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The Introduction of Train as Automobile Machine as A Means of Transportation: It's Impact On Reduction of Road Accidents in Nigeria

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ABSTRACT: *Transportation through the Railway is more appreciative compared to the road transport. Many people have lost their lives and properties through the road transportation, hence the researcher tried to look into the problem of the road transport in Nigeria. In the western word the train is more popular compared to the use of vehicles to convey human beings and goods. The road traffic accident statistic from 1990 – 2012 was recorded in 2013, by the road safety commission. The researcher used the descriptive survey research design to carry out this study. The data was illustrated using histogram to demonstrate the rate of accident on Nigerian road showing fatal, serious, minor, killed and injured. Solutions were provided by the researcher on how to overcome the problem on Nigeria road. By providing rail way transport, because rail way transport has no records of accident.*

KEYWORDS: rail way transport, rate of accidents on Nigeria roads, train as automobile machine.

INTRODUCTION

The train as a means of transportation in the western world is becoming very popular, because of growth in the population of human beings. The railway transport was developed to make life comfortable for man and to transfer goods and services from one location to another, when they are produced. The train is an Automobile machine that is locomotive in nature transfers goods, human beings from one location to another. The train is used as a national way of transportation of human beings, goods and services. The train as an Automobile machine is driven on rail road a typical rail way road or track iron. The roads are anchored to beams that are turned to sleepers known as rail road ties (Suleiman, 2010). Rail road is common in the western world like United State of American, Canada, China, Germany, and India etc. It's easy congestion, because it carries many people at a time including manufactured goods from one place to another. According to Suleiman (2010) the rail road is placed on a perpendicular beams which are usually then placed on a foundation that is made of concrete or compressed earth in a bed of ballast which prevent the track from bucking as the ground settles over time beneath passing above.

Train on Track

The rail transports make use of large space because it is double track, rail lines that carry more passenger or goods in a given amount of time than a four lane roads. Rail transport is a major form of public transport in many countries in nation like Asia that has millions of people uses train as a regular means of conveying their goods and services, countries like India, Japan, China and South Korea they all depend on train system as a means of transportation (Suleiman 2010). Nigeria is a country with considerable location which guarantees access to the sea, thus has strong potential for growth and development (Sada, 2009). It was this that made previous administration to declare intention to pursue a vision that will place Nigeria as a leading economy (Suleiman, 2010). The vision 20 – 2020 is a comprehensive frame work that aim to stimulate economic growth in Nigeria. The vision is to place Nigeria among the top leading economic growth in the world to compete with nation like Japan, United states of America, Great Britain, and South Korea etc. Rail transportation is one of the important areas to be covered in the vision (Sada, 2002).

Statement of Problem

Before now transportation system in Nigeria is cumbersome, because road has been the only means of transportation in Nigeria. Many accidents have been recorded on Nigeria road in the 90s and 20s as recorded in 1990 into 2012 in 2013. The Nigerian government in recent time has invested in rail way transport in 2015 and making it to be popular. Hence the study is focused on how the government will improve on railway transportation to reduce road accident on the Nigerian roads and improve on the economy of the nations.

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RESEARCH METHODOLOGY

The researcher used descriptive survey research design to carry out this study. The descriptive research design involves the researcher trying to observe what is happening to sample participants and also variable without being able to manipulate the variables (Okorodudu, 2013). If observations are done at one or more point in time, it would be described as a cross sectional research design. Also if the observations are carried out at different point in time, the design could be described as a longitudinal research design.

The History of Railway Transportation in Nigeria

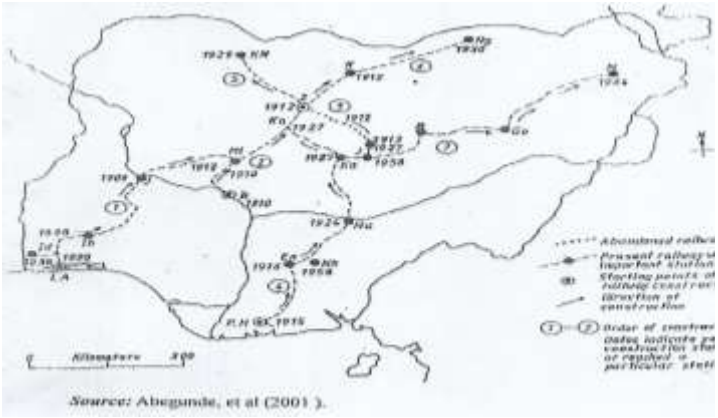
The rail way transportation in Nigeria started back in the 19th century, when Lagos was linked to Ibadan in 1998, which was completed in the early 90s which

