

Transportation system reliability and safety



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Abstract

In this report, the basic of transport system's framework are talked about which cover three noteworthy methods of transportation specifically road, water and air transportation. In each of the area, a short touch in the historical backdrop of these transportations modes is talked about.

The different reasons for accidents are discussed in detailed with data, graphs etc. from various sources. Some of the reasons for road accidents that are highlighted in this report are mainly due to Road rage, Aged driving, Driving after alcohol Consumption and not attentive during driving.

The different reasons are compared and various counter measures to avoid these cases are given.

In addition different approaches to fabricate more secure streets and different procedures to avoid street accidents are specified.

1. Introduction

Transportation system is one of the vital everyday services utilized by a huge number of individuals to achieve their destinations. This is utilized by all classes of individuals in the general public running from President, Prime Minister to basic man. Any deviation in the wellbeing of such system can prompt to cataclysmic outcomes. In the past, numerous high scale and prominent mischance occurred in land, water and air. Consistently number of mishaps around the world keeps on increasing yearly. Consequently, it won't not be wrong to state that transportation system is a standout amongst the most essential examination zones in the field of wellbeing and unwavering

quality and needs a great amount of attention. A single accident can take hundreds of life, so one might say that a principal consideration is expected to make the transportation system as solid as could be expected under the circumstances.

It has been noted that there are over 1.6 million fatal accidents worldwide involving car accidents alone. In developed countries like United States of America, Australia, United Kingdom deaths due to road accidents are one of the leading causes of annual death rate. Even in developing countries the story is same. To minimize death rates due to these reasons, a great amount of funds, resources are released and programs are also conducted to enlighten people.

0. History of Transportation Systems

1. Road Transportation

Transportation systems were at first created to satisfy the human hunger for voyaging faster and to cover large distances. In olden days, people used foot wears, snowshoes to travel long distance. In the early days of transportation time, animals were used as a essential vehicles. The innovation of the spoke-wheel incredibly expanded the effectiveness of transportation system and requirement for roadways were created. Early roadways were produced using block and stones. Yet, it wasn't until the modern insurgency in the eighteenth century that new methods were produced. With the assistance of Macadam, roads were built.

The innovation that had the best effect on current transportation system came as steam engine in the eighteenth century. Steam engines were

initially utilized in railway system, as well as in vehicles and steamboats. People could travel more noteworthy separations than any time in recent memory with the assistance of this new development. Diesel trains were created to further upgrade the abilities of the railway system. The creation of IC engines in the early twentieth century reformed the car part and developmental changes in the car outlines have prompted to the vehicles that are seen on the streets nowadays. Presently there are more than twenty three million vehicles in Canada alone with nine hundred thousand kilometer of roads.

0. Water Transportation

Paddles and sails speak to the two early advances in water travel, expanding both ship's speed and dependability. With paddles, boats could be paddled against the current, also move regardless of the possibility that confronting ominous winds. With sails, boats could outfit the huge vitality of the wind to travel long separations. A standout amongst the most critical early revelations was the lateen sail, a triangular sail that could change over side winds into forward constrain. The lateen sail permitted boats to cruise against the wind, or tack. It was the real sail innovation utilized via nautical individuals in old circumstances. The stern rudder, which permitted more noteworthy control of boats, supplanted the side controlling paddle in the eighth century in China and in the twelfth century in Scandinavia.

Incredible advances were made in navigation that permitted boats to dare to ocean and securely return. Early oceangoing boats for the most part remained nearby to shore, however primitive astrolabes had been produced to help decide latitude. Therefore, seafarers could decide their position in <https://assignbuster.com/transportation-system-reliability-and-safety/>

water. The astrolabe was prevailing by the octant, and in eighteenth century the sextant was designed. The sextant remained the most exact gadget to gauge scope until the twentieth century. To decide course when deceivability was poor, the Chinese utilized a lodestone spoon turning on a bronze plate as an early compass. By the twelfth century the attractive compass was being utilized as a route help. With the expanding ocean investigation of the world that started in the mid 1400s, the specialty of mapmaking bloomed. With precise maps, pioneers could discover their direction when their area was checked against known historic points.

