



**ISA-TOPE**



# Introduction to ADAS (Advanced Driver Assistance Systems)



**MINNESOTA STATE**  
Transportation Center of Excellence



DUE #2054997

# Module 1 – Objectives

<b>Operations</b>	<i>Research the specific vehicle and demonstrate knowledge of how the ADAS system works on it. Identify the various switches and instrument panel indicators that are ADAS related.</i>
<b>Components</b>	<i>Identify the location and describe the operation of the various ADAS components such as radar, lidar, cameras, ultrasonic sensors, related modules, etc.</i>
<b>Diagnostics</b>	<i>Demonstrate knowledge of which other systems are related to ADAS (ex. ABS, ECM, Steering, etc.).</i>
<b>Repair/Replace</b>	<i>Perform a vehicle inspection (pre-service), paying special attention to ADAS components.</i>
<b>Calibration</b>	<i>Identify what conditions or situations would cause a technician to perform a calibration.</i>



# Operation of ADAS System

- Knowing the operation of the system you are working on is key to being able to repair the ADAS system.
- Without knowing "how it works", you really are working blind.
- Many technicians have worked on a problem for a very long time before realizing that what they are trying to fix is really "normal operation"
- You can find Description and Operation in the service manual, and this is always where you need to start.



thereby support insurance claims and legal exposure.

OnLaneALERT warns of imminent unplanned departures from the current lane

- Monitors lane markings and evaluates vehicle position within the lane
- Recognizes when the vehicle crosses lane markings
- Distinguishes between intended lane changes and unintended lane drifts based on turn signal usage
- Alerts the driver to take corrective action to avoid unintentional lane departure



\* Federal Motor Carrier Safety Administration Office of Research and Analysis Publication No. FMCSA-RRA-07-017, 2007

\*\* FMCSA Onboard Safety Systems Effectiveness Evaluation, 2013



# Operation of ADAS System

- The ADAS system works with various systems on the vehicle to help control braking and throttle control
- If the forward radar system "sees" another vehicle, at a selected distance, the ADAS system will back off the engine throttle to reduce speed.
- If more reduction is needed, the Antilock Brake System will apply braking to slow down the vehicle.

