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STANDARDS

Energy Management Subcommittee

SCTE STANDARD

SCTE 225 2020

Cable Operator Fleet Maintenance and Vehicle Selection Operational Practice

NOTICE

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1. Introduction

This document is identical to SCTE 225 2015 except for informative components which may have been updated such as the title page, NOTICE text, headers and footers. No normative changes have been made to this document.

1.1. Executive Summary

Cable operators run a distributed network covering thousands of miles connecting facilities to customers and facilities to facilities. This network requires maintenance, upgrades, installation and repairs. Also, new cable subscribers require visits to their site ensuring proper deployment of equipment and turn up of service. All of this is accomplished via a fleet of vehicles that if not managed optimally can impact both the company's bottom line as well as environment.

1.2. Scope

This operational practice will outline steps helping cable operators to:

- Optimize fleet reliability
- Minimize fleet operating and maintenance costs
- Minimize fleet unregulated and regulated emissions
- Help to properly outline questions to match the right vehicle for the right job

This practice applies to cable operator owned or leased fleet and does not include sub-contracted employee fleets.

1.3. Benefits

Cable operators' fleets represent a significant capitol and operational expense regarding budget management and with the proper attention financial and operational values can be optimized. With a growing customer concern for environmental care, the cable operator fleet is highly visible in the consumer's eyes. This operational practice helps to optimize financial and environmental impact through right size deployment, data, and maintenance.

1.4. Intended Audience

The following teams would benefit from adopting this operational practice: corporate management, fleet management, and vehicle operators respectively.

1.5. Areas for Further Investigation or to be Added in Future Versions

For future consideration, alternate fuel vehicles could be studied to present use cases for non-petroleum based vehicles.

2. Normative References

The following documents contain provisions, which, through reference in this text, constitute provisions of this document. At the time of Subcommittee approval, the editions indicated were valid. All documents are subject to revision; and while parties to any agreement based on this document are encouraged to investigate the possibility of applying the most recent editions of the documents listed below, they are reminded that newer editions of those documents might not be compatible with the referenced version.

2.1. SCTE References

- No normative references are applicable.

2.2. Standards from Other Organizations

- No normative references are applicable.

2.3. Published Materials

- No normative references are applicable.

3. Informative References

The following documents might provide valuable information to the reader but are not required when complying with this document.

3.1. SCTE References

- No informative references are applicable.

3.2. Standards from Other Organizations

- ANSI American National Standards Institute: **http://www.ansi.org/**
- DOT Department of Transportation: **http://www.transportation.gov/**
- EPA Fuel Economy Guide: **http://www.fueleconomy.gov/**
- NHTSA - National Highway Traffic Safety Administration: **www.nhtsa.gov/**
- OSHA Occupational Safety and Health Administration: **https://www.osha.gov/**

3.3. Published Materials

- ASTM F1430/F1430M-15: Standard Test Method for Acoustic Emission Testing of Insulated and Non-Insulated Aerial Personnel Devices with Supplemental Load Handling Attachments http://www.astm.org/Standards/F1430.htm

4. Compliance Notation

shall	This word or the adjective "***required***" means that the item is an absolute requirement of this document.
shall not	This phrase means that the item is an absolute prohibition of this document.
forbidden	This word means the value specified shall never be used.
should	This word or the adjective "*recommended*" means that there may exist valid reasons in particular circumstances to ignore this item, but the full implications should be understood and the case carefully weighted before choosing a different course.
should not	This phrase means that there may exist valid reasons in particular circumstances when the listed behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
may	This word or the adjective "*optional*" means that this item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.
deprecated	Use is permissible for legacy purposes only. Deprecated features may be removed from future versions of this document. Implementations should avoid use of deprecated features.

5. Abbreviations

5.1. Abbreviations

AVL	automatic vehicle locator
GPS	global positioning system
CSR	customer service representative
OBD	on board diagnostics

6. Understand the Fleet

Understanding the data associated with the cable operators fleet operations is a critical step in operational practice. The MSO *should* interview fleet managers, technical operations managers, technicians, dispatchers and customer care supervisors to understand what impacts a truck roll.

