

NEW YORK JOURNAL, SUNDAY, APRIL 18, 1897.

THE WHEEL IN POLITICS.

How the Rubber-Tired Vote of
Chicago Elected a
New Mayor.

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The Latest Idea for a Horseless Carriage.

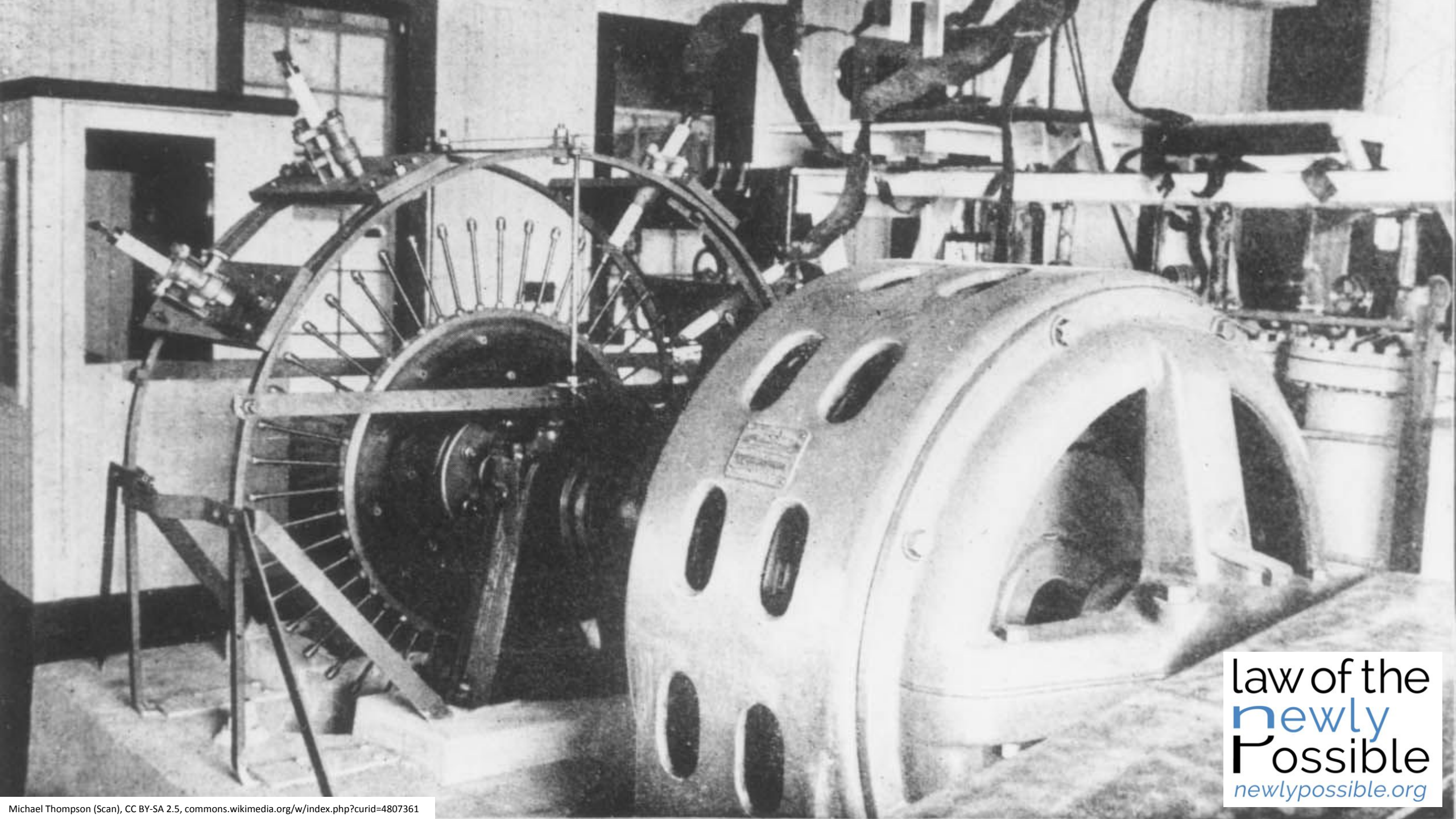




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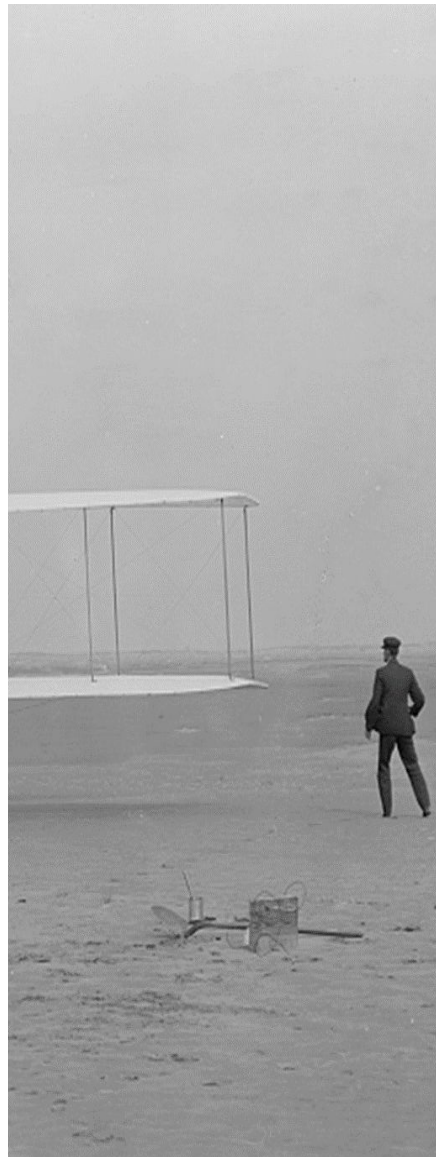
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The future's right on schedule