The most essential innovative advancement for inland water transportation was the development of the canal lock. The lock interfaces extends of trench worked at various rises. In spite of the fact that a basic waterway bolt was utilized by the Chinese, the most broad utilization of secures was discovered Holland, where usable locks were operation. As the herald of today's two-gated lock, the pound bolt permitted boats to enter one end of a trench and, after water was included or expelled, to exit at the flip side at an alternate water level.

0. Air Transportation

I. C engine has a significant effect on air transportation. The first aero plane was flown by Wright brothers in the year 1903. As time passed the development of jet engine allowed even greater speed and distances making it possible to travel round the globe in less time. Commercial air transportation began in 1914, first scheduling was done across Tampa bay

and Florida. Since then there has been a lot of changes by bringing the world closer together.

0. Present scenario

3. 1 Road Accidents

Accidents involving automobiles make headlines every day all over the world. Over 1.5 million deaths were related to accidents. And as mentioned earlier, automobile accidents related deaths are only second to AIDS in terms of causes of untimely death for men between the ages of 15 and 44. There are many causes that contribute to the high number of fatalities. Major causes are explored further and their potential solutions are carefully examined in this report.

- 3. 1. 1 Attention and Awareness

One of the other major causes of automobile accidents includes lack of attention and awareness by the drivers. Using phones while driving is one of the main reasons for accidents. In 2003, it was determined that cell phone use alone may have been responsible for more than 2.5kdeaths and 330,000 injuries in U. S alone. It was also responsible for 1.5 million instances of property damage.

Motorists who use cell phones while driving are four times more likely to get into crashes serious enough to lead to death. New results, published in July 2005, suggest that banning hand-held phone use won't necessarily improve safety if drivers simply switch to hands-free phones. The study found that injury crash risk didn't vary with type of phone.

In California, a study was conducted on the relationship between cell phone usage and driving at the same time. It was determined that cell-phone use was linked to accidents involving 611 drivers during the first six months of 2002.

A study from the United Kingdom revealed that talking on any cell phone while driving is so mentally distracting that it is as dangerous, as driving when slightly over the legal blood-alcohol limit.

By mid 2004, American bodies such as the National Highway Traffic Safety Administration (NHTSA) were rightly starting to challenge the wisdom of approving the use even of hands-free cell phones while driving. The world-renowned Transport Research Laboratory was commissioned to perform a study after a survey revealed that 40% of drivers in Britain, use a cell phone while driving. Even though most of those drivers realized that using a cell phone is distracting, they did not think it to be as dangerous as drinking and driving.

Another study was carried out over three months, after which a panel of volunteers was tested on a sophisticated driving simulator. The level of driving impairment was tested for the three relevant driving situations: talking on a hand-held cell phone, talking on a hands-free phone, and driving when slightly over the legal blood-alcohol limit. The result was that the drivers' reaction times were thirty percent worse when they were talking on cell phones than when they were borderline intoxicated. Compared to normal driving conditions, drivers talking on the hand-held phone were fifty percent impaired. Two of the most visible problems that resulted from this

impairment were an inability to maintain a constant speed and an inability to remain a safe distance from the vehicle ahead.

Drivers in the study later admitted that they had actually found it easier to drive while intoxicated (just over the legal limit) than when using a cell phone, whether it was hand-held or hands-free. Drivers using cell phones also missed many more road signs than did the drunk drivers. It was also demonstrated from the study that hand-held cell phones proved to be even more distracting than hands-free units.

Steps taken to prevent this

Even though there are many studies which dispute the effects of cell phone usage and accidents. Lawmakers all over the world are being convinced that there exist a connection and have, therefore, legislated laws banning the use of hand held phones while driving.