was later extended to transferring goods and service. The opening of the Jebba bridge from Lagos to Jebba was linked to Kaduna and Zaria in 1915 with the Kano – Baro line which was completed in 1911 (Onakomaiya, 1978).

In 1991 another railway line was lead from East of the River Niger from Port-Harcourt to Enugu, and was later extended to Jos and Kaduna, there by linking the east to the west, Jos was linked with Zaria in 1912 for the evacuation of tin from Jos through the rail way line was close in 1957. The main aim of constructing the rail way line is to connect the sea port to mining and farming part of the country Nigeria (Suleiman, 2010).

The two main railway lines were built from Zaria to Kaura Namada, then from Kano to Nguru. In 1958 to 1964, the extension of Borno rail way was constructed (Suleiman 2010). This is 640km line which goes from Kuru near Jos through Bauchi and Gombe to Maiduguri (Abegude , et al 2001). In 1966 an oil refinery in Alesa Eleme that lead to Elelenma in Port-Harcourt to Enugu rail line was added. This brought Nigeria rail way line to a kilometer of 3505 kilometers of single track narrow gauge railway connecting the two sea ports, Lagos and Port – Harcourt. The growth of the Nigeria railway system can be seen on the map below

Map: Showing the Nigerian railway tracks.



Source: Abegunde, et al (2001).

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Train as an Automobile Machine

The train as an Automobile machine has some basic components or feature that makes it to move on a track called rail road some of the basic components are discussed as follows according to (Ozigis, Oche, and Lawal, 2021).

Engine Block

The engine block provides the support for the other engine component parts. The engine block is made of cast aluminum cylinder material with cast iron lines and piston having a prevail over simple cast process in which the piston runs directly on the alloy bores for diesel engine (Filho, 2013, Ansari 2020). The needs to manufacture engine blocks that achieves fuel consumption reduction in locomotive engine has resulted in shift from cast iron to aluminum alloy as aluminum light engine block lead to enhanced thermal conductivity and efficiency (European aluminum association, 2011,Torres et al 2006)

