Electronic Logging Devices (ELD) Final Rule Overview

Heavy Vehicle V2V Basic Safety Message and Implementation
PRESENTATIONS

FMCSA ELD MANDATE COMPLIANCE DATE IS APPROACHING

KEY REGULATION THAT WILL HAVE POSITIVE AFFECT ON SAFTEY
APPROXIMATELY 3.1 MILLION DRIVERS WILL NEED AN ELD
REVIEW OF THE MANDATE AND OPERATIONAL CONSIDERATIONS

NHTSA AS WELL HAS KEY INITIATIVES ON SAFETY IN THAT OF VEHICLE TO
VEHICLE SAFETY MESSAGES IN ALL VEHICLES COMMERCIAL AND PRIVATE
ANPRM ISSUED FOR AUTOMOTIVE
WE WILL HERE VIRGINIA TECH STUDY ON COMMERCIAL VEHICLES
Summary of Final Rule

Final Rule was published to Federal Register on December 16, 2015

Rule addresses

- ELD Use
- ELD Technical Standards
- Retention of Supporting Documents

Carrier is responsible for ensuring ELD has been registered with FMCSA
All CMV’s must have either an AOBRD or ELD installed by 12/18/2017.

- All devices must be ELD compliant by 12/16/2019.
- 2 Years - AOBRD or ELD Device may be installed
- 2 Years - Only ELD devices may be installed
- 2 Years - Continue to use AOBRD devices installed
# Comparison of Technical ELD Specifications

<table>
<thead>
<tr>
<th>Feature/Function</th>
<th>1988 AOBRD Rule</th>
<th>2015 ELD Final Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Integral Synchronization</strong></td>
<td>Integral synchronization required, but term not defined in the FMCSRs.</td>
<td>Integral synchronization interfacing with the CMV engine ECM to automatically capture engine power status, vehicle motion status, miles driven, engine hours. <em>(CMVs older than model year 2000 exempted)</em></td>
</tr>
<tr>
<td><strong>Recording Location Information</strong></td>
<td>Required at each change-of-duty status. Manual or automated.</td>
<td>Require automated entry at each change-of-duty status at 60-minute intervals while CMV is in motion, at engine-on and engine-off instances, and at beginning and end of personal use and yard moves.</td>
</tr>
<tr>
<td><strong>Graph Grid Display</strong></td>
<td>Not required – “time and sequence of duty status changes.”</td>
<td>ELD must be able to present a graph grid of driver’s daily duty status changes either on a display or on a printout.</td>
</tr>
<tr>
<td><strong>HOS Driver Advisory Messages</strong></td>
<td>Not addressed.</td>
<td>HOS limits notification NOT required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Unassigned driving time/miles” warning provided upon login.</td>
</tr>
<tr>
<td><strong>Device “Default” Duty Status</strong></td>
<td>Not addressed.</td>
<td>On-duty not driving, when CMV has not been in motion for 5 consecutive minutes, and driver has not responded to an ELD prompt within 1 minute.</td>
</tr>
<tr>
<td></td>
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<td>No other nondriver-initiated status change is allowed.</td>
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</table>
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<tr>
<td>Clock-time Drift</td>
<td>Not addressed.</td>
<td>ELD time must be synchronized to UTC, and absolute deviation must not exceed 10 minutes at any point in time.</td>
</tr>
<tr>
<td>Communications Methods</td>
<td>Not addressed – focused on interface between AOBRD support systems and printers.</td>
<td><strong>Two Options:</strong></td>
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<tr>
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<td></td>
<td>1. <strong>“Telematics”</strong>: At minimum, ELD must transfer data via both wireless Web services <strong>AND</strong> wireless email.</td>
</tr>
<tr>
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<td>2. <strong>“Local Transfer”</strong>: At minimum, the ELD must transfer data via both USB 2.0 <strong>AND</strong> Bluetooth.</td>
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<td>Both types of ELDs must be capable of displaying a standardized ELD data set to authorized safety officials via display or printout.</td>
</tr>
<tr>
<td>Resistance to Tampering</td>
<td>AOBRD and support systems must be, to the maximum extent practical, tamperproof.</td>
<td>ELD must not permit alteration or erasure of the original information collected concerning the driver's ELD records or alteration of the source data streams used to provide that information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELD must support data integrity check functions.</td>
</tr>
<tr>
<td>Identification of Sensor Failures and Edited Data</td>
<td>Must identify sensor failures and edited data.</td>
<td>ELD must have the capability to monitor its compliance (engine connectivity, timing, positioning, etc.) for detectable malfunctions and data inconsistencies.</td>
</tr>
<tr>
<td></td>
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<td>ELD must record these occurrences.</td>
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</table>
Exemptions from the Rule