Cellular telephone use is rapidly expanding worldwide and is increasingly being used by all age groups for personal communications, while business use continues unabated. Some new cellular telephone users will place calls while driving, which may lead to greater exposure to cellular telephone-related distractions in the driving population, all else being equal. Driver inattention to the driving task, the key safety-relevant outcome of driver distraction, has been implicated in many traffic crashes. The distraction may be reduced if drivers are aware of the hazards and use their cellular telephones carefully while on the road.

Distraction potential can also be reduced by ergonomically sound cellular telephone designs and new Intelligent Transportation System (ITS) technologies that may be capable of compensating for driver distraction by alerting drivers when traffic conflicts or hazards are present.

The safety benefits of cellular telephones are well recognized as users frequently make calls to report disabled vehicles, accidents, hazardous road conditions, medical emergencies, and crimes in progress. However, the safety benefits are not without drawbacks. For example, some emergency response networks have reported in excess of one hundred "911" calls for the same incident, making the networks unavailable for reporting other emergencies. Furthermore, traffic safety itself may be degraded somewhat if more drivers are distracted while making such calls in hazardous driving situations, e. g., slowed or stop-and-go traffic, and rubbernecking.

Elderly drivers in general find it more difficult to perform concurrent tasks and process information quickly. A cellular telephone, if used while driving, may aggravate age-related problems by introducing a distracting, concurrent task. In addition, elderly drivers will often find it more challenging to operate cellular telephones that tend toward small displays and controls designed to specifications drawn from a younger population. Laws limiting the use of cellular telephones while driving have been enacted in a number of countries throughout the world. Laws specifically prohibit careless or inattentive driving. While attempts have been made to enact laws limiting the use of cellular telephones while driving in some States in the U. S., none thus far has been successful. In Washington state however, the motor vehicle was amended to specifically permit use of "approved" headphones by motorists

“ using hands-free, wireless communications systems,” which may be viewed as promoting the use of hands-free cellular telephones and prohibiting the use of hand held or other unapproved systems.

States are encouraged to actively enforce their reckless and inattentive driving laws and states without inattentive driving laws should consider enacting such provisions. When law enforcement police officers see reckless or inattentive driving that is associated with the use of cellular telephones, it ought to be noted in the officer’s report or on the citation. Similarly, when a crash occurs, it should be noted on the police crash report whether a cellular telephone was in use during or prior to the crash. This information could be useful in allowing states to assess the magnitude and nature of the problem of cellular telephone use by drivers.

Legislative proposals that have been introduced in the States have focused primarily on prohibiting the use of cellular telephones that require drivers to use their hands to operate or hold the phone. These proposals generally allow the use of hands-free models. The outcome of any restrictions or limitations, however, may not be as clear-cut as initially believed. For example, these legislative initiatives seem to be based on the assumption that hands-free cellular telephones are acceptable while driving, but hand-held phones are not. Properly implemented, hands-free designs should reduce the distractions associated with dialing, holding, reaching for, or picking up a dropped handset and allow the driver to keep both hands on the wheel. However, hands-free phones do nothing to mitigate the distraction potential of cellular telephone conversation.

Proposed legislation that prohibits only the use of hand held cellular telephones may, in fact, promote cellular telephone use (e. g., drivers may use their phone more frequently and for a longer duration) among limited users and non-users by suggesting that hands free use is safe. This could potentially increase “ exposure” to any safety hazards that may exist. Thus, the outcome of legislation specifying hands free only usage, may be an increase in cellular telephone related crashes to the extent that conversation itself is a causal factor in crashes.

Considering the inconclusive nature of empirical evidence reviewed on the magnitude of the cellular telephone-related highway safety problem, existing legislative initiatives may thus be inappropriate on technical grounds alone for now. For this reason, it is important to add to any legislation adequate data collection system to monitor the impact of the legislation on relevant crashes.

An effort should be also be made to examine the cost-benefit tradeoffs of legislative actions related to cellular telephone use while driving. Potential costs of unrestricted cellular telephone use may include those associated with distraction-induced crashes and degraded driving performance. Benefits of unrestricted cellular telephone use include more efficient use of commuting time, emergency service notification capability, and the conveniences attendant to closer communications with family, friends and business.

