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# A Survey on Application of Automobile Safety Features

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**Abstract -** *Improvements in vehicle safety techniques is a key strategy that can be implied in addressing both national and international reduction in numbers of casualties happening on roads and in achieving a safer road traffic system. Vehicle safety targets the safety of all personnel accessing the roads. It primarily at the time comprises of measures designed to help avoid the possibility of a crash or reduce the chance of injury in the event of a crash. Road traffic injuries, though being a major public health issue, is often neglected, resulting in need for a concentrated effort for a sustainable prevention model. Out of all the public facilities and systems available to general public on a daily basis, road transportation is one of the most complex and the riskiest. Worldwide statistics show that the estimated number of people killed in road traffic crashes every year is almost 1.2 million, while the reported number of injured in such accidents could be as high as 50 million. According to a survey, without increased efforts and proper initiatives, the number of road traffic deaths globally is forecasted to rise by at least 65% between 2020 and 2030. In the era of computer, technology has taken leaps of advancements in almost every field. This paper analyzes about some of the advanced vehicular safety features, its implementations and importance of having them in the vehicles along with the need of making some of the technologies mandatory.*

***Key Words***: Road Traffic Accidents, Accident prevention, Ignition Interlocks, Drunken Driving, Active and Passive Safety Features

## 1.INTRODUCTION

With the advances of New Technology and exponentially increasing vehicular density, the occurrence of Accidents has almost become inevitable with the number of reported accidents increasing day by day, resulting in toll of human lives equally or in some cases more than any natural catastrophe. The ever increasing rate of accidents is becoming a real problem, that needs to be taken care of in real-time, by drawing up of a suitable action plan, involving various modules of Traffic Engineering Measures, Proper Enforcement Action plans, Educational techniques, which requires co-ordination of more than one entities/techniques/concepts.

Vehicle design is fundamentally important to developing a safe traffic system which promotes safe interaction between users, vehicles and the asphalt environment. A range of risk factors can be accessed by the users which helps reduce the risk of crash, crash involvement and severity of crash injuries. Till date, vehicle engineering for improved safety has generally been focused towards modifying a vehicle to

help the driver avoid possibility of a crash, or to provide protection to those inside in the event of a crash.

Advanced technology has been often advocated as a means of significantly reducing the incident and impact of road crashes. For example, a breaking system guided by radar tech will prevent or moderate, one of the most destructive and daily occurrences, the rear – ram collision. The interest in the development of high technology crash countermeasures has resurfaced in the recent years; conceivably as a result of significant advances in miniaturization of required electronic equipment and the usage of micro-electronics in vehicle systems such as ignition, braking and performance monitoring.

## 2. CAUSES OF ROAD ACCIDENTS

Broadly, the causes of road accidents can be classified into Human Related, Vehicle Related, Road Related and Environment related factor classes. Surprisingly out of which about 90% of the road accidents are Human Related. A 1985 report based on British and American crash data, states that driver inattentiveness, heavy intoxication and other human factors contribute either wholly or partly to a huge proportion of about 93% of crashes. The data is represented in the following Venn diagram.

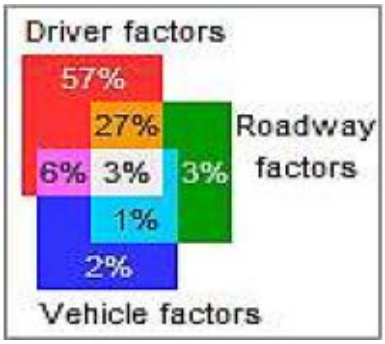


**Fig -1:** Breakdown of British and American crash causes

## 3. NEW TECHNOLOGIES AND ADVANCED SAFTEY FEATURES

Society assumes these Road Accidents are just a behavioral problem, rather than being a problem that demands both, changes to behavior as well as technology. This implies that even though technological measures can shake down the number of Accidents caused, it doesn't mean that people can drive irresponsibly or as they wish.

In recent years, there has been exponential improvements in road transport safety features. On one hand, the technology now available allows vehicles to drive safely in traffic conditions independent of human input (though still in implementation stage). On other hand, some common sense and basic technologies (such as drowsiness detection) can reduce fatalities to a great extent, if made compulsory in all types of vehicles.

