NHTSA

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

EDR Reported Driver Usage of Crash Avoidance Systems for Honda Vehicles

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Background

- Prior studies into Advanced Driver Assistance Systems (ADAS) status and activation during crash events relied on police reported crash data
- ADAS availability varies by Make, Model Year, trim level, etc.
- Vehicle Owner's Manuals may list all possible ADAS equipment options, regardless of whether the subject vehicle is equipped with these technologies
- Starting with 2016 MY, Honda began phasing in vehicles that reported ADAS pre-crash data on EDR

Honda EDR Study

- Selection Criteria
  - Crash Investigation Sampling System (CISS) Case Years 2017-2021
  - 2016 Model Year and newer ADAS equipped Honda and Acura vehicles
  - Honda/Acura EDRs have ADAS status reporting capability
- Cases individually reviewed. ADAS technology documented for whether it was “On” or “Off” during the recorded crash event
- If an ADAS system was “On,” data was further assessed to determine whether the system “Engaged” during the 5 seconds of reported pre-crash data

Honda EDR Study Limitations

- Crashes were not filtered by crash type or ADAS activation
- Study limited to Honda vehicles and their drivers
- Behavioral reasons for why drivers had ADAS systems “On” or “Off” at the time of crash were not assessed
- ADAS systems are specific to Honda’s implementation
- This study does not address the effectiveness of Honda’s crash avoidance systems to avoid or mitigate crashes

ADAS Terminology

Honda Symbol	Honda EDR Terms	Common Terms	Abbreviation
	Forward Collision Warning/ Collision Mitigation Braking System	Forward Collision Warning/ Automatic Emergency Braking	FCW/AEB
	Lane Departure Warning/ Road Departure Mitigation	Lane Departure Warning/ Lane Keeping Assistance	LDW/LKA
LKAS	Lane Keeping Assist	Lane Centering Assistance	LCA
ACC	Adaptive Cruise Control	Adaptive Cruise Control	ACC

Exemplar Honda ADAS EDR

ABS

Stability Control

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 1 of 3

Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal Position, % full	Service Brake (On, Off)	ABS Activity (On, Off)	Stability Control (On, Off, Engaged)	Steering Input (deg)	Engine RPM
-5.0	63 [102]	35	Off	Off	On Non-Engaged	0	7,000
-4.5	63 [102]	35	Off	Off	On Non-Engaged	0	7,100
-4.0	64 [103]	35	Off	Off	On Non-Engaged	-5	7,100
-3.5	64 [103]	34	Off	Off	On Non-Engaged	-10	7,100
-3.0	64 [103]	0	Off	Off	On Non-Engaged	-5	7,000
-2.5	63 [102]	0	On	Off	On Non-Engaged	-5	6,900
-2.0	62 [99]	0	On	Off	On Non-Engaged	0	6,600
-1.5	60 [96]	0	On	Off	On Non-Engaged	10	6,400
-1.0	57 [92]	0	On	Off	On Non-Engaged	35	5,800
-0.5	50 [81]	0	On	On	On Non-Engaged	30	4,900
0.0	50 [81]	0	On	On	On Non-Engaged	30	4,900

Collision Mitigation Braking, Forward Collision Warning

Road Departure Mitigation, Lane Departure Warning

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 2 of 3

Time Stamp (sec)	PCM Derived Accelerator Pedal Position, % full	Forward Collision Warning (Not Warning/ Warning)	Collision Mitigation Braking System (Not Engaged/ Engaged)	Collision Mitigation Braking System, Forward Collision Warning (On/Off)	Lane Departure Warning (Not Warning/ Warning)	Road Departure Mitigation (Not Engaged/ Engaged)	Road Departure Mitigation, Lane Departure Warning (On/Off)
-5.0	45	Not warning	Not engaged	On	Not warning	Not engaged	Off
-4.5	46	Not warning	Not engaged	On	Not warning	Not engaged	Off
-4.0	42	Not warning	Not engaged	On	Not warning	Not engaged	Off
-3.5	48	Not warning	Not engaged	On	Not warning	Not engaged	Off
-3.0	48	Warning	Not engaged	On	Not warning	Not engaged	Off
-2.5	48	Warning	Not engaged	On	Not warning	Not engaged	Off
-2.0	48	Warning	Not engaged	On	Not warning	Not engaged	Off
-1.5	64	Warning	Engaged	On	Not warning	Not engaged	Off
-1.0	0	Warning	Engaged	On	Not warning	Not engaged	Off
-0.5	0	Not warning	Not engaged	On	Not warning	Not engaged	Off
0.0	0	Not warning	Not engaged	On	Not warning	Not engaged	Off