Permission or forgiveness



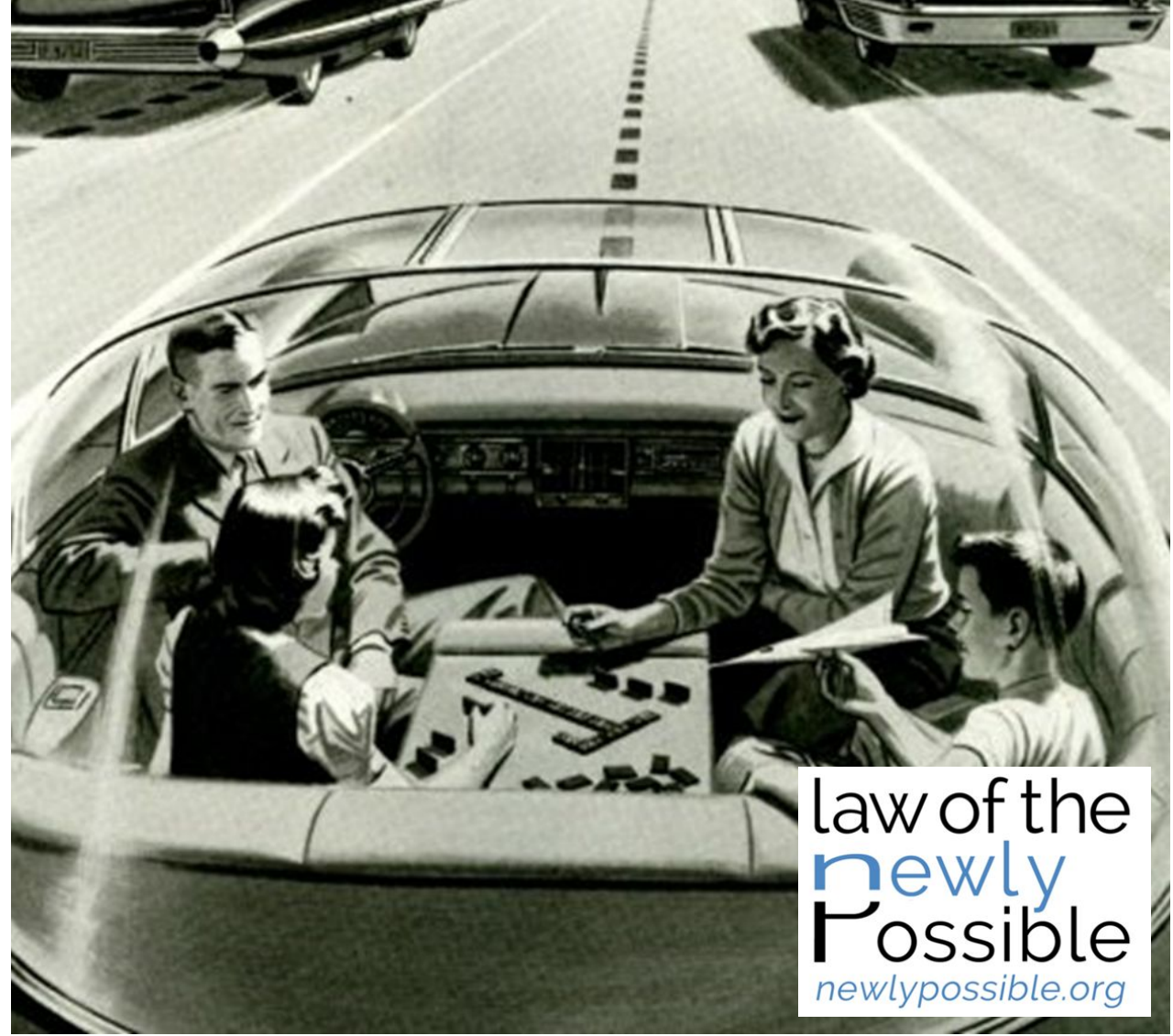
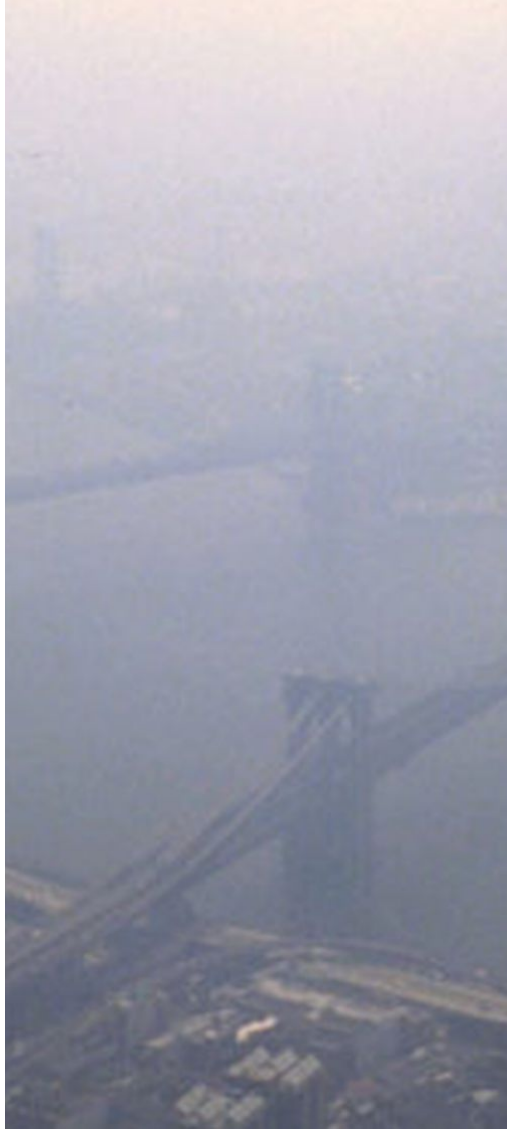
Automated Vehicles Are
Probably Legal in the
United States

Bryant Walker Smith | November 1, 2012

cis
The Center for
Internet and Society

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Σ new problems < Σ old problems ?



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Everything is beta

@elonmusk

1:27 PM - Jul 10, 2016

Use of word "beta" is explicitly so that drivers don't get comfortable. It is not beta in the standard sense.



