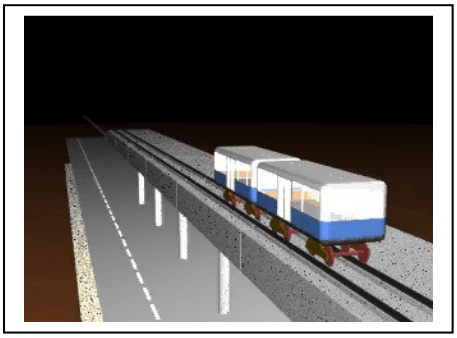
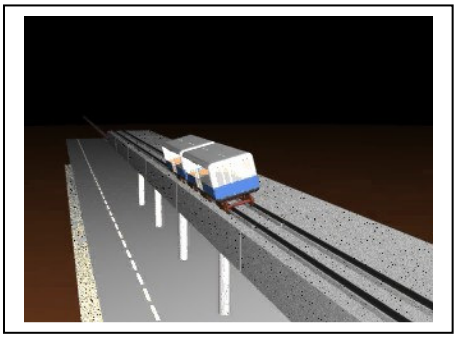
Skybus Metro- is an improved metro rail! Safer, 100km per hour air-condition travel to handle 20000 to 80000 passengers per hour per direction! Our country's technology!

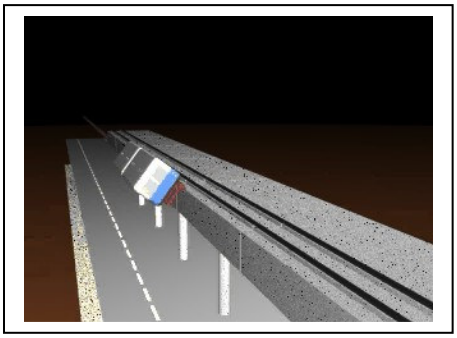
The railway technology, used in metros suffer from a fundamental technology defect: derailment and separation of traveling coach from the railway track, falling down on the ground killing people.



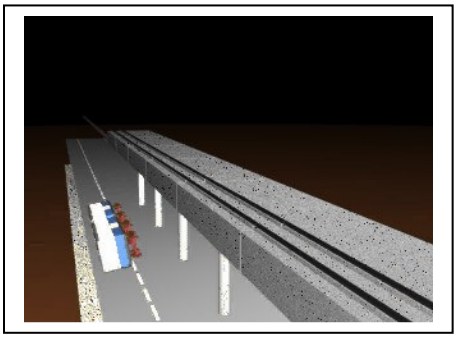
So long as wheels are on rail, the coah runs. But failure of rails/ obstruction or even heavy wind force can create a dangerous situation…..



But when wheels climb the 25 to 30 mm flange, go over the rail, derailment occurs..



Then there is nothing to hold the coach to the track- coach just topples



Such capsizing can kill people inside the coach as well as those on the road below!

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Evolution of Skybus technology- improved railway !

Standard Railway coach running on railway track...

The under-frame with standard railway wheel-set running on railway track..

Evolve into

Skybus-an improved railway!

The under-frame remains same, railway wheels run on the same track, the coach is firmly attached to the under-frame positively

The under-frame with wheels and railway traction motors & railway track enclosed in the concrete box- travel on the railway track , carrying the coach below outside the concrete box- now the coach and the track are positively held together- cannot escape from rails!

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Safety Certification Issues:

The same railway elements well proven and used in metro rails are used- at the least it is as safe but, actually safer because of improvements.

