Plug-In Hybrid Medium-Duty Fleet Demonstration and Evaluation Program

FOA-28 Award #EE0002549

Webcast
April 15, 2010

Courtesy of Eaton
Program Overview

Mark Kosowski - EPRI

Courtesy of Eaton
Vehicle Description

- F550 & E450 Chassis Options
- Ford 6.7L diesel and 5.4L gasoline engine options
- 13 – 15 kWh Li-Ion battery pack
- Regenerative braking
- Engine-off at zero speed
- All-electric operation at low speeds
- All-electric jobsite operation

Courtesy of Eaton
Project Objectives

• Demonstration and evaluation of 378 PHEV medium-duty trucks
• Develop a production ready PHEV system for class 4 – 5 vehicles
• Develop production ready “smart charging” capability for vehicle
• Build customer familiarity
• Use project results for further system refinement
• Conduct studies to develop a path for successful commercialization
Program Milestones

Start Program (December 2009)

Volume Production Build Complete (September 2011)

1st Fleet Delivery (April 2011)

Fleet Evaluation Complete (Aug 2013)
## Project Funding Breakdown

<table>
<thead>
<tr>
<th>Source</th>
<th>Funding Amount</th>
<th>Percent of Total</th>
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</thead>
<tbody>
<tr>
<td>DOE</td>
<td>$45.4M</td>
<td>50%</td>
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<tr>
<td>CEC</td>
<td>$5M</td>
<td>5%</td>
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<tr>
<td>EPRI</td>
<td>$3.1M</td>
<td>3.4%</td>
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<tr>
<td>Eaton</td>
<td>$2.38M</td>
<td>2.6%</td>
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<tr>
<td>Fleet Participants</td>
<td>$35M</td>
<td>39%</td>
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</table>
Key Partners with the DOE

South Coast AQMD (Lead)

EPRI (Program Management)

Eaton Corporation
Smart Charging Suppliers
SCE Evaluation
Fleet Participants
Altec Industries

Ford Motor Company
A123 Inc.
Emerson
Other Key Suppliers

Hybrid Installation
Battery Pack Manufacturer
Motor Inverter
E-Accessories

Body Manufacturer
Financial Services
Specifications Overview and Fleets

Mark Kosowski - EPRI

Courtesy of Eaton
PHEV F550 Program Scope and Specifications

Scope:

• Eaton Hybrid 6 speed Automatic-Manual Transmission
• Ford 6.7L Diesel Engine
• High Energy Lithium-Ion Battery (13 to 15 kWh)
• Blended Regenerative Braking
• Engine Off at Zero Speed
• On-board Charger (>3.3 kW)
• Charging-Level 1 (120 Vac) and Level 2 (240 Vac)
• Electrified Accessories (Steering, Brakes, and HVAC)
• Export Power (5 kW, 120 Vac, 60 Hz)

Performance Specifications:

• ePTO operation (>5 Hours with Engine-Off)
• Up to 10 miles pure electric range (30 mph average)
• Up to 300 miles range between refills
• Charge time less than 6 hours with Level 2
• FMVSS compliant
PHEV E450 Program Scope and Specifications

Scope:

- Azure Hybrid System
- Ford 5.4L Gasoline Engine
- High Energy Lithium-Ion Battery (13 to 15 kWh)
- Blended Regenerative Braking
- Engine Off at Zero Speed
- On-board Charger (3.3 kW)
- Charging-Level 1 (120 Vac) and Level 2 (240 Vac)
- Electrified Accessories (Steering, Brakes, and HVAC)

Performance Specifications:

- Up to 10 miles pure electric range (~25 mph average)
- Up to 300 miles range between refills
- Charge time less than 6 hours with Level 2
- FMVSS compliant
## Base Vehicle Offerings