Windows 10 (initial version released July 2015)	Windows 10 version 1511	Windows 10 version 1607 and Windows Server 2016	Windows 10 version 1703	Windows 10 version 1709
KB4093111 (OS Build 10240.17831)	KB4093109 (OS Build 10586.1540)	KB4093120 (OS Build 14393.2214)	KB4093117 (OS Build 15063.1058)	KB4093105 (OS Build 16299.402)
KB4088786 (OS Build 10240.17797)	KB4088779 (OS Build 10586.1478)	KB4093119 (OS Build 14393.2189)	KB4093107 (OS Build 15063.1029)	KB4093112 (OS Build 16299.371)
KB4074596 (OS Build 10240.17770)	KB4074591 (OS Build 10586.1417)	KB4096309 (OS Build 14393.2156)	KB4088891 (OS Build 15063.997)	KB4095572 (OS Build 15254.369)
KB4077735 (OS Build 10240.17741)	KB4075200 (OS Build 10586.1358)	KB4088889 (OS Build 14393.2155)	KB4088787 (OS Build 15063.966 and 15063.968)	KB4089848 (OS Build 16299.324)
KB4075199 (OS Build 10240.17741)	KB4056888 (OS Build 10586.1356)	KB4088787 (OS Build 14393.2125 and 14393.2126)	KB4092077 (OS Build 15063.966)	KB4088776 (OS Build 16299.309)
KB4056893 (OS Build 10240.17738)	KB4048952 (OS Build 10586.1295)	KB4077525 (OS Build 14393.2097)	KB4074596 (OS Build 15063.936)	KB4090912 (OS Build 15254.313)
KB4053581 (OS Build 10240.17709)	KB4048952 (OS Build 10586.1232)	KB4074590 (OS Build 14393.2068)	KB4077528 (OS Build 15063.936)	KB4090913 (OS Build 16299.251)
KB4048956 (OS Build 10240.17678)	KB4052232 (OS Build 10586.1177)	KB4057142 (OS Build 14393.2054)	KB4074592 (OS Build 15063.909)	KB4090912 (OS Build 16299.248)
KB4042895 (OS Build 10240.17643)	KB4041689 (OS Build 10586.1176)	KB4056890 (OS Build 14393.2007)	KB4057144 (OS Build 15063.877)	KB4077675 (OS Build 15254.248)
KB4038781 (OS Build 10240.17609)	KB4038783 (OS Build 10586.1108)	KB4053579 (OS Build 14393.1944)	KB4056891 (OS Build 15063.850)	KB4058258 (OS Build 16299.214)
KB4034668 (OS Build 10240.17533)	KB4034660 (OS Build 10586.1045)	KB4051033 (OS Build 14393.1914)	KB4057142 (OS Build 15063.786)	KB4073291 (OS Build 16299.201)
KB4025338 (OS Build 10240.17488)	KB4025344 (OS Build 10586.1007)	KB4048953 (OS Build 14393.1894)	KB4053580 (OS Build 15063.766)	KB4056892 (OS Build 16299.192)
KB4032695 (OS Build 10240.17446)	KB4032693 (OS Build 10586.962)	KB4052231 (OS Build 14393.1797)	KB4055254 (OS Build 15063.729)	KB4073117 (OS Build 15254.158)
KB4022727 (OS Build 10240.17443)	KB4019473 (OS Build 10586.916)	KB4041688 (OS Build 14393.1794)	KB4048954 (OS Build 15063.726 and 15063.728)	KB4054517 (OS Build 16299.125)
KB4019474 (OS Build 10240.17394)	KB4015219 (OS Build 10586.873)	KB401691 (OS Build 14393.1770)	KB4048954 (OS Build 15063.675)	KB4056342 (OS Build 15254.124)
KB4015221 (OS Build 10240.17354)	KB4016636 (OS Build 10586.842)	KB4038801 (OS Build 14393.1737)	KB4048954 (OS Build 15063.628)	KB4051963 (OS Build 16299.98)
KB4016637 (OS Build 10240.17320)	KB4013198 (OS Build 10586.839)	KB4038782 (OS Build 14393.1715)	KB4041676 (OS Build 15063.674)	KB4048955 (OS Build 16299.54)
KB4012606 (OS Build 10240.17319)	KB3210721 (OS Build 10586.753)	KB4038956 (OS Build 14393.1670)	KB4040724 (OS Build 15063.632)	KB4048955 (OS Build 16299.44)
KB3107020 (OS Build 10240.17236)	KB3205286 (OS Build 10586.713)	KB4034661 (OS Build 14393.1613)	KB4038782 (OS Build 15063.608)	
KB3205383 (OS Build 10240.17202)	KB3198584 (OS Build 10586.682)	KB4034658 (OS Build 14393.1593)	KB4038220 (OS Build 14393.1537)	
KB3198585 (OS Build 10240.17190)	KB3198586 (OS Build 10586.679)	KB4034658 (OS Build 14393.1532)	KB4025334 (OS Build 14393.1532)	
KB3192440 (OS Build 10240.17146)	KB3192441 (OS Build 10586.633)	KB4025339 (OS Build 14393.1480)	KB4022723 (OS Build 14393.1378)	
KB3193821 (OS Build 10240.17113)	KB3185614 (OS Build 10586.599)	KB4022723 (OS Build 14393.1358)	KB4022723 (OS Build 14393.1230)	
KB3185611 (OS Build 10240.17113)	KB3176493 (OS Build 10586.545)	KB312985 (OS Build 10586.494)	KB4019472 (OS Build 14393.1198)	
KB3176492 (OS Build 10240.17071)	KB3172985 (OS Build 10586.494)	KB3163018 (OS Build 10586.420)	KB4015217 (OS Build 14393.1066 and 14393.1083)	
KB3163912 (OS Build 10240.17024)	KB3163018 (OS Build 10586.420)	KB3156421 (OS Build 10586.318)	KB4016635 (OS Build 14393.970)	
KB3163017 (OS Build 10240.16942)	KB3147458 (OS Build 10586.218)	KB3147458 (OS Build 10586.154)	KB4016635 (OS Build 14393.969)	
KB3156987 (OS Build 10240.16854)	KB3140748 (OS Build 10586.122)	KB3140748 (OS Build 10586.122)	KB4013429 (OS Build 14393.953)	
KB3147458 (OS Build 10240.16769)	KB3135174 (OS Build 10586.104)	KB3135174 (OS Build 10586.104)	KB4016635 (OS Build 14393.729)	
KB3140745 (OS Build 10240.16725)			KB3216755 (OS Build 15063.113)	
KB3135174 (OS Build 10240.16683)				

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We need innovation ...

... in automated driving technologies

... in safety assurance

... in regulation

Focus *less* on the technologies

And *more* on their companies

...

A diverse set of...

