Redefining Autocar Transport on IR :

The BCACBM Wagon

Presentation in IRSE Seminar at Jamalpur: 13th February, '2012

Automotive Market India : A View

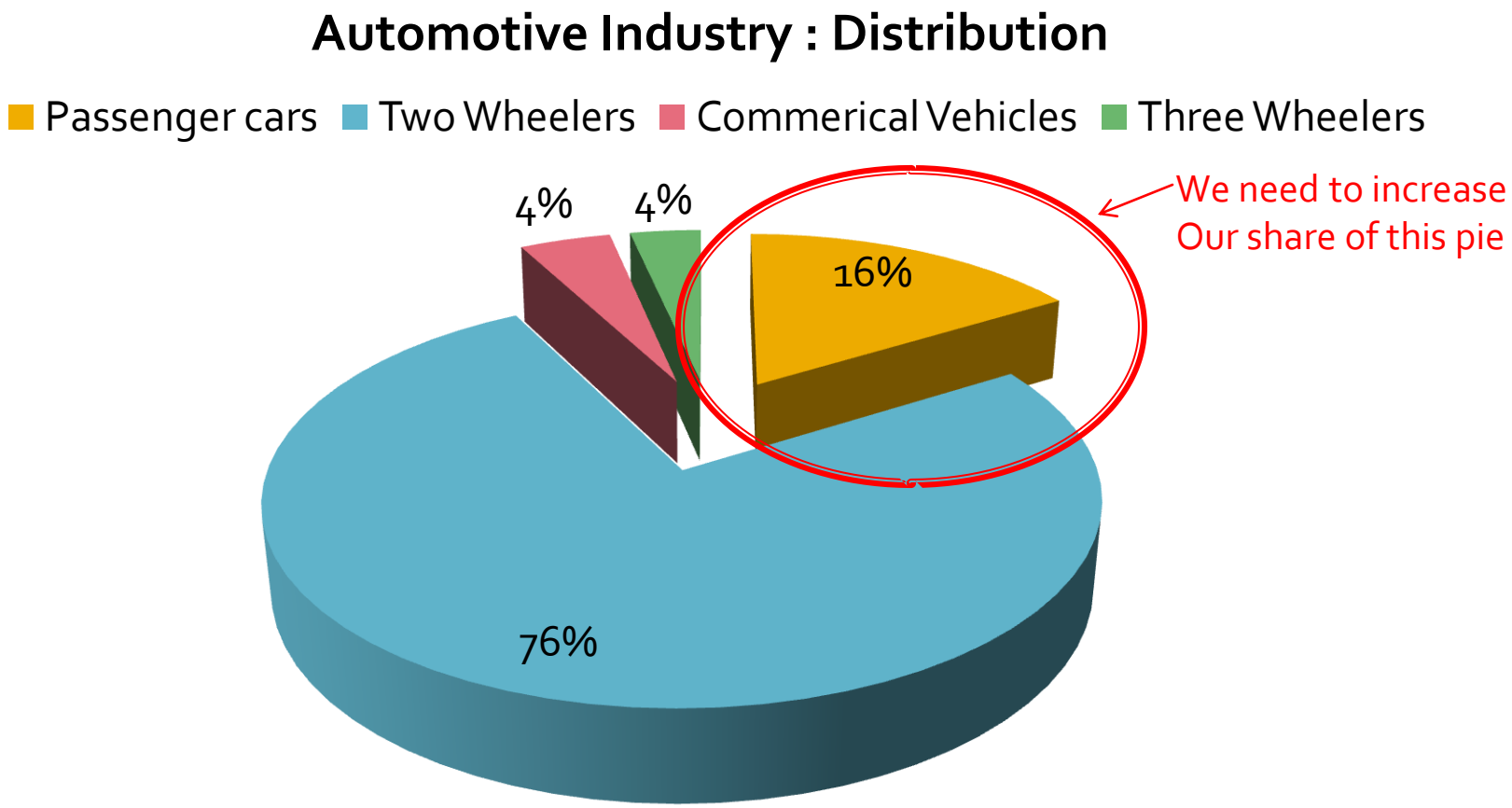
- Passenger Car production in 2010: **2.9 million**
- Projected Growth of **30 %**
- Projections of Car Sales:
  - Upto **5 million** in 2015
  - Upto **9 million** in 2020
- India's Position in the World :
  - Ready to overtake Brazil as 6th Largest Passenger Car Manufacturer with 3 million cars per annum
  - 4th largest Exporter of Passenger Cars in Asia behind Japan, South Korea and Thailand.