Vehicle safety equipment majorly include 2 groups of instruments, on-board sensors, that collect data and on-board units (OBUs) that use that data to compute chances of accident and may generate an alarm or may even take partial control of some features of the vehicle. These systems provide advantage of early warnings to the driver of potential dangers or override in some cases to some degree to prevent the expected collision through the driver's control of the vehicle in attempt to avoid collisions. However, these benefits are only applicable to vehicles equipped with such equipment.

Some issues unresolved yet and concerning these systems include the need to ensure and establish a reliable system standard to avoid apparent confusion and potential dangers caused due to variations in commercially available OBUs. Moreover, it is important to make drivers aware of the surroundings to an extent to which the system will be able to reduce danger when enforced, in order to avoid excessive reliance on OBUs.

Safe use of in-vehicle technologies can be successfully ensured by:

- Adapting User-friendly designs, taking into account the human limitations of distractibility, constrained memory, field of view etc.
- Integrated solutions like automatically turning down the radio when a phone call occurs.
- Adaptive solutions like adapting to driving conditions.
- Standardized testing procedures of the total task load.

### 3.1. Active and passive safety features

The terminologies "active" and "passive" sound simple but are far much important terms in the world of automobile safety. "Active safety" indicates the technology which is used in assisting the preclusion of a crash while "passive safety" refers to components of the vehicle itself like airbags, seatbelts and the chassis of the vehicle that helps to protect occupants in the event of a crash. Active safety features include but are not limited to ABS, traction control and EBD, are meant to avoid an accident. Passive safety features include but are not limited to in-built crumble zones in the monologue body shell which deforms in a head-on collision event to absorb the energy released from the oncoming vehicle, are in being to protect the driver as well as the passengers inside the vehicle when an accident occurs despite the perfect functioning of the various active safety integrations.

Six active safety technologies that hold promise in near future or are in current implementation are:

**Electronic stability control or ESC**: one of the biggest game changing technology in auto safety in years. ESC is built on top of ABS. The sensors determine when the vehicle is moving in a wrong or dissimilar direction from its pointed destination, and uses the ABS to brake the appropriate wheels to get it back on course.

**Lane departure warning:** when the vehicle is unintentionally sliding out of its designated lane, an alert is generated to warn the driver.

**Collision warning with automatic braking**: By making use of a radar similar in working to that of cruise control, this system tries to sense when the traffic ahead is slowing or stopped and generates an alert for the driver with an audible warning and will bring the car to a stop if he fails to react in time.
**Blind-zone warning:** It senses when another vehicle is approaching your vehicle's flanks, this system alerts the driver with a warning light and/or audible alarm. One factor that might reduce its effectiveness is that when the warning light is on the outboard mirror, some drivers simply don't use.
**Emergency brake assist:** This system determines when the driver is applying the brakes in a panic situation and applies more brake quicker. Not only might it prevent some crashes but it may reduce the severity of a crash.
**Adaptive headlights:** These headlamps pivot in response to where the front wheels are pointed, helping illuminate around curves on dark roads.

### 3.2. Must have safety features

At present India's congested roads are the deadliest in the world. The automobile tragedy is one of the most serious of these manmade assaults on the human body. Most of the following safety features are mandatory for the vehicles in American and Europe which is not so in India. Making these as mandatory will certainly will have good impact and save so many lives.

- Anti-lock braking systems (ABS)
- Electronic Brake force distribution systems
- Automatic Braking system to prevent or reduce the severity of collision
- Seat belts limit the forward motion of an occupant, stretch to slow down the occupant's deceleration in a crash, and
- prevent occupants being ejected from the
- vehicle.
- Airbags inflate to cushion the impact of a vehicle occupant with various parts of the vehicle's interior.
- Laminated windshields remain in one piece when impacted, preventing penetration of unbelted occupants' heads and
- maintaining a minimal but adequate transparency for control of the car immediately following a collision. Tempered
- glass side and rear windows break into granules with minimally sharp edges, rather than splintering into jagged
- fragments as ordinary glass does.
- Crumble zones absorb and dissipate the force of a collision, displacing and diverting it away from the passenger
- compartment and reducing the impact force on the vehicle occupants. Vehicles will include a front, rear and maybe side
- crumple zones (like Volvo SIPS) too.
- Side impact protection beams.
- Collapsible universally jointed steering columns, (with the steering system mounted behind the front axle - not in the
- front crumple zone), reduce the risk and severity of driver impalement on the column in a frontal crash.