<table>
<thead>
<tr>
<th></th>
<th>Body Style</th>
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<tbody>
<tr>
<td><strong>Chassis</strong></td>
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<td></td>
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<tr>
<td><strong>GVWR</strong></td>
<td>F550 4 X 2</td>
<td></td>
</tr>
<tr>
<td><strong>Wheelbase</strong></td>
<td>141&quot;</td>
<td>165&quot;</td>
</tr>
<tr>
<td><strong>Cab to Axle Length</strong></td>
<td>60&quot;</td>
<td>84&quot;</td>
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<tr>
<td><strong>Minimum Payload</strong></td>
<td>4000 lb</td>
<td>7900 lb</td>
</tr>
<tr>
<td></td>
<td>3500 lb</td>
<td>3000 lb</td>
</tr>
<tr>
<td></td>
<td>7500 lb</td>
<td>Shuttle</td>
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<tr>
<td><strong>Body</strong></td>
<td>AT35G</td>
<td>AT37G</td>
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<tr>
<td></td>
<td>Service</td>
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<td>AT37G</td>
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<td>AT40M</td>
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<tr>
<td></td>
<td></td>
<td>Service</td>
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<tr>
<td><strong>2011 F550 Diesel 6.7L</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>2011 E450 Gasoline 5.4L</strong></td>
<td>NA</td>
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*Courtesy of Eaton*
# Program Timing

<table>
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<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tr>
<td>Body Design</td>
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<tr>
<td>Fleet Specifications and Ordering</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design and Produce Hybrid System</td>
<td></td>
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<tr>
<td>Prototype Vehicle Build and Test</td>
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<tr>
<td>Non-Hybrid Vehicle Manufacturing</td>
<td></td>
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<tr>
<td>Hybrid Vehicle Manufacturing</td>
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<tr>
<td>Fleet Deliveries</td>
<td></td>
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<tr>
<td>Fleets in Field</td>
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Today
Accomplishments to Date

• Three Fleet Participants webcasts were completed
• Fleet surveys conducted
• Kick-off meeting with the DOE held on January 27, 2010
• Face to Face Meeting was held with the Fleet Participants on February 4 and 5, 2010 in Pomona, California
• Specifications: 80% Complete
• Component Development: Major suppliers selected, Other Suppliers being selected
• SOWs are being finalized at all levels
• Manufacturing has planned the stations and needs for the production line
Near Term Actions

- Next Face to Face Meeting planned in June time frame in eastern side of the US
- Fleet Agreements will be ready no later than April 30
- Webcasts will occur every 6 to 8 weeks dependent on the need in between Face to Face meetings
- Website will be available for communications
- Chassis specifications will be finalized and communicated to the fleets for review
- Complete the Requirements
- Complete the SOWs
- Complete the Supplier Selection
Charging and Infrastructure

Mark Kosowski - EPRI

Courtesy of Eaton
Clarifying Infrastructure and Charging Requirements

- PHEV Medium-Duty Trucks will have two versions of charging
  - Level 1
  - Level 2 (low)

<table>
<thead>
<tr>
<th>Type</th>
<th>Power Level</th>
<th>Vehicles</th>
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</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>1.2 – 2.0 kW</td>
<td>PHEVs (10-20 mi range)</td>
</tr>
<tr>
<td>120 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2 (low)</td>
<td>2.8 - 3.8 kW</td>
<td>PHEVs, EREV (20-40 mi range)</td>
</tr>
<tr>
<td>240 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 2 (high)</td>
<td>6 – 19 kW</td>
<td>EVs (80+ mi range)</td>
</tr>
<tr>
<td>240 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 3 (DC-DC)</td>
<td>20 – 200 kW</td>
<td>EVs</td>
</tr>
</tbody>
</table>
Charging – Level 1 Charging

• Level 1 plugs generally anywhere

• It is plugged into a normal 120V Nema outlet powered up to 2 kW

• Level 1 charging will take from 12 to 14 hours to charge
Charging – Level 2 Charging

- Level 2 can be used with a Charge Station
- The Charge Station is hardwired to 208V or 240V Single phase

Level 2 EVSE

Common Inlet on the Vehicle
Fleet Infrastructure Challenges

• EVSE will be either from:
  – ClipperCreek, Inc. or
  – Coulomb Technologies, Inc. or
  – Other qualified suppliers (but EVSE must be made in the USA, have been experienced in the field, and EPRI approved)

• All charging facilities will be ready prior to vehicle delivery

• EPRI will provide Infrastructure Support to the fleets as needed
Smart Grid

Sunil Chhaya- EPRI

 Courtesy of Eaton
Why a Smart Grid Interface with Medium Duty PHEV?