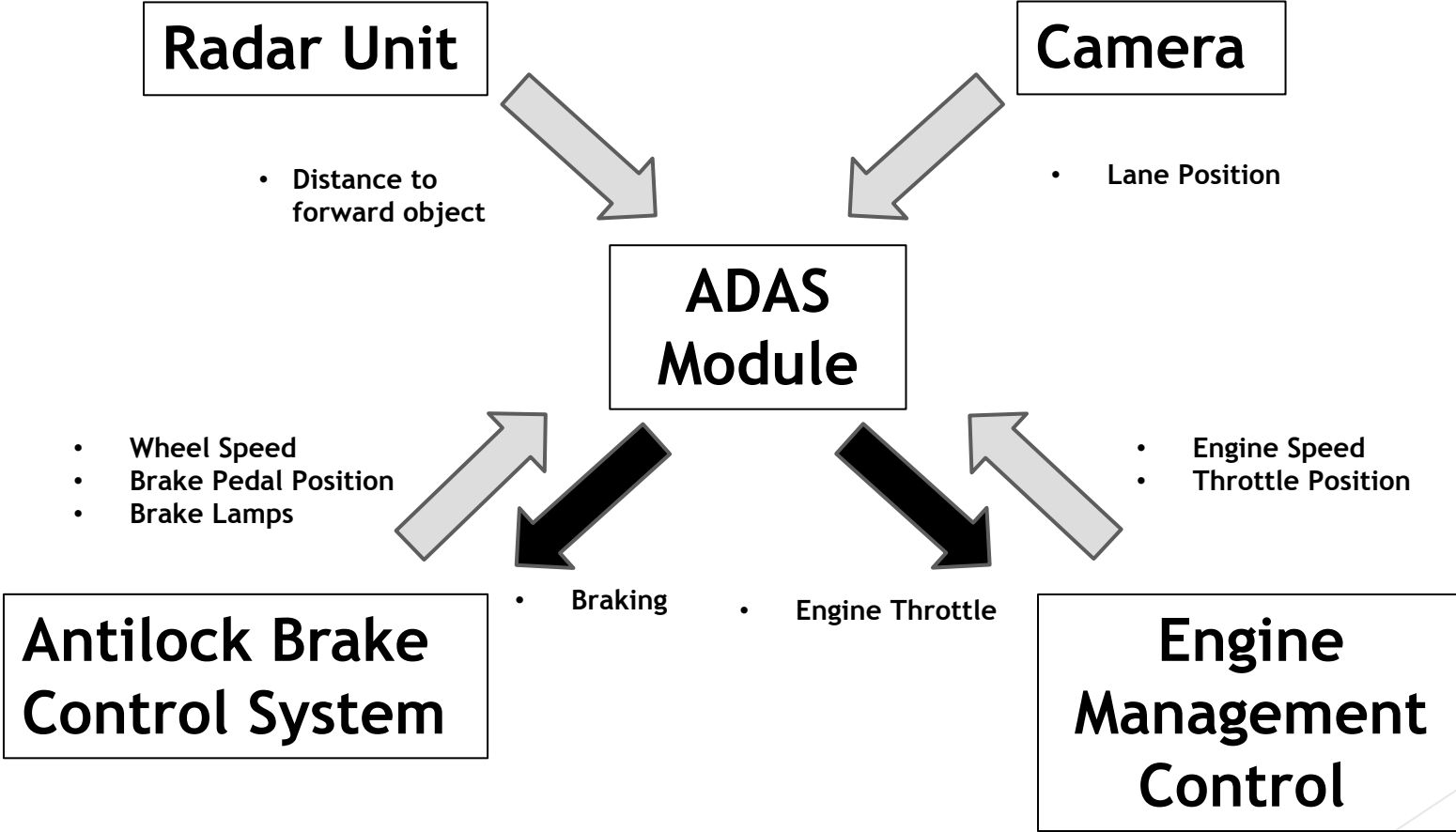


# Operation of ADAS System

- The Lane Departure Warning System will use the forward-facing camera to "see" the lines on the road.
- If the system detects that the driver is leaving their lane, an audible sound will alert the driver of that.
- The driver should then correct and steer the truck back into the lane.



# ADAS System Communications



# Adaptive Cruise Control

## OnGuardACTIVE™

WABCO's most advanced, radar-only collision mitigation system with active braking on moving, stopping and stationary vehicles

The All Season System 

### Mitigates imminent collisions with stationary vehicles:

- Alerts the driver via acoustic, visual and haptic signals
- Provides partial braking to reduce impact of impending collision

Long range radar enables earlier identification of imminent rear-end collisions

### Helps prevent imminent collisions with moving or stopping vehicles:

- Alerts the driver via acoustic, visual and haptic signals
- Provides up to full braking and can bring vehicle to a complete stop