- 3. 1. 2 Alcohol consumption and Driving

It became evident soon after the introduction of motor vehicles that drivers' under the influence of alcohol increases the risk of crashing, and laws prohibiting alcohol-impaired driving. Enforcement of laws by authorities was the primary approach to accidents prevention, but it proved difficult to prove roadside evaluations of drivers' fitness to drive. During the 1940's, highway patrol police officers identified alcohol involvement in only three percent of traffic collisions whereas epidemiological studies using breath and blood measurement of alcohol levels showed much greater alcohol involvement. The evidence that alcohol was causally involved in a significant proportion of crashes led to the enactment of blood alcohol concentration (BAC) limits for driving. The first such law was passed in 1939 with the limit set at 0.15% BAC. Although the laws subsequently passed throughout the United States lowered the limit to 0.10% or 0.08%, scientific studies of alcohol effects on driving skills demonstrate that impairment also occurs at even lower BACs. Empirical data suggests that the degree of impairment produced by alcohol may be modified by other variables. During the time of the study in 1962, women drivers drove far less frequently and for shorter distances than male drivers, hence possibly making them more susceptible to alcohol effects on driving. Analysis of the study's data relied primarily on uni-variate statistical methods, which could not discriminate the effects of age, gender, and drinking practices from the effects of other variables.

In the same study, a gender and alcohol interaction did not occur until the BACs reached a level of 0.08% and above. At those levels, women were more frequently accident-involved than men. Laboratory studies of the responses by men and women to alcohol, however, provided inconclusive

results. Most experiments had given men and women the same alcohol dosage but since the body fat and total body water of men and women differ greatly even when they are the same age, height and weight, women reach a higher BAC than men for the same alcohol amount. Many early studies failed to take this into account, but more recent studies have used comparable BACs rather than equivalent doses.

Even though most early studies failed to find significant difference between male and female subjects, more reliable evidence exists for an interaction between alcohol and drinking practices. The Grand Rapids study reported that the likelihood of involvement in a collision for drivers at the same BAC was greatest for the drivers with the lowest daily alcohol consumption. A study done in 1974 supported this finding with a comparison of extremely heavy drinkers and moderate drinkers. They reported that heavy drinkers were less impaired than moderate drinkers at equal BACs on several psychomotor tasks. Also, a mean ethanol clearance rate of 0.020% per hour for the heavy drinkers, in comparison to a rate of 0.017% per hour for the moderate drinkers, showed a physiological difference between the heavy and moderate drinkers.

Steps taken to prevent this

One of the major tools used to reduce the number of fatalities involving DWI is a law called the 0.08 BAC Law. As of August 2000, 19 states and the District of Columbia and Puerto Rico have enacted .08 per se laws in the United States. These laws make it illegal to drive with a blood alcohol concentration (BAC) at or above 0.08 percent. The early evidence has

demonstrated that 0.08 leads to a reduction in alcohol-related fatalities, especially when implemented in concert with a strong publicity campaign and highly visible enforcement. A real-life example of the effectiveness of 0.08 BAC law is found in Illinois where the number of drivers with positive BACs ($BAC > 0.08$) in fatal crashes decreased 13.7 percent in Illinois after implementation of the 0.08 law. This is a statistically significant reduction, and included drivers at both low and high BACs. The researchers estimated that the 0.08 law saved 47 lives in Illinois in 1998. The 13.7% reduction in Illinois is higher than typically has been found in other studies of the effects of 0.08 laws. There is a minimal cost associated in the implementation. Also, only a small increase in arrests, but not enough to overburden the courts. It can be accommodated with existing law as same rules of enforcement apply, for example probable cause law to stop a driver. It also succeeds in sending a message to the public that the State is getting tougher on impaired driving and therefore potential benefits far outweigh any costs

