Sky Bus Of India: 21st Century Innovation In Urban Public Transportation

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Abstract

India, a country over one billion population has been facing serious difficulty of urban congestion and traffic jams since 1970's in her major cities. Public transport system in Mumbai has been overworking three times its capacity. Public transport system in Delhi, Colcutta and Chennai is also under strain. Elevated railway and underground railway could be options to support overworked surface railway and city bus system in Indian cities. However, Elevated railway is too invasive and underground train poses risks of fires and evacuations. Also, underground train could not address concerns for foundations of heritage buildings in highly congested cities in India. India requires a public transportation solution that would not disturb city plan and still be effective. In order to solve this problem, Indian railways innovated 'sky bus' for urban public transportation and acquired worldwide patents during 2001 and 2004.

It took more than twenty years for Indian railways to develop sky bus, certified by TUV Inter Traffic GmbH of Germany for its safety. Urban public transportation in India has bad history of accidents. Sky bus technically has zero per cent possibility of derailment and death on rail track. This itself is a revolutionised advantage as Indian railways register more than 2000 deaths on rail tracks each year.

The sky bus technology is a workable solution to ease urban congestion. The technology of sky bus would not only be able to transform whole public transportation system in urban India but also would reduce pollution levels in the cities. This project requires huge investments in India. The benefits of sky bus system are tremendous however, high project cost is a great impediment for implementation of the project. This completely indigenous design of the sky bus has attracted a consortium of thirty four companies to realise the prototype. Elin EBG Traction, a company from Austria provides technological collaboration for the project.

In spite of receiving support and approval from various government and non-government organisations sky bus project has been going slow. Indian state governments and city corporations hesitate to be the firsts in implementing this project.

This research explains in a historical perspective, how India has been trying to transform her urban transportation system.

Introduction

In India, sky bus is seen as 21st century innovation in urban public transportation. This paper explains how India has been trying to transform her urban transport system with sky bus.

This paper is based on secondary data. It has been difficult to search data for this paper as sky bus is the latest innovation for urban public transport and is not yet world known. The data for this research is also collected from authentic internet sources and the sources are mentioned in the reference section.

India has been facing serious difficulty of urban congestion and traffic jams since 1970's in her major cities. Public transport system in Mumbai has been overworking three times its capacity. Public transport system in Delhi, Colcutta and Chennai is also under strain.

Growth In Indian Urban Population

Although India occupies only 2.4 per cent of the world's land area, it supports about 16 per cent of the world's population. Only China has a larger population. Almost 40 per cent of Indians are younger than 15 years of age. About 70 per cent of the people live in more than 550,000 villages, and the remainder in more than 200 towns and cities. Over thousands of years of its history, India has been invaded from the Iranian plateau, Central Asia, Arabia, Afghanistan, and the West. The magnitude of the annual increase in population can be seen in the fact that India adds almost the total population of Australia or Sri Lanka every year. A 1992 study of India's population notes that India has more people than all of Africa and also more than North America and South America together. Between 1947 and 1991, India's population more than doubled.

According to census of India in 2001, out of the total population of 1027 million about 742 million live in rural areas and 285 million in urban areas. The net addition of population in rural areas during 1991-2001 has been to the tune of 113 million while in urban areas it is 6 million. The percentage decadal growth of population in rural and urban areas during the decade is 17.9 and 31.2 per cent respectively. The percentage of urban population to the total population of the country stands at 27.8 per cent. The percentage of urban population to total population in the 1991 census was 25.7 per cent. Thus, there has been an increase on 2.1 per cent in the proportion of urban population in the India during 1991 and 2001. India has four cities with population more than 10 million.

Indian Urban Transport

In India, transportation demand in urban areas continue to increase rapidly as a result of both population growth and changes in travel patterns. As it enters the 21st century, the urban areas in the country confronts a historic transportation crisis that has become a planning war against increasing mobility gridlock and air pollution. Given the financial restrictions and environmental concerns, it appears unlikely that this demand can be accommodated without dramatic changes in travel behaviour. The principal urban transportation policy needs to adopt a comprehensive strategy for achieving mobility and air quality mandates.

In the absence of a good, convenient and efficient public transport system in urban areas, there has been an increasing trend towards more and more ownership and utilization of personalized motor vehicles to commute which is not only more energy intensive and polluting, but also more expensive to the economy.

While on one hand, the vehicle mix in urban areas has aggravated congestion and air pollution, on the other, specifically production of buses and their design for mass transportation has not received adequate attention in the national automobile policy. With growing traffic congestion, thousands of dismayed drivers in the urban areas are finding out that rush hour traffic is slowing to a crawl. This in turn leads to higher oil consumption and emissions which are poisoning the urban areas.

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The pressure on the Mumbai rail system is all the worse because the population growth has been concentrated in the suburbs. This means that the rail network has to cope with increasing numbers of commuters. The dominant feature of commuter movements in Mumbai is the overwhelming dependence of the travelling public on the suburban railway services of two zonal railways, the Western railway and the Central railway. As much as 73 per cent of passenger kilometres are covered by the suburban railway system as compared to the 27 per cent of bus and 20 per cent of private vehicles and taxis.