Lane Keep Assist

Adaptive Cruise

Cruise Control

Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1) - Table 3 of 3

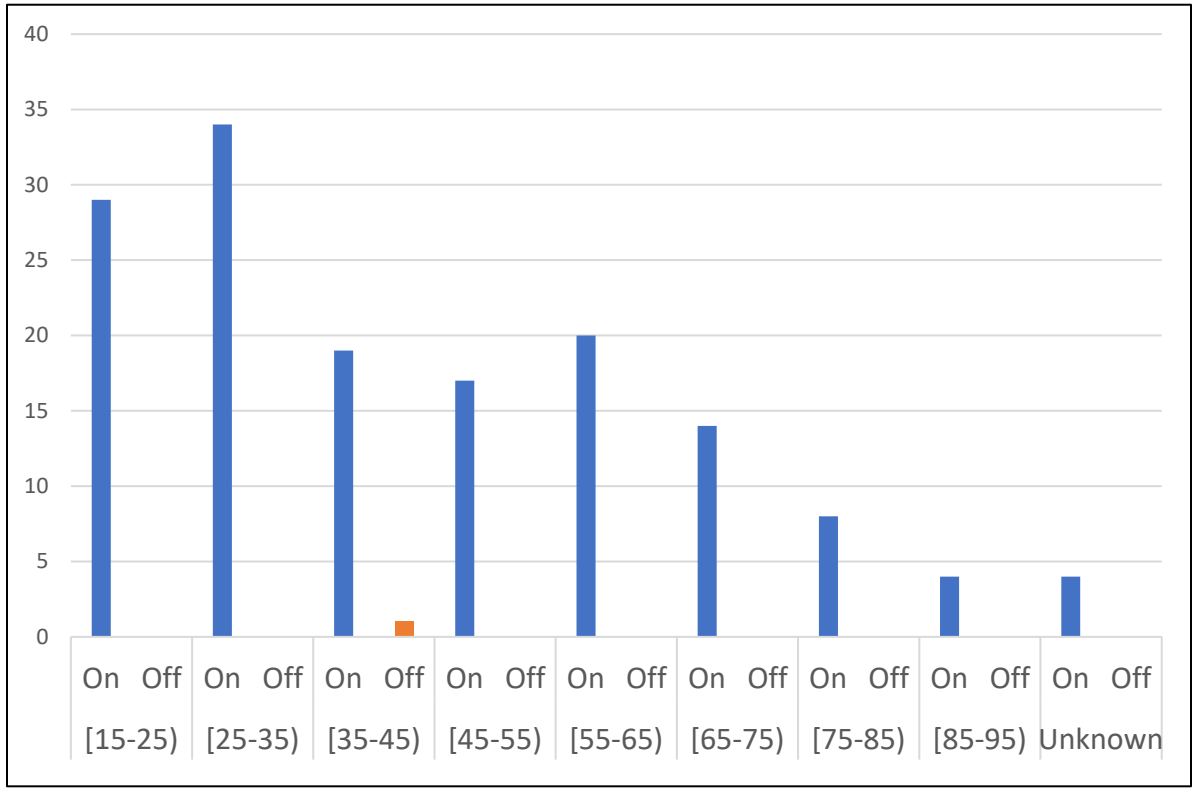
Time Stamp (sec)	Adaptive Cruise Control (Not Engaged/ Engaged)	Adaptive Cruise Control (On/Off)	Lane Keeping Assist (Not Engaged/ Engaged)	Lane Keeping Assist (On/Off)	Cruise Control (Not Engaged/ Engaged)	Cruise Control (On/Off)
-5.0	Engaged	On	Not engaged	On	Engaged	On
-4.5	Engaged	On	Not engaged	On	Engaged	On
-4.0	Engaged	On	Not engaged	On	Engaged	On
-3.5	Engaged	On	Not engaged	On	Engaged	On
-3.0	Engaged	On	Not engaged	On	Engaged	On
-2.5	Engaged	On	Not engaged	On	Engaged	On
-2.0	Engaged	On	Not engaged	On	Engaged	On
-1.5	Engaged	On	Not engaged	On	Engaged	On
-1.0	Engaged	On	Not engaged	On	Engaged	On
-0.5	Not engaged	On	Not engaged	On	Not Engaged	On
0.0	Not engaged	On	Not engaged	On	Not Engaged	On

