

The Needs to Establish an Integrated Safety System for Express Bus

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Abstract

The aim of this paper is to present an analysis of the safety of express buses in Malaysia by providing an overview on road accidents involving express buses, current road safety enforcement and regulations, and driving comfort and safety in Malaysia. Bus accident is a major public concern in Malaysia as they often involve the lives of innocent victims. Redundancy of regulations and enforcements by different agencies and the lack of safety management capabilities of the bus industry have been identified as the main issues in express bus transportation. Bus drivers are more likely to exceed the speed limit due to the lack of enforcement and low traffic volume during the night compared to during the day. Hence the discussion will highlight the current enforcement, safety policy, regulatory process and riding comfort of the driver as the major factors that deals with safety of both the vehicle and passengers. Therefore, it is crucial to tackle the highlighted parameters in terms of managing road accidents of express buses. Various operational management must also be addressed to improve enforcement and safety management of roadside hazards.

Keywords: hazard; regulation; road accident; safety index; safety management

1. Overview on road accident involving express bus

This Buses are important in daily life to transport the masses, either to commute to work, travel to different cities, or go to school. It is cheap, hence its large use across the country. However, it is common news to hear reports of bus accidents in Malaysia. According to the Malaysian Institute of Road Safety Research (MIROS), a total of 1855 bus accidents were reported in Malaysia between 2012 and 2015. This alarming statistic has also shown that the highest number of accidents involved express buses, with a total of 716 accidents. Therefore, it is important to investigate the causes of express bus accidents and to identify measures to increase the safety of these buses as it relates to public safety [1]. Recent studies by Yusoff et al. [2] investigated the influence of drivers on bus accidents. Through surveys, the relationship between the tiredness of drivers and bus accidents in Kuching were investigated and the result shows that express bus operators play an important role in the prevention of bus accidents due to driver more likely to exceed the speed limit during night-time and suggests the need for further actions from relevant enforcement agencies and stakeholders. Drivers were 2.5 times more likely to drive at high speed during night-time due to lack of enforcement and low traffic volume compared to during the day. The study found

that express bus speeding maybe due to the feeling of being safe in a larger vehicle.

Earlier studies have suggested that further efforts aimed at reducing risky bus driver behaviours demand critical considerations and actions from relevant enforcement agencies and stakeholders. In addition, express bus operators are encouraged to monitor the risky driving behaviour of drivers using suitable monitoring systems. The major cause of mechanical failures among all types of buses was identified to be brake failures with 56% of the total mechanical failures. Around 52% of all commercial buses were involved in traffic accidents with a yearly mean of 3.8 accidents per commercial bus [4]. Commercial buses are considered as the main mode of transportation in most developing countries. In Malaysia, commercial buses are privately owned and operated generally by individuals and transportation firms [5].

1.1. Current situation on road safety in Malaysia

Road traffic accidents and injuries are well-known problems in developing countries in ASEAN especially in Malaysia. Statistics by the Royal Malaysia Police have shown that the average number of fatalities due to road traffic accidents has exceeded 6400 each year between 2006 and 2014. The number of accidents increased in 2016 compared to 2015, from 489,606 to 521,466 road crashes

and from 6706 to 7152 road deaths respectively. This shows an increase in road accidents in Malaysia.

Figure 1 shows the total number of bus accidents in Malaysia from 2012 to 2015 [6]. The highest number of accidents involved express buses, with a total of 617 accidents. This is an alarming statistic since many campaigns involving the police and other transport authorities like the Road Transport Department have been carried out every year. This is due to limitations in the following aspects: (a) communication from the related authorities or

agencies, (b) regulation and enforcement by difference agencies, (c) safety management capabilities of the bus industry, and (d) certified Occupational Road Transport Safety & Health Officers. This will eventually lead to a decrease in the public trust in using buses as one of the safer mode of transport, compared to other developed countries where there is less express bus accidents and fatalities. For example, only one fatal crash was recorded in 2016 in Australia.