**WABCO**





# Adaptive Cruise Control



# Crash Mitigation

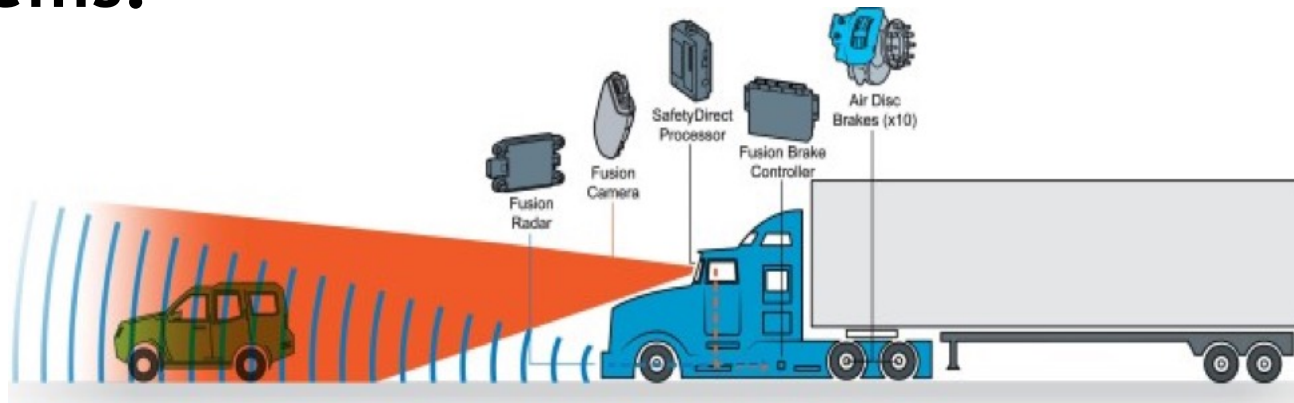


# Lane Departure Warning



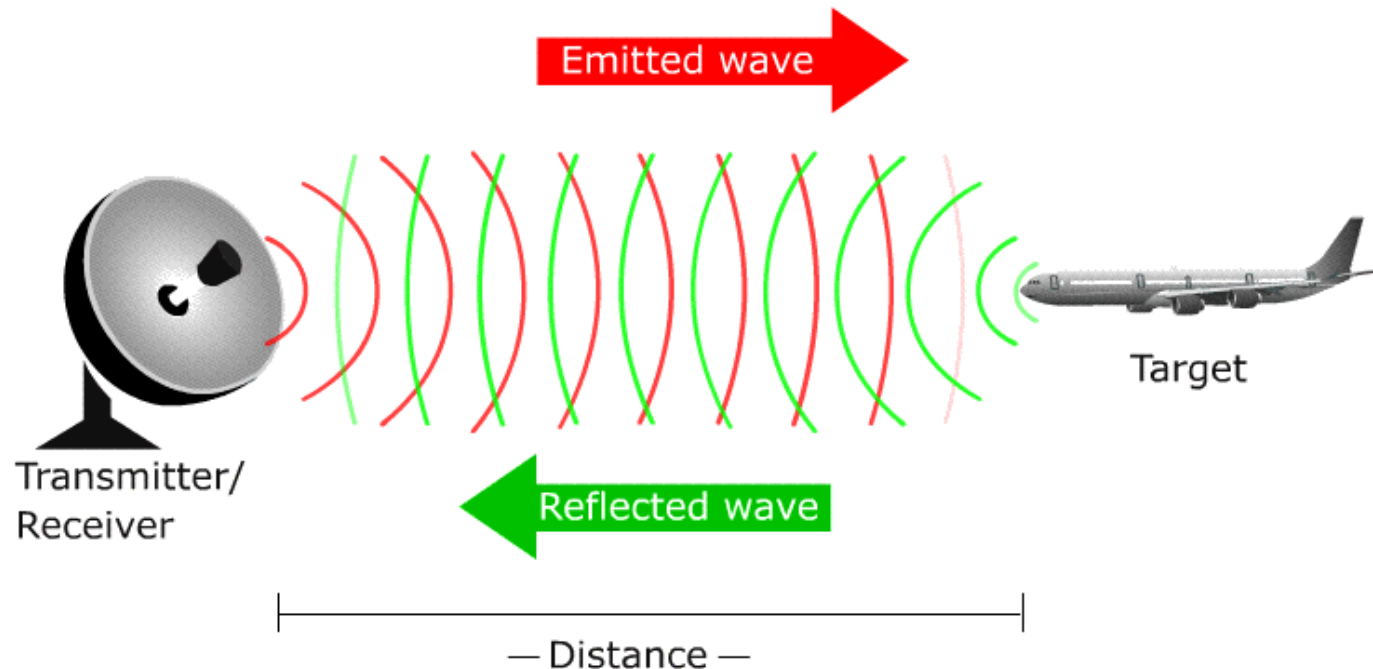
# ADAS Components

- ADAS systems use many different components working together to provide features like Adaptive Cruise, Lane Departure Warning, Crash Mitigation, and other related autonomous driving systems.



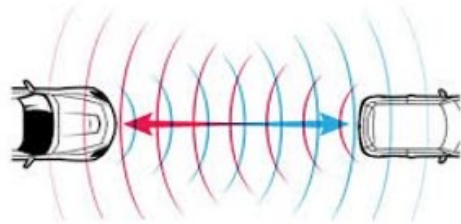
# Radar

- Radar has been around since before World War 2.
- You may know it best when hearing about aviation. It works by emitting radar waves that bounce off objects, and the waves that come back will generate an image of what the object is. Radar can also judge distance based on the time it takes for the signal to return and whether it is moving towards or away.