## 4. BENEFITS OF ADVANCED SAFETY FEATURES, VEHICLE MONITORING SYSTEM

Benefits of Advanced Safety Features and Vehicle Monitoring Systems had been studied at various countries, according to Elvik et al. (1997), it is estimated that feedback on speed using VMS and other measures can reduce 65% of pedestrian crashes, 41% of injuries, and 16% of rear-end crashes. Project level studies include ATEC/ITS-France (2002), which surveyed various study results in Europe. In the United Kingdom, 28% of the injuries were reduced, 10-30% in Germany and 35% of all crashes in Switzerland. Similarly, PIARC (2000) surveyed the accident reduction by weather information systems in various countries, and reported an average crash reduction of 30-40%.
New challenges
There are several claims and concerns resulting from the arrival of the new technology. It is feared that drivers may lose skills they previously had. This is only a danger if those skills are still required (e.g. the use of the hand crank to start an engine is an obsolete skill). Drivers who have only driven vehicles equipped with ABS may not be aware of the technique of modulating brake pedal force to maintain control on slippery roads. Old skills that may still be useful on occasion may no longer be taught. Certain drivers cannot operate manual transmissions. Most of the danger in
loss of skill is during transition from one technology to another. It is feared that drivers may come to overly depend on a new technology. Drivers may expect the new technology to do more than it is designed to do. They may not be

alert to the situations that are outside the performance envelope of the technology and so may not be ready to take manual control in these circumstances.

- Drivers may not take full advantage of the new technology. This phenomenon is evident with other technologies (e.g. video recorders, computers, washing machines) that offer facilities which are rarely used or too complicated to remember. However, in vehicles, these facilities could enhance safety, and failure to take advantage of them will reduce the safety potential and could, in certain circumstances, increase the road death and injury toll.
- Drivers may misuse or abuse the new technology. The technology could be designed for one purpose but used for another that may result in danger.
- Drivers may be confused or distracted by the new technology. The attention allocated to the new technology may leave insufficient mental capacity for essential safety and observational tasks. Recent research on cell phone use by drivers has highlighted this problem.
- Drivers' past experiences may result in incorrect understanding of the new technology.
- Drivers may consider the imposition of some systems as an infringement of their liberty such as was initially felt with the introduction of compulsory motorcycle helmet wearing, seatbelt wearing, and alcohol breath testing.

## 5. CONCLUSIONS

Vehicle design is fundamental to a safe traffic system which requires safe interaction between users, vehicles and the road environment. Vehicle design, which takes account of the behavioral and physical limitations of road users, can address a range of risk factors and help to reduce exposure to risk, crash involvement and crash injury severity. If a revolution, through legislation, took place with a focus on automobile safety then sure the accident rate would drop drastically resulting in fewer injuries, maims and deaths on the roads. Indian consumers are not paying special attention towards safety. This is because of the negligence and different kind of mentality when compared with Europe or America which has to change. The Government should insist insurance companies to give considerable discounts in premium for the vehicles fixed with advance safety features. According to the Insurance Institute for Highway Safety, Electronic stability control (ESC) could prevent nearly one-third of all fatal crashes. Though many insurers do grant lower premiums for safer cars and discounts for safety equipment, however it is plausible that the current level of discounts offered today by insurers is lower than is socially optimal. Granting lower premiums and discounts for safer cars and safety devices would probably increase consumer demand to these products, and thus the level of research and development of new safety products would rise and accident fatalities will reduce. Though new technologies may compensate for driver errors, it is important that drivers be aware of the capabilities and limitations of systems. To fully realize the benefits of new technologies, drivers need to learn to use them and gain experience. Proper design is important to ensure that drivers are not overwhelmed.

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