• Enable PHEV to perform demand response, load control and off-peak charging functions
  – Demand response: Interrupt charging during a summer peak emergency
  – Load control: Control charging power to a specific value based on premise circuit loading criteria
  – Off-peak charging: Either time or price-based signal that shifts charging interval during off-peak hours
• Provide means for utility to communicate bidirectionally with the PHEV using standardized interface
  – Hardware: Various transport layers
  – Software: Standard set by SAE (SAE J2236/J2247)

Question for participants – Need to understand your smart metering interface requirements for EPRI to design to and scope for implementing and using ‘smart charging’ functions
Typical Mode of Operation for Smart Charging Medium Duty PHEV

- All of the PHEV to smart meter communications is in silent mode – no operator intervention required
  - Operator override provision possible for quick charge
- The truck driver just plugs in the vehicle for recharging
- Communication between smart meter or HAN (Home Area Network) controller over power line (PLC type method)
- Based on the default settings or operator preferences for pricing, time of charge, the vehicle will respond to utility pricing, demand response or load control signals to modify charging commands for the battery, while completing charging by scheduled time
- All communication based on messages designed by the SAE standard
- Vehicle always defaults to ‘dumb’ charging in the absence of a smart node to ‘talk’ with

Question for participants – Need to understand your specific requirements for programs related to demand response, off-peak charging and load control
Medium Duty PHEV to Smart Grid Interface Reference Design – Multi-Protocol Router (MPR)

- Connects any PEV with any smart meter
- Standardized SE2.0 application layer
- Vehicle side: J1939 (CAN)
- Meter side: ZigBee, WiFi, Ethernet, HomePlug, expandable to WiMax and 3G/4G cellular data
- Programmable web server interface for protocol conversion setup
- Open and extensible architecture based on off-the-shelf components

Question for participants – Requirements for interfacing with your back office, smart meter or Distribution Automation systems
Multi-Protocol Router Plan of Execution

• Project underway since August 2009
• First design samples for EPRI testing: mid-2010
  – First samples for automotive on-board application delivered last week for another project
• First ruggedized samples for truck integration: 4Q2010
  – On track
• EPRI will lead to help Eaton integrate hardware and software functionality of MPR for seamless operation

MPR hardware and firmware delivered for on-board implementation for one automotive OEM on 4/8/10
Next Steps

• Initiate funding and R&D contract for MD PHEV implementation of MPR
• Aggregate utility requirements for charging incentives and smart metering technologies to assess the scope of work
• Agree on a joint development plan with Eaton
• Define roles and responsibilities for AMI interface functionality to be integrated on-board the vehicle, among EPRI, utility and Eaton teams
Technical Overview

Hélène Cornils- Eaton
The F550 Diesel Utility Plug-in Hybrid System will include:

- Eaton EH-8E306A-CD AMT Transmission (6-Speed)
  - Electric Clutch Actuator (ECA)
  - Single-plate Dry Friction Clutch
  - Transmission Control Unit (TCU)
  - Electronic Power Take Off (ePTO)
- Eaton Direct Hybrid System – Power Electronics
  - 12 kWh min usable energy Liquid-cooled Li-ion batteries – 352V DC nominal
  - Electric Motor/generator Controller / Inverter. Liquid-cooled
- Power Electronics Carrier (including battery)
- Hybrid Control Module (HCM) for supervisory powertrain control
- High Voltage Cables (AC and DC) and Connectors
- Electrified Accessories
- 120 V export power with 6 outlet panel. DC/DC converter (1.5kW, 13.5V output)
- Battery Charger (Level 1 and 2 compliant)
F550 Diesel Plug-in Hybrid Overview
F550 Diesel Plug-in Hybrid Overview

- 15kW Battery Box
- Converter
- Power Steering Pump & Motor
- AC Compressor
- Cooling Pump
- Traction Motor Inverter
- Power Steering Motor Controller
- Charger
- APG
- HV Junction Box
- A/C Condenser, Electronic Cooling Heat Exchanger & Fans

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Estimated Benefits

• Productivity (without HVAC)
  – Estimated 10 miles EV mode
  - or -
  – Estimated 5 to 6 hours of engine-off operation at work site (e-PTO mode)
  – Battery charging in less than 6 hours

• Fuel Economy
  – Estimated fuel savings up to 63% (depending on drive cycle and use of HVAC)