# Radar

- A truck's radar system works by emitting a radar wave signal from a radar unit mounted in the front of the truck.
- The radar wave signal bounces off that object and is then picked up by the receiver located inside the radar unit.



# Radars Components

## Radars Module

Located in the Front  
Bumper Area



# Lane Departure Warning Components

- The forward camera mounts to the windshield
- Has the ability to "see" lines on the road, other vehicles, and in some cases, road signs.
- Must be calibrated whenever suspension, steering or ADAS components are serviced when indicated by the service manual.





# Lane Departure Warning Components

Windshield mounted  
forward facing  
camera



# Network Modules



**ADAS Control Module**

- **The central control for the ADAS system.**
- **Sends and receives inputs and outputs to make the system work.**
- **Communicates with other modules to control throttle and braking.**



# Network Modules



**Anti-Lock Brake Control Module**

- The Anti-Lock Brake control module receives signals from the ADAS module telling it when braking is needed.
- Sends signals to the ADAS module about vehicle speed and brake application.



# Network Modules



**Engine Control Module**

- **The Engine Control Module (ECM) receives information from the ADAS module to control the throttle.**
- **Sends information to the ADAS module about throttle position.**



# Other Components You May Encounter



- **Parking sensors can be used to help with backing trailers**
- **They can be used in front and rear of vehicles.**
- **They use ultrasonic waves which are short waves with a maximum distance of 10 Feet.**



# Other Components You May Encounter

## Blind Spot Sensors

- Allows drivers to "See" things happening in their blind spot.
- Can use either radar or sonar.
- Some trucks already equipped.



# Other Components You May Encounter

## Lidar

- Also known as Doppler Radar
- Last step towards "Autonomous Driving".
- Not currently commercially available.



# Additional Operations of ADAS System

- If the vehicle is equipped with "Lane Keeping", the system will gently steer the vehicle back into its lane.
- If the system has Side Object Detection, the system will signal the driver that there is something located in the blind spot.





# Other Advanced Technologies

How the Blind Spot system works



# Lane Keeping Assist

## OnLaneASSIST™ Lane Keeping Assist System

Combines unique active steering technology with a forward-looking camera for active lane correction. System helps to avoid potential collisions and run-off-road accidents.



# Other Advanced Technologies

- Some versions can steer "Hands Free" in situations of backing trailers, and parking maneuvers (see video)



# Pre-Diagnostic Inspection

Do an Inspection Before Working on an ADAS System



# Calibration

- Whenever removing or reinstalling a part that is a part of the ADAS system is performed, the system may need to be recalibrated.
- Always check with the appropriate service procedures to find out whether this needs to be done.
- There are 2 types of calibration, static and dynamic. Find out if your system requires a static or dynamic calibration before you continue.
- Failure to recalibrate may result in warning lights or poor operation of the system.



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# Get in touch.



[ISA-TOPE.ORG](http://ISA-TOPE.ORG)



- **Carl Borleis**  
Director of Program Excellence, TCOE  
PI, ISA-TOPE  
651-423-8577  
[carl.borleis@dctc.edu](mailto:carl.borleis@dctc.edu)
- **Shannon Mohn**  
Automotive Instructor, M-State  
MTTIA Training Coordinator  
Co-PI, ISA-TOPE  
218-299-6563  
[Shannon.mohn@minnesota.edu](mailto:Shannon.mohn@minnesota.edu)
- **Forrest Brownlee**  
Diesel Technology Instructor, Minnesota  
North - Hibbing  
MTTIA Board of Directors  
SME, ISA-TOPE  
218-293-6862  
[forrest.brownlee@minnesotanorth.edu](mailto:forrest.brownlee@minnesotanorth.edu)
- **Chris Hadfield, Ed.M.**  
Executive Director, TCOE  
Co-PI, National Center for Autonomous  
Technologies (NCAT)  
Co-PI, ISA-TOPE  
651-423-8311  
[Chris.hadfield@dctc.edu](mailto:Chris.hadfield@dctc.edu)

