Safety Guidelines

for Autonomous Mobility and Delivery Providers on the Uber Platform

December 2025

Uber

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The Evolution of our Safety Guidelines - Updated in 2025

Since the launch of the Autonomous Mobility & Delivery (AM&D) Safety Guidelines in 2022, Uber has made meaningful progress in deploying autonomous vehicles (AVs) onto its platform through partnerships with leading companies in both mobility and delivery. This updated edition incorporates three years of operational insights and highlights Uber's increased engagement with industry standards organizations—including SAE International, IEEE, and especially the Automated Vehicle Safety Consortium (AVSC), in which Uber assumed an active role, commencing in early 2023. These collaborations play a vital role in ensuring the safe, responsible integration of AVs into the Uber platform.

Uber's AV strategy is rooted in partnerships with AV developers, manufacturers and fleet operators to build services that prioritize safety, privacy, equity, and sustainability. These partnerships help ensure that AV deployment delivers measurable benefits to riders, drivers, and communities.

Enhanced Guidelines for Autonomous Vehicle Safety

Over the past three years, Uber has collaborated with AV developers and fleet operators to enhance and refine its Safety Program framework. This robust framework has successfully guided our partners through a comprehensive safety due diligence process, evaluating safety culture, vehicle technology, and operational readiness across three phases: planning, demonstration, and operation.

For AV developers, we have refined our guidelines for driving behavior safety evaluation to ensure they are more clearly linked to their overall safety approach (see Appendix C). As such, we expect our partners to demonstrate how evidence and test results support the developer's broader safety claims. This alignment provides greater transparency into the rationale behind safety decisions, reinforces traceability from system requirements through testing outcomes, and strengthens confidence that identified risks have been effectively mitigated.

The AV ecosystem has developed as well, with an increasing number of industry players diversifying their model and relying on partners. For example, Uber partners with AV fleet operators as well as AV technology developers for some of our deployments. Strong coordination and well-defined processes help ensure consistency, accountability, and safety of the overall deployment with organizations having distributed roles and responsibilities. Uber plays a central role by setting clear expectations, ensuring performance metrics are aligned with the latest industry standards, and supporting compliance, thereby fostering alignment and confidence across all fleet operations. This focus area represents one of the key updates in our safety guidelines around operational safety.

Driving Industry Standards Through AVSC Collaboration

Uber's active membership in the AVSC reinforces its leadership in shaping autonomous vehicle safety practices. By contributing real-world operational insights and collaborating on shared safety challenges, Uber helps advance best practices that benefit the broader industry. AVSC Information Reports and Best Practices are directly incorporated into Uber's partner evaluation framework and safety protocols.

To drive alignment on safety information sharing across the AV industry, Uber co-led a working group within the AVSC and informed the content of AVSC's Best Practice for Core Automated Vehicle Safety Information. This AVSC best practice has since become a helpful tool for regulators around the world to understand how Uber's on-boarding process for AVs onto its platform is broadly applicable to regulatory frameworks.

As AV adoption accelerates, Uber remains committed to close collaboration with AVSC members and the broader AV community. Together, they are working to promote public trust, elevate safety standards, and ensure the responsible deployment of AVs in cities around the world.

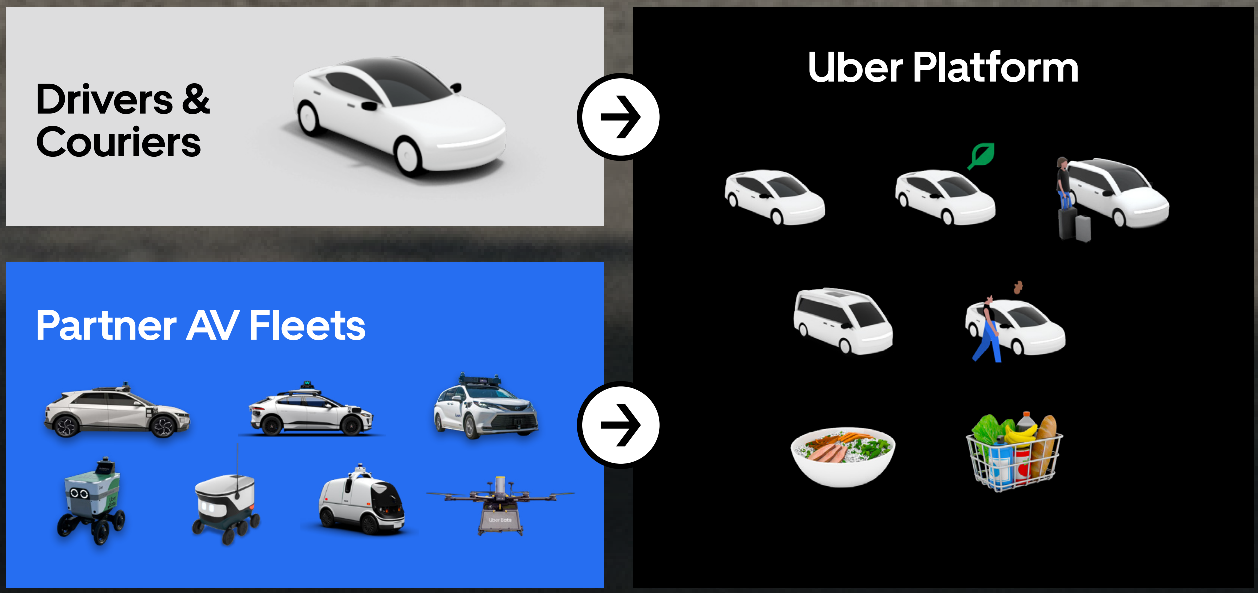
Expanding Modalities: Applicability to Airspace Delivery

Recognizing the rapid evolution of autonomous delivery methods, this update introduces an additional appendix focused on airspace delivery, such as drone-based services. In the United States and Europe, there are robust regulatory frameworks in place for drones that complement our safety assessment process and guidelines. While the regulations for drones are extensive, we expect our partners to take additional steps beyond the regulatory requirements focused on the safety of Uber customers, merchants and the general public. The same structured approach to safety planning, performance assessment, and stakeholder transparency extends to aerial systems. Appendix B provides targeted guidance for evaluating airspace delivery partners to ensure safety while they are operating on the platform, while reinforcing Uber's broader commitment to safety, innovation, and cross-modal integration across the autonomous ecosystem.

As Uber continues to expand its autonomous operations, these updated guidelines serve as a cornerstone for responsible growth grounded in safety, transparency, and industry collaboration. By staying aligned with evolving best practices and embracing emerging modalities, Uber remains committed to shaping a safer, more accessible future of transportation and delivery.

Uber's Vision for Autonomous Mobility & Delivery

Uber's mission is to reimagine the way the world moves for the better, and autonomous vehicles are part of that vision. We expect AVs to increasingly contribute to Uber's business over time, as part of a hybrid network featuring AVs operating alongside conventional vehicles. This type of hybrid network approach has the potential to dramatically lower consumer costs, increase the supply of transportation and delivery options, improve safety, increase service quality, and unlock new use cases. We intend to ensure Uber continues to provide the best mobility and delivery offerings in a future with AVs.



Our approach is to partner with autonomous vehicle developers, fleet operators, and cities to help connect consumers with AV services that:

- Create new opportunities, productivity, and growth for our customers and partners.
- Meet understandable expectations for safety, security, and privacy.
- Drive greater equity and positive environmental outcomes in our communities.

Stand For Safety

Safety is one of our eight values here at Uber, and it is a driving force behind our Autonomous Mobility & Delivery (AM&D) Safety Program.

Safety never stops
We embed safety into everything we do. Our relentless pursuit to make Uber safer for everyone using our platform will continue to make us the industry leader for safety. We know the work of safety never stops, yet we can and will challenge ourselves to always be better for the communities we serve.

As such, we have an obligation to our stakeholders to reassure them that when Uber is introducing autonomous vehicles to our network, and their communities, we are doing so with meaningful safety diligence, including with respect to whether the specific automated driving system is able to safely operate on public roads and within the unique landscape of the cities where they seek to deploy.

AM&D Safety Program

Safety Program Objective

For conventional vehicles, a rigorous and robust set of regulatory standards help govern vehicle design (through federal laws) and fleet partner operational responsibilities (through state and local rules). Many of these rules continue to govern autonomous vehicles (AV). In addition, states and localities have begun to enact rules specifically designed to govern the testing and commercial operation of autonomous vehicles -- though the prescriptions vary significantly from jurisdiction to jurisdiction, including on the core question of evaluating an autonomous vehicle's safe operation. Although some of these laws may speak to commercial deployment, few to our knowledge focus on the ultimate question of the criteria that should govern deployment through a consumer-facing platform.

Whatever the state of the regulatory development around autonomous vehicles, Uber believes we have an important role to play in understanding how our potential partners plan on approaching AV safety for any operations involving the Uber platform.

As such, it is the goal of the AM&D Safety Program to implement a safety framework that:

- Defines a comprehensive and pragmatic strategy for understanding how potential partners would approach the safety of any operations on the Uber platform, creates a consistent assessment process, rooted in applicable industry safety standards and best practices.
- Establishes the baseline for automated & autonomous robots and vehicles to deploy and continue operation on the Uber network across mobility and delivery use cases.

Critically: The AM&D Safety Program **is not** meant as a substitute for a partner's internal safety approach. Because partners know their own operations best, Uber does not have access to the same operational details that inform safety decisions. Our analysis focuses on whether a partner has provided sufficient information to warrant inclusion on the Uber network for delivery or mobility connectivity. That analysis does not replace the fundamental legal and safety question of whether a vehicle is safe enough to operate in public. Partners own this responsibility. As part of any deployment through our platform, we ask partners to certify their ability to do so.

The AM&D Safety Program asks different but important questions aimed at building confidence with Uber's stakeholders, including customers, public sector partners, and the public. Partners are best positioned to explain their safety processes, and we expect them to demonstrate their approach.

This targeted effort evaluates the credibility and integrity of a partner's submission without verifying assumptions and artifacts supporting their safety approach or the ultimate functional safety of their vehicle. It also does not establish elements of a partner's safety program. Only developer and operating partners can determine the right bases for a safety conclusion.