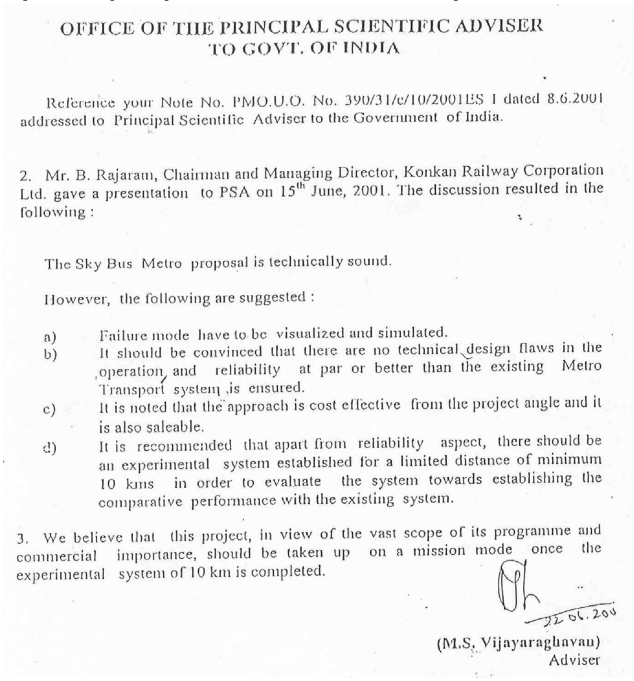
TÜV TÜV Rheinland Group

World's leading railway safety experts of TUV, Rheinland, Germany comment on Skybus technology:

On system level the concept of Sky Bus Metro appears feasible for safe implementation with respect to the suitable existing safety standards that could be used for design, construction and operation and with respect to the positive safety record of the reference systems chosen for this study (see chapter 5.1 of this report).

The experts will ensure that the commercial Skybus for use of public will satisfy the international safety norms.

A high level Scientists Committee headed by Bharat Ratna Abdul Kalam (then Principal Scientific Advisor in PMO/ Govt. of India) concluded after examining Mr. B Rajaram's presentation:
Skybus proposal is technically sound.



OFFICE OF THE PRINCIPAL SCIENTIFIC ADVISER
TO GOVT. OF INDIA

Reference your Note No. PMO.U.O. No. 390/31/c/10/2001ES I dated 8.6.2001 addressed to Principal Scientific Adviser to the Government of India.

2. Mr. B. Rajaram, Chairman and Managing Director, Konkan Railway Corporation Ltd. gave a presentation to PSA on 15th June, 2001. The discussion resulted in the following :

The Sky Bus Metro proposal is technically sound.

However, the following are suggested :

a) Failure mode have to be visualized and simulated.
b) It should be convinced that there are no technical design flaws in the operation and reliability at par or better than the existing Metro Transport system is ensured.
c) It is noted that the approach is cost effective from the project angle and it is also saleable.
d) It is recommended that apart from reliability aspect, there should be an experimental system established for a limited distance of minimum 10 kms in order to evaluate the system towards establishing the comparative performance with the existing system.

3. We believe that this project, in view of the vast scope of its programme and commercial importance, should be taken up on a mission mode once the experimental system of 10 km is completed.

22.06.2001

(M.S. Vijayaraghavan)
Adviser

On Konkan Railway Skybus test track, Bhaba Atomic Research Centre and RDSO(Ministry of Railways) tested to safety parameters as applicable to metro rail systems, (prescribed by the Chief Commissioner of Railway Safety, Govt. of India) the results are:

Safety

The system is basically a railway with improved suspension systems and patented features. The norms for safety clearance for dynamic behaviour, as per railway rolling stock, are applied and

checked if any adverse results come because of suspended coaches below the wheels. The measurements were made by RDSO (Research Designs and Standards Organization, Ministry of Railways) during Jan 2005.

Speed (Kmph)	Braking Distance meters	Vertical		Transverse		Longitudinal	
		Max accn g	RI	Max accn g	RI	Max accn g	RI
60	136	0.036	1.703	0.026	1.788	0.052	2.136
70	174	0.122	2.692	0.04	2.003	0.077	2.395
		Excellent	Excellent	Excellent	Excellent	Excellent	Excellent

Permissible limits Max.acceleration 0.3g going upto 0.35 g if no resonance is observed. Ride Index (RI): 3.25 normal can go upto 4.0 for EMU and DEMU.

Train control is as per Railway standards and Motorman driven observing Railway General rules.- even with this Sky Bus, a short unit of 20m,yields 1min headway. Structurally the Codes of Practice observed and the Schedule of Dimensions fixed, moving checked to find that design and actual conditions in dynamic conditions are satisfactory.

The performance is much better than the prescribed limits as evident from the figures.

The World's First test track has yielded excellent results showing the superior behaviour of Sky Bus technology.

Implementation with Safety certification-guidelines recommended:

Certification for safety can be done under the existing Tramway Act 18xx, once the State Govt notifies the Skybus under the Act and appoints a Safety Commissioner.

