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Autonomy Still Needs Humanity

The Role of Remote Operations in Safe and Accountable Autonomous Mobility

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We have been asking the wrong question:

"When will we remove the human?"

OLD FRAMING

Autonomy = removing humans

Success = zero human intervention

BETTER QUESTION

What is the right human role at each stage of autonomy?

How do we design it well?



How "driverless" became the brand - and why it backfired

The brand promise

"Full Self-Driving"
"Driverless"

- Companies competed on autonomy as an absolute.
- Human involvement construed as technology not ready yet

The inconvenient human

- Remote operators quietly omitted from marketing.
- Safety drivers framed as temporary.
- Overseas Remote Operators reported as scandal, not celebrated as safety design.

The trust collapse

- When human involvement surfaced, it read as deception.
- Every incident became a broken promise. Public trust collapsed – it sets the industry back.

Remote operations is not a workaround - it is a design feature

What people imagine:

- Agents controlling everything behind the scenes to “fake autonomy”
- A call centre watching dashcams - just in case

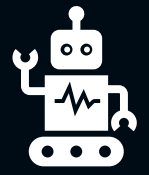
What they actually are

- Structured safety architecture
- Defined intervention authority & escalation paths
- Operational accountability chain



Same ”AV” label – but different architectures

Each company has its **own proprietary stack**.
The operational architecture is shaped by **three distinct forces**. **None of these are visible** at SAE level.



Technology Stack

Determines the Dynamic Driving Task & fallback architecture



Commercial Model

Determines who owns each role



Operational Design

Deliberate decisions for safety & efficiency

Architectural variation is not a problem - it is innovation.
Regulators need frameworks that ensure accountability is traceable regardless of how a company structures its operations.

The basics needed to launch and scale the human layer of AV operations

People

- Training & (de)certification program
- Workforce Management: Fatigue management, cognitive load, leave, attrition, etc.
- Harmonized plans with stakeholders: in-field, maintenance, customer service, emergency services, etc.

Systems

- Remote operations tooling; including ergonomics and human factors
- Fallback systems: power, comms, connectivity
- Operational reporting and regulatory submissions
- Physical and cyber security

Processes

- SOPs and Rulebook
- Crisis Management Plan
- Governance Framework (incl. escalation paths & performance management)
- Operational feedback loops for system improvement

The public misconception around Remote Operators : Vehicles Ratio

Deployment context

The ratio is shaped by where and when you operate: ADS calibration to a specific city, ODD complexity, cultural driving norms, and local familiarity with AVs.

Scope of Remote Operators responsibility

What triggers an intervention - and what the operator does during it - varies significantly between companies

No standard calculation methodology

The same operation could report 1:8 or 1:20 depending on whether the denominator is fleet size, active vehicle-hours, peak staffing, or an average.

On-shift ratio ≠ workforce required

The ratio is not a headcount. Once shift patterns, leave, training, attrition, and fatigue rules are applied, the actual headcount needed to sustain that target can be three times higher - or more.

Deliberate business choices

Risk appetite, SLA thresholds, and acceptable queueing risk are design decisions. Two companies with identical systems can legitimately target different ratios.

The right regulatory question is not 'what is the ratio?' → It is 'what is the safety case that justifies it?'

Every governance framework, every SOP, every workforce ratio you have seen

...exists because a human must be accountable for what happens on your streets.

That is not a constraint on autonomy. It is the condition of public trust.

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Autonomy still needs humanity.

That is not a limitation. They are complementary.

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