...technologies

...applications of those technologies

...business cases for those applications

...participants in those business cases

SAE J3016™ LEVELS OF DRIVING AUTOMATION

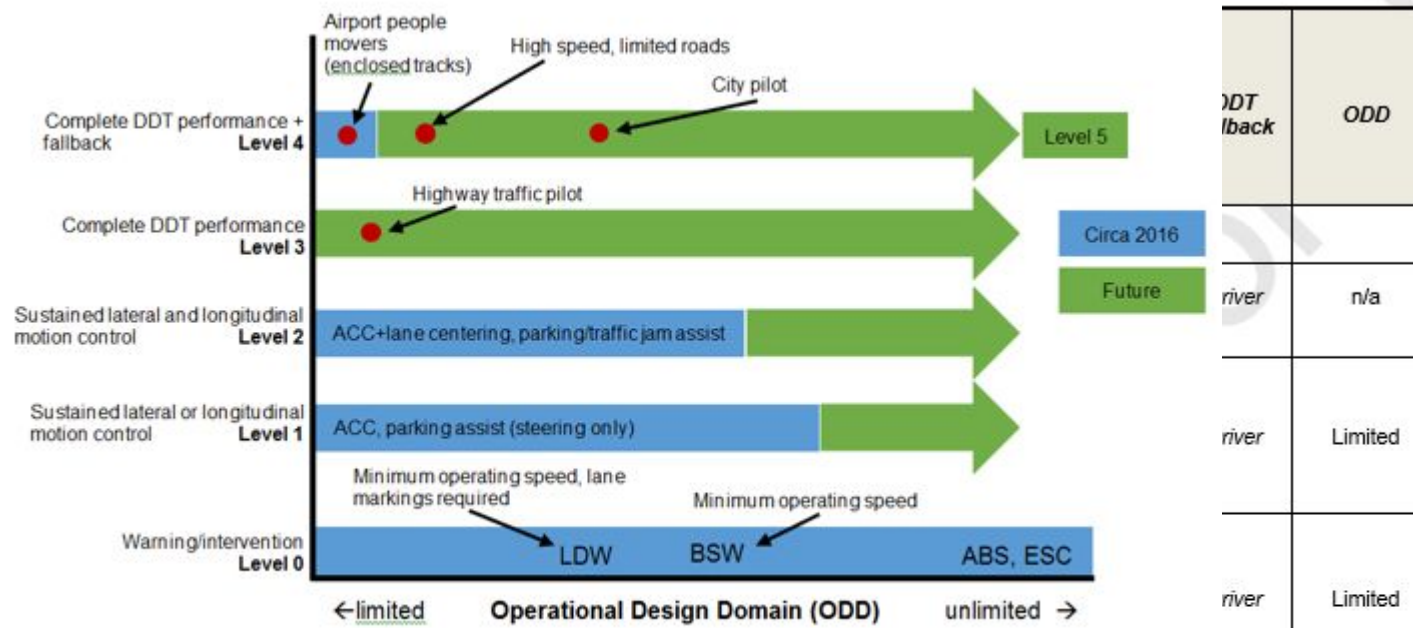
	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
	You must constantly supervise these support features; you must steer, brake or accelerate as needed to maintain safety			When the feature requests, you must drive	These automated driving features will not require you to take over driving	
What do these features do?	These are driver support features			These are automated driving features		
	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions	
Example Features	<ul style="list-style-type: none"> • automatic emergency braking • blind spot warning • lane departure warning 	<ul style="list-style-type: none"> • lane centering OR • adaptive cruise control 	<ul style="list-style-type: none"> • lane centering AND • adaptive cruise control at the same time 	<ul style="list-style-type: none"> • traffic jam chauffeur 	<ul style="list-style-type: none"> • local driverless taxi • pedals/steering wheel may or may not be installed 	<ul style="list-style-type: none"> • same as level 4, but feature can drive everywhere in all conditions

Pop quiz!

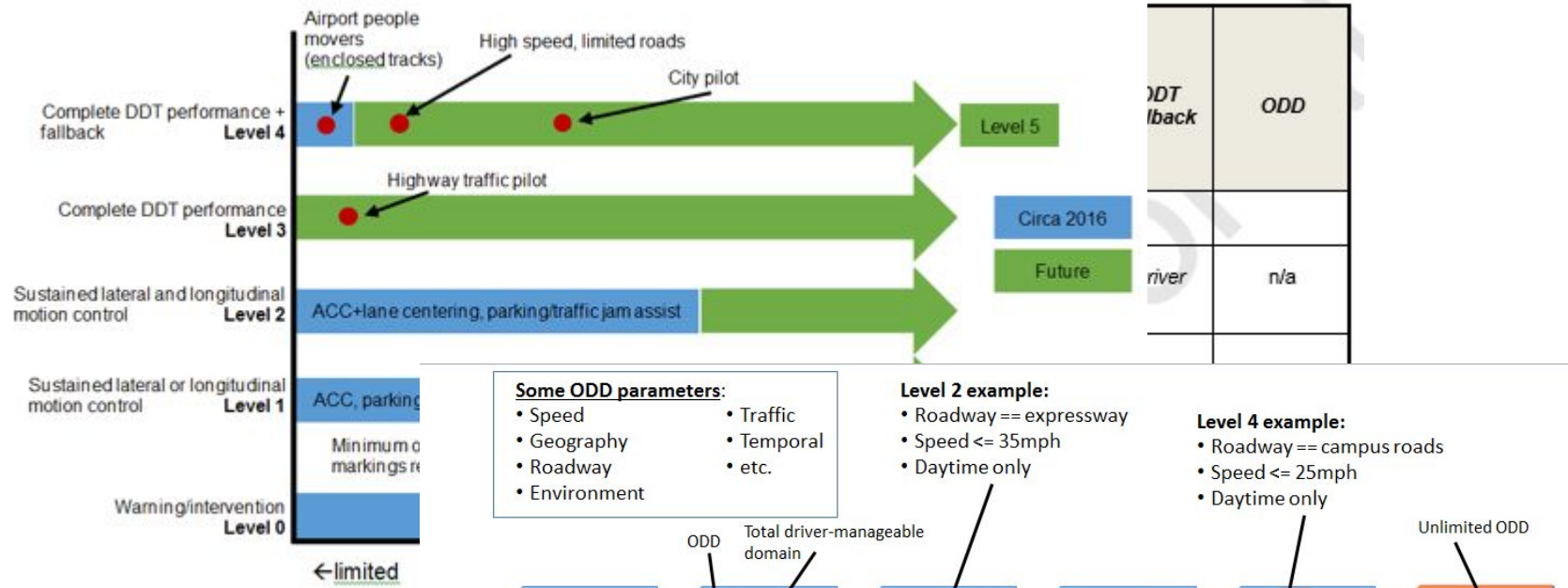
On reaching a crash, an automated vehicle (AV) stops in its lane until someone at a monitoring center sketches a travel path. Using its sensors, it then follows this path.