Since the technology breakthrough by our country has made the high speed mass urban transport safer and also financially viable proposition if one adopts the Skybus, it is in public interest that the following guideles are issued for States to follow so that they can implement urban transport project using Skybus technology, requiring NIL funding from the State, with almost no land acquisition and not disturbing any existing habitats.On BOOT basis the projects can be executed, State giving the right of way 6m above road level and right to place in the road divider, columns of width not exceeding 1.2m. at a spacing of 20m along the road, without disturbing existing utilities.

1. The State Govt shall notify that Skybus shall be governed under the Tramway Act18xx, and special rules made under the Act by the State for safe operation for public use.
2. Based on the dynamic test results and structural compliance with codes of practice, a third party consultant shall give certified information to satisfy laid down norms, along with joint certification by the Heads of concerned technical branches: this forms the basis for the Safety Commissioner appointed by the State under the Tramway Act to issue Safety certificate which is the same procedure followed in case of railway.
3. Since Skybus is fundamentally a railway only, except it is made now derailment proof and collision proof, the same established rules for opening railways are used to prepare the documentation for the Safety Commissioner's inspection.
4. The codes of practice for construction of the concrete/stell structures of the Skybus shall be to Indian standards where available or to existing international standards as applicable.
5. For safety of running, the Indian Rly rules as well as UIC norms will form the basis for certification.

6. For signal and train control, if it is manually operated system, the existing Indian Railway Signal engineering Manual and principles used to locate signals, after taking into account the braking distances and the speed profiles needed. It is noted that additional safety layer of ACDs and speed profile comtrol based on distance required to brake, basis will be also be functional- to step in in case driver fails to observe the signals. The revenue risk of Headways and through put are rntirely taken by the BOOT operator. However, it is noted that calculations indicate even with manual operations, one minute headway is possible, and incase it is more, then instead of one unit two units have to run, in case 2 minute headway is adopted to ensure throuhputs.So public interest is served.
7. If totally automated. then the appropriate CENELEC standards shall be complied with.
8. With capacities to match the heavy duty metro rail system, States have a choice to improve their urban transport without financial burden.
9. The BOOT operator shall take all the responsibility both financial and technical to build own ,operate and transfer the asset at no cost to the State at the end of concession period.The Govt appointee viz., Skybus Safety Commissioner under the Tramway Act will assure the Public Safety aspects , as laid down in the rules for opening the Skybus system for public use.(the formats prepared for test tracks and used in Goa, to be supplied by Konkan Railway- for guidance.)
10. To cover revenue risk for the operator, the operator may be allowed to exploit the commercial space created at the station and all along the route over the Skytop, over the concession period and in case he puts up a few towers at stations, these towers will be for a longer period of 50 years. It is to be noted that no special land of Govt is required for this purpose, but only marginal short length (50m) and nominally widened foot paths to provide for Staircase access from road has to be given to the BOOT operator.

Without the aid of central funding or loans , if States want to take up the Skybus projects to solve their urban transport problem, the above guidelines may be followed.

The inventor Mr. B. Rajaram who got patents from countries like USA and others for this innovative technology improving rxisting railway, has assigned the rights to people of our country through Konkan Railway Corporation(Govt of India undertaking). This technology is a real threat to the existing vendors of old metro rail technology from abroad. Skybus technology makes our industry and engineers leaders for the world- it is vastly improved metro rail which also costs less than half of what the outside technology vendors are charging our country. So it is but natural for the vendors and brokers to mount a vilification campaign to belittle and spread disinformation about our own country's strength "intellect"- Skybus technology is actually, not in competition with any other technology- in fact, Skybus properly understood, makes all others pale into insignificance!

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FAQ:

From: <bojjiatri@yahoo.com>
To: <sky_bus_metro@yahoogroups.com>
Sent: Wednesday, February 05, 2003 8:52 AM
Subject: [sky_bus_metro] Some FAQ

> with refereence to ncfi digest 714, can u please educate the group
> about following matters?
>
> 1. what are the dimentions of each bus?
>
> Each bus coachis 9.25m long and 3.2m wide and a Sky Bus unit
> comprises two such bus coaches, with total length of 18.5m

>>> Ie each bus has a clean floor area of 29.6 sq.m, not counting seats, passages, entry and exit space requirements. So what is the effective available space for passengers

>effectively 27 sq m is provided- no seats except for disabled at edges- 151 is capacity for each . Pls see file reg PPHPD and headways file.