Automotive Market India: GDP Perspective

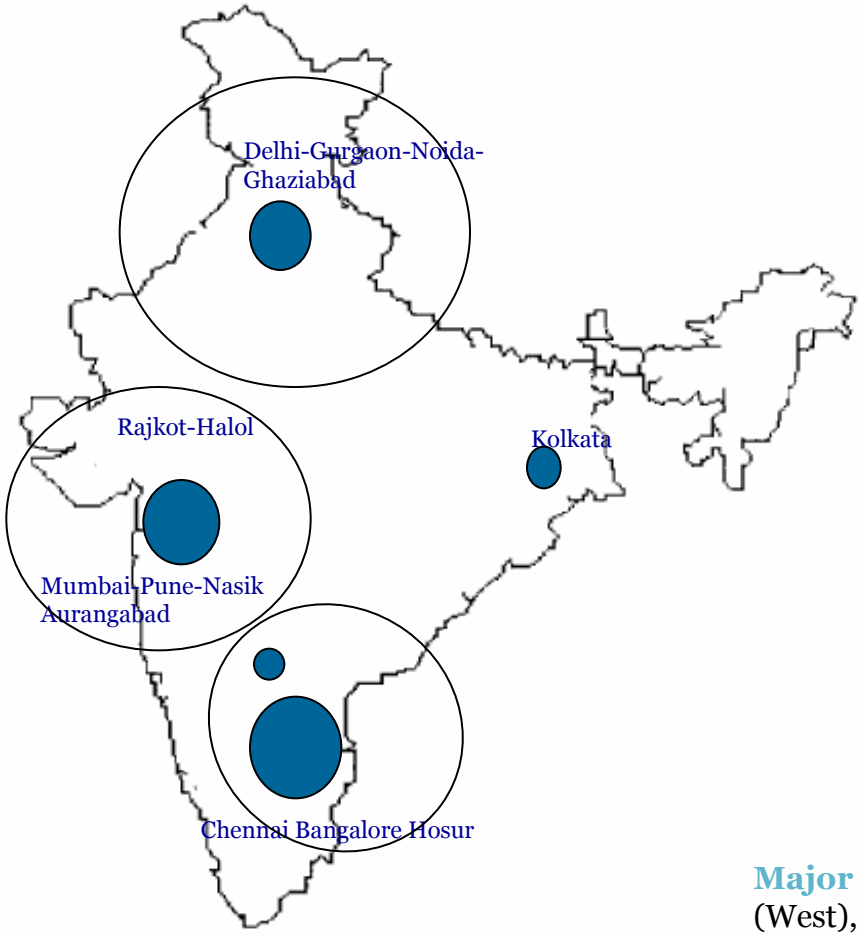
- Industry contribution to GDP in **2004** was **4 %**
- In **"Automotive mission Plan 2006-2016"** unveiled by Honbl. PM in 2007, Auto share in GDP envisaged at **10%** in the year **2016**
- In **2011**, Automotive Industry contribution to GDP has already reached **9 %**



Automotive Market Distribution



Automotive Manufacturing Hubs



North / Central

Ashok Leyland	Eicher
Force Motors	Hero Honda
Hindustan Motors	Honda
Honda SIEL	ICML
Kinetic	LML
Majestic	Maruti Suzuki
Piaggio	Yamaha
Swaraj Mazda	Tata Motors

East

Hindustan Motors
Tata Motors

South

Ashok Leyland	Enfield
Ford	Greaves
Hindustan Motors	Hyundai
Mahindra & Mahindra	Tatra
Toyota Kirloskar	TVS Motors
Volvo	

West

Ashok Leyland	Atul Auto
Bajaj Auto	Daimler Chrysler
FIAT	Force Motors
GM	GreavesKinetic
M & M	Premier
Skoda	Tata Motors

Major automotive clusters - Mumbai-Pune-Nasik-Aurangabad (West), Chennai -Bangalore-Hosur (South) and Delhi-Gurgaon-Faridabad (North)

Auto Transport : Indian Railways

- Overall market of appx **Rs 1600 Crores**
  - Assuming 50 % Railways share : **Rs 800 Crores**



- Actual Current Share : Appx **4 %**



- Rolling Stocks used:
  - NMG Rakes : **125 Cars** per Rake
  - BCACM(Converted BLC): **265 Cars** per rake
- Total Rakes in Operation : Appx 10

Need to look differently…..