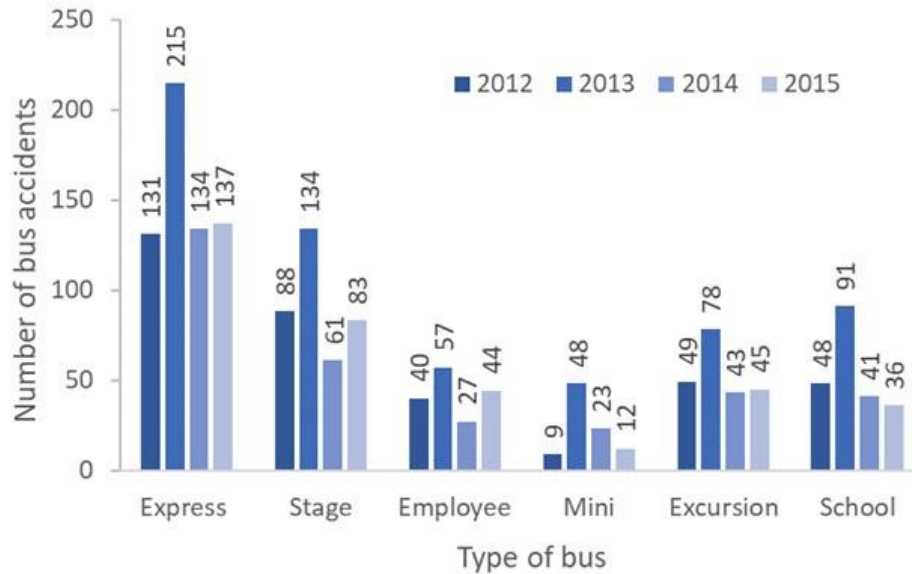


Fig. 1: Statistics on bus accidents in Malaysia from 2012-2015 [6]

Currently there is poor integration of data system between regulatory agencies that deal with public transport especially express bus. In order to improve this, steps such as the introduction of merit and demerit between agencies for operators and drivers should be implemented. This will lead to the increase of advocacy to public and passenger on safety prioritisation. Hence, strengthening the current safety management verification process.

2. Comfort and driving safety

Today's global competition has incited numerous bus manufacturers to design their products based on consumer's inclination and fulfilment. The main elements that need to be considered in the design of express bus include seat design and posture of bus drivers. An unfortunate accident or road injury cannot be avoided but it can be prevented by considering drivers' comfort and safety of the driver in the design of bus vehicles.

Safety design is one of the major considerations in the production of a vehicle since the added safety features will enable an easier and more comfortable driving. Driver comfort impacts the driver's long-term health. In recent years, intelligent transport systems have become a prominent subject among transportation researchers. Research on vehicle safety is an important subset of intelligent transport system research. Today, safety warning systems that prevent traffic accidents have been attracting much public attention [7]. The focus on road safety has now shifted from collision protection to prevention. In order to feel comfort and safe while driving, the safety of the vehicle needs to be considered.

2.1. Vehicle control and information systems for safe driving

Recently, the application of adaptive cruise control (ACC) system is widely used in the manufacturing of automobile vehicle. This system measures the following distance to the preceding vehicle using radar and automatically maintains the appropriate following

distance. The system recognises lanes using vision sensors and keeps the vehicle from deviating from its lane. Currently, these systems are based on highway driving. In striving towards driving comfort and safety, these systems should also be used on regular roads. Accomplishing this aim will require progressions in innovations and technologies for precisely recognising the environment surrounding the vehicle and activation of the ignition system.

2.2. Advanced driver assistance systems

Encouragement from the wide public and industry in enhancing the safety and comfort of driving, advanced driver assistance systems (ADAS) has received growing interest in the automotive market. Application of ADAS in automobiles such as automatic cruise control, parking aids, lane departure warning or night vision have already been acquired and introduced [8]. One of the innovative technologies introduced to the market is the ADAS for lane-changing, lane-keeping and collision avoidance systems [9]. Conventional ADAS technology can detect objects, perform basic classification, alert the driver of hazardous road conditions, and in some cases, slow or stop the vehicle. This level of ADAS is great for applications like blind spot monitoring, lane change assistance, and forward collision warnings.

Safety camera in vehicles was introduced to eliminate drivers' blind spot. Blind spots are areas of the road that cannot be seen while looking forward or through either the rear-view or side mirrors. In fact, advances in safety have reduced casualty rates by such a high margin, that cars being sold today offer definitively better safety statistics than those previously. Safety has turned into a huge differentiator throughout the most recent decade, the accessibility of crash test data and the capacity to avoid serious accidents has become a real factor in consumers' choice of vehicle.