> 2. what is the passenger carrying capacity of each car.
>
> Each twin unit carry 300 passengers- at 5.6 persons per sq.m loading -

> which is much better than 6 to 7 persons/sq.m adopted internationally.

>>> Per coach, 29.6 sq.m * 5.6 persons is 166 persons, if the bus is standees only, present overcrowded BEST buses have capacity of around 19 standees, >50 seats

>
> 3. what are the economics vis-a-vis rail, diesel bus
>
> Sky Bus has to be compared with mass rail based ransport- compared to
> elevated metro costs half and compared to underground metro, costs
> one-fourth for a capacity of 40000 passengers per hour.

>>> Compared on what basis, construction, or per coach or propulsion system, or what?

total capital costs are compared.>

> Does not require land but follows roads. Stations are maximum 50 m
> long and access is from the footpath.

>>> If one rake is 18.5 m long, plus coupling length, why have more than double length station, which will allow unnecessary loafing by non passengers, and sight seeing types, as happened at New Delhi Metro. Also, how wide are the platforms, how much foot print on the footpath / road will these stations occupy ? The structural system, safety to passengers boarding, alighting ?

>The design is based on rate of flow of passengers 300 persons per 15 seconds- minimum holding space is provided- entry is only for bonafide commuter having smart card. The length of platform

is only 38m -enough to handle traffic for next century. Compare this length with existing railway platforms!The floor levels and the coach foor match. The presentations in the Files may be seen.
> Fare box collection alone can sustain the system and can give 15%
> FIRR at ridership of 2 lacs per day per 10 km route at Re 1 per km.

>>> Over what time period (what is FiRR?)

>Over 20 years debt services at 15% and FIRR is financial IRR.The template is posted at site for sensitivity analysis
> 4. what makes skybus more safe compared to rail.
>
> Sky Bus is rail based and safer because it cannot derail as the
> bogies have derailment arresters and the coaches cannot capsize on to
> ground because of the positive hold provided between the rails and
> the coach. Also no collision is possible for the coaches which are
> suspended, as the steel beam inside the concrete box takes the impact
> protection the coach units and passengers inside. An expert committee
> after examining the features concluded that the Sky Bus technology is
> safer than existing sytems.

>>> What about getting stranded in the mid route, how is the emergency access and exit done

>100% redundancy in driving motors is provided, and the normal railway operational procedures of clearance of stock disabled are followed. The traverser allows the stock to be taken off the route.
> 5. at what height the sky bus will operate.
>
> The sky rail guidance is about 9.5 m above road level and the
> suspended coach bottom abot 6 m above road level, providing National
> Highway clearances for road vehicles to ply unhindered.

>>> Does it take into account flyovers crossings and other such obstructions

>yes- Sky Bus can fly over fly-overs and can have spans of 50 to 100m- as cable stayed bridge.
> 6. how does one climb up and down - stairs or lifts.
>
> The access is by staircase near footpath- virtually itis like bus
> station of city bus- the station is also at 5.5 m above ground level
> and from the foot path one climbs stairs to access.

>>> Does it take into account barrier free access, ramps, etc. What is the foot print for these stations

>For spastics provisions exist-pls go through the presentation posted at site- arrangements for spastics will explain
> 7. what is the max speed achieved by sky bus.

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>
> Maximumspeed of Sky Bus in a city is 100kmph.

>>> Assuming this speed is ever reached, what is the acceleration time, and decceleration time. For a 10 km section, including, say, 8 stations at 1 km distances, what will be the travel speed. For 100 kmph, it means 1.6 km a minute, so what about distances travelled to attain then braking speed ? Will it ever reach 30 kmph or what ?

>The average speed for 1 km stops at stations is 45 kmph and for alternate services stopping at alternate stations average speed is 55kmph to 60 kmph.

The specifications also are available at site and calculations are standard assuming peak accelerations and limiting the power of driving motors to 85/110KW

> 8. how are the breakdowns handled.
>
> Sky Bus is exactly like a railway line- same standards of operation,
> except the "train", in our case is only 38m long! Redundancy in
> driving motors is provided-even if 50% motrs fail, the Sky Bus units
> can haul themselves and clear at the traverser. If all fail, then
> fellow Sky Bus unit has extra power to push it and take it out at the
> traverser.

