. Regular (non-cutaway) GMC Savana and Chevy Express vans have not been tested, nor do they require testing as they are considered unmodified mass-produced vans. See explanation from FTA below:

“Q. I am trying to purchase two E-350 vans from Ford. The grant person who is my contact wants the Altoona testing certificate from the Ford dealer but the dealer cannot find this information. Does this testing requirement apply to this type of vehicle?”

A. The requirement for Altoona testing would depend on the extent (if any) to which the vans are modified from the stock configuration. If these are unmodified Ford E-350 vans, or they have had only limited modifications (e.g., adding a lift or raised roof) performed in strict compliance with Ford's Vehicle Modification Guidelines, then the Bus Testing Regulation (49 CFR Part 665) would consider them to be "unmodified mass-produced vans" and they would be exempt from Bus Testing ("Altoona testing") requirements if offered in the 4-year/100,000-mile service life category. It sounds as if you would buy the vehicles directly from Ford. If that's the case, these vehicles would likely qualify as unmodified mass-produced vans.

From the FTA Bus Testing Website (see page http://www.fta.dot.gov/research_8874.html):

Unmodified mass-produced van means a van that is mass-produced, complete and fully assembled as provided by an OEM. This shall include vans with raised roofs, and/or wheelchair lifts, or ramps that are installed by the OEM, or by a party other than the OEM provided that the installation of these components is completed in strict conformance with the OEM modification guidelines.

FTA wishes to clarify that this exemption historically assumed that unmodified mass-produced vans would only be offered in the 4-year, 100,000-mile service life category. Unmodified mass-produced vans are categorically exempted from testing by the Bus Testing Regulation only in the 4-year, 100,000-mile service life category; unmodified mass-produced vans offered in the 5-year, 150,000-mile (or higher) service life category are subject to testing.

Feel free to follow up with Mr. Marcel Belanger if you have any additional questions.

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(Posted January, 2010) at

http://www.fta.dot.gov/funding/thirdpartyprocurement/faq/grants_financing_6077.html”