Drivers who conduct driveaway-towaway operations, where the vehicle is the product being delivered

Drivers of vehicles manufactured before model year 2000 (due to vehicle connectivity concerns; this is a change from the proposed rule)

Short-Haul Drivers are generally exempt
  • Includes both large CMV and smaller CMV drivers that currently use the “time card” exception
  • Exclusions to the exemption:
    — May only use paper logs up to eight days in any 30-day period when the air-mile exemption is exceeded
    — Any driver that exceed the air-mile radius exemption more than eight days in a 30-day period must then have an ELD installed on the CMV
ELD Device Certification

Federal Register for ELD Registration (April 2015)

- Register Online
- Online Certification

- Manufacturers are required to test and certify to FMCSA that their devices meet the new standards
- FMCSA will create a public (i.e., Internet) registry of compliant devices and conduct tests to verify manufacturers’ claims
- Carriers may only use ELD devices from a manufacturer that has registered and “self-certified” with the FMCSA and is listed on the FMCSA website
ELD Device Design

- Display size not specified
- Portable ELDs must be mounted during operation of CMV
- Display must be available to enforcement outside of the cab of the truck
- System must have an option for mute or volume control when the driver is in sleeper berth
Security and Tampering Resistant

ELD must provide secure access to data recorded and stored on the system
- Require user authentication during login
- Data must be encrypted to ensure security when transferred to safety officials

Driver accounts only have access to data associated with specified driver
- Protects authenticity and confidentiality of the collected information
- Support employees must have own account

ELD must not allow any individual to tamper with the data
- Incorrect date, time, and location changes to on-duty driving status
- Alter a record created by that ELD
ELD Display Requirements

Identical to current requirements AND
- Driver’s First and Last Name
- ELD Username
- Total Engine Hours
- Miles for Each Driving Period
- ELD Malfunction Status
- Data Diagnostic Status Indicator for the Authenticated Driver
ELD Technical Requirements

**Events record these data elements:**

- Date and Time
- Location
  - One mile while on duty
  - 10 miles during personal use
- Engine Hours and Vehicle Mileage
- Driver Login
- Vehicle Identification
- Authorized Carrier Identification
- Engine Hours, Speed, and Distance

**Events are recorded:**

- At startup and shutdown
- Change of Duty Status
- Once per hour while the vehicle is operating
- At the start and end of Personal Use or Yard Time
ELD Account Creation

- Unique identifier and Driver’s License number
- Drivers must not have administrative rights
- Support and Administrative employees must have own account
- Owner-Operator – will have two accounts: driver account and administrative account
Unidentified Driving & Special Driving Conditions

- ELD must include unassigned driver account
- All unassigned driver time must be assigned OR accounted for on the system and displayed

- Personal Conveyance
  - Not Limited
  - Recorded as Off-Duty

- Yard Moves
  - Recorded as On-Duty not Driving
  - Use as Carrier Determines
ELD Driver Interaction

Driver prompted for entry if one of the following occurs:
  – If the vehicle is in motion with no driver logged in
  – Duty status change if stopped for five minutes or longer (system default is to go into On Duty)
  – Location if there is no GPS signal at the time of duty change

Driver prompted only when vehicle is stopped

Driver does NOT have to be prompted when approaching HOS limits
Automatic Duty Status Change

Change to Drive Duty Status when motion is detected

Require an alert if the vehicle stops moving after five minutes; prompt driver, if no response within one minute change to On Duty Status

Other automatic duty-status actions are prohibited
Driver Edit & Log Approval

- Driver can edit log, except Drive line
- All edits require a comment in order to accept the changes made
- Back office changes must be approved/accepted by the driver
- Original Records must be preserved
- Driver MUST be able to get copies of all records for the past six months from the carrier or system
Roadside Data Transfer Process

- One step process for data transfer
- The ELD must now support ONE of two options for electronic data transfer. At a minimum, it must electronically transfer data to an authorized safety official on demand via…..