The remainder of this document does not prescribe standards, a single safety standard, or metric for all partners, but summarizes industry approaches. These safety demonstrations may not apply in every deployment but may serve as non-exhaustive considerations for future safety demonstrations.

While some parts of this framework may apply to human-driven vehicles, that is not its intended use, as existing regulatory frameworks should apply.

The AM&D Safety team assesses each partner's Safety Plan in relation to its planned scope of operations when determining platform readiness. This framework is intended to support that assessment.

Safety Program Process

The program is organized into three phases that begins with planning, is followed by demonstration, and ultimately involves continuous operation with clear reporting on safety performance. This program identifies the AV fleet partner obligations that are expected to be met, each step of the way.

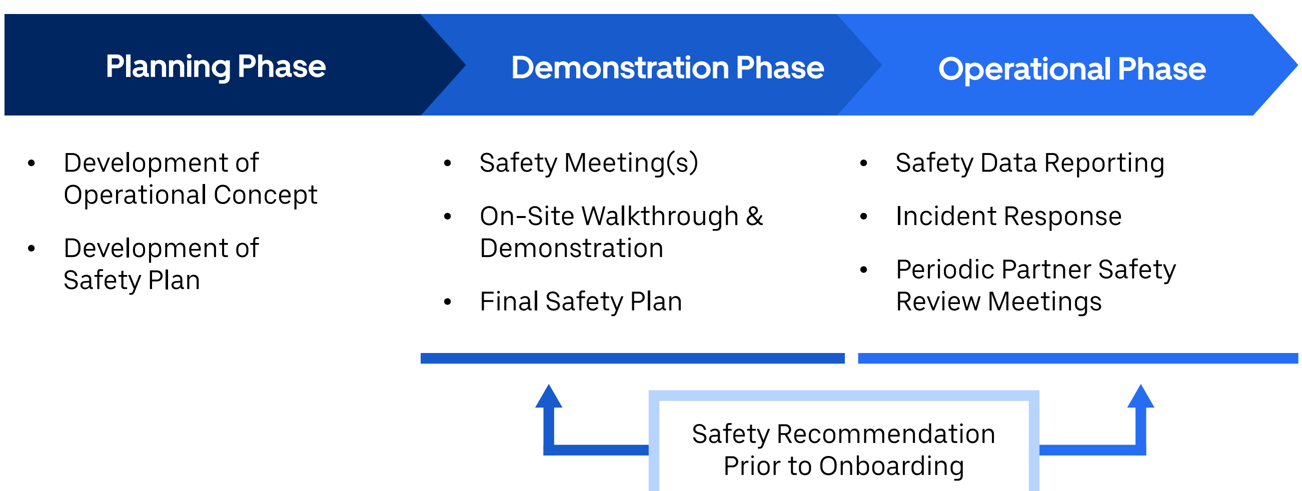


Figure 1: AM&D Safety Program Overview

Safety Plan Overview

The Safety Plan outlines the intended process, methods, milestones, and responsibilities for identifying and mitigating safety risks throughout development, deployment and operation of autonomous vehicles on the Uber Platform. It emphasizes how safety will be prioritized and advanced, often before or during implementation phases.

The Safety Plan developed by each AV partner is a central element of the overall AM&D Safety Program that establishes the partner's proposal for safety expectations, which are then reviewed, discussed and explored during safety meetings and on-site demonstrations. The Safety Plan is intended to be specific to a planned deployment of autonomous vehicles on the Uber Platform and represents a collection of supporting safety information. With the continued maturation of regulatory frameworks, formal attestation or certification of compliance with federal/national, state, and local laws may be cited in the Safety Plan as supporting evidence of a sound and systematic approach to safety.

At a high level, the Safety Plan includes five key elements:

1	**Proposed Operational Concept**	Summary description of the proposed service on the Uber platform, including high level overview of the operations, geographical map of intended service locations and any other relevant ODD elements or constraints.
2	**Safety Approach for Operational Concept**	High-level summary of partner's safety approach to confirm alignment with established industry standards and best practices. The method for evaluating this aspect of the safety plan is outlined in a later section: Safety Approach Assessment Framework.
3	**Regulatory & Standards Compliance**	Summary of adherence to all applicable local, state, and federal regulations, operational safety standards, and industry best practices for the deployment region, including confirmation of required approvals, compliance with local AV frameworks or testing programs (e.g., California DMV Autonomous Vehicle Program), established processes for reporting to regulatory agencies, and ongoing monitoring and response to regulatory developments.
4	**Incident Response Communications Plan**	Standard operating procedures and overview of the Partner's response to a safety incident, including coordination and communication with Uber's AM&D Safety and Operations teams.
5	**Safety Metrics Reporting**	Thresholds and processes for reporting both predictive and outcome -based safety metrics, including collisions, safety incidents, traffic citations, complaints, and other safety performance indicators to be reported on a monthly basis.

Figure 2: AM&D Safety Plan Elements

Taken as a whole, the Safety Plan along with the on-site demonstration and safety meetings are meant to provide support for a partner's argument that the proposed operations do not present an unreasonable risk to safety for our customers or the general public.

Safety Case vs. Safety Plan

There is growing global regulatory support for the need for an operator and/or developer to complete a validated safety case. Accordingly, we encourage the adoption of a safety case framework, as it provides a structured method for demonstrating that an autonomous vehicle (AV) is acceptably safe for deployment and operation. This framework typically incorporates defined safety performance metrics and adherence to regulatory standards and best practices.

A complete and well-supported safety case represents an example of a safety approach that would typically satisfy the safety content required by Uber's Guidelines. The documentation of evidence as part of a robust safety case could be summarized in a way that would form the basis of the safety approach section in the Safety Plan. It constitutes a structured, evidence-based argument demonstrating that an autonomous system operates at an acceptably safe level within its defined Operational Design Domain (ODD). And it also would frequently capture evidence of regulatory compliance. This documentation encompasses key assumptions, limitations, and justifications and is maintained throughout the lifecycle of the system.

The safety case remains the responsibility of the partner. For a Safety Plan, the partner can summarize their safety approach in a clear and meaningful manner (while confirming the summary is representative of the total plan). As part of our evaluation of the overall safety approach, we may select specific claims within the safety case to examine for alignment with recognized best practices and regulatory expectations. Our approach is further explored in the Safety Approach Assessment Framework section of this document.

Safety Plan Assessment

The AM&D Safety team reviews each AV partner's Safety Plan and provides key feedback to better position a partner to connect through the Uber platform. As a part of this process, the Safety team consults key industry safety standards and best practices that may help illuminate a particular partner's approach, as well as relevant national and local guidance. The Safety Team provides such feedback and collects other information that will be germane for the Assessment Framework through a series of meetings with the partner to discuss the content of the Safety Plan followed by an on-site walkthrough and demonstration of the operational concept. This ultimately provides input that is used in the development of a safety recommendation regarding whether to on-board the partner or not to the Uber platform.

Safety Program Benefits

The AM&D Safety Program is designed to be beneficial to both Uber and our AV Partners. On the Uber side, this program achieves the following:

- Ensures the AM&D program is aligned with Uber's corporate value to Stand for Safety.
- Ensures the AM&D program performs reasonable diligence in regards to safety.
- Establishes a flexible framework for goods delivery as well as rides with passengers.

And for our AV Partners, this program has the following potential benefits:

- Establishes mutual support of safety approach and better positions us to stand together in response to a safety incident.
- Provides potential insights regarding how emerging industry standards may be applied to a given use case and operational deployment.
- Provides a partner with the opportunity to help reassure mobility and delivery consumers, and regulators, as to the safety of a partner's operations.
- Offers additional perspective and comfort that a partner's level of safety diligence compares favorably with industry.

Ultimately, this collaborative work generally increases the likelihood of AV product category success through promoting a transparent, consistent, thorough approach to safety across partners on the Uber platform.

Value Of An Autonomous Vehicle Safety Approach Framework

As Uber continues to advance autonomous mobility and delivery, the Safety Approach Assessment Framework provides a unified foundation for evaluating how our partners approach safety within a rapidly developing regulatory landscape. Several elements unique to autonomous vehicle fleets recommend in favor of applying a framework like these Uber Guidelines, especially with the absence of a single, controlling AV regulatory framework or safety standard and the ongoing advancement of the underlying technology. Moreover, a contrast with conventional human-driven vehicles (and especially human-driven fleets) helps to highlight why this approach is limited to AV fleets, and may be inappropriate for other modes of transportation.

First and foremost, the regulatory landscape for autonomous vehicles is rapidly evolving in the US and internationally. At this time there is not an existing federal or state regulation in the United States that can be directly applied to Uber's assessment of our AV partner's safety plans to prove up the sufficient safety of those plans. For human-driven fleets like commercial motor coaches and taxi fleets, there are numerous existing federal, state and local regulations governing the safety of the vehicle and its operations. Similarly, rideshare services are governed by extensive regulations (usually at the state or local level) in the US. These mature regulations help set a consistent standard for conventional vehicles and the provision of certain types of services through a technology platform like Uber's, and provide both a consensus basis for the right level of safety performance and a structure to assure that vehicles and operations meet that standard (e.g., the U.S. government process for certification that vehicles meet all applicable safety standards).

Regulations for AVs are developing, but AV-specific rules have not matured to the extent of other vehicle rules. For SAE Level 4 autonomous vehicles, the European Union has released a regulation for type certification adopted in August 2022, with published interpretation documents. In the United States, NHTSA has not yet enacted regulations that establish the requisite safety levels for AVs, however they have worked with industry stakeholders on proposed programs, revised regulations, expanded exemption pathways, and put in place ongoing research and data collection efforts. Some highlighted efforts in the regulatory space are listed below.

