Initial Findings on Downsizing Large Vehicles

National Association of City Transportation Officials (NACTO)

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Introduction

USDOT Volpe Center – Cambridge, MA

Mission: Advance transportation innovation for the public good.
- 570 federal staff, 400 onsite contractors
- Objectively address our most pressing and complex transportation challenges

Why look at vehicle design?

Identify innovative approaches to:
- Decrease emergency vehicle response time and access limitations
- Increase municipal fleet and contracted large vehicle capabilities
- Improve roadway safety
- Expand design flexibility for roadway/streetscape/public space
Why Downsizing?

- Street design impacts of using a smaller design vehicle
  - Slower speeds
  - Increased visibility & reaction time
  - Decreased crossing distances & times

- Potential safety benefits of:
  - Street designs for smaller vehicles
  - Smaller vehicles in operation
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- The power of a “design vehicle”
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Why Downsizing?

- The power of a “design vehicle”
The benefits of smaller vehicles are clear

A change here...  ...can mean a reduction here

<table>
<thead>
<tr>
<th>Vehicle Dimension</th>
<th>Street/Environment Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelbase</td>
<td>Turn radius</td>
</tr>
<tr>
<td>Wheel cut</td>
<td>Turn radius</td>
</tr>
<tr>
<td>Steering axle configuration</td>
<td>Turn radius</td>
</tr>
<tr>
<td>Width</td>
<td>Lane width</td>
</tr>
<tr>
<td>Driver seat height</td>
<td>Blind spots</td>
</tr>
</tbody>
</table>

- Decrease emergency vehicle response time and access limitations
- Increase municipal fleet and contracted large vehicle capabilities
- Improve roadway safety
- Expand design flexibility for roadway/streetscape/public space
The million dollar question

Can a smaller vehicle still do the job?
Smaller DOESN’T necessarily mean less capable

<table>
<thead>
<tr>
<th>Box Truck</th>
<th>3-axle</th>
<th>2-axle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variations</td>
<td>Rigid</td>
<td>Rear steer</td>
</tr>
<tr>
<td>GVWR (pounds)</td>
<td>52,000</td>
<td>52,000</td>
</tr>
<tr>
<td>Curb-curb turn radius (feet)</td>
<td>40</td>
<td>33</td>
</tr>
<tr>
<td>Max. cargo body length (feet)</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Overall length (inches)</td>
<td>454</td>
<td>Not available</td>
</tr>
</tbody>
</table>

Same GVWR, smaller turning radius

Same GVWR, longer cargo body, smaller turning radius
Smaller can maintain OR INCREASE capability

<table>
<thead>
<tr>
<th>Variations</th>
<th>Standard pumper</th>
<th>SFFD pumper</th>
<th>“Rapid Attack Apparatus” pumper</th>
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</thead>
<tbody>
<tr>
<td>Carrying Capacity (gal.)</td>
<td>750</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Fire pump capacity (gal./minute)</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>Curb-curb turn radius (feet)</td>
<td>36</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Wheelbase (inches)</td>
<td>201</td>
<td>169</td>
<td>129</td>
</tr>
<tr>
<td>Overall length (inches)</td>
<td>384</td>
<td>334</td>
<td>266</td>
</tr>
</tbody>
</table>

Same pumping capacity, smaller turning radius
International representative aerial apparatus

Tokyo

Paris

NYC
Smaller can maintain OR INCREASE capability

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ladder height (feet)</td>
<td>95</td>
<td>105</td>
<td>100</td>
<td>197</td>
</tr>
<tr>
<td>Ladder reach (feet)</td>
<td>89</td>
<td>89</td>
<td>91</td>
<td>69</td>
</tr>
<tr>
<td>Curb-curb turn radius (feet)</td>
<td>40.5</td>
<td>23</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>Wheelbase (inches)</td>
<td>247</td>
<td>190</td>
<td>155 tractor 305-341 trailer[10]</td>
<td>201</td>
</tr>
<tr>
<td>Overall length (inches)</td>
<td>546</td>
<td>393</td>
<td>684-720</td>
<td>504</td>
</tr>
</tbody>
</table>
Fire Aerial Envelope

<table>
<thead>
<tr>
<th>Seagrave AerialScope Ladder Truck (Iveco 160 E 30)</th>
<th>Magirus M32L-AS (Iveco 160 E 30)</th>
<th>Seagrave TDA Tiller Aerial Ladder</th>
<th>Magirus M60L Ladder (Iveco 260 T36)</th>
</tr>
</thead>
</table>

The diagram illustrates the height and reach capabilities of different aerial梯 for firefighting operations.
Conclusion

- **Initial research results indicates:**
  - Downsized large emergency and non-emergency vehicles can maintain or increase capability
  - Win-wins are available for key performance metrics, depending on make and model selection
  - Tradeoffs should not automatically be presumed

- **Downsized large vehicles can potentially make a positive impact**
  - Decrease emergency vehicle response time and access limitations
  - Increase municipal fleet and contracted large vehicle capabilities
  - Improve roadway safety
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