ADAS, including camera safety features, have become a requirement for new car buyers because comfort and driving safety is the

most important factor that are considered by users. Safety features like blind spot monitors and lane departure warnings are more convincing to justify the presence of a central LCD and infotainment system than paying for the upgrade to get a better radio or navigation system. Premium additions to basic car models are progressively focused on empowering better visibility and safety and are proving to be a better economic proposition for the automaker. ADAS assists the driver by using a collision warning

system, curve speed warning system, speedometer, and navigation system and conveys this information on a visual display on the console and via an earpiece [10]. However, the drivers' responsibility, sensitivity and concern remain the main thing to be emphasised. Based on this overview of ADAS in automobiles, a proposal of ADAS which can be implemented in express buses is shown in Figure 2. The implementation of ADAS can help reduce the number of express bus accident.

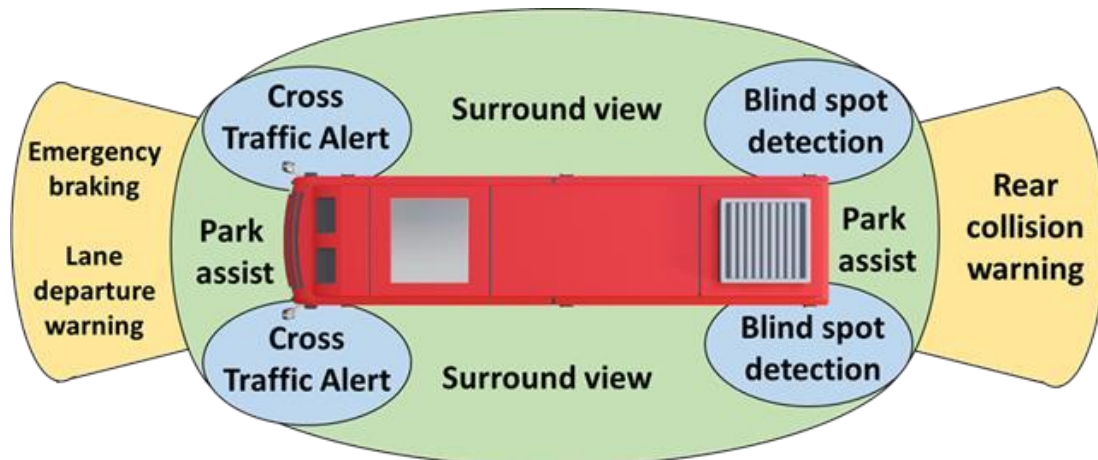


Fig. 2: Proposal of an Advanced Driver Assistance Systems (ADAS) for express bus

ADAS only works as an aid feature that facilitates driving safety. For example, sensor cameras should detect 60 percent of the object's fit before the system can be activated involving 40° horizontal and 20° vertical views with an image quality of 1280 x 960 pixels, including tracking 60 meters ahead [11]. However, this advanced driver assistance systems do not address specific issue or crash type. But these systems could improve driving performance and minimise distraction of misleading or careless driving.

3. Current regulatory process based on safety issues for express bus in Malaysia

Operational safety is an important aspect in ensuring long-term business sustainability for any industry. This is imperative for heavy commercial vehicles such as express buses. Regulatory authorities in Malaysia have administered several policies. However, increased enforcement is still needed to ensure that the policies are adhered to. Currently, operational safety audits of bus operators are performed according to the Industrial Code of Practice 2010 and the Occupational Health and Safety Act (OSHA) 1994 [12]. OSHA is a law enforced by the Department of Occupational Safety and Health Malaysia (DOSH). The principle of the Act is "To make further provision for securing safety, health and welfare of persons at work, for protecting others against risks to safety or health in connection with the activities of persons at work, to establish the National Council for Occupational Safety and Health and for matters connected therewith".

Since 2005, Malaysia has implemented the Malaysia Road Transport rules, which consists of R36-Construction of large passenger vehicles, R66-Strength of superstructure of large passenger vehicles, and R80-Seat for large passenger vehicles. These rules were adopted from the UNECE regulation into the Motor Vehicle Rule (Construction and Use 1959) to avoid fatal accidents due to the collapse of the bus roof structure during rollover accidents [13]. An example was the 2007 bus crash in Bukit Gantang along the North-South Expressway that caused 23 deaths [3]. The poor roof structure of buses caused a high number of deaths in this scenario prompted the regulation concerning exterior and interior bus design to further increase bus safety standards.

Every six months, periodical vehicle inspection is made compulsory for commercial vehicles when renewing road taxes.

This regulation was gazetted in the Road Transport Rule and is being conducted by PUSPAKOM, which is the body mandated by the government of Malaysia to control and manage the inspection process. However, the six-month period of inspection was stated to be insufficient to assess the vehicle's roadworthiness, since commercial vehicles have higher frequency and distance of travel compared to private vehicles [14]. Hence, the critical components such as tires and brakes tend to wear more rapidly. As mechanical failure of these critical components is one of the leading factors for express bus accidents, it is crucial that the period of inspection be re-evaluated to ensure that commercial vehicles such as express buses are in safe conditions for road travel.