- Regulation (EU) 2022/1426, effective August 5, 2022
  - JRC136417
  - JRC140978
- **Regulation (EU) 2022/2236,** adopted in June 2022
- US DOT / NHTSA - Automated Driving Systems: A Vision for Safety
- US DOT / NHTSA - Enforcement Guidance Bulletin 2016–02: Safety-Related Defects and Automated Safety Technologies
- US DOT / NHTSA - Framework for Automated Driving System Safety
- US DOT / NHTSA - Third Amended Standing General Order 2021-01 (Effective June 16, 2025)
- US DOT/ NHTSA - ADS-Equipped Vehicle Safety, Transparency, and Evaluation Program (AV STEP) (NPRM Jan 2025)
- US DOT / NHTSA - Expanded Automated Vehicle Exemption Program (April 2025)
- United Kingdom - Automated Vehicles Act 2024 (c 10)

Second, there are numerous ongoing initiatives shaping the evolving landscape of autonomous vehicle (AV) safety. The organizations highlighted below—through both completed and active efforts—illustrate the breadth and depth of work across technical and operational domains. These standards development organizations (SDOs) play a pivotal role in promoting consistency, transparency, and safety-focused practices that support the design, testing, deployment, and oversight of AV technologies across the ecosystem. Together, these efforts represent a multi-disciplinary and global approach to building trust, transparency, and safety into the core of autonomous mobility.

These organizations collectively shape the **technical, safety, cybersecurity, behavioral, and operational foundations** of autonomous vehicles. Their work ensures AV systems are **trustworthy, consistent, and scalable,** guiding developers, engineers, and policymakers alike.

The **Automated Vehicle Safety Consortium (AVSC)** is an industry-led program under SAE ITC that develops safety principles, shared terminology, and best practices aimed at enabling the safe deployment of SAE Level 4 and Level 5 automated driving systems.

The **British Standards Institution (BSI)** develops UK industry standards and leads the Connected and Automated Mobility (CAM) programme, setting guidelines (e.g., PAS 1880–1882) for the safe design, testing, and deployment of autonomous vehicles.

IEEE develops key AV standards, including the **2040 series** for control, communication, and safety, and **2846** for ethical, predictable AV behavior in complex scenarios.

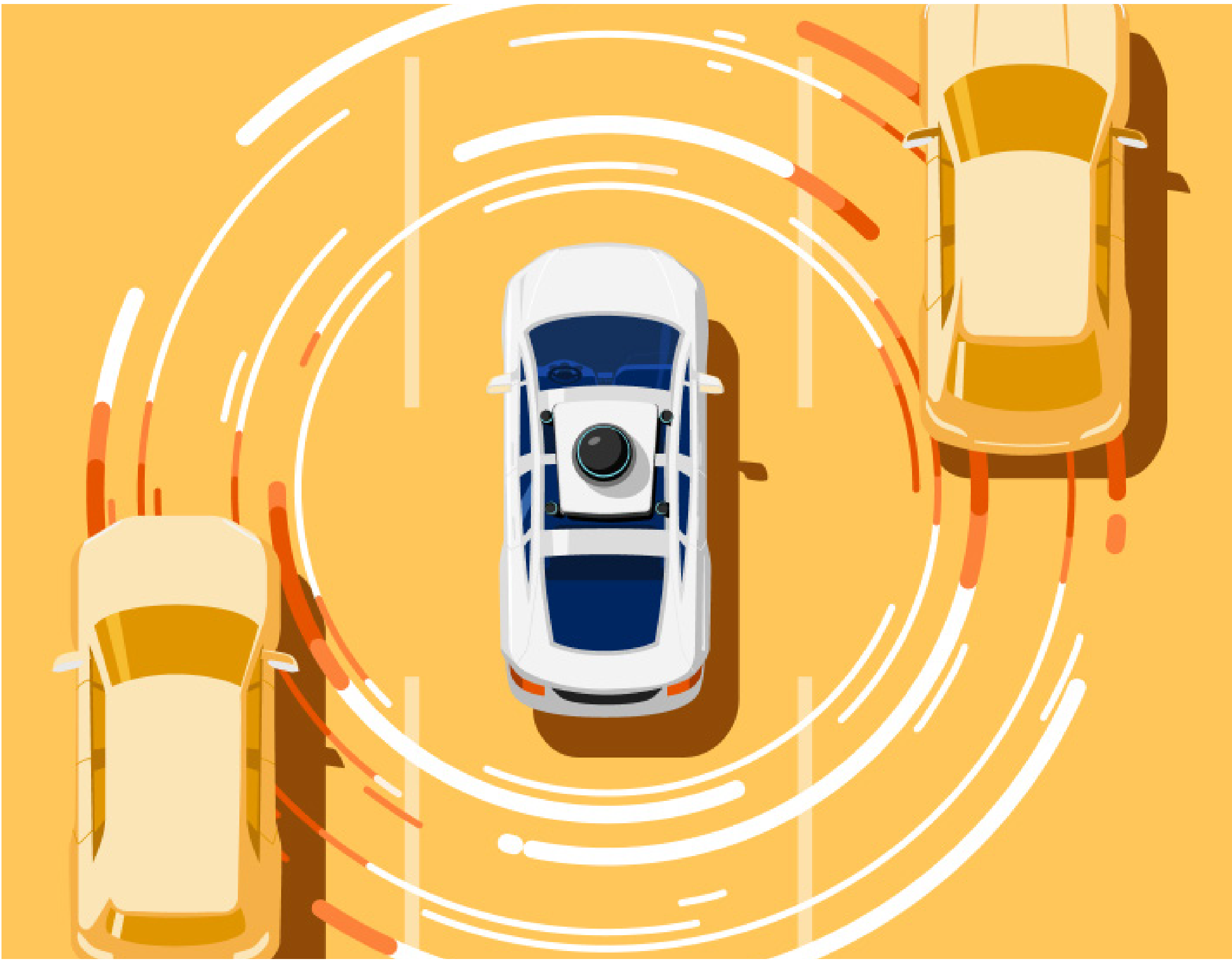
ISO develops global AV standards, including ISO 26262 for functional safety, 21448 (SOTIF) for performance limits, and 21434 for cybersecurity. The 3450x, 5083, and 8800 series further define validation, safety assurance, and system-level risk management for AV development.

NIST (National Institute of Standards and Technology) provides science-based guidelines for AV testing and validation, emphasizing measurable, repeatable safety performance. It also develops cybersecurity frameworks to ensure secure, resilient AV systems and data integrity.

SAE International defines driving automation levels via **SAE J3016** and, through its On-Road Automated Driving Committee, sets standards for consistent terminology, functionality, and testing across the AV industry.

UL (Underwriters Laboratories) developed UL 4600, a comprehensive safety framework for fully autonomous systems, offering guidance on software reliability, safety cases, and risk mitigation to ensure high operational safety.

UNECE WP.29/GRVA develops global AV standards on automated driving, cybersecurity, and safety assessment, and supports the development of interoperable and safety-focused AV frameworks. Its work directly shapes UNECE regulations and enables consistent AV deployment across member countries.



Finally, autonomous vehicle technology at SAE Level 4 continues to evolve and mature, increasing in commercialization, with and without vehicle operators. In some areas, depending on the regulations in that jurisdiction, commercial rides with an SAE Level 4 autonomous vehicle are actively operating without a vehicle operator. In other areas, vehicle operators are in place to operate and monitor the autonomy system that is responsible for executing the driving task. Both use cases present their own challenges. For example, as the technology improves and the human operator has to intervene less, it becomes more challenging to maintain focus and to monitor the system. Meanwhile, as autonomous technology continues to improve and mature, more AV Developers are moving toward SAE Level 4 and Level 5 systems in a progression from driver to driverless operations.

Uber's Safety Approach Assessment Framework is informed by and rooted in the emerging regulations, industry standards and developer-specific approaches. This framework is a starting point for the Uber Autonomous Mobility and Delivery Safety Program to utilize in the assessment of our AV partners' approach to safety. It is expected that this framework will continue to evolve as the regulatory framework and industry standards mature to a point where they can provide a comprehensive framework for evaluating the safety of an autonomous vehicle operating on a customer-facing platform.

Safety Approach Assessment Framework

This Safety Approach Assessment Framework was developed to be flexible enough to apply to a variety of autonomous vehicle use cases facilitated by a customer-facing application (Table 2).

Table 2: Summary of AV Use Cases

<table>
<tr><th>Use Cases</th><th>Infrastructure Utilized</th><th>Vehicle Operator</th><th>Vehicle Type</th></tr>
<tr><td>Delivery of Goods</td><td>Sidewalks</td><td>Partial (remote)</td><td>Purpose-built delivery vehicle</td></tr>
<tr><td>Delivery of Goods</td><td>Bike Lane / Public Roads</td><td>Partial (remote)</td><td>Purpose-built delivery vehicle</td></tr>
<tr><td>Delivery of Goods</td><td>Airspace</td><td>No</td><td>Purpose-built delivery vehicle</td></tr>
<tr><td>Delivery of Goods</td><td>Public Roads</td><td>No</td><td>Heavy-duty Vehicles equipped with an Automated Driving System (ADS), Freight applications</td></tr>
<tr><td>Delivery of Goods</td><td>Public Roads</td><td>Yes</td><td rowspan="4">Conventional passenger vehicle equipped with an Automated Driving System (ADS)</td></tr>
<tr><td>Delivery of Goods</td><td>Public Roads</td><td>No</td></tr>
<tr><td>Passenger Rides</td><td>Public Roads</td><td>Yes</td></tr>
<tr><td>Passenger Rides</td><td>Public Roads</td><td>No</td></tr>
<tr><td>Passenger Rides</td><td>Public Roads</td><td>No</td><td>Purpose-built passenger vehicle</td></tr>
</table>

This list is not meant to be exhaustive. We recognize abundant creativity in new concepts for delivery and mobility are rapidly evolving -- the safety approach framework we are discussing in this document can be conformed to the specifics of these use cases. However, this framework is only intended for application in use cases with vehicles exercising some level of autonomy in operations.

