Fleet Feedback and Fleet Efficiency Metrics

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Agenda

• USMC Telematics User Feedback
• Fleet Efficiency Metrics
• VAM Support Metrics
USMC User Feedback

• USMC currently has telematics installed on over 8,000 vehicles ranging several providers

• NREL surveyed USMC personnel to understand how telematics are currently being used by the fleet.

<table>
<thead>
<tr>
<th>Surveyed Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
</tr>
<tr>
<td>Locations</td>
</tr>
<tr>
<td>Fleet Size</td>
</tr>
<tr>
<td>Installed Devices</td>
</tr>
</tbody>
</table>
Most managers access telematics daily or at least weekly.

Real time vehicle tracking is highly valued for safety and operations success.

Behavior metrics are tracked monthly.
  - Safety is the primary concern and speeding events are a focus.

Managers report improved driver behaviors.

Driver behavior improvement requires:
  - Leadership remaining engaged in driver coaching.
  - Maintaining the manpower resources for tracking behaviors.
Please rank the following telematics features by their importance to you

**Relative Importance of Telematics Capabilities**

<table>
<thead>
<tr>
<th>First Tier (Safety)</th>
<th>Second Tier (Fleet efficiency)</th>
<th>Third Tier (Operational)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speeding Identification</td>
<td>Excessive idling</td>
<td>Geofence violations</td>
</tr>
<tr>
<td>Collision notification</td>
<td>Mileage tracking</td>
<td>Maintenance notifications</td>
</tr>
<tr>
<td>Aggressive driving</td>
<td></td>
<td>GPS routing capabilities</td>
</tr>
<tr>
<td>Driver video reports</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Personnel are most concerned with safety features.
Survey Findings – Goal Importance

*Please rank the importance of the ways in which you use telematics in fleet management*

<table>
<thead>
<tr>
<th>First Tier (Safety)</th>
<th>Second Tier (Operational)</th>
<th>Third Tier (Fleet efficiency)</th>
<th>Fourth Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preventative safety enforcement</td>
<td>Required reporting (FMIS and FAST)</td>
<td>Fuel consumption</td>
<td>Routing</td>
</tr>
<tr>
<td>Accident reporting</td>
<td>Locating Equipment</td>
<td>Low-use vehicle analysis</td>
<td>Geo-fencing</td>
</tr>
<tr>
<td>Assessing driver behavior</td>
<td></td>
<td>Maintenance</td>
<td>Alternative fuel use</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vehicle acquisition analysis</td>
</tr>
</tbody>
</table>

Personnel value support to safety efforts.
Agenda

• USMC Telematics User Feedback

• Fleet Efficiency Metrics

• VAM Support Metrics
Fleet Efficiency Metrics from Telematics

How can telematics services support fleet efficiency?

What should we ask for from telematics providers?

Notes:

• Developing telematics reporting capabilities will likely require close coordination between a telematics provider and internal information systems experts.
• Technologies will continue to evolve and allow for capabilities to continue to expand.
Fleet efficiency behavior change efforts benefit from *trip level* data summaries and reports.

*Trip level data* – summary data for a vehicle event beginning when keyed on (operated for some time) and ending when keyed off.

Allows for:

- Identifying individual driver and vehicle events and behaviors in support of driver coaching.
- Summarizing at higher levels (driver, vehicle, organizational, etc.) to determine broad impacts of potential corrective actions.

Note: Data captured at more frequent intervals (perhaps 1 Hz) can be summarized at the trip level.
Fleet Efficiency Metrics from Telematics

Reducing engine idling

Questions answered:
• Which drivers or vehicles idle most consistently?
• How much fuel is lost due to idling?

Beneficial trip level metrics:
• Engine run time
• Count of idling events
• Total idling time
• Fuel used while idling

Sample: Idling Report Fields

<table>
<thead>
<tr>
<th>Trip ID</th>
<th>Vehicle ID</th>
<th>Driver ID</th>
<th>Org. ID</th>
<th>Start Date Time</th>
<th>End Date Time</th>
<th>Fuel Used</th>
<th>Engine Run Time</th>
<th>Idling Count</th>
<th>Total Idling Time</th>
<th>Fuel Used Idling</th>
</tr>
</thead>
</table>

Idling Impacts:
• Larger LD vehicles >1/3 gallon per hour.
• MD and HD vehicles can approach 1 gallon per hour.