- Capture Car Freight Market by
  - Promotion of Rail Transport
    - Ideal for leads of 450 – 1750 Kms
    - Multimodal Friendly- with last mile connectivity possible
    - Design of Higher throughput Wagons/ Rakes
    - Better Safety of Consignment.
    - Cost effectiveness and more "Green"
  - Exploiting Limitations of Road Transport of Cars
    - Capacity Limitations
    - Prone to damage during transit (being improved)
    - Longer Transit times over longer leads
    - Expensive over long leads(Needs resolution)
    - Environment unfriendliness

AutoCar Rake : Recipe for Success

Detail	VPU – Lease	VPU	NMG	Container	Road
Freight/ Km	4.57	5.31	4.0	8.20	4.09

**Study of one Sector of movement carried out by Logistics providers*

- Rail Transport is Competitive with Road even on date, on certain routes, even with lower throughputs on NMG Wagons

- Need to design higher Capacity Wagons to create win- win situation for both Auto Manufacturers and Railway

Present Status

The following options were available for Autocar Transport on Rail

- NMG Rakes
  - *Lower Throughput*
  - *Limited Number of Rakes converted*
- Bi Level Auto Car Carrier (BCACM)
  - *Converted from BLC Wagons, Not optimized for Autocars*
  - *Lesser Width and Height: Problems in Driver exit and roof damage.*

New Autocar Wagon – BCACBM

- Project Taken up in hand in Feb, 2011
- Extensive Discussions with Customers
  - Inputs from SIAM
  - Inputs from Ms Maruti Suzuki India Limited
- Design Completed within 3 months – End April, 2011
- Ms MSIL indicated willingness for development of Prototype at its own cost.
- Railway Board approval for prototyping by Ms MSIL received.
- Prototyping in Final Stages at Ms TWL on date

Main Design Parameters: New Autocar

Length over Head stock	22626 mm
Length over coupler	23555 mm
Bogie centre distance	14345 mm
Width Maximum (O/s)	2900 mm
Nos. of Units	**3 per rake**
No. of wagon per unit	2 A-Cars & 7 B-Cars
Total No of Wagons in a Rake	**27**
Optimised Maximum Cars per rake	318
Type of cars	**All Cars on Indian Roads including SUVs**
Bogie	Existing LCCF bogie
Wheel Diameter	840 mm New
Floor Height	938 mm
Max Height of Wagon	4305Mm
Material of Construction	IS 2062 (Mild Steel)

Comparison b/w Twin Deck Designs

	BCACM	PROPOSED BCACBM
Middle deck	Fixed	**Movable**
Floor height	1009	**938**
Optimised No. of Cars per wagon	**A-Car=6** **B-Car=6**	**A-Car=11** **B-Car=12**
Material	Mild Steel (IS:2062 Fe250 & IS:2062Fe450)	**Mild steels (IS:2062)**
No of Wagons	45	**27**
Bogie	LCCF	**LCCF (Existing)**
No of cars per Rake	270/265	**318 ***
Max No of Car Models	Limited	**All Cars on Indian Roads**

*** Optimized for Alto, A Star, I 10, Santro**

Design Improvements



- Movable Middle Deck permitting freedom to load all types of cars (1550 mm to 2100 mm Ht from Floor Level)
  - More flexibility with combinations of cars
  - Steps of 50 mm for Middle Deck Height
  - Simple robust Counterweight mechanism of moving middle deck with minimal human effort of 20-50 Kgs
  - Amenable for Automation by the AFTO, if required.
- Longer length of Wagon- savings on cost
- Lower floor height of 938 mm with existing LCCF bogie (840mm dia wheel) – with depressed wheel tracks
- Use of standard hot rolled section and M.S(IS:2062) to minimize cost.
- Use of Standard Couplers instead of Slackless Drawbars – Ease of decoupling

Optimization: New Autocar

- Optimized for all type of Car Transportation needs on Rail
  - Optimized for Alto/ AStar in Upper Deck with Omni, Wagon R, Santro, I – 10 and Nano in Lower Deck **(318)**
  - Also optimized for Same Car combinations : **318 Cars** per rake:
    - Alto, Astar, Santro, I-10
    - Possibility of complete rake transport of the cars above.
  - Other cars in various Combinations with Alto/ Astar in Upper Deck: **264** to **291** Cars
  - All Cars on Indian Roads, including SUVs, can be accommodated in the Wagon : Minimum of **162 Cars** in Lower Deck