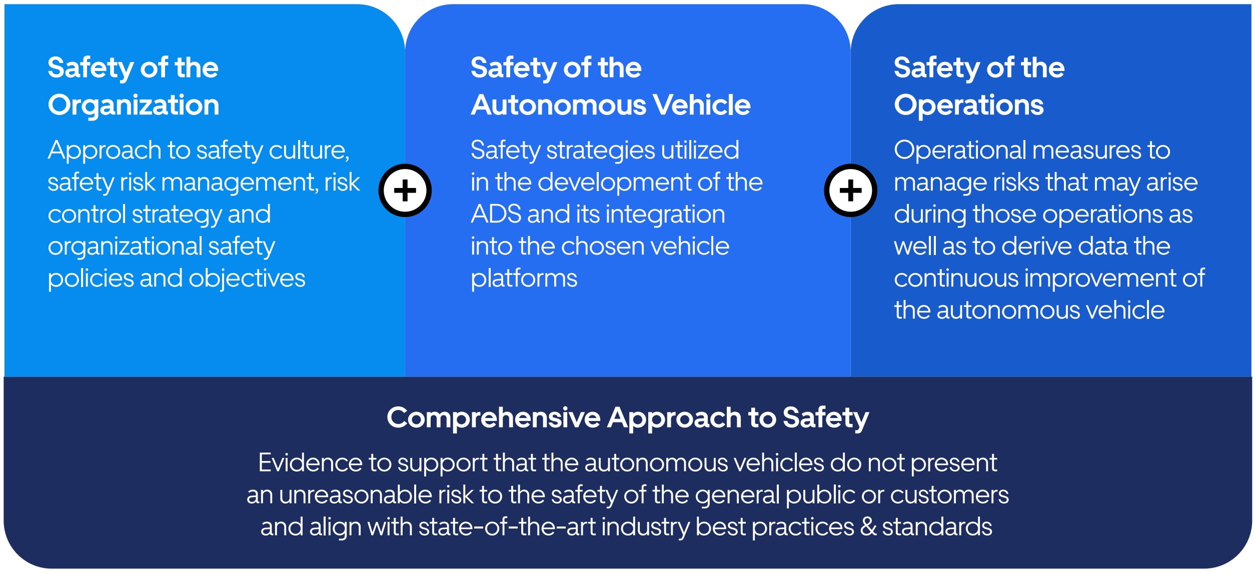


Figure 3: Safety Approach Assessment Framework

The safety plan assessment framework is organized into three safety components that are complementary to each other and ensure that Uber is assessing a partner's comprehensive approach to safety rather than only assessing individual topics such as safety metrics or verification and validation approaches. Within each component there are a set of safety topics that further decompose the areas for collaboration. For each safety topic the framework identifies potentially relevant standards to consider, which are mostly targeted to automated vehicle safety.

Although the Uber AM&D Safety Program is consistently applied across partners, we recognize that partner approaches to safety may vary significantly from one to the next. As a result, the Uber AM&D safety plan assessment does not prescribe a single safety standard or a singular metric and threshold against which the safety performance of all partners is measured. Rather, the AM&D Safety team looks to assess each partner's Safety Plan on its own terms, in reference to the particular partner's planned scope of operations with our framework as a guide. Furthermore, we expect that this framework will continue to evolve as safety standards and frameworks evolve.

Finally, as discussed in the prior section, this framework is not intended to be applied to conventional human-driven fleets due to crucial differences between AV and conventional fleets, including the robust set of regulatory frameworks already established for conventional fleets. As such, we intend this framework to be applied to autonomous vehicle fleets operating in a customer-facing deployment on the Uber platform.

Component 1:
Safety of the Organization

The first component in the framework captures a partner's approach utilized to promote a safety culture, assess and manage safety risk, evaluate risk control strategy effectiveness, and support organizational safety policies and objectives. This component applies to AV Developers and AV Fleet Operators, irrespective of whether they are the same company or distinct partners. The safety of the organization is paramount and should be prioritized in any AV deployment involving various partner configurations.

While this component of the framework has its roots in the aviation industry, much work has been done by industry standards organizations to adapt this to the development, testing and deployment of autonomous vehicles. Both the aviation and the autonomous vehicle industry rely on safety critical systems to operate aircraft as well as ground vehicles; therefore, organizational safety is a critical element in the overall approach to safety. Further, this component often builds off of four related safety topics, including:

1. **Safety Policies & Objectives**
2. **Safety Risk Management**
3. **Safety Assurance**
4. **Safety Promotion**

1.1 Safety Policies & Objectives

Industry best practices recommend that AV developers and fleet operators establish safety policies and objectives to manage safety across the organization with a focus on safety responsibility, accountability, authority, organization resource planning, and emphasis on "just culture"[1] within the organization.

- Safety policies provide guidance to employees and address the organization's commitment to safety.
- Safety reporting systems bring safety hazards to the attention of organizational leadership.
- Reporting and communication structure responsible for overseeing the organization's approach to safety.
- Committee(s) monitor the effectiveness of the organization's approach to safety, resolving safety issues, and tracking safety performance.
- Roles and responsibilities in safety for all levels of the organization, including the Accountable Executive, senior leadership team, functional leads/managers, and all employees.
- Safety objectives which align with the overall safety goals of the organization and create an environment which fosters positive safety culture through safety commitment and leadership.

1.2 Safety Risk Management

Industry best practices recommend that AV developers and fleet operators establish safety risk management programs to proactively manage risk utilizing the concept of safety risk assessments. The following are examples of potential content that has been utilized by developers in their approach to this safety topic:

- Risk-based decision making and safety hazard resolution processes inform decision makers in developing actionable plans to reduce safety risk.
- Processes evaluate the safety risks associated with a change to design or operations, reported safety concern or potential hazard and identify potential mitigating actions to maintain an acceptable level of safety.
- Proactive hazard identification through internal auditing and safety reporting.

1 "Just culture" means a culture in which front-line operators or other persons are not punished for actions, omissions, or decisions that are commensurate with their experience and training, but in which gross negligence, willful violations, and destructive acts are not tolerated. "Just culture" is an essential element of a broader "safety culture," which forms the basis of a robust safety management system

1.3 Safety Assurance

Industry best practices recommend that AV developers and fleet operators establish safety assurance programs to monitor, analyze, and measure overall safety performance, including effectiveness of its safety risk controls, safety management, and associated processes. The following are examples of potential content that has been utilized by developers in their approach to this safety topic:

- Processes assess the safety performance of the organization, the autonomous vehicle and operations, and the effectiveness of the safety risk controls.
- Processes monitor the safety performance of the organization to gauge the progress and impact of the safety risk controls developed and implemented in the SRM process.
- Key results and safety performance indicators to measure progress and effectiveness towards meeting safety objectives.
- Safety investigation processes analyze the safety implications of the organization's safety performance related to an identified safety concern or hazard.
- Continuous improvement processes review organizational safety processes and resources to identify areas where improvements could be made.

1.4 Safety Promotion

Industry best practices recommend that AV developers and fleet operators establish safety promotion programs to inform, educate, and heighten the safety awareness of employees. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Safety training and education integrated at appropriate levels of the organization and content is reviewed periodically.
- Appropriate level of training supports team members performing their duties in an effective and safe manner.
- Safety communications programs promote active engagement in organization safety and development of a positive safety culture.
- Established processes maintain records of safety-related activities conducted by the organization.

Potentially relevant references and standards to consider include:

- AVSC Information Report for Adapting a Safety Management System (SMS) for ADS
- AVSC Information Report for Change Risk Management
- [WIP] SAE J3320 Safety Management System (SMS) Application to SAE Level 3,4,5 ADS-Equipped Vehicles and Supporting Systems
- SAE Technical Paper 2025-01-8673 - Developing a Safety Management System for the Automated Vehicle Industry
- ISO 45001: Occupational health and safety management systems
- EASA Regulation (EU) No 965/2012
- Traits of a Healthy Nuclear Safety Culture, INPO, January 2013
- FAA Advisory Circular 120-92B: Safety Management Systems

Each of these topics, as well as potential supporting content and potentially relevant industry standards, are described further in the subsequent sections of this chapter. No single topic or practice is intended to be prescriptive for the fulfillment of this component; but instead are provided to help spur a conversation between Uber and a partner on how best to demonstrate a partner's approach to the Safety of the Organization.

Component 2:
Safety of the Autonomous Vehicle

The first component in the framework captures a partner's approach utilized to promote a safety culture, assess and manage safety risk, evaluate risk control strategy effectiveness, and support organizational safety policies and objectives. This component applies to AV Developers and AV Fleet Operators, irrespective of whether they are the same company or distinct partners. The safety of the organization is paramount and should be prioritized in any AV deployment involving various partner configurations.

This differs significantly from conventional human-driven vehicles as the ADS is designed to automate the task of driving the vehicle and replace a human driver. Accordingly, this section discusses safety approaches frequently utilized in the development of the ADS and its integration into the chosen vehicle platform(s), with a particular expansion (in this document) on the following topics:

1. **Vehicle Integration & Platform Safety**
2. **Automated Driving System Safety**
3. **Fault Management & Min Risk Condition**
4. **Passenger Safety & ADS Interface**
5. **Vehicle Collision Response**
6. **Safety-Critical Engineering Processes**
7. **Cybersecurity**
8. **Validation & Verification Testing**
9. **Safety Performance Indicators**

Each of these topics as well as potential supporting content and potentially relevant industry standards are described further in the subsequent sections of this chapter. As with Component 1, no single element or standard is intended to be prescriptive for the fulfillment of this component; but instead are provided to help spur a conversation between Uber and a partner on how best to demonstrate a partner's approach to the safety of the autonomous vehicle.

2.1 Vehicle Integration & Platform Safety

Industry best practices recommend that AV developers assess the safety of the vehicle platform(s) on which the ADS is integrated, including active safety systems and overall compliance with federal regulations. For novel vehicle designs, this assessment should also address key differences from conventional vehicle designs. This topic is also relevant for conventional vehicles that have been modified to serve as a platform for autonomous operations (e.g. integrating additional redundant systems). The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Identification of active safety systems installed by the vehicle OEM in the production process, and any such systems impacted by the process of integrating the ADS.
- Conformance with applicable vehicle safety standards (as applicable) or proof of an exemption from specific standards for the autonomous vehicle.
- Conformance with applicable vehicle safety standards (as applicable) or proof of an exemption from specific standards for the autonomous vehicle.
- Description of the functional safety approach, including verification and validation for fault management, crash response, and any other novel design elements that support the integration and operations of the autonomous system at the platform level.