- 1) Is this L3 or L4 automated driving?**
- 2) Is there a remote driver?**

Level	Name	Narrative definition	DDT		DDT fallback	ODD
			Sustained lateral and longitudinal vehicle motion control	OEDR		
Driver performs part or all of the DDT						
0	No Driving Automation	The performance by the driver of the entire DDT, even when enhanced by active safety systems.	Driver	Driver	Driver	n/a
1	Driver Assistance	The sustained and ODD-specific execution by a driving automation system of either the lateral or the longitudinal vehicle motion control subtask of the DDT (but not both simultaneously) with the expectation that the driver performs the remainder of the DDT.	Driver and System	Driver	Driver	Limited
2	Partial Driving Automation	The sustained and ODD-specific execution by a driving automation system of both the lateral and longitudinal vehicle motion control subtasks of the DDT with the expectation that the driver completes the OEDR subtask and supervises the driving automation system.	System	Driver	Driver	Limited
ADS ("System") performs the entire DDT (while engaged)						
3	Conditional Driving Automation	The sustained and ODD-specific performance by an ADS of the entire DDT with the expectation that the DDT fallback-ready user is receptive to ADS-issued requests to intervene, as well as to DDT performance-relevant system failures in other vehicle systems, and will respond appropriately.	System	System	Fallback-ready user (becomes the driver during fallback)	Limited
4	High Driving Automation	The sustained and ODD-specific performance by an ADS of the entire DDT and DDT fallback without any expectation that a user will respond to a request to intervene.	System	System	System	Limited
5	Full Driving Automation	The sustained and unconditional (i.e., not ODD-specific) performance by an ADS of the entire DDT and DDT fallback without any expectation that a user will respond to a request to intervene.	System	System	System	Unlimited



ADS ("System") performs the entire DDT (while engaged)						
3	Conditional Driving Automation	The <i>sustained</i> and <i>ODD-specific</i> performance by an ADS of the entire DDT with the expectation that the <i>DDT fallback-ready user</i> is <i>receptive</i> to ADS-issued requests to <i>intervene</i> , as well as to <i>DDT performance-relevant system failures</i> in <i>other</i> vehicle systems, and will respond appropriately.	System	System	<i>Fallback-ready user (becomes the driver during fallback)</i>	Limited
4	High Driving Automation	The <i>sustained</i> and <i>ODD-specific</i> performance by an ADS of the entire DDT and <i>DDT fallback</i> without any expectation that a user will respond to a <i>request to intervene</i> .	System	System	System	Limited
5	Full Driving Automation	The <i>sustained</i> and unconditional (i.e., not <i>ODD-specific</i>) performance by an ADS of the entire DDT and <i>DDT fallback</i> without any expectation that a user will respond to a <i>request to intervene</i> .	System	System	System	Unlimited

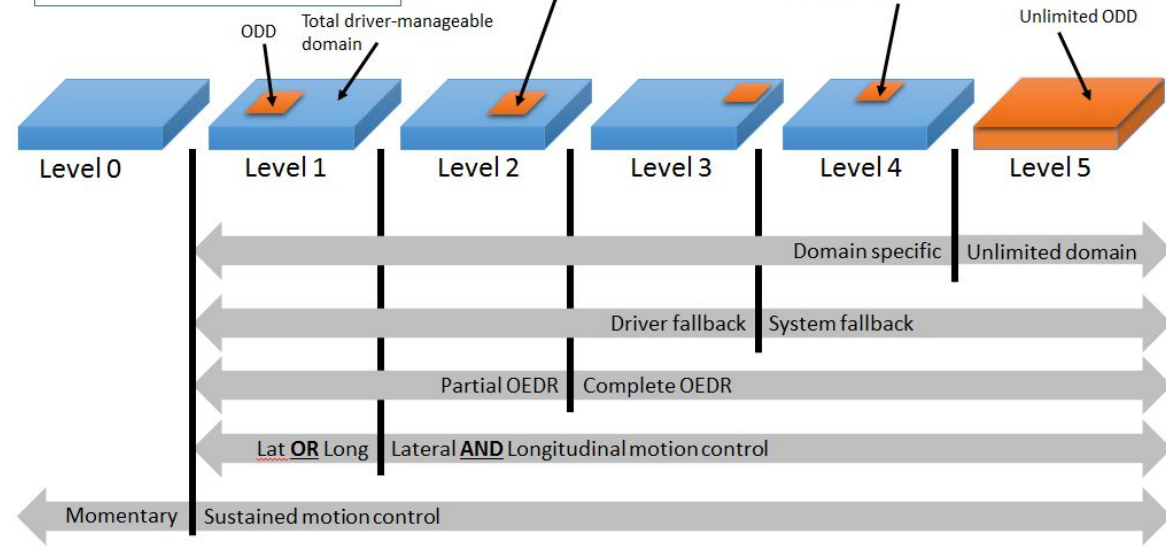


- Some ODD parameters:**
- Speed
 - Geography
 - Roadway
 - Environment
 - Traffic
 - Temporal
 - etc.