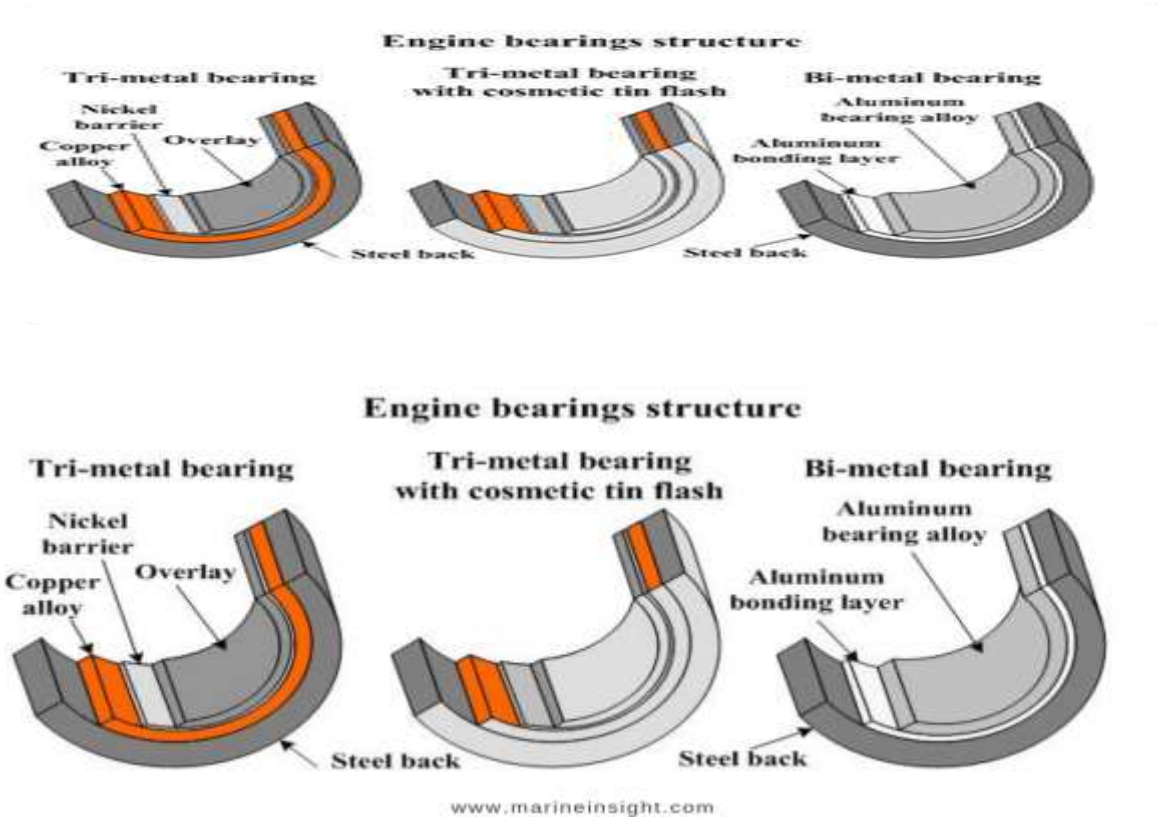
Thermal conductivity arose from low temperature of the crankshaft; bearing and inner bore region in the morning on start of the engine and on engine running that can reach up to 1500c and 2000c respectively, but dissipate its heat in to coolant (European aluminum association, 2011).

Engine Block.

Researchers like Vencil and Rac (2014) examined 616 crankshaft bearings damaged by different mechanisms and fault three analysis was performed. The researcher concluded that must causes of failure are abrasiveness and surface fatigue wear. The causes of failure are then incorporated in material selection for the locomotive crankshaft bearings as well as for wheel and differential bearings (kraymico and kraymlen, 2014).

Locomotive crankshaft bearing can be made from aluminum tin, copper alloy which has excellent compressive properties and unique lubricating properties under over heat conditions. Some researchers like Ozigis and Aliyu, (2017), Shao, et al (2017) worked on the behavior of engine main bearing under dynamic load with influence of oil film, the crankshaft and engine block. The researchers conclude that the right fluid is one with lubrication properties such as

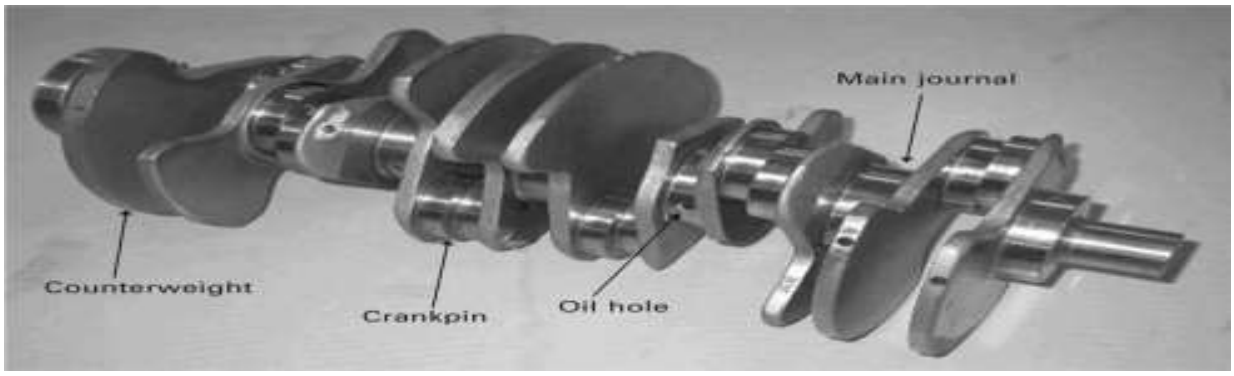
orbit movement and oil film thickness that can improve bearing performance (Ozigi and Oche, and lawal 2021).