Results: EDR Reported ADAS Status

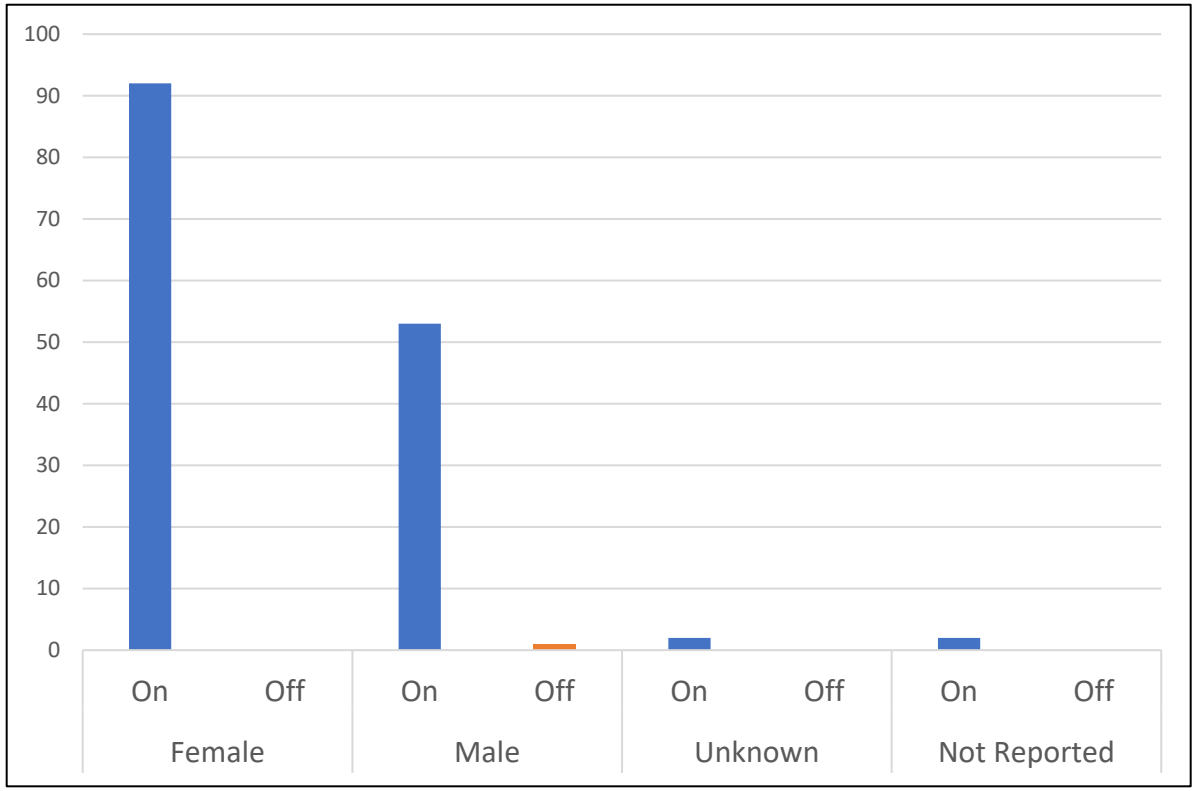
- 150 CISS cases
  - 92 Females, 54 Males, 4 Unknown/Other
  - Average Driver Age: 44 years