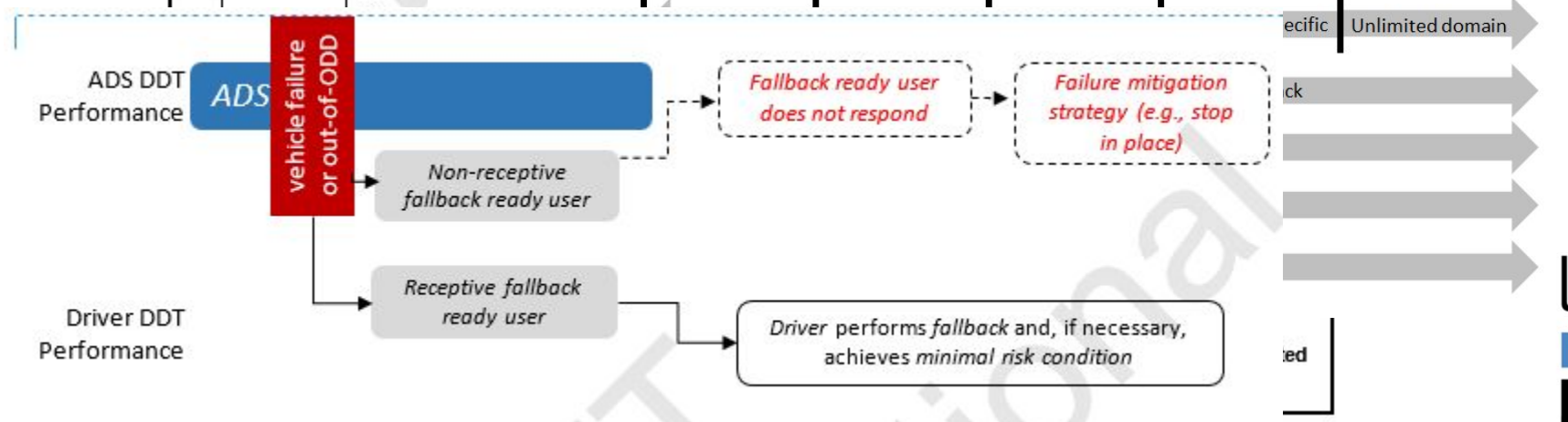
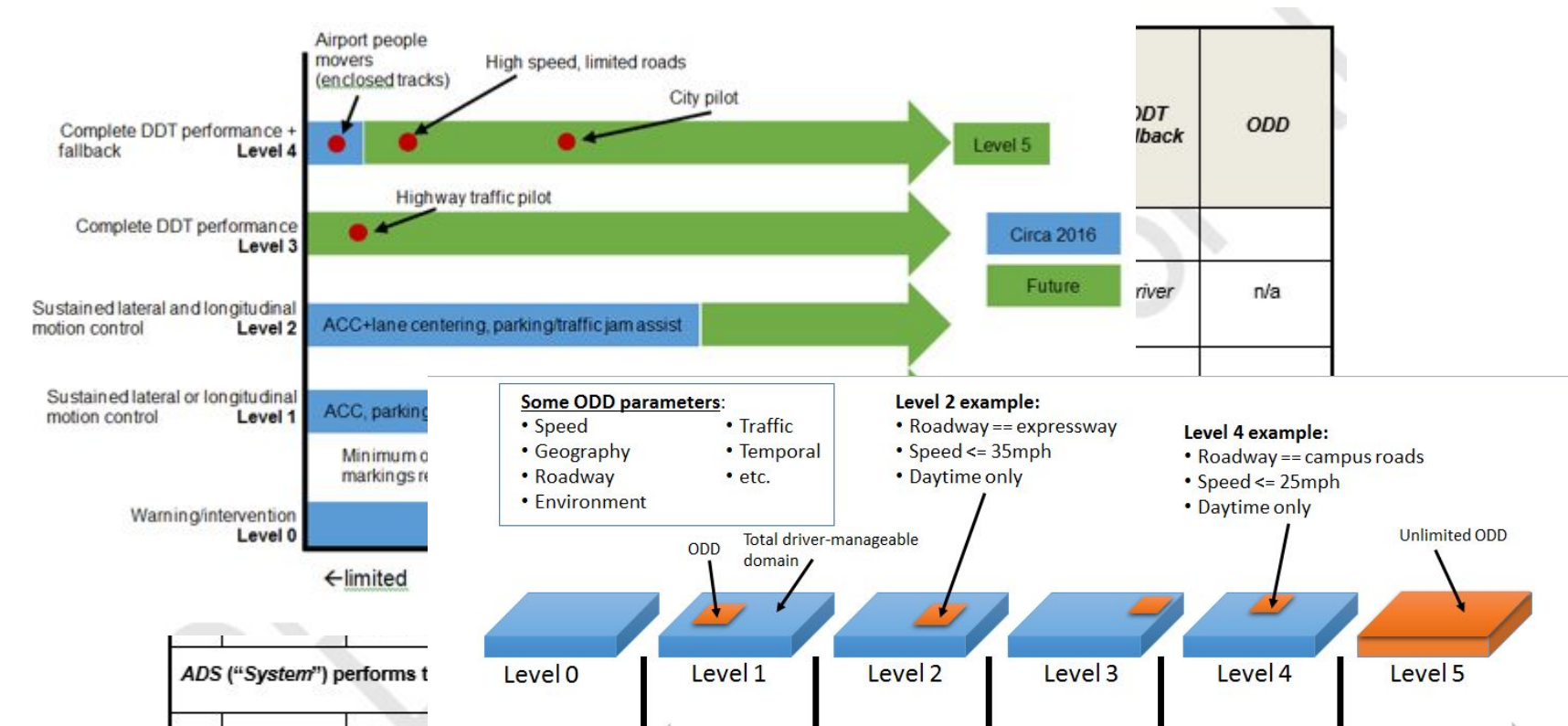
- Level 2 example:**
- Roadway == expressway
 - Speed <= 35mph
 - Daytime only

- Level 4 example:**
- Roadway == campus roads
 - Speed <= 25mph
 - Daytime only

ADS ("System") performs t		
3	Conditional Driving Automation	The sus ADS of DDT fa requests relevant
4	High Driving Automation	The sus ADS of expect
5	Full Driving Automation	The s (specific) performance by an ADS of the entire DDT and DDT fallback without any expectation that a user will respond to a request to intervene.