Bearings

Crankshaft

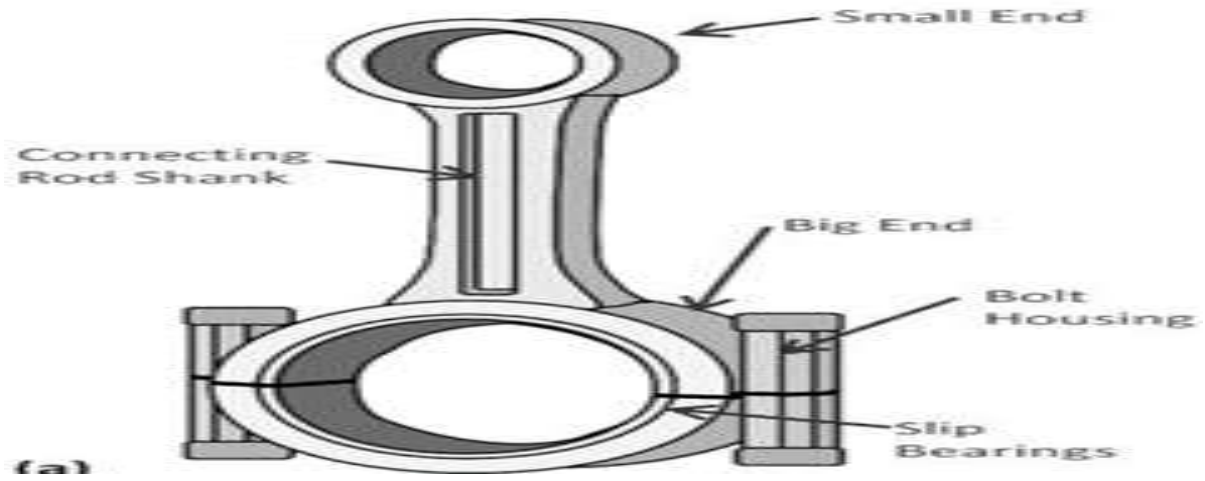
The train engines are required to have a high output, the service conditions with solid crankshaft that is small in size (Solanki, 2010, Kuboff and Mori; 2005). The service conditions include cyclic loading that require high fatigue strength and wear resistance material such as forged steel crank shaft for diesel engines. The design of crankshaft normally incorporates dynamic loading which are optimized to obtain effective shaft diameters and size (Solankir, Tanboli,zinjunadia ,2011). Forged carbon steel and alloy steels crankshafts are preferred relative to cast iron due to light weight, precise dimensions and better damping required in diesel to meet the required high output and cost. Some researcher like Stojanvic and Glisovic, (2016) and Gupta, et al 2015, investigated forged steel and ductile cast iron crankshaft. The research concluded that cast iron crankshaft can be replaced by forged crankshaft from strength point of view (Ozigis, Oche and Lawal 2021). Power et al 2015 state methods of manufacturing crankshaft that include forgoing, casting, machining which are being replaced with modern methods such as 3D printing, rapid proto-type and rapid manufacture to produce locomotive engine crankshaft.



Crankshaft

Connecting Rod

A connecting rod rotates at both ends that result in instantaneous angular displacement between the connecting rod axis and the piston axis as the piston slides up and down the cylinder. These are several factors that guide the selection and manufacturing of connecting rod. Some researcher like Sriharha and Rai, (2020) worked on designing consideration for connecting rod based on materials for the same loading conditions in the manufacturing of connecting rod. Some researcher worked on design, simulation and manufacturing of connecting rod, some researcher worked on design, simulation and manufacture of connecting rod from ultra fine grained material and isothermal forging. The other production processes for connecting rods include die forging and power metallurgy for the forged, steel and carbon steel alloys. Connecting rod failures include throwing and rod bearing breakages.