6.1. Data points to gather

- Miles driven per month per vehicle
- Age of vehicle
- Inventory of vehicle types
- Gallons of gasoline/diesel fuel consumed per month
- Dollars spent on fuel per month per vehicle
- Service intervals per vehicle
- Telemetry alerts: speeding, idling
- Maintenance cost history
- Load carried (weight)
- Equipment type carried

Job Function

- 5 hrs./day in vehicle
- Vehicle used as a mobile office
  - Laptop stand, Bluetooth and tablets used 50% of the time
- Escalation response and infield tech support
- Delivering CPE and other equipment
- QA/QC
- 100% home-garaged
- Carry CPE about 17 days/month
- Responsible for about 12 technicians

Load Carried

- ✓ Typically carries one CPE tote but varies from region and with job requirements
- ✓ Wire and cable spools/reels
  - ✓ RG11 – 63%
  - ✓ RG6 – 85%

Miles Driven

- Average 100 mile/day (60 urban and 40 suburban)

Total Miles Driven	% Drivers
50-100	55%
100-150	24%
0-50	21%
150-200	0%

Equipment Carried

- ✓ Glow rods, layup sticks and shovel
- ✓ 5-7 safety cones
- ✓ Ladders carried:
  - ✓ Step - 40%
  - ✓ 10 ft. - 20%
  - ✓ 28 ft. - 55%
  - ✓ Do not use a ladder - 29%
- Fire extinguisher, safety vest, hard hat, traffic triangles and flags
- Do not haul trailer or generators

✓ = Higher Priority Vehicle Identifier

Figure 1 - Example of Technician Interview Question Components

Do not underestimate the value of the time spent with the invested team members responsible for truck rolls. Having a good understanding of what impacts truck rolls and being able to address especially repeat truck rolls is critical to overall fleet efficiency optimization. A cable operator fleet metric to help identify efficiency would be the fuel consumed per revenue generating unit (RGU).

6.2. Include fleet size relative to the mission

Define the right fleet to homes passed ratio to ensure optimal route coverage. Having too many vehicles places unnecessary overhead while too few vehicles can lead to reputation damage with lack of responsiveness and delays in service availability.

6.3. Procedures that can impact fleet performance include

- Outage monitoring – understanding dependencies of root cause of outage to prevent truck rolls where restoration is not yet possible
- Trouble call pre-call cancelation policies – ensure the customer will be present when visit is confirmed (ensure the root cause of trouble is still present)

- Customer self-help tools – consideration of self-installation kits and internet troubleshooting based
- Quality control procedures for technicians – ensure signal at the home when performing a repair is optimal to prevent future truck rolls
- Training and reviews

7. Life Cycle Costing

Life-cycle costing is the method that Fleet Managers use to look into the future to project actual fleet costs throughout the life of the vehicles under consideration. The first step in performing such an analysis is to determine its primary objectives; for example:

- To improve accuracy in analyzing total, projected costs of alternative vehicles, including new vehicle models, for the anticipated life of the vehicles;
- To obtain substantiated objectivity in vehicle selection decisions.