System	System	System	Unlimited
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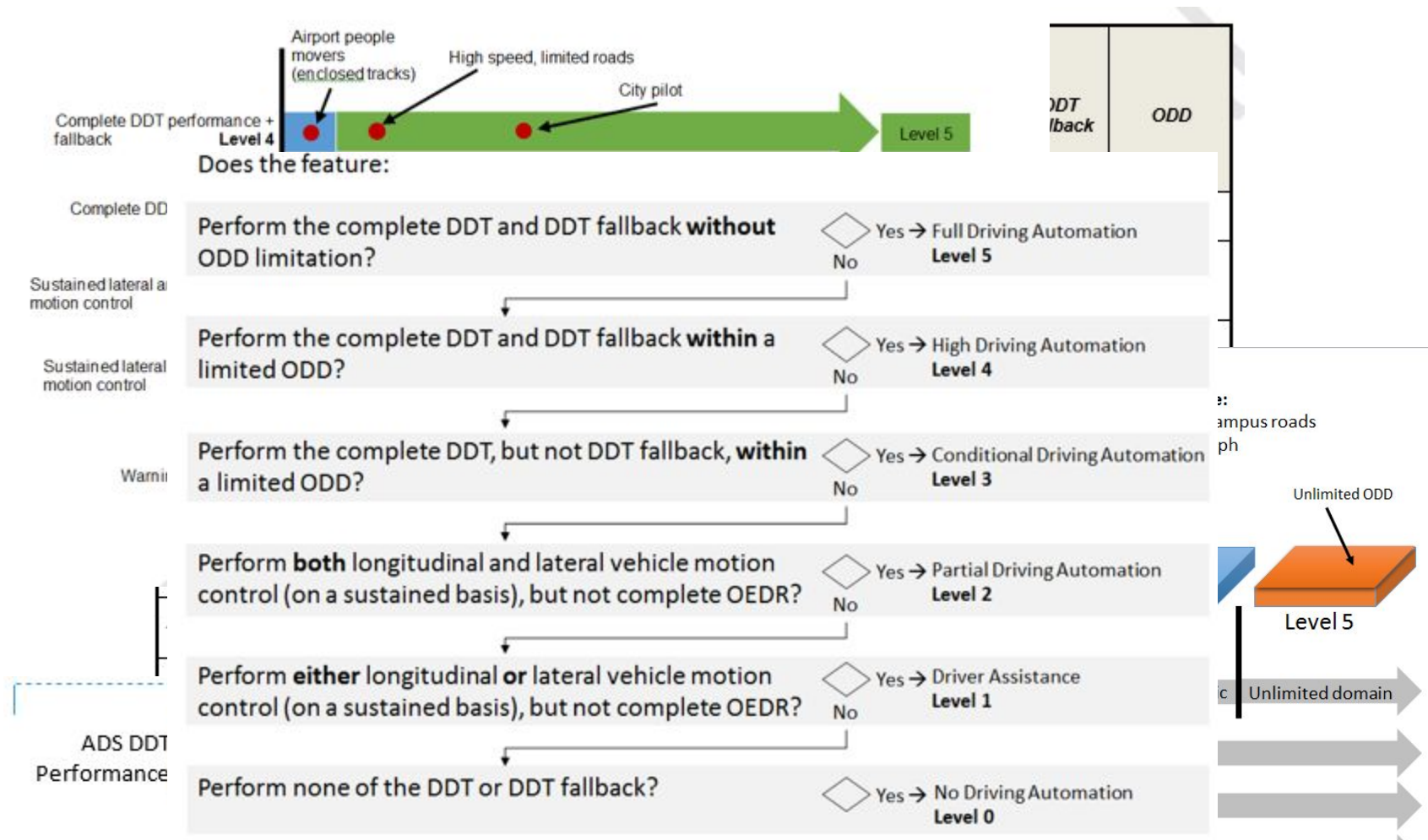


Figure 8 - Simplified logic flow diagram for assigning driving automation level to a feature