- **Telematics** – via **wireless Web services** and **email**
- **Local transfer** – via **USB2.0** and **Bluetooth**
- Both types must be capable of displaying a standardized ELD data set in the format specified in this rule to an authorized safety official on demand, the authorized official selects method of transfer

- **Backup requirements**:
  - Drivers must be able to show a roadside inspection officer a graph-grid of his/her hours of service compliance, either on the ELD’s display or on a hardcopy paper printout.
  - The display must be visible to the officer without entering the vehicle, such as handing the display to the officer.
5 Categories of Supporting Documents

- Origin and Destination (BOLs)
- Dispatch and Trip Reports
- Expense Receipts
- Mobile Communication
- Payroll
Supporting Documents

Required Data Elements
- Driver Name
- Date
- Time
- Location

• Max of eight records in a 24-hour period
• Drivers must submit within eight days
• Drivers must produce at roadside (those that are in possession)
• Must retain information so that it matches the log
• Carrier must keep minimum of eight supporting documents per driver per day if they have them
• If the carrier does not have eight supporting documents with all the elements, they must keep those that have all elements except “time”
<table>
<thead>
<tr>
<th><strong>Publication Date</strong></th>
<th>December 16, 2015</th>
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<td>The date the rule was published in the Federal Register</td>
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<table>
<thead>
<tr>
<th><strong>Effective Date</strong></th>
<th>February 16, 2016</th>
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<tbody>
<tr>
<td>The date the rule goes into effect; 60 days after the publication date. <strong>Enforcement Phase 1 begins</strong></td>
<td></td>
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<tr>
<th><strong>Compliance Date</strong></th>
<th>December 18, 2017</th>
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<tbody>
<tr>
<td>The date that all carriers must be compliant with the rule; two years from the publication date; CMVs must have AOBRD or ELD installed. <strong>Enforcement Phase 2 begins</strong></td>
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<thead>
<tr>
<th><strong>Full Compliance Date</strong></th>
<th>December 18, 2019</th>
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<tr>
<td>CMVs must have ELD installed <strong>Enforcement Phase 3 begins</strong></td>
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Phase 1

- **Awareness and Transition Phase:** The two-year period following publication of the ELD rule February 16, 2016 to December 18, 2017.
- During this time, carriers and drivers subject to the rule should prepare to comply, and may voluntarily use ELDs.
- Carriers and drivers subject to the rule can use any of the following for records of duty status (RODS):
  - Paper logs
  - Logging software
  - AOBRDS (Automatic On-Board Recording Devices)
  - ELDs that are registered and listed on the FMCSA website
- Logging software roadside requirements for LE:
  - Display and printout required per inspector’s request. Graph grid required.
- ELD Roadside requirements for LE:
  - Display or printout required, per driver’s choice. Graph grid required.
  - (Optional: Fax or email may be provided.)
- AOBRD Roadside requirement for LE:
  - Display required. Allowed to have chart, electronic display, or printout.
  - (Optional: Fax or email may be provided.)
Phase 2 and 3

• **Phase 2: Phased-In Compliance Phase:** The two-year period from the Compliance Date to the Full Compliance Phase (four years following ELD rule publication) December 18, 2017 to December 16, 2019.

  - Carriers and drivers subject to the rule can use:
    - AOBRDS that were installed prior to December 18, 2017.
    - Certified, registered ELDs following rule publication December 16, 2015.

  During this second phase, information technology software tools will be available to securely transmit ELD record of duty status (RODS) information to FMCSA officials and law enforcement for enforcement and compliance purposes. The rule’s new supporting document requirements for drivers and motor carriers using either device will also begin during this phase, on the rule’s compliance date.

• **Phase 3 - Full Compliance Phase:**

  - After **December 16, 2019** all drivers and carriers subject to the rule must use certified, registered ELDs that comply with requirements of the ELD regulations.
Questions?
Overview

• Introduction
• Background
• Project Description and Objectives
• Approach
• Discussion
Acknowledgements

- Industry stakeholders
  - Great Dane Trailers
  - New Flyer
  - Motor Coach Industries (MCI)
  - IC Bus, Navistar, Inc.
  - Kenworth Trucks, PACCAR, Inc.
  - ATA
Virginia Tech Facts

- 32,000 students
- 4th largest College of Engineering in the U.S.
- 140 new engineering faculty in the next 10 years (more than 500 total)
- Allows us to perform completely proprietary and confidential research
  - No disclosure without sponsor approval
  - Vast experience conducting propriety/confidential research
VTTI Facts

• #1 or #2 largest transportation institute in the U.S., depending upon metric
  – #1 in federal grants and contracts
  – #1 in private-sector contracts
  – Largest group of driving safety researchers in the world
    • Active + Passive
    • Experimental, Naturalistic, Epidemiological
    • Pioneer of Naturalistic Driving Study Research Method

• 72 sponsors; 270 projects
  – More than 40 ongoing proprietary projects
• 475 employees
• More than 150 grads/undergrads supported annually
• Projected to grow 50% during the next three years
Connected Vehicles and Infrastructure

- Since 2005, VTTI has conducted $30M+ in connected V2V, V2I, and V2X projects
- VTTI is working on 30+ connected-vehicle projects
  - Working on both DSRC and cellular applications for V2I, V2V, and V2X
Smart Road Connect-vehicle Test Bed
Vehicle-to-Vehicle Communication