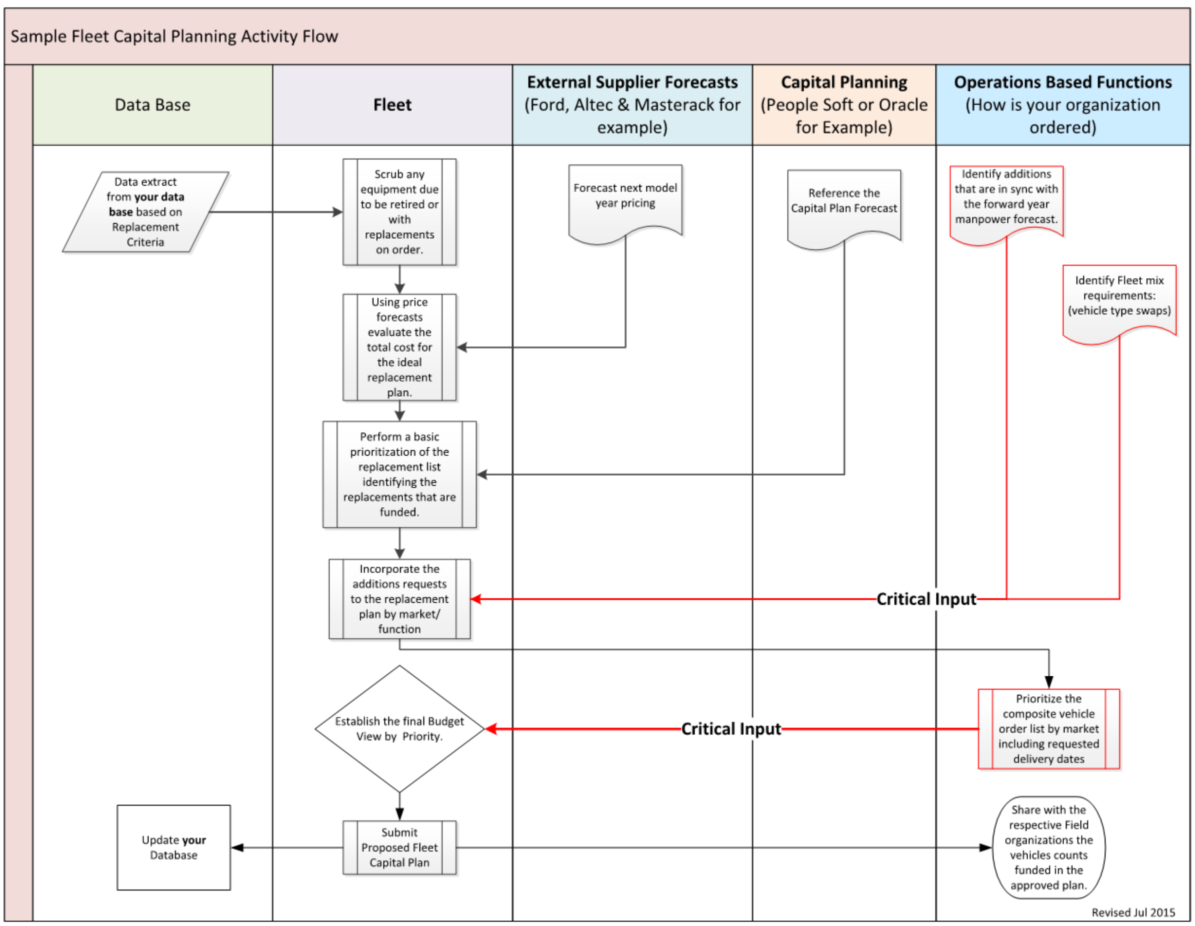

Figure 2 - Example Fleet Capital Activity Flow

In addition, many fleet managers use life-cycle costing as an alternate costing flow approach:

- To estimate the operating costs of the vehicle over the life of the vehicle in the fleet.

- Fleet life-cycle costing typically divides into three phases (several commercially available models are available to create a locally applicable version of a life cycle cost model):

7.1. Life cycle costing phase one

Gather information about the vehicles targeted for comparison. A comparable analysis of vehicle costs *should* include:

- Dealer invoice
- Depreciation
- Maintenance (including oil)
- Tires
- Fuel
- License and registration fees (and any taxes, if applicable)
- Finance costs (if applicable)
- Insurance (as applicable)
- Parking (if applicable)
- Storage (if applicable)

Although most fleets share several common cost elements, Fleet Managers *should* prioritize or adjust the cost elements based on their fleet's individual circumstances.

7.2. Life cycle costing phase two

Develop, acquire, or contract for a software/database system model to use for the costing. The model *should* incorporate elements of the usage profile. The parameters are set within each category of vehicle to be tested and include:

- Location
- Territory descriptions
- Mileage
- Fuel grade and price
- Retention cycle

7.3. Life cycle costing phase three

After gathering cost data on each selected vehicle and developing an analytical model based on individual fleet circumstances, compare the results. During this phase:

- Analyze all relevant costs for each vehicle
- Rank vehicles according to projected life-cycle costs
- Establish potential savings for the life-cycle of each vehicle

This comparison *should* identify which vehicles ultimately will cost the organization the least amount – not just in terms of capital investment, but also in operating costs.

Life-cycle costing helps fleet managers identify when operating costs exceed replacement costs and is, therefore, a valuable tool for budget formulation and budget monitoring, as well as operating efficiently throughout the year.

For new vehicles, life-cycle costing helps to identify the true cost of ownership for lease/purchase decisions.

8. Components of vehicle cost

To manage vehicle costs effectively, a fleet manager and vehicle operator must first understand costs and the factors that they can influence to control them. Like production costs, the costs of providing a motor vehicle may be classified as variable or fixed, depending upon how the costs vary as a result of the miles accumulated. The operating costs of a vehicle relate directly to each mile driven. Thus, fuel, oil, maintenance, and tires represent variable or operating-cost categories.

Fixed costs relate more to the passage of time than to miles driven; that is, they remain substantially set over a given period of time, even when the miles driven change. Thus, registration, taxes, depreciation, insurance (or self-insured reserve), and lease payment (which includes depreciation) or finance expense represent fixed-cost categories.