Connecting Rod

Piston

The main purpose of piston in an engine is to transfer force from expanding gas in the cylinder to the camshaft. The effects of this can cause fatigue damage of piston in the form of piston

side wear and piston. Piston head cracks, Dhamecha et al, (2020), Singh and Sharma, (2014) designed and analyze piston using different materials like cast iron aluminum alloys and bronze using operating parameters of specified gas pressure, temperature and material properties. It was concluded that aluminum alloys is the best materials for piston (Ozigis, Oche and Lawal 2021). The production of piston, using 3D printing is among the advances in the addition to additive manufactured (Dolan, Budde and Chramm, 2018).

The mechanical loads on the piston result from peak pressure up to 200 bars in the combustion chamber and force of inertia that is caused by high acceleration due to the reciprocating motion of the piston (Kim et al 2012). The thermal load on the piston has gas temperature between 18000 and 26000 and exhaust gas temperature between 5000 and 8000. Therefore a piston should have enormous strength minimum mass and be able to dispense the heat of combustion quickly piston can be produced by gravity die casting with controlled solidification or forced with reduced wall thickness (Ozigis, Oche and Lawal 2021). Dolan, Budde, and Chramm, (2018) stated there is increase in use of alloyed steel instead of aluminum due to higher power requirement of locomotive engine particularly for increased higher effective pressure that leads to improved thermal efficiency, however lubrication condition of alloyed steel piston is inferior to aluminum alloy piston' (Senator and Aleksendria, 2013). Symytical, (2018) stated in their research that the advance in piston rings with forces on interaction between rings, cylinder wall, that can result in severe friction, wear oil consumption and power loss in locomotive engine.

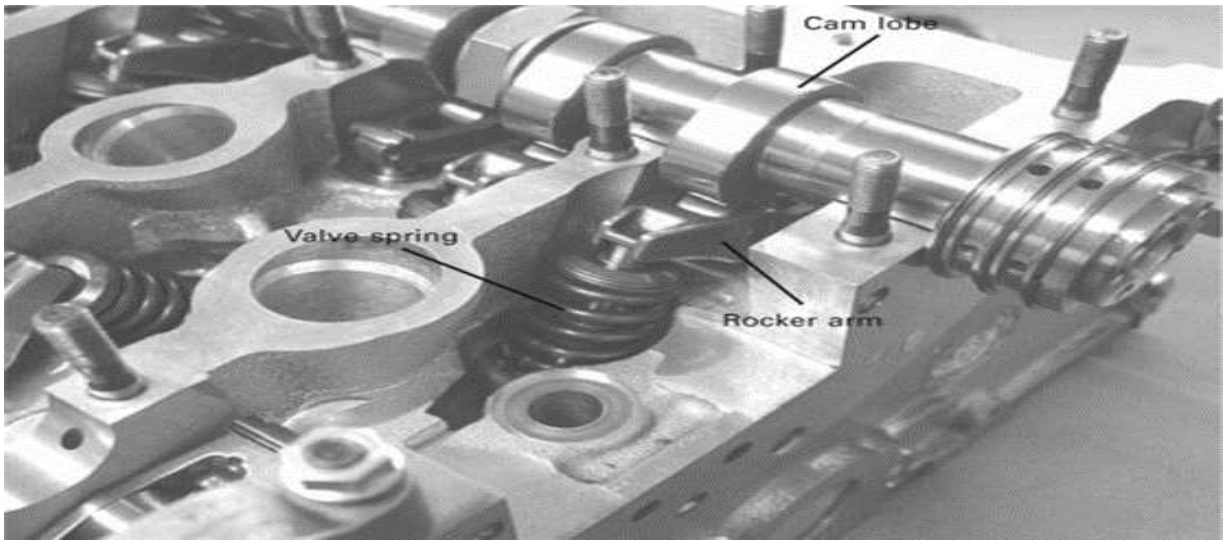
Piston and Rings Groove

Rocks Arm and Camshaft

The rocks arm is part of the valve actuating mechanism and is responsible for oscillating the lever for conveyance of radial movement from the cam lobe into linear movement as the push

rods open the valve (Mendes and Tomoyose, 2010). The processes of rocker arm opening and closing of the inlet and exhaust valve leads to admission of fuel and air into combustion chamber during the inlet stroke or exhaust gases to be expelled during the exhaust stroke (Husaini and Sheikh, 2013). The weight and strength of rocker arm are important hence forged carbon steel is used in its manufacture to meet energy required for low rotation, higher torque and durability in diesel locomotive engine.