Potentially relevant references and standards to consider include:

- Federal Motor Vehicle Safety Standards (FMVSS)
- Regulation (EU) 2018/858
- UNECE Vehicle Regulations

2.2 Automated Driving System Safety

Industry best practices recommend that AV developers address the full scope of the automated driving system—including on-vehicle hardware, off-board infrastructure, the operational design domain, and any use of remote assistance—when discussing ADS safety. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Identification of the ODD demonstrating operational conditions for which the ADS was designed, specific to the provider and deployment context, and contains any constraints for the ADS to safely execute the dynamic driving task.
- Identification of hardware, software and system components of the ADS on-board the base vehicle platform and the functions that each performs as part of the overall system.
- Identification of off board systems that are needed to achieve performance of the ADS in the operational design domain.
- Identification of the role of remote assistance as part of the overall ADS description.
- ADS processes to monitor compliance with the ODD constraints during operation.
- ADS processes to respond in the event of a departure from ODD.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Core Automated Vehicle Safety Information
- SAE J3131- Definitions for ADS Reference Architecture
- [WIP] J3259 - Taxonomy & Definitions for ODD
- SAE J3088: Active Safety System Sensors
- ISO/FDIS 34501 Test scenarios for automated driving systems - Vocabulary
- ISO 34502: Scenario based safety evaluation framework
- ISO/PAS 8800:2024(en) Road vehicles — Safety and artificial intelligence
- ISO / IEC TR 5469:2024 Artificial Intelligence - Functional Safety and AI Systems
- PAS 1881:2022 Assuring the operational safety of automated vehicles
- PAS 1883:2025 ODD – Implementing BS ISO 34503
- ANSI/UL 4600 Safety for the Evaluation of Autonomous Products
- ASAM OpenODD Concept Paper

2.3 Fault Management & Minimum Risk Conditions

Industry best practices recommend that AV developers define and implement an approach for detecting and mitigating faults that could affect the ADS's ability to perform the Dynamic Driving Task (DDT) safely, including those requiring a transition to various minimum risk conditions (MRCs). The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Use of comprehensive analyses (e.g. Failure Mode and Effects Analysis, System-Theoretic Accident Model and Processes, Fault Tree Analysis) to identify the relevant failure scenarios for the ADS in the specified ODD and the resulting failures addressed by the fault management system.
- Approaches to monitor and detect system faults in the ADS and base vehicle platform.
- Approaches to mitigate realized faults during operations, including redundant system architectures, fallback to degraded mode, or initiation of minimum risk maneuver.
- Approaches to leverage remote driving or remote operations to manage a fault or failure encountered by the ADS.
- Potential minimum risk maneuvers and conditions to be utilized by the ADS in the presence of a system fault, such as stop in lane vs. safe stop out of lane of travel vs. return to location in degraded mode.

Potentially relevant references and standards to consider include:

- AVSC Info Report on Stopped Conditions
- SAE J3164_202301 - Taxonomy and Definitions for ADS Behaviors and Maneuvers
- SAE J3016 - Taxonomy and Definitions for Terms Related to Driving Automation Systems
- SAE J3187 - System Theoretic Process Analysis (STPA) Recommended Practices for Evaluations of Automotive Related Safety-Critical Systems
- ISO/SAE PAS 22736: Taxonomy and definitions for terms related to driving automation systems for on-road motor vehicles

2.4 Passenger Safety & ADS Interface

Industry best practices recommend that AV developers address the in-vehicle HMI concept and design for vehicle occupants, operators, and remote supervisors, including their safety-related interactions with the ADS. Developers may also consider any external HMI used to communicate the ADS's intent to other road users. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Concept and design of the in-vehicle HMI including the key components and functions for vehicle operators and/or remote supervisors to monitor the ADS while taking into consideration potential for distraction.
- Concept and design of the in-vehicle HMI including the key components and functions for passengers to interact with the ADS and to reach out to remote support in the event of an emergency.
- Safety-related interactions between vehicle occupants and the ADS, including the constraints and associated ADS vehicle behavior as a result of passenger interactions through the HMI.
- Approaches for maintaining safety in the event that passengers interfere with vehicle controls.
- Approaches for detecting and maintaining safety in the event of unexpected passenger behavior such as removing seatbelt, opening the doors while vehicle is in motion, or at a stop before the conclusion of a trip.
- Concept and design of the external HMI including the key components and functions for communicating externally to other road users and to customers interacting with the AV.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Passenger-Initiated Emergency Trip Interruption
- AVSC Best Practice for Core Automated Vehicle Safety Information
- [WIP] SAE J3261- Resources for persons with disabilities when using ADS-DVs
- SAE J3114 - Human Factors Definitions for Automated Driving and Related Research
- Visual-Manual NHTSA Driver Distraction Guidelines

2.5 Vehicle Collision Response

Industry best practices recommend AV developers establish mechanisms within the vehicle platform to reduce both the likelihood and severity of harm to AV occupants and the public. The following are examples of content that developers have previously used to address this safety topic:

- Processes utilized to ensure that the additional ADS components integrated (e.g. HMI components or ADS hardware) into the AV do not pose an unreasonable safety risk to vehicle occupants or general public in the event of a collision.
- Approaches to detect collisions between the autonomous vehicle and other road users, including light impacts with vulnerable road users, animals or property.
- Overview of data elements that will be captured in the time prior to a triggering event (i.e. collision, deployment of safety restraints, etc) to help determine ADS-related collision factors.
- Approaches to prioritizing the survivability of the set of data elements to be captured in the event of a triggering event occurring.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Data Collection for ADS-DVs to Support Event Analysis
- AVSC Best Practice for ADS-DV Immediate Post-Crash Behaviors and Interactions
- SAE J3197 Automated Driving System Data Logger

2.6 Safety-Critical Engineering Processes

Industry best practices recommend that AV developers adopt a comprehensive development model—grounded in systems engineering—to ensure development processes are carried out methodically and systematically. This includes dedicated, safety-focused processes that maintain appropriate attention to safety and risk throughout the development lifecycle. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Systems engineering processes related to the design and development of the ADS, including the role of safety requirements in the overall process.
- Approaches to a system of systems-focused design strategy used in the creation and maintenance of the autonomous service.
- Processes to specify the hardware (HW) design requirements, address HW functional safety and the resulting selection of HW components for the ADS.
- Processes to specify the software (SW) design requirements, SW functional safety, and the resulting safety-related software requirements used in the development of the SW for the ADS.
- Processes to ensure the ADS meets the quality policies and objectives of the organization, including supply chain, manufacturing, release management, document management and others that could affect the autonomy, safety, regulatory, brand and trust.
- Processes to track and assess changes to the ADS in regards to their potential impact to safety.
- Processes for release management, with clear decision making before a new version of HW or SW is integrated into ADS operations.
- Processes for managing software updates, including the methods for delivering them to both the vehicle itself as well as the operations team managing the fleet.

Potentially relevant references and standards to consider include:

- AVSC Information Report for Change Risk Management
- SAE J3206 - Taxonomy and Definition of Safety Principles for ADS
- SAE J2886 – DRBFM (Design Review Based on Failure Modes)
- SAE J2980 – Considerations for ISO 26262 ASIL Hazard Classification
- ISO 26262 - Road vehicles — Functional safety
- ISO 21448 - Safety of the Intended Function
- ISO 9001 - Quality management systems — Requirements
- IEEE/ISO 15288: Systems and software engineering - System lifecycle processes
- ANSI/UL 4600 Standard for Safety for the Evaluation of Autonomous Products
- ASPICE 3.0: Automotive Software Process Improvement and Capability Determination
- IATF 16949 - Automotive Quality Management Systems
- MIL-STD-882E - Standard Practice for System Safety

2.7 Cybersecurity

Industry best practices recommend that ADS developers and fleet operators address the cybersecurity risk management processes utilized to identify vulnerabilities and mitigate harm to operations, the AV, and the organization posed by cyber intrusion. Autonomous driving organizations face similar cybersecurity challenges as traditional automotive companies, with a potentially higher impact due to the AV's heightened reliance on complex software, sensors, connectivity and decision-making algorithms. A cybersecurity compromise could lead to severe consequences, including accidents, data breaches, and loss of public trust. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Approaches utilized for developing engineering requirements for cybersecurity risk management regarding concept, product development, production, operation, maintenance and decommissioning.
- Processes for monitoring operational cybersecurity risks and mitigating impacts posed by cyber intrusion (including incident response and recovery).

Potentially relevant references and standards to consider include:

- SAE J3061 - Cybersecurity Guidebook for Cyber-Physical Systems
- ISO 21434 - Road Vehicles Cybersecurity Engineering
- ISO/TR 4804 - Road vehicles - Safety and cybersecurity for ADS
- ISO 27001 - Information security, cybersecurity and privacy protection
- UNECE Regulation No. 155
- UNECE Regulation No. 156
- Automotive Information Sharing and Analysis Center (ISAC) Best Practice Guides
- NIST Cybersecurity Framework
- NHTSA Cybersecurity Best Practices for Modern Vehicles