Crash Avoidance System	On	Off	% On
FCW/AEB	149	1	99%
LDW/LKA	73	77	49%

Demographics Overview – FCW/AEB

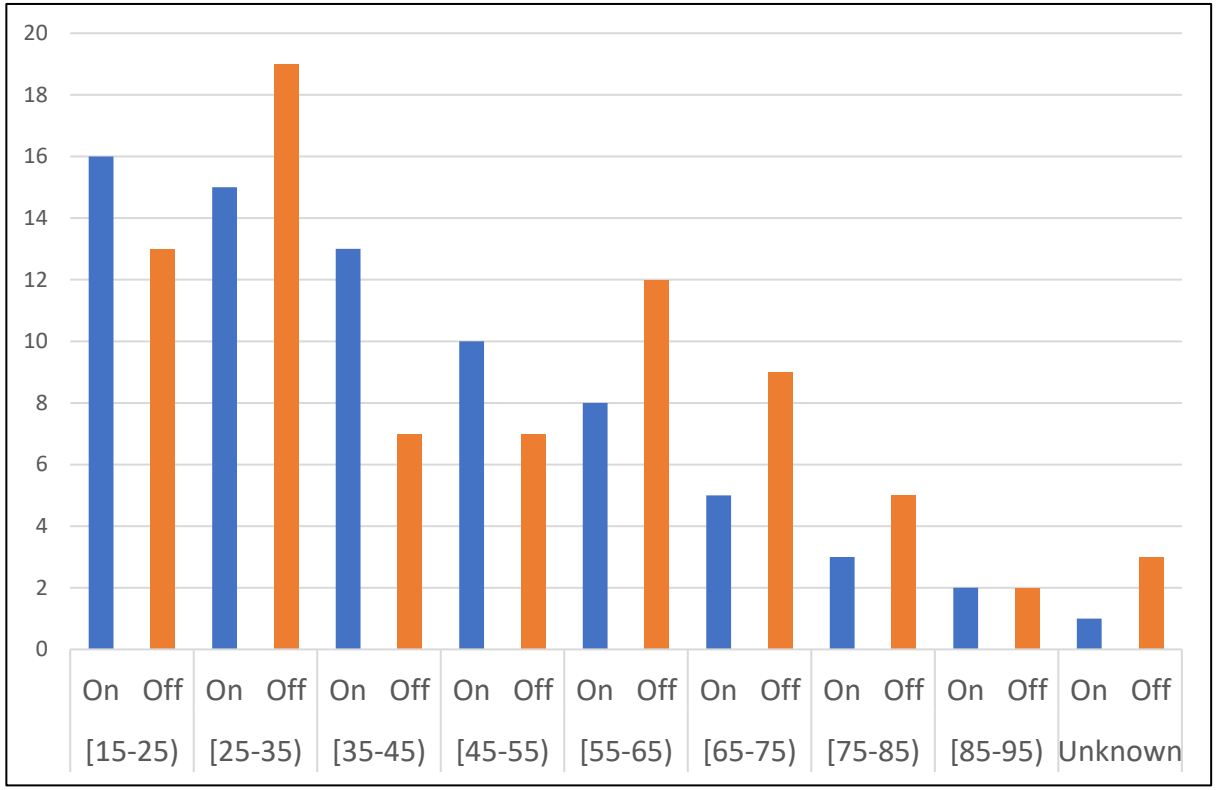


FCW/AEB Status (On/Off) by Driver Age (years)