3.1. Safety star grading system programme

In 2013, the Safety Star Grading System Programme (SSGP) was initiated by the Malaysian Institute of Road Safety Research (MIROS). The SSGP is a star rating system provided to bus operators based on their service and safety aspects. These ratings are given by consumers. This vital information is accessible by the public to assist consumers in making decisions on the safest bus company to travel by and provides a benchmark for standard bus operations and safety practices for bus operators. This allows passengers to put pressure on bus operators to improve their service and prioritise on safety [15].

Following a fatal accident involving an express bus, the common practice of Malaysia's public transport industry regulator, the Land Public Transportation Commission (SPAD), is to immediately suspend the license of the bus operator for a certain duration, usually up to a year. This was the case for the 2016 express bus crash near Pagoh, Johor that killed 13 passengers. Following the tragedy, MIROS advised the government to make SSGP mandatory under the existing public transport regulatory system. While suspending licenses may be a temporary measure, it will also have negative implications. The need of consumers might not be met, or on a more serious note, illegal bus operators will emerge. Therefore, more creative solutions should be sought to reduce express bus accidents [16].

4. Current enforcement for express bus

The Land Public Transport Commission (SPAD) was established on 3rd June 2010, following the passing of the Suruhanjaya Pengangkutan Awam Darat Act 2010 by the Parliament in May 2010. SPAD is responsible for ensuring safe, reliable, responsive, accessible, efficient, planned, integrated, affordable and sustainable land public transport system to enhance the economic growth and quality in Malaysia [17]. Currently, there are more than 100 operators that offer express bus services to the public which come under the jurisdiction of the Commission. SPAD acts as the regulator for these operators, and monitor issues like touting, speeding, reckless driving, route and scheduled adherence. SPAD Industrial Code of Practise (SPAD ICOP) was introduced to ensure that bus safety is always fulfilled by the bus operator, thus, minimising bus incidents [18]. SPAD has been absorbed by the Ministry of Transport (MOT) in 2018 to synergise the work force and avoid overlapping of duties between the commission and the ministry. This will help to increase safety of road transport in Malaysia. Following this approach, bus operators are advised to put the safety issues as a priority and adopt safety practices as a culture in their management. Five elements that became the main frameworks for SPAD ICOP are management and monitoring of SHE programmes, vehicle management, driver management, travel risk management and record management. This is to ensure that the top management of bus operators are highly committed in safety issues regarding their employees and the public. The bus operators are also responsible to ensure that buses are in safe mechanical conditions and optimum for every journey. Issues related to the bus driver such as skill, behaviour, working hours as well as salary also need to be considered by the employer to ensure the safety for each journey. Additionally, GPS records must also be monitored by the supervisor to avoid speed violation and driver attitude. All data relevant to bus safety such as incidents, training, risk management and bus maintenance must be properly documented for record.

4.1. Safety policies practice codes in Malaysia

The management of bus operators must comply with the terms proposed by the Occupational Safety and Health Act, OSHA 1994 (Section 37) that require bus operators to lead any safety programme relevant to bus safety [19]. As stated in Section 30 of the OSHA Act [20], employers need to establish safety and health committees for companies with five or more employees. Bus operators should appoint a safety officer to monitor and act as an advisor for any relevant issues on bus safety to comply with Section 29, OSHA. However, a safety officer is only compulsory if a company exceeds 40 employees [21]. Current policies and regulations emphasize that bus operators are fully responsible for the safety of their express buses.

5. Conclusion

This paper analyses the safety of express buses in Malaysia by providing an overview on road accidents involving express buses, current road safety enforcement and regulations, and driving comfort and safety in Malaysia. Regulations and enforcements introduced by the Malaysian government were aimed to monitor and train bus operators and drivers. However, findings have shown that the main problem regarding safety of express buses in Malaysia is the redundancy of regulations and enforcements by different authorities and agencies resulting in poor safety management capability. The study presents the technological advances that have been made to increase road safety such as vehicle control and information systems for safe driving and advanced driving assistant systems. This progress can help drivers avoid careless driving and avoid accidents. The combination of technological advances

and regulations are needed to improve the safety of express buses. The main conclusion that can be drawn is that there is a need to establish an integrated safety system for express buses in Malaysia.

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