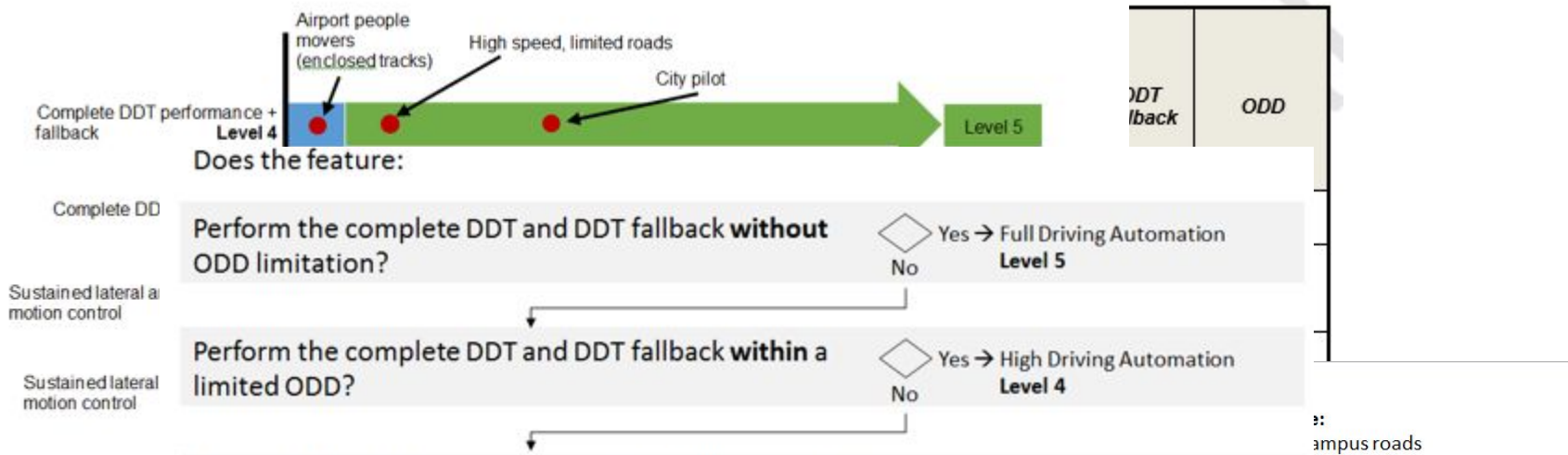


Figure 8 - Simplified logic flow diagram

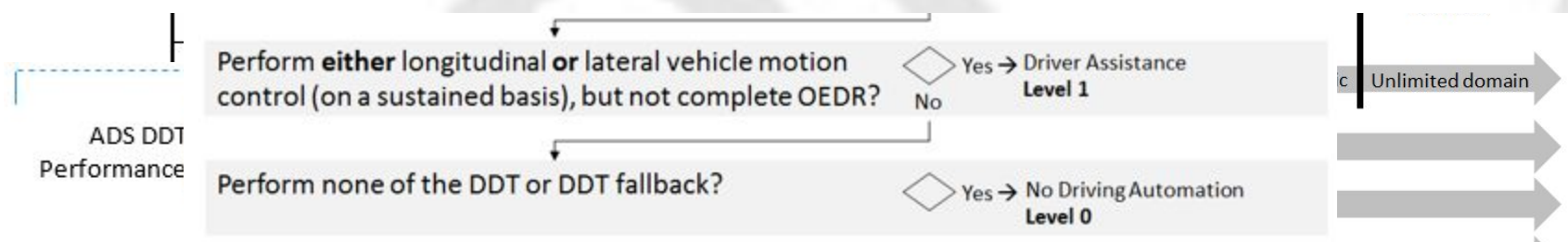
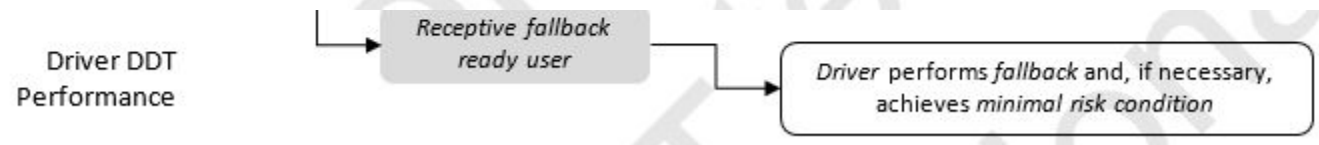


Figure 8 - Simplified logic flow diagram for assigning driving automation level to a feature



“Drive means to drive, operate, move, or be in actual physical control of a vehicle...”

“Operate ... means to drive...”

“Operating ... is generally given a broader meaning [than driving].”

SAE J3016™ LEVELS OF DRIVING AUTOMATION

	SAE LEVEL 0	SAE LEVEL 1	SAE LEVEL 2	SAE LEVEL 3	SAE LEVEL 4	SAE LEVEL 5
What does the human in the driver's seat have to do?	You are driving whenever these driver support features are engaged – even if your feet are off the pedals and you are not steering			You are not driving when these automated driving features are engaged – even if you are seated in “the driver’s seat”		
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These are driver support features

These are automated driving features

What do these features do?	These features are limited to providing warnings and momentary assistance	These features provide steering OR brake/acceleration support to the driver	These features provide steering AND brake/acceleration support to the driver	These features can drive the vehicle under limited conditions and will not operate unless all required conditions are met	This feature can drive the vehicle under all conditions
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Example Features

<ul style="list-style-type: none"> • automatic emergency braking • blind spot warning • lane departure warning 	<ul style="list-style-type: none"> • lane centering OR • adaptive cruise control 	<ul style="list-style-type: none"> • lane centering AND • adaptive cruise control at the same time 	<ul style="list-style-type: none"> • traffic jam chauffeur 	<ul style="list-style-type: none"> • local driverless taxi • pedals/steering wheel may or may not be installed 	<ul style="list-style-type: none"> • same as level 4, but feature can drive everywhere in all conditions
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Who should an automated vehicle kill?

Does the public trust AVs?

How safe is safe enough?

How should safety be assessed?

~~Does the public trust AVs?~~

We are fickle

Marketing is coming

Words are not actions

A lot changes before 100%

~~Should the public trust AVs?~~

They don't yet exist

They will be really diverse

They won't be *super* dangerous....

How safe is safe enough?

Prospective: Before deployment

Retrospective: After deployment

Retrospective safety will mean

At least as safe as a **human in the maneuver**

and

At least as safe as a **comparable AV**

and

Safer than the **last AV that failed**

Prospective safety will mean

Reasonable confidence
that the AV developer
is worthy of our trust

Who drives an AV?

Humans won't drive AVs

Computers won't drive AVs

Companies will drive AVs

Uber's fatal crash



Companies will drive AVs

AVs are only as safe as their companies

Companies are legal subjects that act through their human and machine agents

Companies can do right even after their technologies fail

A trustworthy corporate driver

Shares its safety philosophy

Makes a promise to the public

Keeps that promise

Safety philosophy

“This is what we’re doing

“This is why we think it’s reasonably safe

This is why you can believe us”

Promise to the public

“We market only what we reasonably believe to be safe

“We will be candid about our limitations and failures

“When we fail,
we will make it right”

Keeping that promise

Manage public expectations

Supervise the entire product lifecycle

Mitigate harms promptly, fully, and publicly

A trustworthy company

Shares its safety philosophy

Makes a promise to the public

Keeps that promise

AUTOMATED OPERATION OF VEHICLES ACT

NATIONAL CONFERENCE OF COMMISSIONERS
ON UNIFORM STATE LAWS

uniformlaws.org/Committee.aspx?title=Highly%20Automated%20Vehicles

Automated driving provider

Self-identifies to the US state government

Represents that the automated vehicle is capable of complying with the vehicle code

Acts as the legal driver from the start of automated operation until a human driver intentionally terminates that operation

Keep it simple

Either you are intentionally driving...

...or you are not driving

Because when everyone is responsible,
no one is responsible.

Complementary approaches

Levels of automation as a promise to the public

SAE J3016 Definitional Concept

Automated driving system entity (ADSE)

UK Law Commissions and the Australia National Transport Commission

Safety self-assessments for automated driving

Transport Canada and the US National Highway Traffic Safety Administration

Safety is not just a single test!

Management philosophy

Design philosophy

Hiring and supervision

Evaluation and integration of standards

Monitoring and updating

Communication and disclosure

Strategies for obsolescence

....

Safety as marriage, not wedding

AV developers will vow their systems are safe

Will you trust them then and in the future?

What is the basis for that trust?

Regulators can do this well

Focus on processes and systems

Identify assumptions and logical progressions

Ask questions and challenge answers

For provinces and territories

What are your government's goals?

How can automated driving help those goals?

How else can you achieve those goals?

See *How Governments Can Promote Automated Driving* at:

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newlypossible.org



**AND A LEAN, SILENT FIGURE
SLOWLY FADES INTO THE
GATHERING DARKNESS, AWARE
AT LAST THAT IN THIS WORLD,
WITH GREAT POWER THERE
MUST ALSO COME -- GREAT
RESPONSIBILITY!**



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