The most precious asset in growing urban areas is the land. Allocation to residential and commercial purposes put heavy pressures on land for public use like parks and open spaces apart from very important and critical roadways. Hardly 6 per cent to a maximum of 18 per cent of land in cities form roadways. The roadways once laid, almost remain constant. The physical constraint of road area being constant, as population increases, naturally loads on roads increase.

Options For Improvement In Indian Urban Public Transportation

As more and more people from different habitats try to converge on to the central business district, the road has no capacity to handle and congestions erupt. Roads take one exactly to the point where one wants to go. But the capacity is limited in terms of passengers per hour that can be handled. Even if one considers only buses, need to maintain the braking distances between two buses and the space maintained between them affects speed as well as limits per lane what capacity can be achieved. When mass transit, that too at higher speed is required, rail based systems only can handle. Indian Railways considered different options for permanent improvement in urban transport system but none of these options could give perfect solution. Following were the major options:

Elevated railway technically can not reach truly congested central busy roads where the mass transport is needed. It is also too invasive and may require dislocation of some portions of habitat as well as introduces noise pollution.

Underground railway is less invasive on surface but still poses technically challenging risks of fires and evacuations. It also has to address concerns for foundations of heritage buildings. If road vehicles are involved, in inter-modal transfers, it becomes weak link in the chain of transport between walking and railway. Both modes suffer from derailments and capsizing killing commuters.

Surface railway is impossible to lay in an existing city. But even to lay the same in a new development, one should keep in mind what happens after 50 years of laying the same. India has example of her own suburban system. The city remains divided by the corridor and it is an eternal noise polluter in the heart of city day in and day out.

Sudden disgorging of heavy loads of commuters at stations create need less congestion on the roads, reducing quality of life. Almost close to 2000 persons die annually- because of trespassing or falling from trains in present Indian system, whatever be the excuse and justification for accepting the same. In addition vulnerable to minor vandalism by urchins, but resulting in grievous injuries like losing sight for

the commuters. Also this mode cannot follow roads, so the weak link of road vehicles has to be brought in for inter-modal transfers.

Derailments, collisions and capsizing concerns remain with loss of life for all the above mentioned three systems.

The Innovation And Advantages Of Sky Bus

Indian Railways, studied these options and recognized the fact that they should have all problem solving solution. After long research of more than 20 years, under the leadership of B. Rajaram a team of professionals and researchers innovated sky bus system for urban public transportation. Indian Railways acquired worldwide patents during 2001 and 2004 for sky bus. These patents stand assigned to the president of India. Sky bus system in latest innovation in urban public transportation and has special advantages which are explained as follows:

1. Sky bus follows the existing roads but does not take road space and is as flexible as a bus
2. Has rail based mass transit capacity, same as existing rail metro
3. It does not divide city while providing integration along its alignment
4. Sky bus is derailment and collision proof and has no capsizing of coaches so that there can never be loss of life
5. It is free from vandalism
6. Noise free and pollution-free
7. Sky bus is non-invasive and requires the least amount of scarce land space and it does not come in the way of development

The Sky Bus Technology

Sky bus requires, 52 to 60 kilogram per meter rails which are placed at standard gauge floating in elastic medium and damped by inertia of measured mass held in a box enclosure, supported over 1 meter diameter columns spaced at 15 meters and located at 15 meter distance from each other, in the divider space in between lanes on a road way, at a height of 8 meters above road surface. This provides the support and guidance for powered bogies which can run at 100 kilometres per hour. The coach shells suspended below, carry passengers in air conditioned comfort. This can follow existing road routes, while existing traffic on roads continue. The fixed structure at 8 meters height above road level is aesthetically pleasing and there is no concern of claustrophobic feeling for road users.

Figure 1: Model of sky bus. Source: Konkan Railway Corporation, sky bus project

Sky bus is aesthetic and eco-friendly. The sky bus can never derail, capsize nor it can collide, hence is safer than existing rail based system. Sky bus received approval from TUV Inter Traffic GmbH of Germany for its safety. With no signaling and having no points and crossings, this is a mass transit system, which can be put up within two years in any crowded and congested city. In addition to moving people sky bus system can carry standard 20 feet containers, boosting its capacity utilization to double to that of other existing systems.

Sky Bus metro falls under tramway category, under Art 366(20) of Constitution of India, since it operates along existing roadways and within municipal limits, hence excluded from Indian railway act.

The Components of Sky Bus

Sky way - In the middle of road way pile foundations supports 1 meter diameter column approximately 8m high, and space at 15m all along the road way. The sky way consists of a concrete box structure carried over a series of piers at a height of 8 m above existing road level. Two rails fixed with appropriate fastenings with the concrete box support and guide the sky boogie. There are no points and crossings.

Sky bogies - Standard two axle bogies used in metros for speed of 100 kilometers per hour are used (but can have higher speeds, if required up to 160 kilometers per hour) of standard gauge.

Linear induction motor technology is incorporated with 4th rail driving which is above the bogie with regenerative power capability. Third rail is used for current collection. Braking of bogie is available. Bogies are regenerative and has disc breaks. It also is equipped with emergency mechanical breaks.

