



# Human Factors Challenges of Remote Support and Control

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Transport  
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# Why Use Remote Support & Control?

- In extreme or harsh environments where it would be dangerous to have a human operator
- To improve work conditions, reduce workload and fatigue due to manual machine operations
- **Passenger vehicles**— an automated driving system requires assistance or control to negotiate a difficult or unexpected situation; a driver or passenger needs assistance

# Human Factors Challenges of Remote Support & Control: A Position Paper from HF-IRADS

## Human Factors in International Regulations for Automated Driving Systems (HF-IRADS)

- Group of HF experts around the world to support UNECE activities on the safety of automated driving systems
- Under the auspices of International Ergonomics Association (IEA)

## Motivation

- Remote support and control are being considered as viable options for a wide range of situations, from on-board monitoring to temporary or full vehicle control
- The need for human factors involvement to understand the use cases and design for safe use

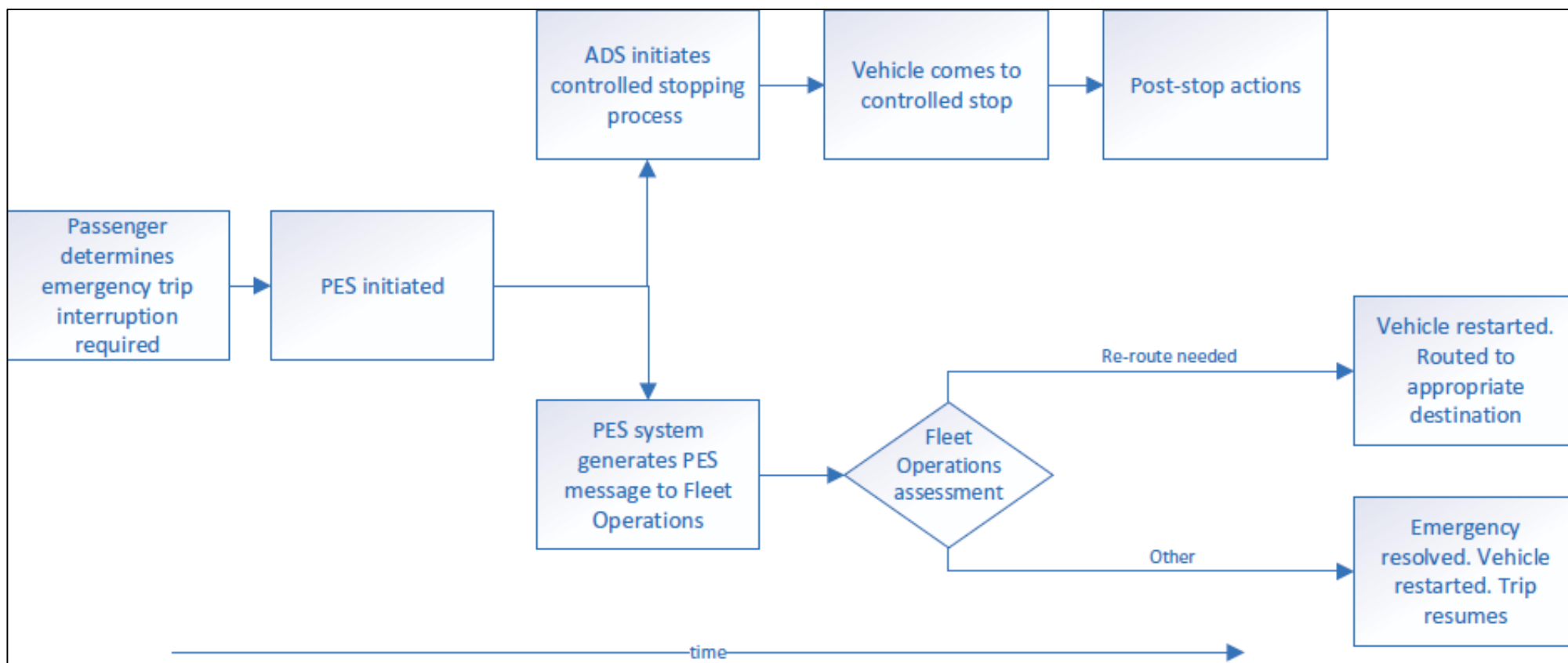
# Examples of Remote Support and Control

	Remote Assistance	Remote Management	Remote Operation
<b>Remote Operation Functions (Remote Human)</b>	<ul style="list-style-type: none"> <li>• Providing information (e.g. passenger inquiry)</li> <li>• Support &amp; Assistance (service provider)</li> <li>• On-Board Monitoring (visual &amp; auditory); safety monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Assistance for hazard detection; scanning environment</li> <li>• Authority to resume movement (or stop. partial or full control)</li> <li>• Authority to deviate from fixed path</li> <li>• Limited path guidance in special situations</li> <li>• Based on human perception, intervention and action</li> </ul>	<ul style="list-style-type: none"> <li>• Temporary or full control under normal, unexpected or emergency conditions</li> <li>• May be full remote driving at               <ul style="list-style-type: none"> <li>• Slow speed</li> <li>• High speed</li> </ul> </li> </ul>
<b>Examples</b>	<ul style="list-style-type: none"> <li>• Information requests, breakdown assistance (tow truck; On-Star)</li> <li>• Stop request, emergency request, ACN communications</li> </ul>	<ul style="list-style-type: none"> <li>• Remote dispatcher</li> <li>• Unexpected hazards in roadway such as uneven road, new construction, roadway blockage...</li> </ul>	<ul style="list-style-type: none"> <li>• Dealing with failure modes</li> <li>• Intervening and guiding shuttles on a path at low or high speeds</li> </ul>

Considerations  
For Remote  
Support &  
Control



# Example: Passenger Initiated Emergency Stop (PES)



# Remote control and operation is complex

## Humans + ADS + Remote Operation

### Use cases need to be investigated and understood

- Wide range of possibilities from monitoring to vehicle control
- Cannot assume that remote handling constitutes a viable backup for all problems encountered by vehicles under the control of ADS
- Safety Case for each application of remote support and control

### Design of work environment

- Human roles and responsibilities, capabilities and limitations
- Proper design of the work environment is essential for safety and function

### Research to support activities

- Develop design guidance, best practices for safe and effective use
- Evaluation metrics and assessment procedures

Thank you for your attention!

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[AVSC \(2020\) Best Practice](#) – Passenger-Initiated Emergency Features

[HF-IRADS \(2020\) Human Factors Challenges of Remote Support and Control](#)