2.8 Validation & Verification

Industry best practices recommend that ADS developers address the testing approach to verify and validate all of the ADS performance competencies, including simulation, closed course, and on-road testing, with description of test methods and metrics, ODD-relevant scenarios, behavioral competencies and summary of test results. More specific V&V guidelines for driverless operations is included in Appendix C. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Processes to establish and assess safety risk targets, including comparisons to manually driven vehicles.
- Use of V&V outputs in risk management to support release and launch decisions.
- Safety and hazard analysis to inform risk mitigation strategies.
- Analyses to define ODD characteristics, allocate properties, and define actor interactions.
- Approaches to ensure comprehensive ODD coverage, including decomposition methods.
- Identification of reasonably expected behavioral competencies and scenarios within the ODD (nominal, critical, edge cases, known unknowns).
- Processes for coverage assessment of behavioral requirements and data (training, testing) across scenario types.
- Approaches to provide rationale that the method used for the coverage assessment is comprehensive.
- Processes to organize and identify test scenarios from abstract to concrete levels.
- Methods for detecting and responding to reasonably expected objects/events in the ODD.
- Scenario identification and handling for both nominal and edge-case situations, including VRUs (Vulnerable Road Users).
- Use of multiple testing modalities (simulation, closed course, on-road), including gap analysis and evaluation of test fidelity and reliability.
- Execution of subsystem- and system-level V&V for the end-to-end AV product, covering the autonomy system, vehicle platform, and all products and tooling required for NVO commercial deployments, including but not limited to the Rider App, in-cabin HMI, fleet-management systems, and depot-operations tools.
- Verification statistical confidence methods and dataset validation.
- Processes to establish and meet the overall safety risk targets including any comparisons to the safety risk of manually driven vehicles.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Describing an Operational Design Domain;
- AVSC Best Practice for Metrics and Methods for Assessing Safety Performance;
- AVSC Best Practice for Evaluation of Behavioral Competencies;
- AVSC Best Practice for Safety Performance Thresholds Based on Human Driving Behavior;
- AVSC Best Practice for Interactions Between ADS-DVs and Vulnerable Road Users (VRUs)
- SAE J3164_202301- Taxonomy and Definitions;
- SAE J3247_202403 Automated Driving System Test Facility Safety Practices;
- [WIP] SAE J3208 - Taxonomy and Definitions of ADS V&V;
- SAE J3237 - Dynamic Driving Task Assessment (DA) Metrics for ADS
- [WIP] SAE J3279 - Developing and Validating Simulations for ADS;
- ISO/TS 5083:Design, verification and validation
- ISO 22737: Low-speed automated driving (LSAD) systems for predefined routes
- IEEE 2846 - Assumptions in Safety-Related Models for Automated Driving Systems

2.9 Safety Performance Indicators

Industry best practices recommend that AV developers and fleet operators consider a range of safety performance indicators—at both the system and subsystem levels—as part of an aggregate safety assessment across the organization, operations, and the ADS/vehicle, including relevant analysis methods and performance targets. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Approaches to identify key leading measures of safety performance and provide feedback into the ADS development and testing processes.
- Processes to establish safety performance targets for acceptable safety performance of the ADS.
- Processes for ingesting ADS data necessary to compute key leading measures of safety performance
- Processes to collect and report safety performance metrics to regulators and other stakeholders (as required).

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Metrics and Methods for Assessing Safety Performance;
- AVSC Best Practice for Evaluation of Behavioral Competencies;
- SAE J3237 - Dynamic Driving Task Assessment (DA) Metrics for ADS
- ANSI/UL 4600 Standard for Safety for the Evaluation of Autonomous Products

Component 3:
Safety of the Operations

A comprehensive approach to safety encompasses not only the safety of the organization and its autonomous vehicle but also the manner in which operations are conducted. These operational functions may be performed by partners or delegated to third-party providers. Regardless of the arrangement, the organization submitting the safety plan retains ultimate responsibility for the oversight and proper execution of these functions.[2]

Autonomous vehicle operations differ significantly from other human driven fleet operations primarily due to the need for a skilled human to monitor the automated driving system when it is under development and due to the lack of a human operator presence in an operational level 4 vehicle. For a vehicle under development, vehicle operators monitor the automated driving system to ensure it is not operating outside of its safe design parameters (e.g. ODD). For an operational SAE level 4 vehicle, there is no vehicle operator present; therefore, many of the tasks previously accomplished by a human must be addressed by the AV or remote operations, such as handling public misuse and interactions with public safety officials. Thus, this section discusses common approaches to operational measures to manage risks that may arise during those operations. This section also discusses opportunities for continuous improvement of the autonomous vehicle. This discussion focuses on the following topics:

1. **Vehicle Operators**
2. **Remote Operations**
3. **Event & Incident Management**
4. **Field Support**
5. **Fleet Operations & Maintenance**
6. **Public Misuse**
7. **Public Safety Interactions**
8. **Food Safety (Delivery Only)**

2 If Uber directly provides, that process is subject to the same review described in this document.

3.1 Vehicle Operator / In-Vehicle Fallback-Ready User

Industry best practices recommend that ADS developers and fleet operators establish procedures for selection, training and oversight for in-vehicle fallback ready users monitoring the AV while in operation. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic::

- Processes to screen potential vehicle operators based on driving experience, driving record, criminal background check, and driving evaluation.
- Processes to progressively train vehicle operators beginning in the classroom and progressing to closed course training for manual driving of an autonomous vehicle, including post-training evaluation and assessment.
- Processes that include manual operation of the vehicle in controlled conditions and in or around the intended ODD, including the infrastructure and other road users in representative scenarios (e.g. handling blind spots, negotiating intersections, navigating multiple lane traffic, managing merging traffic, and situations with vulnerable road users).
- Processes to progressively train vehicle operators beginning in the classroom and progressing to closed course training for real-time supervision of a prototype ADS-operated vehicle, including detailed instruction regarding rules of conduct (e.g., proper placement of hands and feet during testing; no use of hand-held devices; breaks must be taken on a regular schedule).
- Processes for supervised operational training as the co-driver or as a ride-along to observe the primary driver actions and vehicle communication with the co-driver.
- Approaches to continuously evaluating driver performance and, as necessary, providing continuous, remedial or refresher training.
- Processes to ensure only qualified and authenticated vehicle operators are able to operate the AV.
- Approaches to utilizing vehicle operator monitoring systems capable of detecting and recording incidents of prolonged inattention, error and/or mis-use by in-vehicle operators during test trips, including use of real-time alerts to correct and deter undesirable behavior.
- Approaches to utilizing real-time in-cabin video and audio feeds during operations to monitor and interact with passengers, while also accounting for privacy concerns.
- Approaches to ensure the vehicle operator can regain manual control of the steering, braking, and acceleration of the vehicle can be achieved at any time.
- Approaches to ensure vehicle operators receive appropriate notification of safety relevant AV system information, including faults, and the controllability of the AV is still assured or a minimum risk maneuver is executed.
- Policies regarding in-trip protocols, such as fatigue management strategies, limitations on use of electronic devices, maximum hours on duty, mandatory breaks, and communications between in-vehicle operators and other vehicle occupants.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for In-Vehicle Fallback Test Driver Selection, Training, and Oversight Procedures for Automated Vehicles Under Test
- SAE J3018 - Guidelines for Safe On-Road Testing of SAE Level 3, 4, and 5 Prototype Automated Driving Systems (ADS)
- [WIP] SAE J3300 - Automated Driving System Fallback Test Driver Skill Certification

3.2 Remote Operators / Remote Fallback-Ready User & Remote Assistance Operations

Industry best practices recommend that fleet operators establish procedures for selection, training and oversight of remote operations staff. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Processes to screen potential remote operators based on safety mindset, criminal background check, and other relevant criteria (e.g. driving evaluation, remote piloting).
- Processes to progressively train remote operators beginning in the classroom and progressing to closed course training for remote driving of an autonomous vehicle, including post-training evaluation and assessment.
- Approaches to continuously evaluating remote driver performance, adherence to policies, and as necessary providing continuous, remedial or refresher training.
- Operational Safety Plan describing the use of Remote Operators or Remote Assistance and their respective protocols.
- Process for remote assistance activation, detailing trigger conditions, criteria for initiating assistance, rider support communications and expected response times.
- Processes for the remote operator manual controls available and how each would be applied.
- Approaches to ensure vehicle or remote operators receive appropriate notification of safety relevant AV system information, including faults, and the controllability of the AV is still assured or a minimum risk maneuver is executed.
- Policies regarding in-trip protocols, such as fatigue management strategies, limitations on use of electronic devices, maximum hours on duty, mandatory breaks, and communications between in-vehicle operators and other vehicle occupants.
- Approaches for Remote Assistance Verification and Validation to ensure that Remote Assistance features function as intended.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for ADS Remote Assistance Use Case
- SAE J3016 - Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles
- BSI Flex 1886 v2.0:2024-09
- ISO 7856:2025(en) Remote support for low speed automated driving systems (RS-LSADS)

3.3 Event and Incident Management

Industry best practices recommend that fleet operators establish processes for managing and responding to an operational incident including first responder interactions, data collection, and governmental reporting. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Processes to handle incidents that occur that involve other road users and/or emergency responders, including 24/7 on-call support for incidents with the expertise and access to tools/resources.
- Processes to support triage, investigation and prepare to implement real-time decisions from AV Developer about the fleet, including restricting or modifying operations to mitigate risks arising from incidents.
- Processes to perform vehicle inspections, document evidence, and report to Uber and other key stakeholders.
- Process for vehicle retrieval in the event of a collision to include periodic tabletop exercises to ensure that all operations personnel understand their roles and responsibilities.
- Processes to store and produce incident response documentation in the event of an incident.
- Processes to train all operations personnel on response protocols in the event of an incident.
- Processes to identify and implement any corrective or mitigating actions resulting from the analysis of the incident and data collected.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Data Collection for ADS-DVs to Support Event Analysis
- AVSC Best Practice for ADS-DV Immediate Post-Crash Behaviors and Interactions
- SAE J3197 Automated Driving System Data Logger

3.4 Field & Safety Support

Industry best practices recommend fleet operators to establish processes for field support for events or incidents in which the vehicle is unable to continue its trip. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Processes for Field Support as part of the overall Incident Response process, detailing roles, responsibilities and expected actions.
- Approaches for handling public interactions and deescalation in the field during incident handling.
- Processes for singular vehicle retrievals including roles and responsibilities for dispatch, addressing issues, documenting and reporting on vehicle state/function and flow for towing a vehicle back to depot.
- Processes for passenger interaction and handling while engaging in field support activities.
- Processes for returning a vehicle to service after field support activities.
- Processes for retrieval of multiple vehicles in the event of fleet grounding, including cross-collaboration with dispatch, remote assistance, rider support and other involved stakeholders.
- Processes for maintaining safety when approaching and tending to a vehicle for field support.
- Processes for communication between remote assistance and dispatch crew including roles/responsibilities.
- Processes for responding to safety-related support requests from Uber customers

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Core Automated Vehicle Safety Information
- AVSC Best Practice for ADS-DV Immediate Post-Crash Behaviors and Interactions