• Reduced CO2 emissions
• Reduced Noise
E450 Gasoline Plug-in Hybrid

Eaton is currently working with AZURE to develop a plug-in version of the AZURE Balance Hybrid on E450 gasoline Shuttle bus

**Benefits:**
- AZURE system is already developed and certified by Ford on the E450 5.4L gasoline shuttle bus application (including e-accessories)
- The Plug-in system will include the same A123 battery pack than the F550 Diesel
- AZURE is Ford QVM certified and would install A123 battery at their facility
- Limited RnD required (“fast” development and deployment)

**Drawbacks:**
- Post transmission design (less efficient)

**Estimated Timing:**
- Battery pack integration: 8 months
- Vehicle validation: 2 months
- Start of production: 10 months after contract
Battery will be replaced with A123 14.1kWh pack.
Actions Taken in 1st Qtr 2010

- **Technical**
- **Specification**
  - Project Scope – 90% complete
  - Vehicle Specification – 95% complete
  - System Specification – 90% complete
  - Vehicle weight distribution – complete
  - Charging sequence strategy – 50% complete
  - SAE J1772 interface investigation

- **Ford**
  - Ford is fully engaged and supportive
  - 2 Engineering vehicles were delivered to Eaton
  - Working with Ford on logistics, safety and validation
  - First 20 units scheduled at Ford
Actions Taken in 1st Qtr 2010

• **Technical**
  • Component Development
    – Supplier Selection – 75% complete
    – Eaton received first battery and motor
    – Body design / PHEV space claim complete
    – Clutch Development – kicked off
    – Flywheel and flywheel housing development – kicked off
    – Motor FEAs complete

• System feasibility study
  – Structural analysis complete
  – Base vehicle performance testing – complete (MY 2011 vehicle testing)
  – Packaging analysis - complete
  – MP2 vehicle received – will be sent to Altec for upfitting
  – Ran tests on redundant approach for e-accessories
Actions Taken in 1st Qtr 2010

• General:
  • Contracts between key partners are being finalized
  • Contract Expert has been brought on board to support project.
  • Informative Website has been developed by Eaton

http://www.roaddranger.com/Roadranger/DOEProject/index.htm
Current Resource Ramp Up

- October
- November
- December
- January
- February
- March
Manufacturing

Chad Sarver - Altec
Aerial Device Integration
Body/Chassis/PEC Integration
Body/Chassis/PEC Integration (cont.)
Body/Chassis/PEC Integration (cont.)
Ordering Process

• All orders will be sent to Altec Program Manager
• Altec will procure the chassis cab for all participants
• All 2011 chassis orders to be processed by May 2010
• All order packages to be processed by May 2010
• All customer specific promise delivery dates will be given to the fleet participants by Altec Program Manager
• Package design will be reviewed by Altec Engineering for feasibility in regards to weight restraints and layout of PHEV system
• All orders will be subjected to a Total Quality build program which will be initiated by Altec with each fleet participant
Demonstration and Evaluation

Mark Kosowski - EPRI

Courtesy of Eaton
Demonstration and Evaluation

• All vehicles will be up-fitted with a Data Acquisition System
• While the vehicles are used in the field, the system will accumulate data during vehicle-on events
• The data will be periodically sent to a main-frame computer for storage and reporting
• The Events will be either:
  – Key-On Events, Charge Events, or Aerial Events
• Data and reports will be available to analyze usage, loads, and consumption trends
• The demonstration phase will last about 2 years
Data Acquisition System

- All vehicles will be up-fitted with a Data Acquisition System
- Presently, the preferred system is made by Telogis. Final selection will be made soon.
- Monthly telemetry costs will be covered by the program
- The system includes a fleet management system that is localized to the fleets but can also aggregate multiple fleets
- The system will be used to upload daily data stored on the vehicle for analysis
One Platform for Location Intelligence
Product & Solution Overview
One Platform for Location Intelligence

**Telogis Fleet**
Get real-time location and status for all assets with full fleet metrics, alerts and reports.

**Telogis Route**
Reduce miles and travel times with optimized routes and instant reroutes. Link to Telogis Fleet for Actual vs. Plan.

