



Industry experience with Pedal Misapplication / ACPE

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State of the art passenger cars in Japan



- ACPE is a system operating at standstill which is detecting conditions when a pedal error can be assumed and suppressing such unintended acceleration (typically a very strong acceleration or kick-down).
- The conditions to detect “pedal error” are not necessarily based on obstacle detection. Different types of system indeed exist:
 - Some systems detect obstacles and inhibit/limit the acceleration to avoid/mitigate potential collisions.
 - Some systems do not detect obstacles, but conditions when a pedal error can be assumed (e.g. the driver suddenly slams on the accelerator pedal at standstill), to inhibit/limit the acceleration.
- ACPE is operating at standstill
- Some systems are also operating at low speed, in similar use cases as those addressed by low-speed collision avoidance system (AEBS)

JNCAP PEDAL MISAPPLICATION OVERVIEW



- Scope:
 - limited to ACPE systems able to detect obstacles
 - the feature is expected to suppress unintended acceleration to avoid resulting collision, in case of pedal misapplication at standstill
- JNCAP had introduced this feature in 2018.
 - Current JNCAP Protocol has two scenarios for avoiding / mitigating collision with Vehicle from [0,8/0,9/1,0]m (manufacturer's choice) **from stand still.**
 - Forward Scenario
 - Reverse Scenario
 - In addition, base-tests without target are performed (measuring collision speed without a function)
 - Awards – full points for avoidance, partial points for mitigation
- From 2023 JNCAP intends to introduce additional Car-to-“Stationary adult pedestrian” scenarios (tbc – no protocol is published yet / no industry experience yet)



Picture source JNCAP

JNCAP PEDAL MISAPPLICATION TYPICAL USE CASES / TEST SCENARIO



	Forward Scenario	Reverse Scenario
Initial position	Vehicle in stand-still, Steering wheel in neutral position	
Transmission	Automatic or robotized gearbox * lowest forward gear or D	Automatic or robotized gearbox * Reverse gear or R
Test	Test driver quickly steps from brake pedal to the accelerator and holds it all the way down until car stops or exceed the potential collision location	

* manual gearbox out of scope; i.e. double pedal error not considered (accelerate and release clutch pedal)

Functionality

- Pedal application logic is analyzed and/or Sensor detecting obstacles
- In case of potential pedal error detection inhibition of vehicle movement

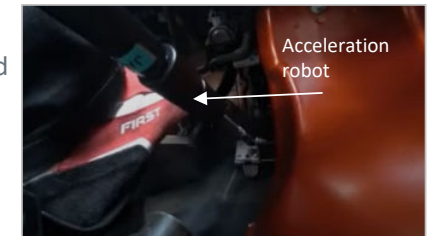
Relevant Links

- JNCAP - General Description of Pedal Misapplication - [Pedal misapplication prevention / National agency for Automotive Safety & Victims' Aid \(nasva.go.jp\)](https://www.nasva.go.jp/en/press/2019/06/20190618.html)
- [Methods for Checking Equipment Designed to Curb Acceleration In The Event of Peddle Misapplication.pdf](#) (JNCAP protocol in English – Version from June 2019)
- [Version of JNCAP protocol from March 2022](#) (in Japanese)



For testability reason the kick-down on acceleration is realized by the robot, while test driver releases brake pedal

See example :
<https://youtu.be/KC9vqif0hrw?t=74>



Picture source JNCAP

JNCAP PEDAL MISAPPLICATION

Results 2019-2022

- General
 - Only car-to-car standstill scenarios tested so far
 - Widely implemented feature on vehicles in Japan
- Sensors
 - For reverse detection mostly ultrasonic sensors are used
 - For forward detection: ultrasonic, radar, vision sensors or sensor fusion is used





Back-up AEBS vs ACPE

PEDAL MISAPPLICATION

How to Distinguish ACPE vs AEB



Highlighted red text: potential ACPE / AEBS overlaps

	AEB	ACPE
Subject of control	“AEB” is required to controls the brake system to stop the vehicle. AEB also controls the power train system to suppress acceleration force	“ACPE” controls the power train system to suppress acceleration force.
Driver’s behavior	AEB intervenes when driver fails to take measures to avoid a potential collision	Driver by mistake apply acceleration instead of a brake. ACPE ignores / override driver’s input
Operational speeds	Works while driving (at least down to 10km/h for C2C and 20km/h for C2P/C2B)	Standstill and low speed
Overridability	<i>“...at any time through a conscious action, e.g., by a steering action or an accelerator kick-down, ...”</i>	Inhibits kick-down