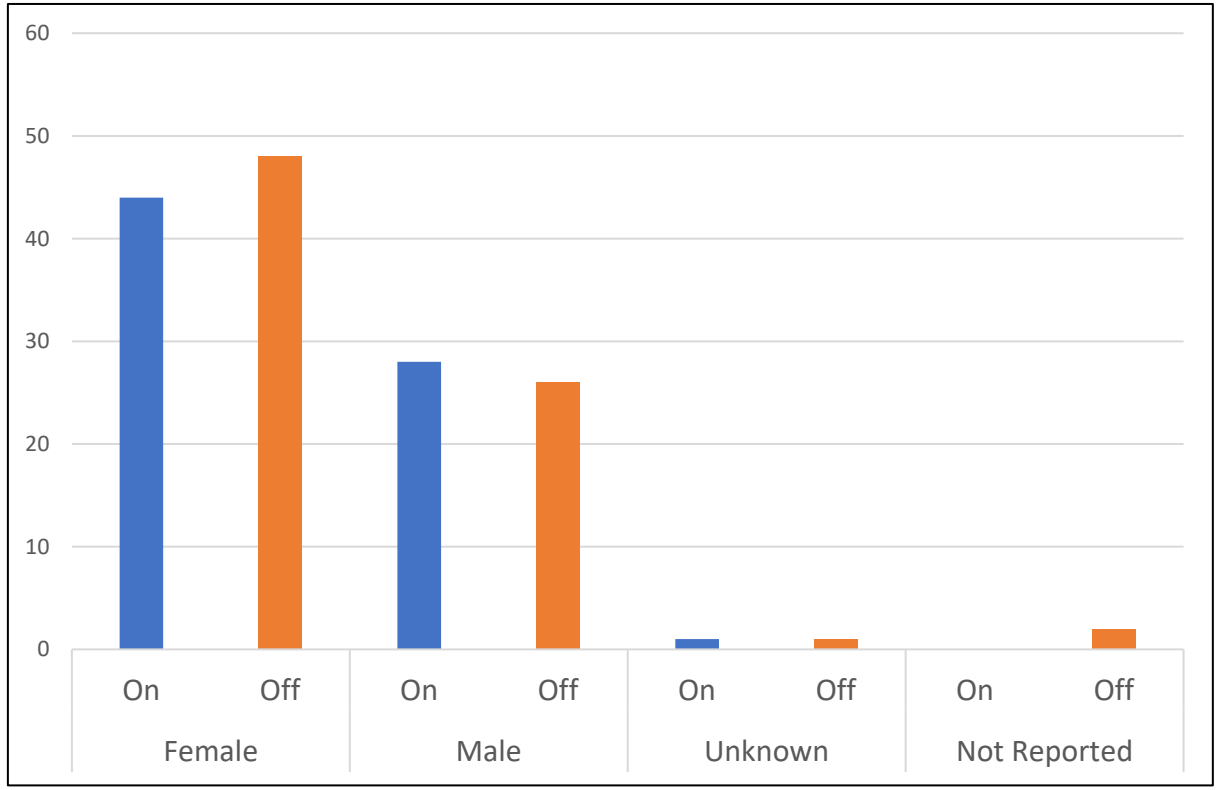


FCW/AEB Status (On/Off) by Driver Sex

Demographics Overview – LDW/LKA



LDW/LKA Status (On/Off) by Driver Age (years)



LDW/LKA Status (On/Off) by Driver Sex

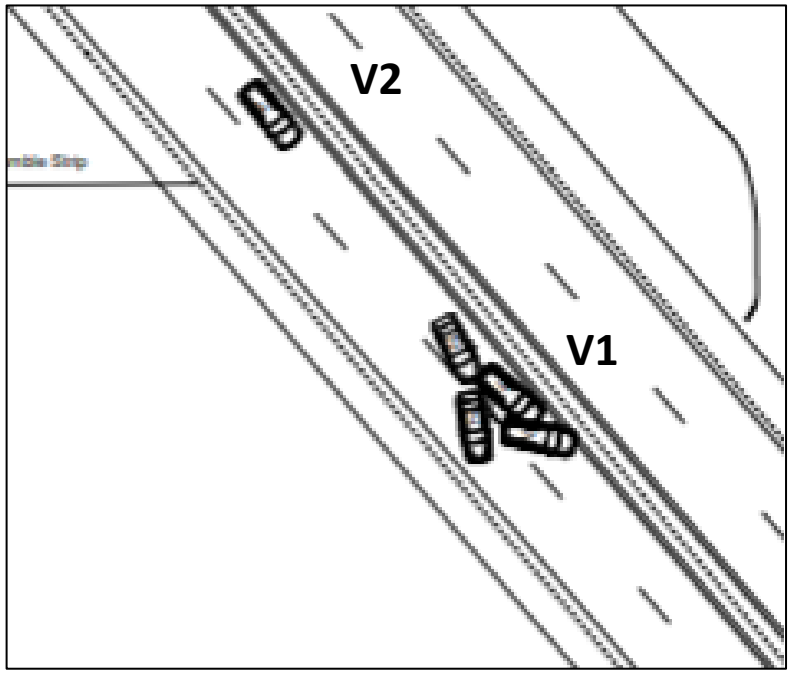
ADAS System Activation

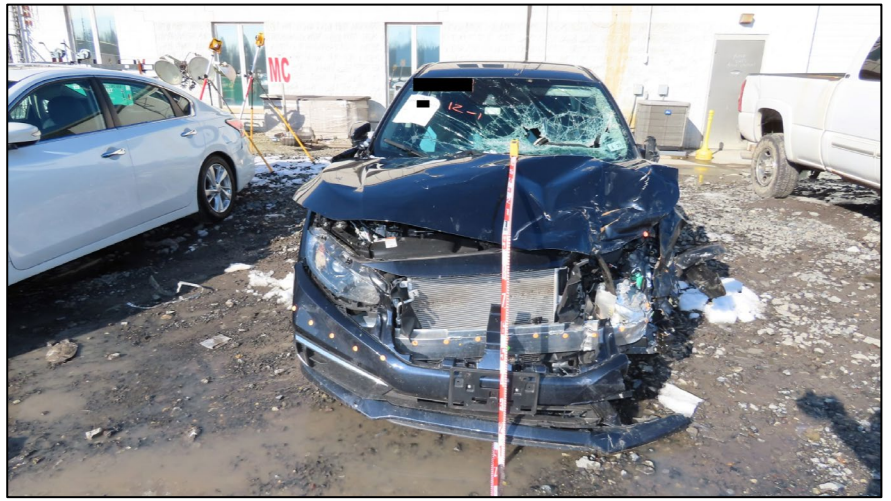
- 21 cases had active crash avoidance or driver assistance systems
- 6 cases had FCW warning, with 3 also reporting AEB “Engaged”
- LDW/LKA was not “Warning” or “Engaged” in any cases
- 15 cases reported ACC and/or LCA as “Engaged.” 3 cases had both ACC and LCA simultaneously engaged