Fleet Efficiency Metrics from Telematics

Reducing inefficient and aggressive driving

Questions answered:
• Which drivers or vehicles are top concerns?

Beneficial trip level metrics:
• Trip fuel used
• Extreme acceleration count
• Extreme braking count
• Speeding count
• Speeding duration

Aggressive Driving Impacts:
• Improving driving behavior can lead to a 5-10% savings.
• Reducing extreme behaviors can save 20%.

https://www.afdc.energy.gov/conserve/driving_behavior.html

Sample: Inefficient Driving Report Fields

<table>
<thead>
<tr>
<th>Trip ID</th>
<th>Vehicle ID</th>
<th>Driver ID</th>
<th>Org. ID</th>
<th>Start Date Time</th>
<th>End Date Time</th>
<th>Trip Fuel used</th>
<th>Extreme Accel. Count</th>
<th>Extreme Braking Count</th>
<th>Speeding Count</th>
<th>Speeding Duration</th>
</tr>
</thead>
</table>
Fleet Efficiency Metrics from Telematics

Reducing vehicle miles traveled

Questions answered:

- Are drivers consistently driving farther than required?

Beneficial trip level metrics:

- Miles driven
- GPS calculated mileage
- Avoidable mileage $\rightarrow$ \textit{GPS route mileage} – \textit{driven mileage}
- Geofence alerts

Sample: VMT Reduction Fields

<table>
<thead>
<tr>
<th>Trip ID</th>
<th>Veh. ID</th>
<th>Driver ID</th>
<th>Org. ID</th>
<th>Start Date Time</th>
<th>End Date Time</th>
<th>Trip Fuel Used</th>
<th>Miles Driven</th>
<th>GPS Calc. Mileage</th>
<th>Avoidable Mileage</th>
<th>Avoidable Mileage Fuel Saved</th>
<th>Campus Geofence Alerts</th>
</tr>
</thead>
</table>


Fleet Efficiency Metrics from Telematics

Choosing efficient vehicles

Questions answered:

• What fuel savings are possible with a more efficient vehicle?

Beneficial trip level metrics:

• Route/mission identifier –based on start and stop locations
• Miles driven
• Off-road geofence alert
• Fuel saved with downsized vehicle

Sample: Efficient Vehicle Choice Report Fields

<table>
<thead>
<tr>
<th>Trip ID</th>
<th>Vehicle ID</th>
<th>Driver ID</th>
<th>Org. ID</th>
<th>Start Date Time</th>
<th>End Date Time</th>
<th>Trip Fuel Used</th>
<th>Route ID</th>
<th>Miles Driven</th>
<th>Off-road Geofence Alert</th>
<th>Fuel Saved With Downsize</th>
</tr>
</thead>
</table>

Fuel Saved with Downsize: Based on a comparison of the current vehicle’s fuel usage and mpg rating versus expected fuel consumption from a more efficient vehicle.
Organizational summaries can highlight success and areas for improvement.

**Example:**

<table>
<thead>
<tr>
<th>Org ID</th>
<th>Driver ID</th>
<th>Idle Events Per Trip</th>
<th>Total Idling Time (mins)</th>
<th>Fuel Used Idling (Gallons)</th>
<th>Speeding Count</th>
<th>Speeding Duration (mins)</th>
<th>Avoidable Mileage</th>
<th>Avoidable Mileage Fuel Use (gallons)</th>
<th>Fuel Saved With Downsize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Org 1</td>
<td>Driver 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Org 1</td>
<td>Driver 2</td>
<td>1</td>
<td>10</td>
<td>0.02</td>
<td>10</td>
<td>90</td>
<td>2</td>
<td>0.1</td>
<td>0</td>
</tr>
<tr>
<td>Org 1</td>
<td>Driver 3</td>
<td>4</td>
<td>90</td>
<td>1.5</td>
<td>1</td>
<td>1</td>
<td>50</td>
<td>1.7</td>
<td>0</td>
</tr>
<tr>
<td>Org 1</td>
<td>Driver 4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0.25</td>
<td>10</td>
</tr>
<tr>
<td>Org 1</td>
<td>Driver 5</td>
<td>1</td>
<td>7</td>
<td>0.01</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>
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- VAM Support Metrics
Telematics Support to VAM Processes

Telematics services can improve VAM processes:

- **Reduced manual effort** and total time to complete.
- **Improved accuracy** through automated data capture.