>>> Ideal conditions. But I think I have misunderstood, if in 1 above, each Sky Bus unit is two coaches, ie 18.5 m, how in this case, the train is 38 m long ? Is it then actuallyu 4 coaches ?

>One unit is only 18.5m. The train length in Sky Bus is only 18.5m for first 10 years- and may be go upto 38m if extraordinary loads have to be handles.

Nothing ideal- we do day in day out in running and handling breakdowns of trains!

> 9. what is the type of engine and how much pollution it can
> generate
>
> The driving bogies are exactly like our suburban driving bogies-
> electrical motors driving the axles- similar to normal railway metro.
> Infact the same proven 3 phase AC motors of metro are used.
>
> 10. how will the loing done for different directions at
> junctions.
>
> In Sky Bus we do not use points and crossings. There is a traverser
> every 10 km , which transfers the Sky Bus unit from one track to
> another/ or shift to a depot the excess buses/ or turn them back in
> reverse or another direction.

>>> Where are these traversing points, depots, planned for and located in say, Andheri, Ghatkopar, and how much area is required for these

>At the terminals the traversers are located. Both at Andheri and Ghatkopar two traverser are present. But the depot will be at Andheri-the traverser is a 3/4 line type.the movie shows how it works.
>
> 11. what is the average life of bus.
> The life is same as that of a stainless steel railway coach!

>>> And that is ?

>not less than 20 years.

> 12. what are the safety measures in the system.

> Compared to conventional railway systems, the centre of gravity of the mass being carried on the wheels is brought down to be closer to the wheel support- hence dynamic safety is many time improved
>
> In conventional railway wind can topple the trains and in Kerala once, an express train went into river by being toppled by wind!!
> In Sky Bus wind cannot topple- there is positive link between the rail guidance system and the Bus Coaches- with 400% safety factor built into multiple suspenders.
>
> The railway bogies in conventional system have propensity to lose control on derailment, but additional safety in Sky Bus bogie is that we have derailment arresters, which prevents the wheel from jumping off the rails. So we are ensuring that there is no derailment.
>
> In normal railway systems, when collision takes place, derailment also occurs, and carriages capsize killing people. But in Sky Bus no collision can take place between the coaches- even after the 3 levels of braking fail and the Sky Bus units hit each other in a collision, the Sky Coaches in which people are travelling, will only swing to and fro- but will not collide with each other nor capsize.
>
> 13. are there stations? how do people change buses for their
> way.
> The stations are available every 1 km. It is a natural foot bridge across the road. From upline to down line the station provides natural access which is easy. At sky top one can change to different bus routes too!

>>> This establishes that the Sky Bus will never reach 100 kmph, but will be more or less 25 to 30 kmph, slower than suburban trains, whose stations are around 3 km or more apart

>Not correct. With two km stations the sky bus reaches 100 kmph speeds. The train control system in Sky Bus is different-from existing 100 year old technologies. The moving block system without any fixed colour light sytem, but controlled thru microprocessors- is at the cutting edge of technology.
> 14. how many sky buses will be needed for a city's transportation needs.
>

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> For a city 100 km route can be designed Approximately
> initially about 400 units will suffice to provide for moving 5
> million commuters a day.
>
> 15. besides passengers, can they handle luggages and baggages.
>
> Yes- Sky Bus units going to Airports and Rly stations can carry
> luggage. In addition during off peak period containers can be
> transported, as well as trucks as in RO-RO service. So
pollution due to trucks can be eliminated.
>
> 16. are the engines silent.
>
> The electrically run system is quiet and there is no
pollutants. The noise of steel wheels running on the steel
rails, railway sound as you hear also is trapped in the concrete
box, and the noise levels will be much less than what you get in
elevated metros like DMRC/Delhi or Hongkong.
>
> 17. how much time it will take to carry passenger from point to
point?
>
> In peak period the speed will be 55 to 60 kmph, with stops at 2
km,
> skipping alternate stations, by alternate service.
> Otherwise 45 kmph is the average speed. So you can calculate
the time
> of journey. You will never wait for more than one minute for
the
> service at a station.

>>> These figures are not commensurate with actual calculations and previous statements. If the time for waiting is no more than 1 minute, does that mean travel time between stations is 1 minute. If so, we need calculations to show how far the Sky Bus will go before it reaches 50 kmph, then, reduce to a full stop. Then, calculate the average speed.