**Telogis Mobile**
Stay Connected through two-way messaging, forms, work orders & navigation.

**Telogis Integration**
Full API capabilities with seamless integration, training and enterprise support.

**Telogis GeoBase**
Build powerful and differentiated mobile and web-based location based services.
One Platform for Location Intelligence

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Full API capabilities with seamless integration, training and enterprise support.

**Telogis GeoBase**
Build powerful and differentiated mobile and web-based location based services.
The most reliable, scalable and comprehensive fleet management solution in the market. Improve operations, asset utilization and driver safety with GPS software that scales to fleets of all sizes. Give IT and business stakeholders the right tools to be successful with GPS across the enterprise, with flexible APIs and GPS hardware options.
Key Features of Telogis Fleet

- Fast & Powerful Mapping
- Find Closest Capable Driver
- Routing with Optimization
- Maintenance Reporting
- InSight Real-Time Alerts
- Vehicle Diagnostics
- Automated Advanced Reports
- Fleet, Driver & Team Management
- Role Based Hierarchy
- Alerts Against Posted Speed Limits
- Enterprise Dashboard
- Turn-by-Turn Navigation
- GIS Map Content Layers

Real-Time GPS Tracking & Management Tools

DigitalGlobe™ Satellite Imagery
Fast Mapping with Spatial Clustering

Telogis Fleet provides rich and extremely detailed maps for war rooms and fast paced dispatch environments

- See an entire fleet of thousands of vehicles on one screen and quickly, drill down to a single vehicle (in lightning speeds)
Seamless Role-Based Hierarchy

Whether you’re the CEO, Operations Manager, Risk Manager, Dispatcher, IT Manager or have some other role within the company, Telogis Fleet delivers customized views using a single, common data repository.

- Security levels and assignments are user-configurable with an unlimited number of sub-users

**Security levels include:**

- Crew
- Field Supervisor
- Fleet Supervisor
- System Administrator
InSight Alerts & Driver Scorecards

InSight™ allows you to enter business rules and receive notifications of violations to control your business without spending a lot of time poring over reports or clicking on maps.

**Set up InSight** for vehicle, fleet, driver or teams and be notified only when exceptions to defined rules occur:

- Vehicle idle time
- Hard braking
- Hard swerving
- Fuel & oil level
- Engine data
- Speeding against posted speed limit
- Maintenance
- And much more
Over 75 Powerful Automated Reports

Telogis Fleet offers a flexible reporting engine with a full suite of reports, ranging from very detailed to high level

- Run reports by vehicle, fleet, driver or team
- All reports are generated in an easy-to-read format that can be printed, saved or set to send automatically to one or more recipients
- Most reports allow you to jump to the detailed map view in one click
- Save your setup for one-click reporting
- 78 standard reports, 84 standard alerts and unlimited custom possibilities
- Telogis offers more report flexibility than anyone in the industry, both real-time or scheduled and emailed reporting
Enterprise Dashboard

Customizable KPIs that monitor fleet and operational performance such as **fuel efficiency, on-time/late arrivals, idling time, speeding, maintenance alerts**, and more

Fleet Managers can see exactly what is costing more than expected, while operation managers can compare productivity by division or region.
Engine Diagnostics

Telogis Fleet provides the ability to determine vehicle maintenance frequencies based on true usage time.

Examples of engine diagnostic data:

- Battery usage hours
- Fuel metrics
- Ignition
- Boom
- PTO
- And more
Actions for Fleet Participants

- Send Truck Specifications to Altec for approval
- Vehicle orders need to be completed and into Altec by May 30
- Fleet agreements should be approved and sent back by May 30
- Fleets need to identify that support is required for EVSE installation
- Fleets need to identify the kind of EVSE required—wall-mount, post mount, or floor mount
- Need to understand fleet’s smart metering interface requirements for EPRI to design to and scope for implementing and using ‘smart charging’ functions
- Need to understand fleet’s requirements for programs related to demand response, off-peak charging and load control
- Need requirements for interfacing with your back office, smart meter or Distribution Automation systems
Questions and Answers
Contacts

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EATON
Hélène Cornils
(269) 217-8884
Helenelcornils@eaton.com
Auto Industry Adopting Single Conductive Connector (SAE J-1772)