- SAE Standards
  - J2735 – defines a message set for V2X communication
  - J2945/1 – defines minimum performance requirements for V2V safety applications for light vehicles
Heavy Vehicle V2V Research Overview*

- Demonstrated V2V on Heavy Vehicles in Controlled and Naturalistic Environments
  - Developed prototype V2V trucks and retrofit systems
  - Driver feedback from Commercial Vehicle Driver Clinics.
  - Safety Pilot Model Deployment
  - Performance requirements for safety applications and radio and communications performance (antenna placement, safety applications)

- Heavy Vehicle Specific Data Analysis and Safety Benefits
  - Applicable heavy vehicle V2V crash scenarios and target population.
  - Determined V2V safety application effectiveness on tractor trailers and calculated preliminary safety benefits.

- Evaluated unique heavy vehicle issues
  - Developed Basic Safety Message (BSM) for articulated vehicles including combination vehicles with 1 or more trailers

Background: Development of HV BSM

• Primary sources related to Tractor Trailer Basic Safety Message (TT-BSM) Development project
  – Key findings
    • Trailer modeled as separate “vehicle” during turn maneuvers
    • Computed based on trailer geometry and tractor dynamics
  – Key take-away: proposed parameters for HV BSM
    • DF_TrailerInfo is proposed and describes the trailer position and heading.
    • Need length and pivot locations (kingpin and axle locations) of trailer
Project Objectives

- Identify single unit trucks that require additional information in the BSM
- For combination trucks, develop and evaluate system concepts to capture the length and pivot locations of the trailer
- Build and test a prototype of one of the system concepts
Strategy

- Identify the spectrum of possible solutions
  - Default values, driver input…automated identification, “smart” trailers
System Architecture

- Sensor 1
- Sensor 2 (opt.)
- Sensor n (opt.)
- User Interface (opt.)
- Truck network (J1939)

OBU

- IMU
- GNSS

DSRC Antenna

GNSS Antenna
Strategy

• Identify technologies needed to implement possible solutions
• Develop system concepts to support solutions
• Evaluate the design concepts based on the following high level categories:
  – performance, cost, manufacturability, installation, maintenance, cross functionality
Workflow

Review Existing HV V2V Research

BSM Evaluation

HV Related Classifications

Model Development
Workflow

Key Parameters for HVs

Identify Vehicle Types & BSM Recommendation

Single Unit Trucks

Combination Unit Trucks

Identify Technologies to Measure Key Parameters

System Concept Development

System Evaluation Matrix

Build and Test Prototype
# Evaluation Criteria

<table>
<thead>
<tr>
<th>System Features</th>
<th>System Dependencies</th>
<th>Cost Estimates</th>
<th>System Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting requirements</td>
<td>Placement</td>
<td>Material costs</td>
<td>Cost Estimates</td>
</tr>
<tr>
<td>Installation requirements (OEM, Fleet, Owner-operator)</td>
<td>Limitations on truck types</td>
<td>Manufacturing cost</td>
<td>Adaptability - different truck/trailers</td>
</tr>
<tr>
<td>CPU</td>
<td>Calibration requirements</td>
<td>Installation cost</td>
<td>Scalability (volume)</td>
</tr>
<tr>
<td>Truck interface</td>
<td>Service needs</td>
<td>Maintenance cost</td>
<td>Maturity of Technology</td>
</tr>
<tr>
<td>Enclosures</td>
<td>Special installation req’s</td>
<td></td>
<td>Manufacturability</td>
</tr>
<tr>
<td>Manufacturability (DFM)</td>
<td>Driver interactions</td>
<td></td>
<td>Maintenance</td>
</tr>
<tr>
<td>Software requirements</td>
<td>Required updates (SW)</td>
<td></td>
<td>SW updates implementation</td>
</tr>
<tr>
<td>Health monitoring</td>
<td>Regulation compliance</td>
<td></td>
<td>Component costs</td>
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<tr>
<td>Redundant measurements</td>
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<td>Replacement procedure</td>
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<tr>
<td>Component count</td>
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<td>System health monitoring</td>
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<tr>
<td>Cabling</td>
<td></td>
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<td>Cross platform applicability (LV)</td>
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<tr>
<td>Tamper resistance</td>
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<td>Additional functionality (BSW)</td>
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</tbody>
</table>
Summary

• Project Goal: Identify methods to identify trailer parameters to support heavy vehicle V2V applications

• Next Step: Continue discussion among industry stakeholders and invite feedback now and as the project moves forward
Discussion
Contacts

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