Online Course: Automated Vehicles in Logistics

Lesson 1 Introduction to AGV's

Module 2 State-of-Art of AGVs

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Introduction | State-of-Art of the AGV Technology

Lesson overview

1. Features of the AGV
2. State of Art
3. Advantages and disadvantages
4. Use case description

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Features of the AGV

1. Self driving and self steering vehicle
2. Following a predefined path
3. Receiving commands to execute transportation jobs
4. Self awareness to its environment
5. Can operate safely with persons in it's vicinity
6. Will send status to the commanding level

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State-of-Art of AGV Technology

What type of AGVs can be integrated in logistical operations without unexpected problems?

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Introduction | Features of the AGV

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Technology Readiness Level

System Test, Launch & Operations — TRL 9

System/Subsystem Development — TRL 8

TRL 7

Technology Demonstration — TRL 6

Technology Development — TRL 5

TRL 4

Research to Prove Feasibility — TRL 3

Basic Technology Research — TRL 2

TRL 1
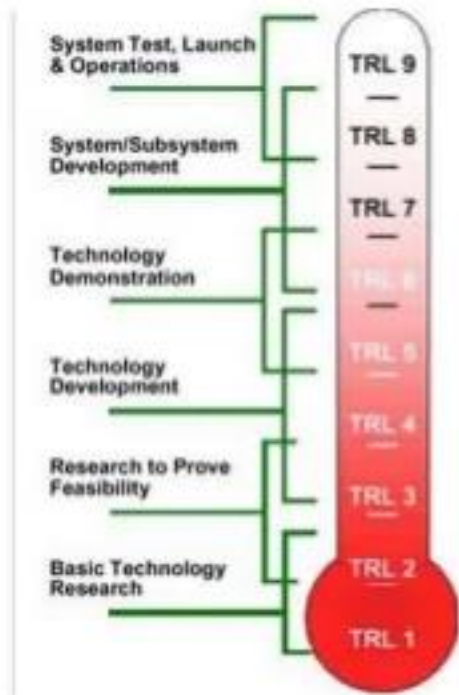
From…
"It would be cool to fly…, " (Wright brothers)
To…
"Shall we take the airplane or train for a citytrip"