Capturing costs enables a fleet manager to benchmark with other organizations. For purposes of this section of the operational practice, we will focus on an overview of operating costs.

8.1. Fuel

As you might expect, the cost of fuel remains the largest operating expense. For cable operator fleets, petroleum reduction requirements and regulations regarding acquisition of alternative fuel vehicles add complexity to tracking fuel usage and controlling costs. Central to controlling fuel costs is selecting the most fuel-efficient vehicles possible, given the fleet mission and unit usage. To help facilitate the selection process note Figure 3 and please utilize the worksheet in appendix A.

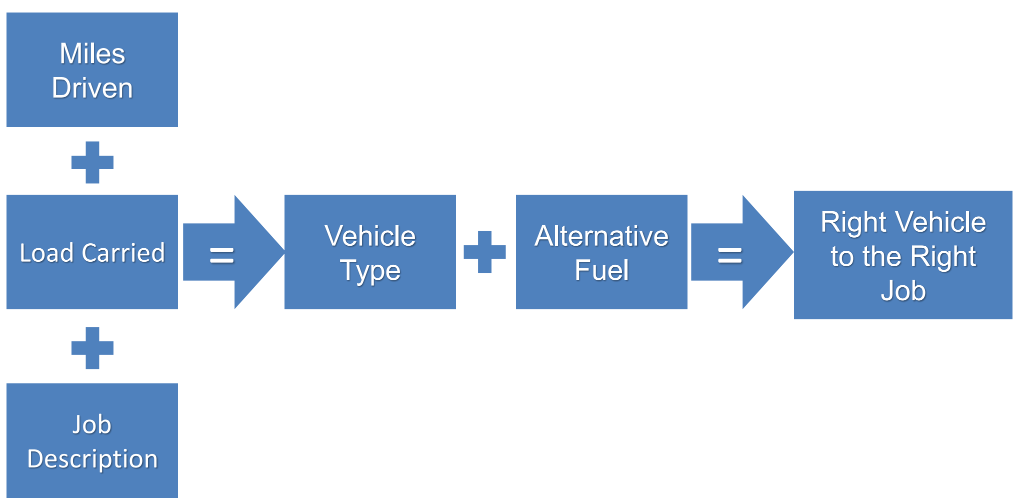

Figure 3 - Vehicle Selector Matrix

Purpose is to align the Tech and Line Manager and Supervisor with the proper vehicle based on job function, in conjunction with up-fitting the appropriate new vehicles with an alternative green solution.

Fuel conservation efforts, however, must go beyond acquisition of fuel-efficient vehicles. For example, fleet managers should maintain individual-vehicle fuel-consumption records and generate exception reports to assist in identifying excessive usage. One means of improving fleet fuel economy is through ongoing driver training to heighten energy-conservation awareness. Major elements to consider in such a program include:

- Fuel efficient driving techniques training;
- Trip planning;
- Vehicle maintenance;
- Promotional campaigns; and
- Participation in State and local energy conservation efforts.

Often, training funds are scarce and competitively divided within each organization; therefore, the fleet manager must be creative in his or her approach to succeed. For example, the fleet manager can look to the person responsible for "Energy Management" within the organization and combine the training requirement into this fund source. The fleet manager can also partner sustainability management teams to raise awareness.

8.2. Oil

Engine friction is a fact of life. Consequently, the effort to improve engine efficiency through the reduction of friction is an ongoing concern. Frequency of changing oil, oil quality, and type of oil affect the efficient operation of an engine and represent the primary means of controlling this cost area.

Changing engine oil regularly improves fuel efficiency and helps to keep engine parts in optimum operating condition. On the other hand, changing oil too frequently is a waste of this precious natural resource, adds unnecessary cost, and imposes an unreasonable burden of inconvenience upon the driver. An auto manufacturer's oil-change schedule *should* be viewed as the ideal guideline. Territory and driving habits ultimately influence the oil-change timing. Fleet managers and drivers *should* know whether their fleet vehicles operate under severe driving conditions, which are typically defined as:

- Trips that are less than 20 miles long.
- Driving in dusty or sandy conditions.
- Short trips in cold weather where the engine never warms up.
- Idling for extended period of time.
- Towing or pulling trailers.

Short trips do not allow the engine to heat sufficiently to remove condensation, which aids the formation of sludge and acid. Under these severe driving conditions, changing the oil according to recommended OEM specifications for oil service intervals assures far greater engine efficiency.