Optimization Avenues: A View

Cars in Lower Deck	Alto/Astar in Upper Deck	Cars in Lower Deck	Total No of Cars per rake
ALTO	162	156	**318**
OMNI	162	156	**318**
EECO	162	0	**162**
A-STAR	162	156	**318**
WAGON-R	162	156	**318**
ESTILO	162	129	**291**
RITZ	162	129	**291**
SWIFT	162	129	**291**
DZIRE	162	129	**291**
SX4	162	102	**264**
HONDA CITY	162	102	**264**
ACCORD	162	102	**264**

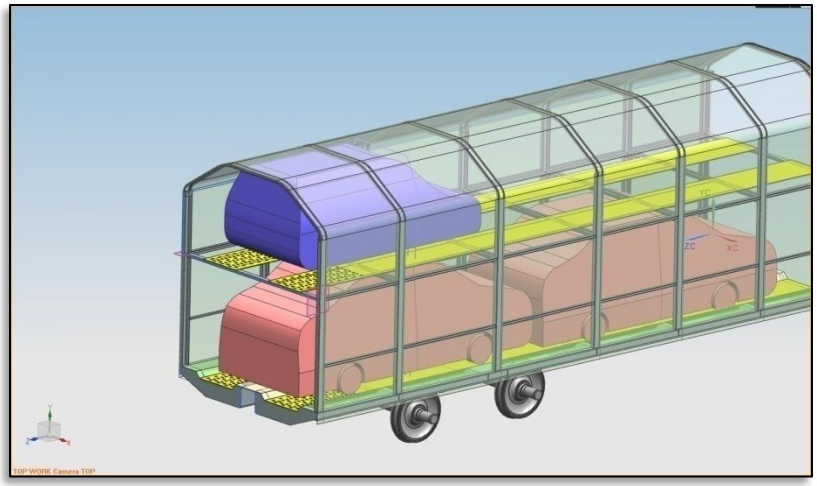
Optimization Avenues: A View

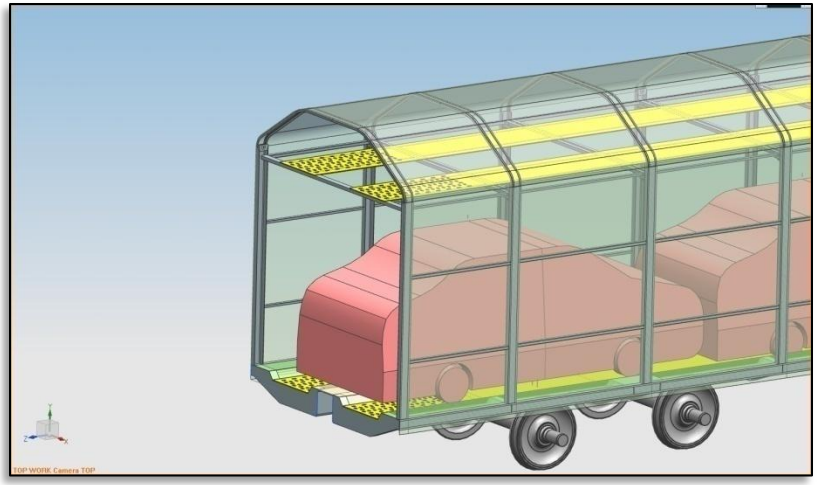
Cars in Lower Deck	Alto/Astar in Upper Deck	Cars in Lower Deck	Total No of Cars per rake
SANTRO*	162	156	**318**
I10*	162	156	**318**
ACCENT	162	129	**291**
VERNA	162	129	**291**
TUCSON	162	129	**291**
ELNTRA	162	102	**264**
FORD FIGO	162	129	**291**
COROLA	162	102	**264**
INNOVA	162	102	**264**
CAMRY	162	102	**264**
INDICA	162	129	**291**
INDIGO	162	129	**291**

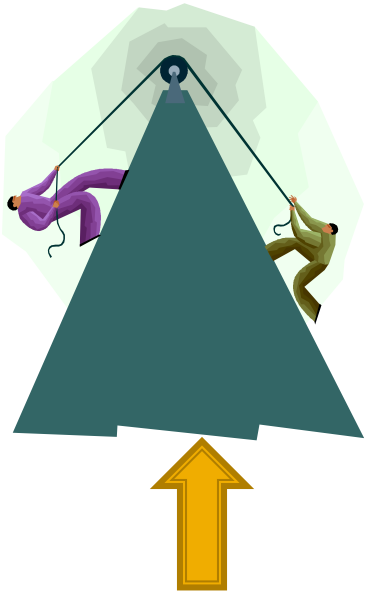
Optimization Avenues: A View

Cars in Lower Deck	Alto/Astar in Upper Deck	Cars in Lower Deck	Total No of Cars per rake
SUMO	162	0	**162**
SAFARI	162	0	**162**
NANO	162	156	**318**
ACE	162	0	**162**
POLO	162	129	**291**
JETTA	162	102	**264**
SCORPIO	162	0	**162**
LOGAN	162	129	**291**
XYLO	162	0	**162**
BOLORO	162	0	**162**

