# Security Review: Automobile Undercarriages

The undercarriage of an automobile is arguably the most important area of the vehicle. Undercarriages house vehicular exhaust systems, fuel systems, brake systems, suspension systems, and easy access to the bottom of the engine bay. With all of the functionality of an undercarriage, it is also safe to say that this is the most valuable area of the vehicle aside from the engine bay. Due to the high value and functionality of a vehicle's undercarriage, the security risks and vehicular assets must be carefully assessed and evaluated. The security of the undercarriage must be evaluated in order to ensure the safety of the driver and other passengers of the vehicle.

## Assets / Security Goals

1. One most targeted areas in attacks on a vehicle's undercarriage is the exhaust system. The exhaust pipes and various interconnecting segments should be safely attached and protected to the best of the manufacturer's ability.
2. Another target of an attack is the fuel system. A malfunction in this system in a worst-case scenario could result in an explosion, so extreme care must be taken in the security of this module.
3. The brake system is one of, if not the most, vital part of a vehicle's undercarriage as it stops the vehicle from colliding with other objects on the road.
4. A vehicular undercarriage allows for a user, authorized or unauthorized, to have access to the vehicle's engine from below. This should be the most heavily protected area of the vehicle as without a fully functional engine, a vehicle cannot properly run.
5. Last but not least, the suspension system, while still vital, is not as easily tampered with should an attack occur. This system is the most interconnected with the frame of the vehicle and is very hard to remove.

## Potential Adversaries / Threats

1. The most obvious adversary to the undercarriage is the common thief. In populated and unpopulated areas, it is common to have multiple vehicles with stolen parts from the undercarriage, whether at night or in broad daylight.
2. Angered ex-partners or acquaintances are another threat as they could potentially tamper with a system and compromise the security of the vehicle.
3. A torturous road is another adversary to the assets as one big pothole, one sharp curve that is unmarked, or an object in the road could cause a massive failure in any of the named assets.
4. Other drivers on the road also pose a serious threat. Should an accident occur, it is likely that one of the undercarriage systems will be damaged afterward.
5. Lastly, a more subtle and forgotten adversary is normal wear and tear. Over time, the undercarriage parts will wear down and require replacement.

## Potential Weaknesses

1. The primary weakness, while also being a strength in practicality, is the accessibility of the undercarriage. Lifted vehicles are easier to work on, but are also easier to steal from. With a large amount of space between the bottom of the chassis and the ground, a thief can crawl under the vehicle, make a few simple cuts, and walk away with a vehicle part in less than 5 minutes. The accessibility to the undercarriage also allows for tampering with the systems from angered individuals.
2. A lesser weakness is the lack of warning should something go wrong in the undercarriage. More than likely, if something has been tampered with or removed, the driver will not know until they drive the vehicle, posing a serious danger risk.
3. A forgotten weakness is that of vanity. A nicer-looking vehicle that has been customized will be more susceptible to attacks than that of a more common-looking vehicle.

## Potential Defenses

1. A long, slim, breathable metal plate could be attached to the undercarriage to prevent easy access to unauthorized users.
2. More durable material being used in the manufacturing process could protect the vehicle’s undercarriage from hazardous roads, damage from accidents, and normal

wear and tear.

3. More sophisticated vehicle alarm systems could also help prevent a thief from stealing.
4. A small, durable camera attached to the bottom of the vehicle, monitoring the undercarriage when the vehicle is off, could help prevent thieves.
5. Driving on safer, less dilapidated roads could result in less wear and tear on the undercarriage of the vehicle.
6. Lastly, an obvious defense against wear and tear and torturous roads is regular vehicle maintenance.

## Risks

The undercarriage of a vehicle is comprised of many vital, complex systems, all of which are essential for the successful use of the vehicle, making the risk of an attack or malfunction extremely high. Like a computer or data system, a singular successful breach or malfunction could bring with it the destruction of the entire operation. The biggest and most preventable risk to a vehicular undercarriage is the risk of tampering or theft. Should a system be tampered with, the realization of the tampering may not come until it is too late for the driver to resolve the issue, but the risk can be absolved using one or more of the potential defenses listed above. The risk of damage from wear and tear becomes greater over time as the wear and tear gets worse. Other drivers and the risk of accidents constitute a constant risk that cannot be resolved.

## Conclusions

For many car owners, the security of their vehicle is thought of, but never truly taken into consideration as deeply as it should be. This lack of deeper thought about security will leave the undercarriage of their vehicle vulnerable to the aforementioned potential adversaries and threats. Thus, it is crucial that security be deeply considered and funds be properly allocated to protect the undercarriage of the vehicle. Investing in a vehicle monitoring system, protective undercarriage cover, enhanced vehicular warning system, etc. would be a smart decision, however, investment into lift kits, custom colorization, or custom exhaust, while providing a more appealing vehicle, could compromise the safety of the vehicle. For most people, vehicles and their associated undercarriage components are not easily replaced. The financial costs of these components can range anywhere from fifteen dollars to tens or hundreds of thousands of dollars. Even with all

of the precautions being taken, and security measures in place, it is impossible to provide absolute, perfect security for an automobile undercarriage. As security technology evolves, so do the thieves and those who wish to compromise that technology. The decision of how much security is enough is up to the owner of the vehicle to decide upon, but should be thoroughly thought out and deeply considered as the financial and material loss of a vehicle or any of its parts far outweighs the cost of security and safety.