Failure to change oil at or before a manufacturer's specified timetable can also void a warranty. This cannot be overemphasized, and adherence is essential to avoid expending unbudgeted funds to pay the unplanned repair costs of a component. In this era of self-service fueling, fleet managers must insist that drivers assigned a vehicle maintain a full level of crankcase oil and adhere to the oil-change policy.

8.3. Maintenance

A sound preventive maintenance program is essential to minimizing total fleet expenditures. Obviously, vehicles *should* be properly maintained, and through the development and enforcement of policies and procedures, fleet managers can come to grip with controlling maintenance expenses.

A number of results of a poor maintenance program can negatively affect both the fleet and fleet-cost performance:

- Increased downtime
- Increased probability of unsafe vehicles
- Reduced resale value for vehicles at disposal time

Conversely, a number of the results of a sound maintenance program positively affect both the fleet and fleet-cost performance:

- Reduced operational costs
- Reduced frequency of accidents
- Reduced insurance costs
- Reduced downtime
- Increased probability of fulfilling mission and work assignments
- Optimum resale value for vehicles at disposal time

8.4. Tire selection and maintenance

Safety *should* be the number one approach to tire selection, maintenance and operation.

In general, low frequency of maintenance, increased tread-wear life, improved fuel economy, and enhanced ride characterize today's tires. Road adhesion, comfort ride characteristics, operating conditions, geography and tire performance characteristics dictated by the job will impact overall life expectancy of the selected tires.

Fleet operators *should* be cautious when looking at filling tires with anything other than the common gas station air filling stations. Elements such as nitrogen may on the surface appear to add performance enhancements, for a fleet operator, non-traditional air will complicate the maintenance of the tire.

It is important to match the tire rating with the normal operating load that the tire is mounted on. Please refer to the OEM specification.

Today's radial tires even help control fuel costs. Their stiff tread results in low rolling resistance, which reduces engine work. As a rule of thumb, rolling resistance has a 5 to 1 ratio with fuel economy; thus, a 25% improvement in rolling resistance results in a 5% fuel savings. Please note, refer to the specific OEM notices regarding rolling resistance and safety specifications.

The same tread stiffness enables a larger "footprint" on the road, which increases contact area and thereby improves handling and braking capabilities. The increased contact area is responsible to a significant degree for the excellent performance of radials on wet and snow-covered pavement.

The chief causes of early tire failures and increased tire expenses are:

- Incorrect tire pressure
- Improper alignment
- Wheels out of balance
- Bad driving habits
- Overloading

Under-inflated tires tend to wear along the sides, while over-inflated tires wear out down the middle. Drivers *should* maintain tire pressure at the vehicle manufacturer's specifications. A sticker indicating the proper pressure for a particular vehicle is usually mounted on the driver's door post or on the glove compartment door. The pressure limits embossed on the tire sidewall indicate the strength of the tire. Under-inflation leads to:

- Shortened tire life
- Reduced fuel economy
- Uneven tread wear
- Reduced handling performance
- Reduced braking performance

Over-inflation causes:

- Uneven tread wear
- Premature failure of the tire elements

8.5. Accelerated tire wear characteristics

To prevent accelerated tire wear, proper inflation (pressure to OEM specification) proper wheel alignment, wheel out of balance (indexing on truck tires) are all significant contributors to premature tire wear. Addressing and correcting inconsistencies with the three mentioned common issues will optimize tire life and can result in improved fuel efficiency.

8.6. Bad driving habits

Bad driving habits are a major cause of a multitude of problems concerning a vehicle's condition. For example, collisions with curbs, high-speed take-offs and fast cornering and last-minute braking contribute to rapid tire wear and lower fuel efficiency.

9. Fleet management optimization

Optimize Procedures: Align and standardize process and procedures with the OEM guidelines and recommendations. Do not underestimate the impact of geography when managing the fleet. Be cautious of accepting maintenance recommendations unsupported by OEM provided data.

Incentives and Training: Define, develop and deliver incentives based on training to motivate the teams to perform to expected targets set by senior stakeholders. The culture of performance is important to success.

Implement Technology: Telematics technology and global positioning systems (GPS), are tools that helps to create the opportunity for more effective routing and managing technician performance. Technical operations managers *should* both be able to transparently leverage the location and route activity to include:

- Time of arrival to a job compared to time that the job was actually started (tech status).
- Time of completion of the job compared to the time the vehicle started moving to the next job.
- Safety management – hard starts, hard stops and speed management *should* be examined. Real time feedback has proven to aid in driver performance improvements.
- Route adherence optimizing route management so that the right technician is dispatched at the right time for the right job.