>Please understand moving block sytem is different from what you know from current suburban sytems you know.I suggest pls read calculations in the file Pphpdheadways posted at site. The length of train and train control systems have impact.

> 18. where will the ticket windows, cloak room facilities,
police help.
> Smart card contact-less systems are used, where the machines
validate
> the card and add value when you pay the money to the ATM like
> machine. These will be available not only at stations but also
in many other places.
> Every Sky Bus unit will have webcam surveillance and there is
> continuous security monitoring of the Sky Bus during travel.
Instant communication with central control is also provided from
every Sky Bus Manned by Sky Man , who is technically trained to
take care of any hitches in the driverless Sky Bus, he also acts
as Sky marshal.
>
> 19. who are likely to travel by this system. will the car
owners switch.
>
> Air-conditioned no-wait travel and at average price of Re1 per

km or with monthly pass at Rs 500 per 1000 km travel per month, will attract our urbanites, who value time and money,

>>> What about intermodal changeover points, where does one park to get onto Sky Bus, descend at destination, get into ring route public transport, or whatever, what are the plans for this type of transportation 'interconnectivity', or is it that all systems are working entirely in isolation ?

>Sky Bus is an intermodal integrator! It eliminates the problems you face now trying to marry railway and road. In this case rail and road are synonymous.Outside the CBD the Sky Bus station towers provide for car parks too. Wish you see the full presentation.The concept of terminus generated by conventional railway working like a huge pipeline is modified to a grid- in Sky Bus, you get down on road where you want to get down.as you do in your own car.

> 20. will the insurance companies insure passengers.
> Safer than railway systems, then with international standard certification, same group insurance charges will be
> paid as part of ticket.
>
> 21 will there be monthly pass. will there be classes of Ist and IInd.
> There can be Executive class for a few trains- matter of choice. The executive class charge will be 4 times the economy class.
>
> 22. what about privacy and security of flats exposed to bus route against antisocial elements, house breakers etc?
>
> The Sky Bus coaches are totally sealed and not possible to get out in between. The privacy is ensured because the lighting inside and outside are matched in such a way that visibility close to flats etc is restricted for the travellers.
>
> 23. what are the expansion options availabe for growing future
> needs?
> Sky Bus units can provide modular growth. For next century needs are met with. Can expand from 40000 passengers per hour to 80000 per hour per route km.

And if no rise and landing, then where will the depots for the coaches be, where will they be cleaned, maintained, overhauled on the height of the supports.

Depots also are at the same level -these are located outside city limits.

Also, at what point will there be the 'smooth' changeover between different modes of transport.

Transfer points are as easy to provide as providing for normal bus stands. Much smoother than one imagines in present mindsets dictated rigidly by current transport technology like conventional railway.

Not to criticise, but to caution, that however good the technology, the practical implementation is most important.

No arguments on that. If a single rail in mono-rail suspended slow speed system working for more than 100 years, is replaced by two rails and coned wheel having single flange guidance , working

for 100 years at high speeds- it becomes Sky Bus! It is not a fragile cable car! Nor a difficult one to maintain like monorail Malasian system! It is modified railway as good as suburban railway- only center of gravity is brought down. Follows the same Newton's laws- fortunately mr Newton was born before us! Even the current railway engineers are running the railway, born before them! Very few understand physics of the same, but use them, and gain comfort with use. But if the physics are understood, there is little of miracle in nature!

Sorry for my ignorance as usual, because I have not read the relevant links, because apart from figures, the reports do not have anything tangible.

The various files at site do give substantial info- both technical and financial-

For the present, reorganising the traffic flow, absolutely strict and disciplined enforcement, and clearing all obstructions, such as multiple and haphazard parking, encroachments, installing correct lighting, and such, will radically improve flow.

For my personal reasons I believe regimentation and disciplining is symptom of slavish attitudes we inherited- I believe we should create sytems by their merit influence choices of people in terms of convemience to them! Choice shall not be denied.

Incidentally, any study on reintroducing electric trams and trollies, single and double decker ? Equally non polluting, quiet, comfortable.

They have served their purpose. Any solution you design occupying the precious urnam land is a lose-lose strategy. It is not only a requirement to be non-polluting, but also high speed mass transit system, we need. For next century you should not need any other solution- but what you invest should be such that progressively the travel cost should come down!