Or From
"It would be cool to have self-driving cars"
To…
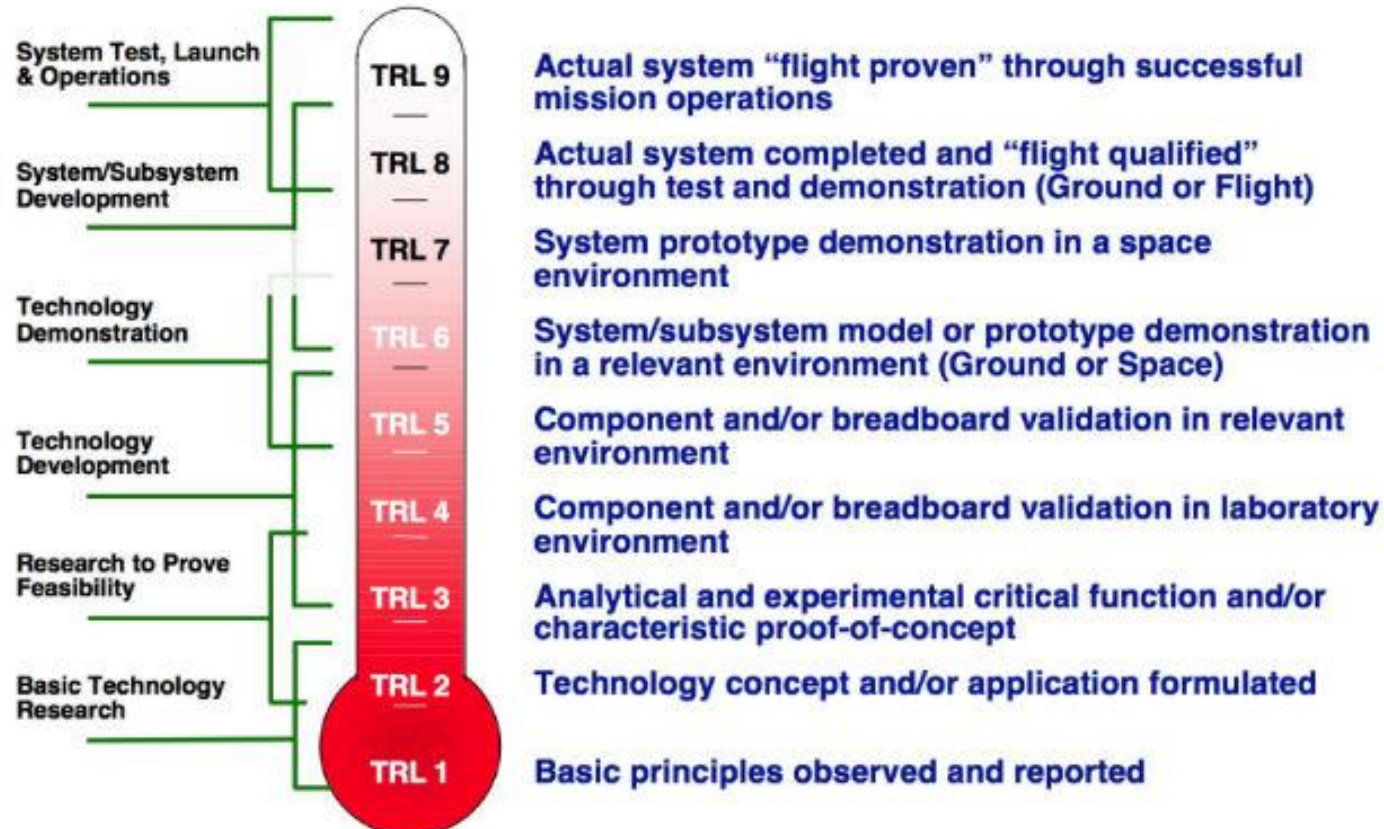"Let's quickly load this cargo, because another AGV is waiting in the staging area"

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NASA/DOD Technology Readiness Level

System Test, Launch & Operations	TRL 9	Actual system "flight proven" through successful mission operations
System/Subsystem Development	TRL 8	Actual system completed and "flight qualified" through test and demonstration (Ground or Flight)
	TRL 7	System prototype demonstration in a space environment
Technology Demonstration	TRL 6	System/subsystem model or prototype demonstration in a relevant environment (Ground or Space)
Technology Development	TRL 5	Component and/or breadboard validation in relevant environment
	TRL 4	Component and/or breadboard validation in laboratory environment
Research to Prove Feasibility	TRL 3	Analytical and experimental critical function and/or characteristic proof-of-concept
Basic Technology Research	TRL 2	Technology concept and/or application formulated
	TRL 1	Basic principles observed and reported

State-of-Art of AGV Technology

Feature	Technology Required	Technical Readiness Level
1) Self driving and steering	Position and speed sensors and actuators	TRL 9, Robots
2) Following a predefined path	Path programming	TRL 9, CNC machines
3) Receiving commands	Automation technology	TRL 9, Industrial automation
4) Self awareness to environment	New; algorithms which analyse sensor data	Weather models, airport detection ports, surveillance camera's
5) Safe operations	New; highly reliable sensors, computers and actuators which intervene in unsafe conditions to prevent accidents	Airplane pilot warning systems
6) Status updates	Communication technology	TRL 9; Industrial automation

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Introduction | State-of-Art of the AGV Technology

Indoor State-of-Art of AGV Technology

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Outdoor State-of-Art of AGV Technology

Mixed Traffic AGV's

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Summary and outlook

1. Technical Readiness Level evaluation of features
2. Self assessment of environment and continuously operating in a safe manner
3. Distinguished speed and combined load for different types of AGVs
4. Distinguished between unmanned operational areas and mixed traffic environment
5. Mature technology for environment perception and multiple safety sensors can advance the technology for AGVs in mixed traffic situation

Advantages and disadvantages of using AGVs;

How can we have maximum benefit with the usage of AGVs in logistical operations?

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THANK YOU FOR YOUR ATTENTION

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