- Diagnostic errors on vehicles possessing the On Board Diagnostic OBD 2 port system, can be reviewed to assess if vehicle maintenance is being handled in a timely fashion that aid in evaluating items like low battery voltage or OBD errors.

10. Leadership communication

Communication is critical to success. Integrating the respective stakeholder's key requirements will have the effect of optimizing fleet asset in the execution of the broader business plan. Key stakeholders would include: technical operations management, fleet management, and drivers themselves. Human behavior plays a significant role in impacting fleet optimization and this communication plan will directly affect optimization of fleet.

11. Fuel efficiency and petroleum reduction

Direct impacts on fuel efficiency include the following:

- **Route Optimization:** Fuel efficiency supporting fleet optimization begins with a holistic approach to fleet management. Obtaining clear insight into the entire fleet route optimization ensures the customers get the closest technician to the job at hand and provides management with the opportunity to optimize staffing.
- **Vehicle Right Sizing and Loading:** Overall fleet fuel efficiency will depend on selecting the right vehicle for the job as ensuring the right mix of space and weight capacity for the mission at hand. For example, rural technicians will have a larger demand on carrying quantity of parts to optimize fuel consumed and reduce unnecessary stops at a supply house. In the same light, larger cities could warrant lighter, smaller vehicles due to proximity of areas serviced in conjunction with the supply houses.
- **Idle Time Management:** Develop reports, scorecards from GPS, and incentives to track goals and improve vehicle idle time.
- **Preventative/Predictive Maintenance:** Define, adopt and educate technicians on companywide preventative maintenance programs based on manufacturer specifications. Predictive maintenance and the anticipation of failure prior to the actual breakdown *should* drive operations to the most effective operating conditions. Ensuring proper maintenance *should* align with management directive to prevent in service failure of the vehicle.
- **Direct Petroleum Reduction:** Sensitive to leading edge technological advancement in powertrain and fuel combinations, with the ultimate goal of reducing the energy investment required to deliver the optimum gallons per homes passed.

12. Conclusion

In many regions of the world, older, high-emitting vehicles account for a small percentage of the overall vehicle fleet but a disproportionately large share of total emissions. These vehicles may be responsible for more than 50% of particulate matter and black carbon emissions by 2020.

Cable Operator Fleet Maintenance Operational Practice is focused on Energy 2020, when establishing these operational practices. By developing sound practical metrics along with establishing policies and procedures for fleets, it becomes apparent and essential to maintain our leading edge competiveness.

The practices outlined create a proactive approach by seeking to reduce our fleet operating expense budgets and also reduces our emissions through improved performance. Implementing a vehicle replacement program to entirely replace older and gross emitting vehicles with newer, more efficient, and environmentally friendly vehicles will contribute to operating savings and enhanced MSO image in the communities we serve. The new vehicle selection *should* be determined by the Right Job/Right Vehicle Strategy with the alternative fuel overlay to ensure your newer, more efficient fleet meets your business needs as well as being environmentally friendly.

We all must continually strive to improve efficiency and performance with our fleets. In the past 30 plus years, each MSO has been relentless in the pursuit of innovation and engineering precision. This same passion and attitude must continue so each MSO can hire and train only the best certified fleet managers, to continually drive cost out and maximize the bottom line.

13. Appendix

13.1. Vehicle Selection Questionnaire

Table 1 - Fleet Tool: Vehicle Selection Workbook, Vehicle Selection Matrix Worksheet

Job Description			
Location (City, State)			
Participants			
1. Max Load Required (lbs.) *(Enter total weight of material, tools and equipment in vehicle.)*			
2. Towing Required (Yes/No)			
3. Max # of Passengers seats			
4. Storage Space Required • Small – *Trunk of Car* • Medium – *SUV Trunk* • Large – *Van or Truck Bed*			
5. Ladder Rack Required (Yes/No)			
6. Up-Fit Type Required • Tech Van Up-fit – *Vehicle may serve as Spare Tech Van* • Utility – *Any other Up-fit needed* • No Up-fit			
7. Average Miles Traveled per Day			
8. % Urban Driving Daily			
9. Total # of Employees in Job Type			
10. Alternative Fuel Preference (Yes/No, If Yes, select: CNG, LPG or Electric)			
Additional Comments *(Include other pertinent criteria such as, 4WD, Towing Capacity, Extreme Vehicle Loads, etc.)*			