The VAM process captures utilization statistics which can be captured through summaries of trip level data:

- Numbers of trips
- Miles traveled
- Hours of use
- Fuel consumed

**Note:** VAM processes will always require manual input including estimates of criticality, changing missions, etc.
Vehicle trip counts define how often a vehicle is used and can justify a vehicle need.

Example trip utilization metrics (prior 12 months):

- Number of trips
- Date of last trip
- Number of weeks with no trips
- Average trips per week (of weeks with at least one trip)

<table>
<thead>
<tr>
<th>Lifetime</th>
<th>Prior 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle ID</td>
<td>Org. ID</td>
</tr>
</tbody>
</table>

Days and weeks with no trips can help define periodic or seasonal vehicle usage patterns.
Vehicle mileage further defines vehicle utilization

Example mileage utilization metrics:

- Lifetime mileage
- Prior 12 months mileage
- Average miles per trip
- Average miles per week (of weeks with at least one trip)
- Weeks with low mileage (manually defined)

<table>
<thead>
<tr>
<th>Vehicle ID</th>
<th>Org. ID</th>
<th>Date Assigned</th>
<th>Miles</th>
<th>Lifetime Average Miles per Trip</th>
<th>Prior 12 months Average Miles per Trip</th>
<th>Average Miles per Week</th>
<th>Weeks with Low Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Engine Runtime:

<table>
<thead>
<tr>
<th>Vehicle ID</th>
<th>Org. ID</th>
<th>Date Assigned</th>
<th>Engine Hours</th>
<th>Engine Hours</th>
<th>Average Hours Per Trip</th>
<th>Average Hours Per Week</th>
<th>Weeks With Low Hours</th>
<th>Time On-site</th>
</tr>
</thead>
</table>

**Time On-site:** Mobile workstations may require a vehicle whose engine operates intermittently at a job site.

### Fuel Consumption:

<table>
<thead>
<tr>
<th>Vehicle ID</th>
<th>Org. ID</th>
<th>Date Assigned</th>
<th>Fuel Use</th>
<th>Fuel Use</th>
<th>Average Fuel Per Trip</th>
<th>Average Fuel Per Week</th>
<th>Weeks with Low Fuel Use</th>
<th>Fuel Saved with Downsize</th>
</tr>
</thead>
</table>

*Energy Exchange: Connect • Collaborate • Conserve*
## VAM Processes – Other Metrics

### LSEV Opportunity:

<table>
<thead>
<tr>
<th>Lifetime</th>
<th>Prior 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle ID</td>
<td>Org. ID</td>
</tr>
</tbody>
</table>

### 4X4 Requirement:

<table>
<thead>
<tr>
<th>Lifetime</th>
<th>Prior 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle ID</td>
<td>Org. ID</td>
</tr>
</tbody>
</table>
Continuous updating of utilization statistics.

**Example:**

<table>
<thead>
<tr>
<th>Vehicle ID</th>
<th>Org ID</th>
<th>Date Assigned</th>
<th>Trips</th>
<th>Weeks w/ 0 Trips</th>
<th>Miles</th>
<th>Weeks With &lt;10 Miles</th>
<th>Time at Job Site (hrs)</th>
<th>LSEV Possible</th>
<th>4X4 Required</th>
<th>Mission Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veh 1</td>
<td>Org 1</td>
<td>5/1/2014</td>
<td>100</td>
<td>23</td>
<td>8,000</td>
<td>23</td>
<td>0</td>
<td>N</td>
<td>N</td>
<td>Commuter</td>
</tr>
<tr>
<td>Veh 2</td>
<td>Org 1</td>
<td>6/1/2015</td>
<td>50</td>
<td>2</td>
<td>3,000</td>
<td>30</td>
<td>200</td>
<td>N</td>
<td>Y</td>
<td>Mb Wk Stn</td>
</tr>
<tr>
<td>Veh 3</td>
<td>Org 2</td>
<td>3/1/2014</td>
<td>600</td>
<td>2</td>
<td>10,000</td>
<td>4</td>
<td>0</td>
<td>N</td>
<td>N</td>
<td>Regional</td>
</tr>
<tr>
<td>Veh 4</td>
<td>Org 2</td>
<td>4/1/2015</td>
<td>90</td>
<td>36</td>
<td>1,000</td>
<td>40</td>
<td>0</td>
<td>Y</td>
<td>N</td>
<td>Campus</td>
</tr>
</tbody>
</table>

Fleet specific business rules could be applied to highlight low and high use vehicles.
Questions??

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