However, some research that was carried out by Patil and Mahale (2019) they stated that the design and development of steps rocker arm. The research validated the rocker arm based on slides design camshaft can be made of forged steel, cast iron and hollow shaft with cam lobes that is press fitted. Mallikarjuma et al (2014) worked on the design of manufacturing of camshaft the research shows a 3D model and soft ware, pro engineers that led to generation of programs for computer numerical control machine (CNC)



Rocker Arms and Camshaft

Rail way Contribution to Nigerian Economy

Railway services have become a significant mode of public transportation in the world, engineers and planners were not able to reduce congestion in the cities. Syahriah, (2013) stated that many optional were being considered in the last decades to enhance mobility among the city population. Similarly in Kuala lumpur in Malaysia, the war against congestion started in the early 1980s where by Kuala Lumper population has increased to more than 2 million with many of them come to cities to work and conduct their business transaction. Masirin and Idiris, (2013) started as commodity transportation and later developed into intensity train service. However currently, operators are planning their best to provide and enhance trains services to meet passengers' requirements and satisfaction (Vukan Vuchia, 2005).

The introduction of new technologies in train transportation has been able to attract more public people to use train services than private vehicle and buses as train transportation are proving reliable and more punctual services (Nordin et al 2017). The Nigeria rail way development started in the 18th century and by 19th century the rail road had gotten to Nguru, Yobe State. The Nigerian government did not take railway transportation very serious. It was the government of Rt. General Mohamadu Buhari in 2015 that took a challenge of rail way transportation to be very serious having Chief Rotami Ameachi as the minister of transportation to be the chief controller of railway, he built a rail way station from Warri to Itakpe and from Itakpe to other routes. This has brought a changed, because many travel through the rail line. It was cheap, faster, and very accommodating compared to road transport that took much life's and make life uncomfortable for passengers. Rail way transport in Nigeria has brought comfort to the people of Nigerian by making people to travel a long distance in Nigeria with a less amount of effort. It's made the country to transport goods and services without stress. It has made the economy of the country to be buoyant because it makes money to be available to the government of the country and her people.

Rate of Accident on Nigerian Roads

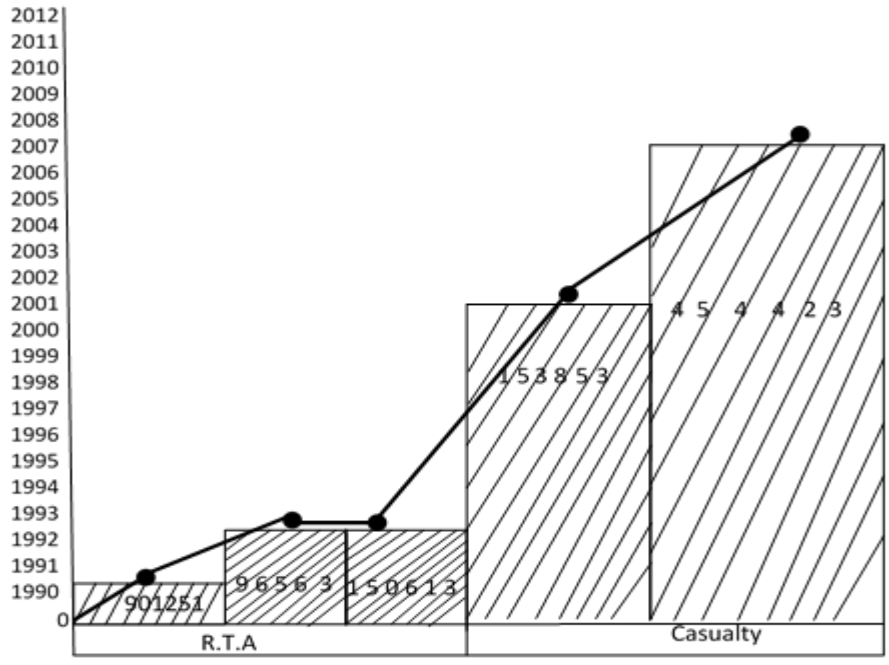
Accident on Nigerian roads is becoming worry some, because of bad road which is one of the causes of road accident' statistics has shown the casuality on Nigeria roads, from 1990-2012.