- 3.1.3 Aged Driving

Fragility increases with age. Elderly drivers and passengers are more likely to be killed than younger drivers in crashes of similar severity. In addition, as a person ages, specific functions related to driving skills may decline; including vision, hearing, reaction time, and cognitive and motor abilities. While many elderly persons are able to compensate because of years of driving experience and safe behaviors, the aging process affects people in different ways and on different timetables; and that's why some elderly people experience a decline in their driving skills. Though motorists over the age of 70 drive far less frequently than other age groups, they already

account for an outsize proportion of fatalities, according to the National Highway Traffic Safety Administration. The death rate per mile traveled for drivers over 85 is four times that of the 30-60 aged group. The only group more dangerous than senior citizens is teen-agers. Senior drivers have special trouble judging speed and distances, which causes an inordinate number of rear-end and left-hand-turn accidents.

- 3. 1. 4 Road Rage

It's defined as an incident in which an impatient motorist or passenger intentionally injures or kills another motorist, passenger or pedestrian; attempts or threatens to injure or kill another motorist, passenger or pedestrian. Road rage is uncontrolled anger that results in violence or threatened violence on the road; it is criminal behavior.

- 3. 1. 5 Improving the Vehicle and Driving Environment

Safety experts are working to enhance the safety of vehicles for elderly drivers. For example, automobiles are being adapted to make driving easier, including the use of features like wide-angle mirrors and increasing the readability of the instrument panel. Force-limiting airbags and seatbelts are in development. The driving environment can also be modified. The Federal Highway Administration has developed a handbook for state officials on road design and management that improves the safety of the driving environment for elderly persons and all other road users. The lettering, brightness and contrast, size, and location of traffic signs can be changed to improve visibility. And finally, traffic and road design can enhance driver safety by including left-turn lanes, protected turn signals, and traffic-calming measures such as speed bumps.

- 3. 1. 6 Environmental Factors

The driving environment impacts the safety of co-passengers when they drive. Signs and road markings may be difficult to see at night; small lettering may be difficult to read even during the day; and large intersections with multiple access roads can be complex and confusing.

Furthermore, the vehicles that elderly persons use may also impede safe driving. Some drivers tend to drive elderly vehicles, which may lack modern safety features. In newer vehicles, instrument panels with many features may be confusing to the elderly drivers. Airbags and seatbelts may require fine-tuning so that they are less likely to break elderly persons' more fragile bones. Seatbelts are especially important for elderly persons because of their increased risk of death in crashes. Driver refresher courses for elderly adults are available. The AARP Driver Safety Program serves more than 700,000 drivers each year. In addition, keeping fit and healthy also affects driving ability. Persons aged 75 or elderly with poor health and disability status (HDS) drive less often than persons with excellent HDS, and report more problems when they do drive. Certain medications can interfere with driving skills, especially for persons taking multiple medications, or combining medications with alcohol.

Steps taken to prevent this

Currently, licensing laws vary dramatically from country to country and province to province. At least 20 states have special provisions, such as vision or writing tests, which 65 and 70-year old drivers must complete before renewing their licenses. Some states have confidential procedures

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that allow friends, family or medical professionals to report seniors they think shouldn't be driving. Other states are considering graduated licensing laws for seniors, similar to ones for teen-agers in some states. In Connecticut, for example, drivers aged 65 or elderly can be on a two-year or six-year renewal cycle, and they usually have to appear in person.

In New Jersey, a recent Senate bill plans to devote funds to create senior citizen " safe-driving health centers" that would offer hospital-based medical and diagnostic services to improve the driving capability of elderly people. They will also assess the need for a senior's car to be modified by adjusting brakes, mirrors or steering. The bill is also going to allow for auto-insurance premium reductions for elderly drivers who complete a safe-driving program.

In Hawaii, new legislation introduced in February would require all residents 75 or elderly to take a driving test when renewing their licenses. In Washington, a 2004 bill that required medical certification for drivers 75 and elderly was introduced, but failed to make it out of committee.

3. 2 Designing better roads

One of the best ways to reduce the number of fatalities due to any road accident is to design better and safer roads. Two fundamental goals have been devised in the strategic plan for design of safer roads: to prevent vehicles from leaving the roadway, and second, to minimize the impact on the traveler if the vehicle does depart the roadway.