• 2 power contacts – up to 80 amps, 240 Vac, 19.2 kW
• 1 ground contact
• Control Pilot signal
  – Verification of vehicle connection
  – Supply equipment ready to supply energy
  – PEV ready to accept energy
  – Ventilation requirements
  – Supply equipment current capacity
  – Equipment ground present
• Proximity detection
  – Indicates to vehicle that plug is present to prevent drive away
• Latch feature
AT37G Aerial Device

STANDARD FEATURES

- Altec ISO-Grip® System
- Telescopic/Articulating Aerial Device
- Compensated Articulating Arm
- Hydraulic Boom Extension
- Insulated, ANSI Category C, 46 kV and Below
- Noncontinuous Rotation
- Platform, 24 x 24 x 42 in (610 x 610 x 1067 mm) Nominal
- Hydraulic Platform Leveling
- Platform Capacity – 350 lb (159 kg) Fixed
- 350 lb (159 kg) w/ Rotator
- Fully Metered Single Handle Upper Control
- Full Pressure, Open Center Hydraulic System
- Platform Access from the Ground
- Emergency Lowering Valve
- Tool Circuit at Platform
- Back-up Alarm
- Outrigger Boom Interlock System (With Outrigger Option)
- Outrigger Motion Alarm (With Outrigger Option)

OPTIONS

- Continuous Rotation
- Secondary Stowage System
- Engine Start/Stop
- Tool Circuit at Tailshelf
- Outriggers, Vertical
- Additional Platform Capacity
- Platform Cover
- Platform Rotator - 90° or 180°
- Platform, 24 x 30 x 42 in (610 x 762 x 1067 mm)

RECOMMENDED FEATURES

- Fall Protection System
- Platform Liner
- Wheel Chocks
- With Outrigger Option: Outrigger Pads
AT40M Aerial Device

STANDARD FEATURES
- Altec Arm Jib
- Fiberglass Upper Boom and Lower Boom Insulator
- Insulated, ANSI Category C, 46kV and Below
- Compensated Articulating Arm
- Continuous Rotation
- Hydraulic Boom Extension
- Hydraulic Platform Rotation and Tilt
- Full Pressure, Open Center Hydraulic System
- Outrigger Motion Alarm and Outrigger Interlocks
- Platform Access From Ground
- Emergency Stop Valves at All Upper and Lower Control Stations
- Platform 24 x 30 x 42 in Nominal
- Tool Circuit at Platform
- Extension Dependent Load Chart
- Jib Capacity Up To 800 lbs (362.9 kg)

RECOMMENDED FEATURES
- Fall Protection System
- Platform Liner
- Wheel Chocks
- Otrigger Pads

OPTIONS
- 2-Man Platform with 180° Rotation and 600 lb (272.2 kg) Platform Capacity – Material Handling is Not Available in This Configuration
- Secondary Stowage System
- Engine Start &Stop
- Second Tool Circuit at Platform
- Tool Circuit Below Rotation
- Manual Throttle
- Jib Adapter
- Phase Lifting Jib Attachment
- Platform Covers

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Aerial Device Integration

- Fiber optic transceivers located at the turntable
- Fiber Optic Transceivers at the Upper Controls
Worksite Energy Management

• Altec is leading the way for aerial lift integration to advanced idle reduction technology
• Over 200 hybrid Altec aerial device vehicles in current circulation
• 81 years of experience working with utility fleets
• Market Leader in trouble truck applications
• Aerial Device integration setup for on-demand usage of ePTO mode
• Engine dormant while at the worksite, 5-6 hours of full electric capacity
• Estimated up to 6 Gallons of diesel expenditure savings per work shift.
Manufacturing Process

- Establish 12 station final assembly production line
- Setup TAKT time model to produce 9 Ford F550 PHEVs per week (est. 2025 hrs/wk)
- Build prototype, develop standard work and work instructions for final assembly line
- Station 1-3 designation to PHEV installation (est. 50 hrs)
- Station 4-10 designation for aerial lift and accessory installation (est. 150 hrs)
- Station 11-12 designation for PHEV and aerial testing (est. 25 hrs)
- Altec will build to individualized specification per fleet needs
- All orders will be subjected to a Total Quality build program which will be initiated by Altec with each fleet participant
Body Manufacturing Process

- State of the art production facility
- eCoating primer on all bodies
- Body undercoating on all bodies
- Powder painting available
- Aluminum body designs available
- Custom designed bodies to fit customer needs
- Modularized compartmentation available