3.5 Fleet Operations & Maintenance

Industry best practices recommend fleet operators establish monitoring processes for autonomous operations to ensure proper maintenance of both the vehicle platform and the ADS. In some cases, operational responsibilities may be delegated to external partners or subcontractors. Regardless of the structure of these arrangements, all participating entities are expected to uphold the same standards. When multiple subcontractors are engaged, having well-defined processes, checks, and balances can help support consistency and safety. Below are examples of content areas that developers and fleet operators have considered in addressing this safety topic:

- Processes to track anomalies and precursor to faults in ADS subsystem components.
- Processes ensure vehicles follow the recommended maintenance schedule.
- Processes for vehicles to receive software updates as required by the OEM.
- Processes for managing a safety inspection protocol covering a minimum set of inspection elements, performed at regular intervals (Safety Inspection Framework).
- Working closely with OEMs or manufacturers of components (including those that are ADS-critical) to understand how their commercial fleet is impacted by manufacturer recalls, and to schedule service to address any safety defects.
- Processes to report the performance of the vehicle and system under test to product and development teams, which includes test outcomes, annotated events, newly encountered scenarios, and safety critical interventions.
- Processes to implement Environmental Health and Safety (EHS) practices and safeguards for fleet operations personnel, ensuring their well-being and compliance with organizational and regulatory requirements.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for Continuous Monitoring and Improvement after Deployment
- AVSC Best Practice for ADS-DVs) Safety Inspection Framework
- ISO 26262 - Road vehicles — Functional safety (Part 7)
- ISO 45001: Occupational health and safety management system

3.6 Public Misuse

Industry best practices recommend that fleet operators establish processes to mitigate potential harm from reasonably foreseeable misuse scenarios involving members of the public outside the AV, as well as riders inside the vehicle (including rider-to-rider scenarios).. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Processes for establishing the responses to members of the public intentionally interfering with the motion of the autonomous vehicle (i.e. sitting on hood, standing in front of the vehicle, intentionally placing static objects).
- Processes for establishing the responses, coordinated with law enforcement, to members of the public intentionally threatening the autonomous vehicle, vehicle operators, or passengers.
- Approaches to identifying the set of reasonably foreseeable hazardous behaviors by passengers inside the AV, including scenarios arising between riders.
- Approaches to identifying the set of mitigations (in-vehicle monitoring, in-vehicle operators) employed to address the set of reasonably foreseeable misuse or hazardous behaviors.

3.7 Public Safety Interactions

Industry best practices recommend that ADS Developers and Fleet Operators establish protocols to ensure first responders know how to safely and effectively interact with ADS-equipped vehicles. Local jurisdictions are increasingly requiring first responder or law enforcement interaction plans, reflecting a growing trend toward standardized safety and emergency response protocols. The following are examples of potential content that has previously been utilized by developers in their approach to this safety topic:

- Processes for maintaining an Interaction Plan that includes a minimum set of key elements such as ODD Description, Fleet Ops, Contact Info, Identifying and Disabling an AV, etc. and ongoing engagement with first responders in areas of deployment.
- Processes for providing ADS platform and system content to assist first responders in the development of training materials that minimally cover the key topics included in the First Responder Interaction Plan.

Potentially relevant references and standards to consider include:

- AVSC Best Practice for First Responder Interactions with Fleet-Managed ADS-DVs

3.8 Food Safety (Delivery Only)

Industry best practice to limit contamination risks in food safety is to follow a Hazard Analysis and Critical Control Point (HACCP) based approach to risk management. The following are examples of content that have been previously used by AV delivery partners in their approach to food safety:

- Processes for cleaning, sanitizing and maintenance of robots to limit contamination, including with respect to potential allergens.
- Processes for merchants to properly load and secure food/drink inside of the robot's chamber or similar compartment such that it remains securely packaged during delivery, limiting spills that could cause cross-contamination and allergen cross-contact.
- Processes for order cancellation in the event of delay and/or incidents while carrying food, including steps for product disposal, documentation and reporting.
- Processes to ensure the compartment design supports temperature control and cleanability, and that surfaces are smooth, non-absorbent, and resistant to corrosion.
- Processes for routine inspection and preventive maintenance to confirm the robot's components remain in good condition and function as intended.
- Design of compartment to maintain temperature of contents for a designated period of time.
- System design and/or processes to prevent unauthorized access to the food compartment.
- Processes for monitoring and ensuring that food isn't kept in transit beyond a safe holding time.
- Processes to ensure that all personnel involved in robot maintenance and sanitation receive applicable food safety and allergen management education relevant to their role.

Potentially relevant references and standards to consider include:

- FDA HACCP Principles & Application Guidelines
- FAO/WHO Code of Practice: "General Principles of Food Hygiene (CXC 1-1969) and its HACCP Annex"
- ISO 22000 Food safety management
- FAO/WHO Code of Practice on Food Allergen Management

Application of the Framework

Uber conducts its own review of prospective AV Partners, and the topics described in this Uber Safety Plan Assessment Framework help inform any back-and-forth with AV partners by providing examples of content that have emerged in the development of industry consensus safety standards generally. As the industry evolves, concepts described in this Framework can adapt to different types of autonomous vehicles operating in different environments, in a variety of respects. However, as mentioned earlier, this framework was developed for AV fleet operations and does not necessarily translate to applications of conventional human-driven fleets.

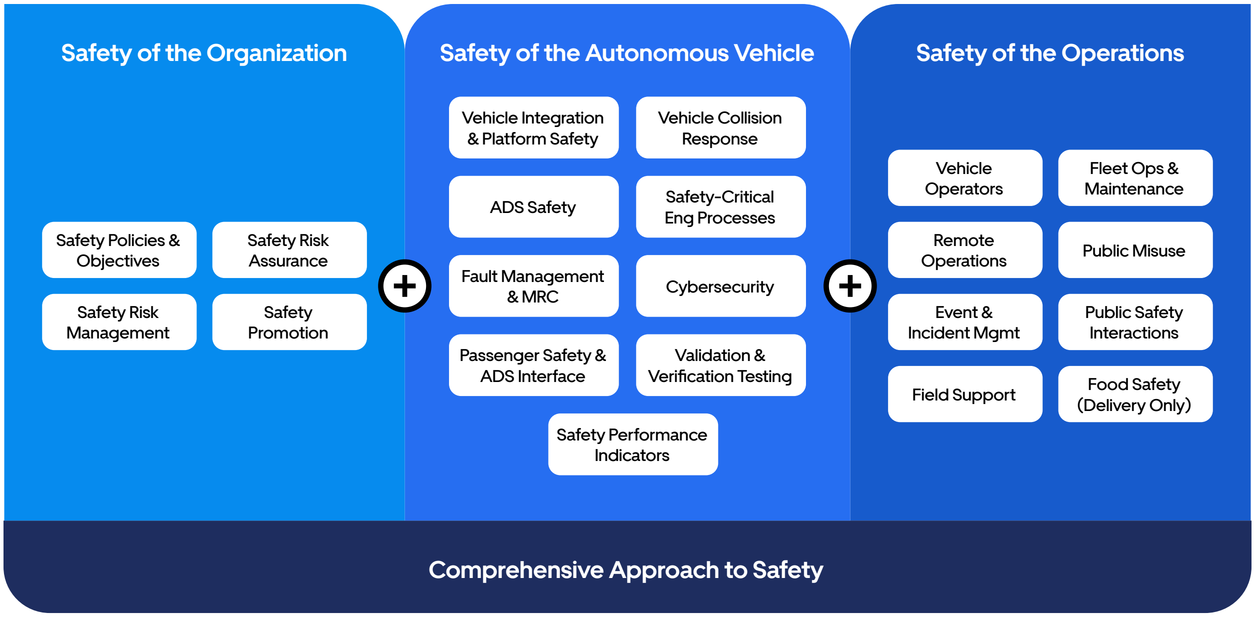


Figure 4: Safety Approach Assessment Framework

In the case of an operational concept defined as the operation of autonomous robots on sidewalks, certain topics might just categorically not apply to the robots' deployment. For example, the possibility of Vehicle Operators and In-Vehicle Monitoring would not be applicable to this deployment and would therefore not need to be addressed in the Partner's safety plan. Appendix A provides a high level crosswalk between the full set of safety topics and the use cases in Table 2: Summary of AV Use Cases.

Other safety elements in the Framework might provide a closer fit; however, they would apply differently based on this operational concept. For example, Vehicle Collision Response is quite different in the case of an autonomous robot operating on the sidewalk versus a traditional passenger vehicle operating on public roads. This is the case with many other topics in the second component.

All told then, for a given operational concept proposed by one of our AV Partners,the generic framework can be tailored to the relevant specifics of a Partner's proposed operations. Further, the planning phase of the Safety Program Process can serve as an opportunity for engagement around that tailoring.

Our analysis does not involve a review of all underlying evidence or test results on which an AV Partner relied in reaching its own conclusions. Rather, we work with the partner towards tailoring a flow of information that supports a reasonable assessment without intruding on proprietary information or invention.

As discussed throughout, a developer may choose to establish the safety of an AV operational concept based on only a subset of these factors, or different factors altogether. This framework recognizes that reality and hopes to catalog various safety topics that partners have, in the recent history of this industry, invoked as part of a safety argument. Our intent is that this review can help spur partner thinking around these issues.