A number of possible countermeasures are available to reduce roadway departure crashes, which represent 59 percent of all fatalities.

Countermeasures to prevent vehicles from leaving the roadway include adequate signing and pavement markings, rumble strips to alert the driver to drifting off the roadway, skid-resistant pavements, and improvements to roadway geometrics. Good visual cues are necessary to assure that the driver can maneuver through ever-changing roadway conditions. Thus it is important that signs and markings are maintained, are provided at the proper location to guide the driver, and are supplying accurate information.

FHWA currently is advancing rulemaking on sign retro-reflectivity standards for traffic control devices as part of the agency's ongoing effort to provide consistent, definable standards that improve the visibility of signs.

Another countermeasure to prevent travelers from leaving the roadway, rumble strips, was identified as one of FHWA's priority, market-ready (ready-to-use) technologies and innovations. Rumble strips are designed to alert a drowsy driver drifting off the roadway by producing an audible sound and physical vibration.

Rumble strips, already widely accepted for roadway shoulder applications, now are being applied and evaluated as centerline treatments as well. A recent report by the Insurance Institute for Highway Safety noted that centerline rumble strips reduced crashes at treated sites by 14%.

Rumble "stripes" are a combination of pavement markings and rumble strips, with the markings applied on top of the rumble strips. Rumble stripes enhance visibility as the vertical face of the rumble strip provides a raised texture that enhances the retro-reflectivity performance of the striping material.

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Once a vehicle leaves the roadway, the goal of the highway engineer is to minimize harm to the traveler. This goal can be met by assuring that the roadside can be traversed safely, by shielding or eliminating roadside objects, or by preventing collisions with opposing traffic. Intersections represent the second strategic focus area to address the fatality-reduction challenge. Intersection crashes represented more than 20 % of all fatalities and half of the injuries in 2002.

Two countermeasures are high on the priority, market-ready innovations and ready-to-use technologies: red light running cameras and roundabouts. Red light running cameras offer the opportunity to address driver behavioral issues as part of an overall engineering approach for improving the operation of intersections. A red light running camera program requires extensive outreach with the public to assure acceptance of the technology and its application. Roundabouts can reduce the number of conflict points at problem intersections, and in rural locations can be particularly effective in reducing the severity of crashes.

Pedestrians are affected by highway projects during construction, particularly in urban areas, and they can be affected negatively for the long term if projects are not designed to address pedestrian movements as part of the overall design objectives. Pedestrian safety requires a three-pronged approach:

1. Making drivers aware of the presence of pedestrians (i. e. encouraging them to make a habit of pedestrian awareness, driving safely around pedestrian areas, and yielding to pedestrians)

2. Encouraging engineers and planners to accommodate pedestrian mobility and safety when designing roadways and other transportation facilities.
3. Educating pedestrians about safe behavior, the meanings of the pedestrian signs and signals, and actions that will improve their own safety;

To target the first and third critical areas, a campaign was developed called the “ Pedestrian Safety Campaign Planner,” a ready-made toolkit of outreach materials that States and communities can customize and use locally. The purpose of the campaign is to sensitize drivers to the presence of pedestrians and to educate pedestrians about minimizing risks to their safety. The Pedestrian Safety Campaign Planner includes materials designed for use in television, radio, cinema, and print advertising. Some of the materials included in the toolkit are available in both English and Spanish. States and local communities are responsible for implementing the campaign through local television and radio stations and print media.

To target the second critical area, a number of initiatives are underway. One is an evaluation of various pedestrian safety engineering and intelligent transportation systems countermeasures in three cities (Miami, Las Vegas, and San Francisco) that will be ongoing for the next several years. Another is the development of “ PedSafe,” a software tool that assists engineers and other interested parties in selecting appropriate pedestrian safety engineering countermeasures for specific sites based on criteria unique to each site.

Road safety audits (RSA) offer an opportunity to provide an independent assessment of a project's safety at any stage of its life: planning, design, construction, or post construct