Road Traffic Accident (RTA) Statistics in Nigeria 1990 – 2012

Years	RTA			Total	Casualty		Total
	Fatal	Serious	Minor		Killed	Injured	
1990	6140	8796	6998	21934	8159	22786	30940
1991	6719	8982	6845	22546	9525	24508	34033
1992	6886	9324	6554	22864	9620	25752	35375
1993	6735	8443	6281	21458	8454	24146	33600
1994	5407	7522	5275	18204	7440	17938	25378
1995	4701	7276	5053	17030	6647	14561	21208
1996	4780	6964	6488	18242	6364	15290	21654
1997	4800	7701	4987	17488	6500	10786	17286
1998	4757	7081	4300	16138	6538	17341	23879
1999	4621	6888	4356	15865	6725	17728	24523
2000	5287	6821	4499	16606	8473	20677	29150
2001	6866	8185	5379	20530	9846	23249	33195
2002	4029	7190	3325	14544	7407	22112	29519
2003	3810	7882	2572	14304	6452	18116	24568

2004	3275	6949	4051	14275	5351	16827	22249
2005	2209	4143	2620	9062	4512	17396	20298
2006	2600	5550	964	9114	4244	17794	22334
2007	2162	4812	1503	8477	4673	27980	22467
2008	3024	5671	2646	11341	6661	27270	33641
2009	2460	6024	2370	10854	5693	18085	32963
2010	1178	2819	1333	5330	4065	17464	22160
2011	1764	2485	516	4765	4372	20757	
2012	1053	3106	1210	6269	4260	454423	25017
Total	**96563**	**150613**	**90125**	**337301**	**153853**	**454423**	**608277**

From the data shown in the table, the R.T.A shows the records of fatal, serious and minor accidents. The total of this three column as shown on the table is lower compared to the casualty column that shows killed and injured, the total is higher compared to the total of fatal, serious and minor as shown on the Federal Road Safety Annual Report 2013. The total of casualty that comprise of killed and injured was 608277 is higher than the total of R.T.A .337301, and this is shown on the chat which was illustrated on the histogram graph.



Histogram graph illustrating accident rate on Nigeria road from 1990 – 2012

From the analysis of the histogram shown above the R.T.A column shows minor accident to be (90125), fatal accident to be (96563) and serious accident to be (150613) from 1990 to 2012. But in casualty column killed or death was (153,853) and the total injured was (454,423). When comparing the casualty with the R.T.A column, it was observed that accidents is more on casualty column than the R.T.A from 1990 – 2012.

CONCLUSION

Road accidents have claimed so many lives, when compared to rail way transport. From statistic of casualty, injured record was (9454423) and people that died or killed was (153,832). It shows that the accident that occurs on road accident is very high. But in the history of rail way transport from 1990 to 2012 there was no record of accident and the train carry more of people and goods when compared to vehicle that ply the high way.

One of the causes of road accident on Nigerian road is the problem of poor roads. The condition of Nigerian roads has put so many vehicles in a bad condition. Nigerian roads are not in a good condition, not motor able, they need service. Any Nigerian vehicle used for eight to ten years has no second hand value because of the poor road system.
Nigerian drivers do not obey road sign that are on the road, because of hurry in driving. They lack caution; they do not obey road signs, because of over confidence when driving on Nigerian roads. All these cause road accident that can lead to death.

Rail way transport compared to the use of Nigerian road has not recorded any history of accident on Nigerian rail way station apart from the attack of banditry or kidnappers, that treating the attack of passenger. The rail way transport is cheaper in terms of monetary spending and more comfortable. Since the introduction of rail way transport passengers find it cheaper and more comfort to travel.

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