Appendix A:
Crosswalk of Safety Topics to Use Cases

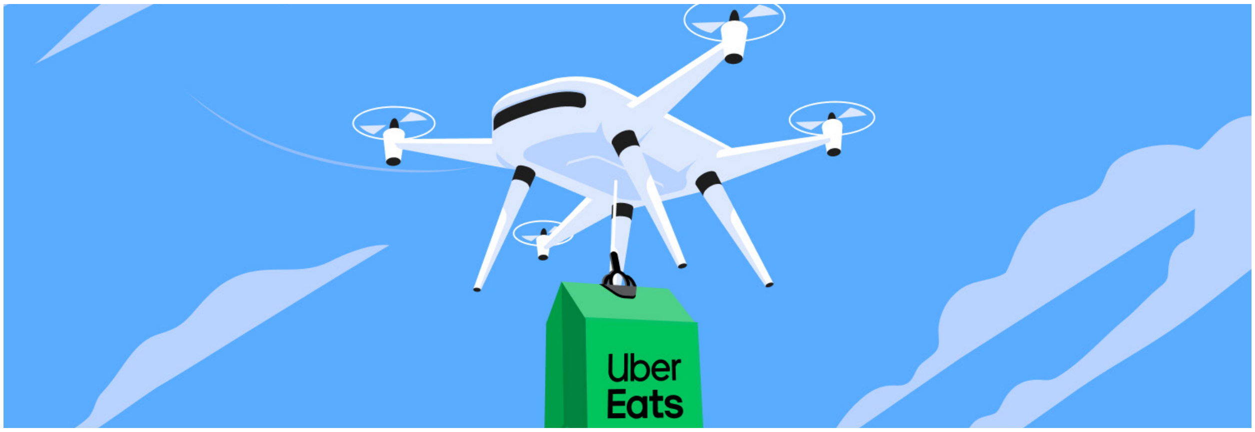
This appendix provides a high-level crosswalk between the safety topics in each component of the framework and the sample use cases identified in Table 2: Summary of AV Use Cases. This crosswalk is intended to highlight the safety topics that have potential relevance to a specific use case; however, a partner may choose to establish the safety of their operational concept based on a different combination of factors or different factors altogether for their use case.

Furthermore, the following definitions are used in this crosswalk:

- Blank = The safety topic is likely not applicable to the given use case
- ★ = Some aspects of the safety topic are relevant to the given use case
- ★★ = Most aspects of the safety topic are relevant to the given use case
- VO = Vehicle Operator is present in the vehicle and overseeing the operation of the ADS
- NVO = No Vehicle Operator is present in the vehicle

Component	Safety Topic	Sidewalk Delivery	Airspace Delivery	Public Roads			
				Delivery (VO)	Rides (VO)	Delivery (NVO)	Rides (NVO)
Safety of the Organization	Safety Policies & Objectives	★	★★	★	★	★★	★★
	Safety Risk Management	★	★★	★	★	★★	★★
	Safety Assurance	★	★★	★	★	★★	★★
	Safety Promotion	★	★★	★	★	★★	★★
Safety of the Autonomous Vehicle	Vehicle Integration & Platform Safety		★★	★	★	★	★
	Automated Driving System Safety	★	★★	★	★	★★	★★
	Fault Management & Minimum Risk Conditions	★	★	★	★	★★	★★
	Passenger Safety and ADS Interface			★	★	★	★★
	Vehicle Collision Response	★	★	★	★	★★	★★
	Safety-Critical Engineering Processes	★	★★	★	★★	★★	★★
	Cybersecurity	★★	★★	★★	★★	★★	★★
	Validation & Verification Testing	★	★★	★	★	★★	★★
	Safety Performance Indicators	★	★★	★	★	★★	★★
Safety of the Operations	Vehicle Operators	★		★★	★★		
	Remote Operators & Assistance	★★	★			★★	★★
	Event & Incident Mgmt	★★	★★	★★	★★	★★	★★
	Field & Safety Support	★★	★★	★★	★★	★★	★★
	Fleet Operations & Maintenance	★★	★★	★	★	★★	★★
	Public Misuse	★	★	★	★★	★	★★
	Public Safety Interactions	★	★	★	★	★★	★★
	Food Safety (Delivery Only)	★★	★★	★★		★★	

Appendix B:
Safety Guidelines for Airspace Delivery



Drones fall under the regulatory purview of national and regional authorities such as the U.S. Federal Aviation Administration (FAA) and the European Union Aviation Safety Agency (EASA). In addition, states and localities can impose additional restrictions, particularly in areas like privacy, land-use, noise, and take-off/landing from specific properties. Uber's AM&D Safety Guidelines document builds off this regulatory content, and our expectation is that operators confirm compliance in their safety plan. The AM&D Safety Guidelines also offer a complementary framework that enhances safety outcomes. These guidelines, originally developed for on-road and sidewalk robot platforms, emphasize a proactive, systematic approach to safety that aligns well with the emerging challenges of drone-based logistics and mobility.

One of the most relevant components of Uber's Safety Guidelines is the implementation of a Safety Management System (SMS). Uber's Safety Guidelines are aligned with regulatory requirements from the FAA and EASA for drone operators engaged in delivery services, and similarly encourages adoption of an SMS that allows for early hazard identification, continuous risk assessment, and active safety promotion among operational teams.

Another area of emphasis is on incident response and investigation protocols. The FAA and EASA have specific requirements for drone operators to report incidents and accidents and formal investigations are conducted by the appropriate authority. Uber's internal guidelines additionally promote a responsive incident management culture. The focus is not just on compliance and post-incident reporting, but on rapid containment, root-cause analysis, and feedback loops into system design and training. This capability becomes even more critical in drone operations where latency in response can result in cascading safety impacts across automated systems and shared airspace.

Finally, Uber's commitment to fostering a safety-oriented culture – through training, transparent communication, and data-driven decision-making – amplifies regulatory efforts. While certifications from the FAA or EASA validate the technical and procedural readiness of a drone program, Uber's internal guidelines ensure that these programs are sustainably and ethically operated, with continuous improvement embedded in the culture.

In summary, Uber's Safety Guidelines do not merely overlap with existing aviation regulations – they operationalize and reinforce them in meaningful, real-world contexts, particularly for emerging modes of transport like drones. By embedding practices like SMS and dynamic incident response into everyday operations, Uber ensures that its drone initiatives meet and often exceed the baseline expectations set by traditional regulators.

Appendix C:
Verification & Validation Guidelines - Progression to Driverless Operations

The Autonomy V&V Guidelines outline the expected verification and validation practices an AV developer and AV fleet operator would follow as part of their safety case. These guidelines cover the full lifecycle of autonomous vehicle development – from defining top-level safety claims and ODD boundaries through multi-modal testing, performance metric design, data-driven validation, and hazard analysis – all culminating in a risk-managed pathway to safe driverless deployment.

Safety Case Structure

A robust safety case begins with clearly defined top-level safety claim(s) and supporting rationale for the AV (for example, a claim that the vehicle is acceptably safe to operate within its intended domain). It is recommended to also document any key assumptions behind these claims, as those assumptions frame the verification and validation approach. We would expect to see elements of operational and organizational safety in addition to development of the autonomous vehicle.

Operational Design Domain (ODD)

The ODD – the specific conditions and scenarios the AV is designed to handle – must be explicitly defined. Organizations typically specify both the overall design ODD and a narrower deployment ODD for the vehicle's initial operations. The safety case includes an ODD coverage assessment to demonstrate that the AV can safely perform all relevant driving tasks within that domain, covering both nominal and edge-case scenarios. We would expect this assessment to also address known unknowns (per ISO 21448/SOTIF) by testing for hard-to-predict scenarios (for example, using fuzzed or synthetic simulations to explore corner cases).

Testing Modalities

V&V typically relies on a combination of testing approaches – simulation, closed-course (proving ground), and **public road** trials – to ensure comprehensive validation. Each modality has distinct strengths: simulation enables high-volume regression tests and exploration of risky edge cases, closed-course testing allows full-system evaluations in controlled conditions, and public-road testing validates the AV against real-world traffic scenarios. We expect that the safety case also shows that each test modality is verified to have sufficient fidelity and stability (e.g. ensuring simulation environments are realistic and repeatable) so that results from testing can be trusted.

Data Validation & Performance Projection

V&V efforts include validating the quality and representativeness of all datasets used (for instance, simulation scenario libraries, training data, and real-world driving logs). Developers may also apply rigorous statistical methods to aggregate test outcomes and project the AV's anticipated performance in deployment with high confidence – for example, a safety case might require accumulating thousands of simulation runs and on-road miles with acceptable results to demonstrate statistical confidence before expanding operations.

Performance Criteria & Metrics

Clear performance criteria must be defined to quantify what "safe enough" means for the AV, typically including measures of safety (e.g. collision or near-miss rates), compliance with traffic laws, and ride comfort or courteous driving behavior. These criteria are implemented via specific metrics at multiple levels – from system-wide metrics (like overall collision rates or hard braking events) to scenario-specific metrics (such as proper stopping at stop signs or maintaining safe gaps around pedestrians) – so that all aspects of driving performance are evaluated. For each metric, the safety case defines the implementation approach and rationale and sets quantitative thresholds or pass/fail targets that the AV must meet in testing prior to release. The AV Partner must provide evidence that the vehicle meets the overall performance targets (for instance, relative to human-driving benchmarks) and conduct ongoing monitoring to catch any performance regressions in operations.

Safety & Hazard Analysis

A comprehensive hazard analysis process is required to proactively identify potential safety issues in the AV design. Partners conduct formal safety analyses at both the system level (examining the vehicle's behaviors and scenarios that could lead to incidents) and the sub-system/component level (examining specific failures of sensors, actuators, software modules, etc.), considering hazards from malfunctions, performance insufficiencies, design limitations, and foreseeable misuse. All identified hazards and failure modes are mapped to corresponding requirements and test cases, ensuring that mitigations or validations exist for each known risk. By applying multiple layers of analysis and testing (akin to a "Swiss cheese" model of overlapping defenses), the safety case greatly reduces the likelihood of any single failure leading to an unsafe outcome.

Risk Management

Because autonomous operation entails inherent risk, the guidelines emphasize robust risk management in all operational decisions. It is essential to continuously identify and assess risks in the autonomy system (addressing both known issues and areas of uncertainty) and establish clear criteria for when residual risk is low enough to advance to the next stage of testing or deployment.

Progression to Driverless

To reach fully driverless service, a phased roadmap is recommended: starting with initial mapping and ODD definition, then iterative development and testing with a safety driver, followed by a supervised pilot phase (a full-system "driverless" test in a controlled setting), and ultimately a controlled launch of driverless operations. Entry criteria are defined for each phase, so the AV only progresses once it has conclusively met the safety goals of the prior stage.

Summary

By utilizing these verification and validation principles—grounded in industry standards and tailored for real-world operations—AV developers and fleet operators can demonstrate a robust safety case that supports responsible scaling of autonomous mobility and delivery services. Uber remains committed to aligning with AV Partners who prioritize transparency, rigor, and continuous improvement in advancing autonomous vehicle safety.