Sky coaches – These are double walled light shells with wide large windows which are suspended from the sky bogies. Coaches are with controlled banking on curves. It can manage with even 100 meter radius curves. These coaches are with air condition and with automatic doors. Audio visual information will be available to passengers in coaches. Coaches have a special four meter wide sliding doors for quick entry and exit of passengers. Each pair of coaches carries 300 persons, and service every one minute or 30 seconds is possible.

Sky stations - Unlike conventional mass transit systems, sky bus needs smaller stations. It can service in every 30 seconds or 1 minute that means virtually no waiting time for passengers.

Sky bus is totally automated without drivers or guards, and access control is made through prepaid cards. Stations act as only access facility, and not as passenger holding area.

Indian Railways consider sky bus as the only and the best solution for long term urban public transportation. Invention of sky bus by Indian Railway meets the requirements of Indian urban public transport system whereas other available options mentioned in this paper do not provide. Sky bus redefines the thinking and planning for urban transport. Advantages of sky bus are tremendous.

Advantages

1. In this new technology of Sky bus, almost no land acquisition will be required, except for providing for right of way on existing roadways
2. Only at terminal points, of about 2000 to 4000 square meters of area will be required, that too at places away from the urban centre.
3. No demolition of structures or no gardens will be destroyed
4. No Vandalism. Not vulnerable to persons throwing stones. Track is inaccessible

5. Fastest evacuation in case of fire as compared to underground metros.
6. If at all derails, cannot fall down, coach keeps hanging. Hence no capsizing takes place as compared to railways and underground metros.
7. No Deaths due to trespassing or falling off from train. In normal metros like Mumbai daily 2 to 3 deaths occur on the system with total casualties reaching almost 2000 per year.
8. Sky Bus follows existing busy roads, thus reaches the very heart of the city decongesting the roads. This is not possible in case of Normal Railway .
9. Capital cost is lowest. Almost 50 per cent of elevated systems and 25 per cent of underground metro for same performance standards.
10. It has lowest running cost. Sky bus has maintenance free tracks, has no signals and points and crossings to maintain.
11. Sky bus does not make interference with normal road traffic. It does not require road over or under bridges.
12. Since the system involves guide ways in the sky, which does not fall into an exact definition of Railway, the number of agencies involved in clearing and executing the project will be minimum and only one authority at state level can be created for implementing the project
13. It can be built on roads with Fly over. It is not an impediment.
14. From the date financial closure is achieved, the project can be completed and commissioned within 2 years.
15. Sky bus riding is aesthetically pleasing and has no noise pollution.
16. Sky bus is insulated against floods, rains and obstruction on track

Implementation of Sky Bus Project in India

The Ministry of Railways has allocated funds to put up a 1.6 kilo meter test track. All elements of the technology which make up the sky bus have been well tested. What needs to be tested is only the system integration.

By July 2004 the test track is expected to clear doubts of experts and then onwards, without government support by way of funds, any private industry can put up the sky bus project. The benefits of sky bus system are tremendous however, high project cost is a great impediment for implementation of the project. This completely indigenous design of the sky bus has attracted a consortium of thirty four companies to realise the prototype.

Some of the corporate giants of India extended support to the trial run of the sky bus urban transport system piloted by Indian Railways. Indian Railways has initiated discussions with the Austria-based firm, Elin EBG, for installing gearboxes to the motors that are to drive the sky bus. The Austrian firm has offered to supply some motors and electric components required for the sky bus free of cost. It has been scheduled to conduct the first trial run of the sky bus during July 2004.

In spite of receiving support and approval from various government and non-government organisations sky bus project has been going slow. Indian state governments and city corporations hesitate to be the firsts in implementing this project. The reason is, sky bus has not run yet. Sky bus has to pass the track test. Four Indian states and few city corporations are ready to implement sky bus project as soon as track tests are approved by the experts.

However, present environment is also favourable for sky bus project. India is ready for development. India's development strategy and economic policy are guided by the objectives of accelerating the growth of output. Though India is a largest democracy in the world with multiparty government, there is today a recognition that in many areas of activity, development can best be ensured by freeing them of unnecessary controls and regulations and withdrawal of state intervention. India has one of the largest industrial sectors in the world, and ranks amongst the top 10 nations in the production and consumption of a wide array of products and services. These facts makes it clear that, if sky bus project receives approval by experts for its track tests, sky bus will become the solution for urban public transportation in 21st century, at least for India.

Conclusion

After experiencing congestions and traffic jams over three decades, India realized her urban public transport system requires transformation for solving several problems at once and for long term. Innovation of sky bus by Indian Railways, a government owned firm is the outcome of this learning process. Sky bus project has been receiving support from government, industry as well as from various publics in India.

This research confirms that the advantages of sky bus technology are tremendous. For overpopulated Indian urban areas, sky bus seems to be the best solution for safe, quality, and inexpensive mass public transportation.

Indian state governments and metro city corporations are waiting for final approval from experts. If sky bus project receives approval by experts for its track tests, sky bus will become the solution for urban public transportation in 21st century, at least for India.

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