Crash Avoidance Systems				Driver Assistance Systems	
FCW (Warning Only)	FCW and AEB Engaged	LDW (Warning Only)	LDW and LKA Engaged	ACC Engaged	LCA Engaged
6	3	0	0	10	8

CISS Case Example: 1-24-2020-181-02

- **Subject Vehicle**: 2020 Honda Civic
- **Summary**: A 2014 Chevrolet Equinox (V1) was stopped, waiting to make a left turn into a driveway. The 2020 Honda Civic (V2) was traveling on the same roadway directly behind V1. The front of V2 contacted the back of V1.





CISS Case Example Continued

Time Stamp (sec)	Speed, Vehicle Indicated (MPH [km/h])	Accelerator Pedal Position, % full	Service Brake (On, Off)	ABS Activity (On, Off)
-5.0	67 [108]	0	Off	Off
-4.5	67 [108]	0	Off	Off
-4.0	67 [108]	0	Off	Off
-3.5	67 [108]	0	Off	Off
-3.0	67 [108]	0	Off	Off
-2.5	67 [108]	0	Off	Off
-2.0	67 [108]	0	Off	Off
-1.5	67 [108]	0	Off	Off
-1.0	67 [108]	0	Off	Off
-0.5	67 [108]	0	On	On
0.0	67 [108]	0	On	On

Time Stamp (sec)	PCM Derived Accelerator Pedal Position, % full	Forward Collision Warning (Not Warning/ Warning)	Collision Mitigation Braking System (Not Engaged/ Engaged)	Collision Mitigation Braking System, Forward Collision Warning (On/Off)
-5.0	10	Not warning	Not engaged	On
-4.5	10	Not warning	Not engaged	On
-4.0	10	Not warning	Not engaged	On
-3.5	10	Not warning	Not engaged	On
-3.0	10	Not warning	Not engaged	On
-2.5	10	Not warning	Not engaged	On
-2.0	10	Not warning	Not engaged	On
-1.5	10	Not warning	Not engaged	On
-1.0	10	Not warning	Not engaged	On
-0.5	0	Not warning	Not engaged	On
0.0	0	Not warning	Not engaged	On

Time Stamp (sec)	Adaptive Cruise Control (Not Engaged/ Engaged)	Adaptive Cruise Control (On/Off)	Lane Keeping Assist (Not Engaged/ Engaged)	Lane Keeping Assist (On/Off)
-5.0	Engaged	On	Engaged	On
-4.5	Engaged	On	Engaged	On
-4.0	Engaged	On	Engaged	On
-3.5	Engaged	On	Engaged	On
-3.0	Engaged	On	Engaged	On
-2.5	Engaged	On	Engaged	On
-2.0	Engaged	On	Engaged	On
-1.5	Engaged	On	Engaged	On
-1.0	Engaged	On	Engaged	On
-0.5	Not engaged	On	Not engaged	On
0.0	Not engaged	On	Not engaged	On

CISS Case Example Continued

- Service brake reported “On” at -0.5 sec.
- FCW/AEB reported “On,” “Not Warning,” and “Not Engaged”
- ACC and LKA reported “On” and “Engaged” until -0.5 sec. prior to the crash event
- Constant vehicle speed reported as **67**mph (108kmph). Owner’s manual states FCW/AEB may activate when Honda’s speed is **62**mph (100kmph) or less

Summary

- Drivers in this CISS Honda study generally kept FCW/AEB “ON,” allowing full benefits of the collision avoidance system to be realized
- Approximately 50% of the drivers in this study turned LDW/LKA “OFF”
- Next Steps – Assess Honda ADAS system performance and limitations
  - Deep dive into each crash to assess whether ADAS technologies may have mitigated crash severity
  - Understand the capabilities and restrictions of the “Operational Design Domain” for specific crash types

Thank You