New Autocar: Double Deck Op

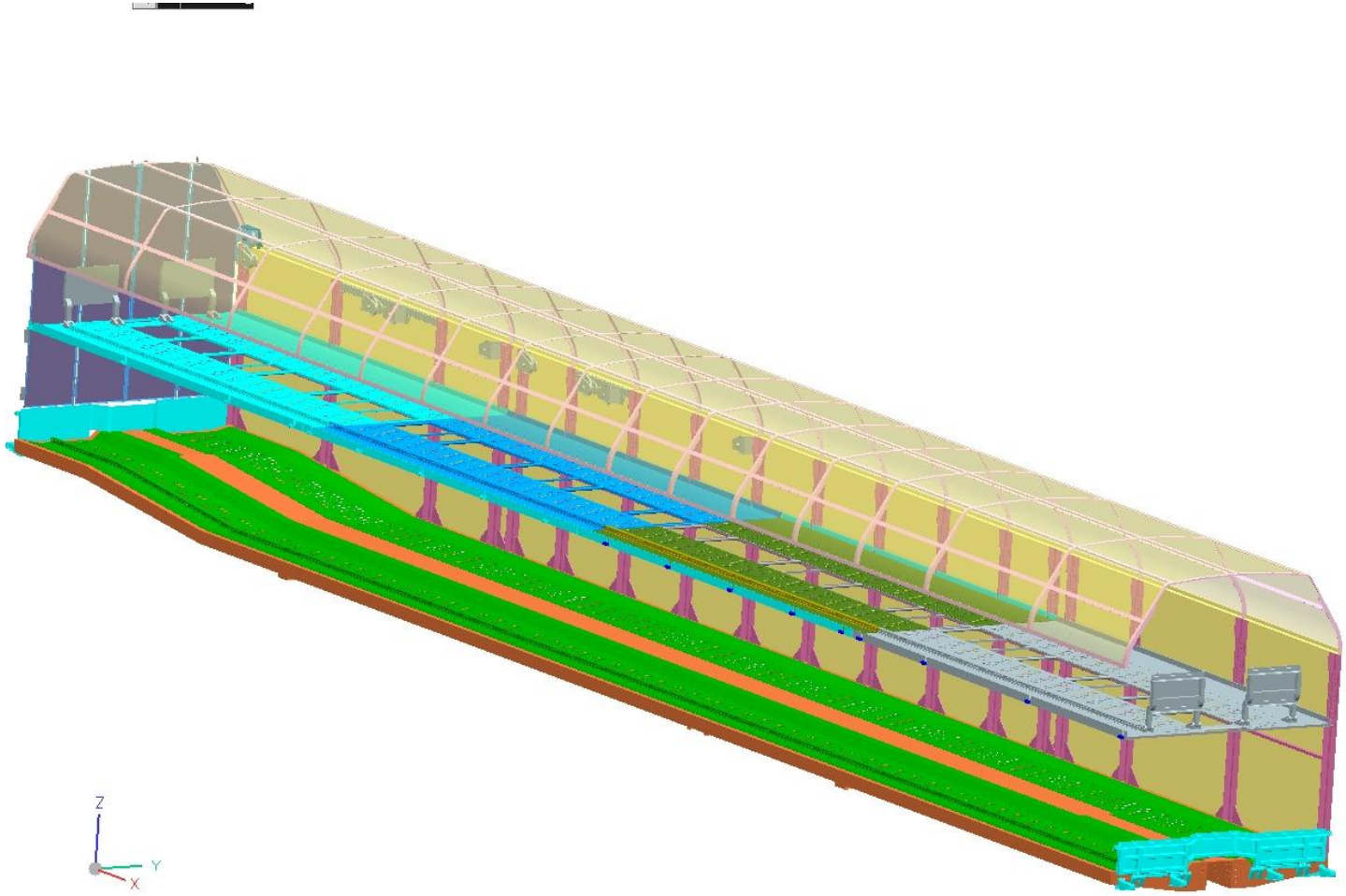




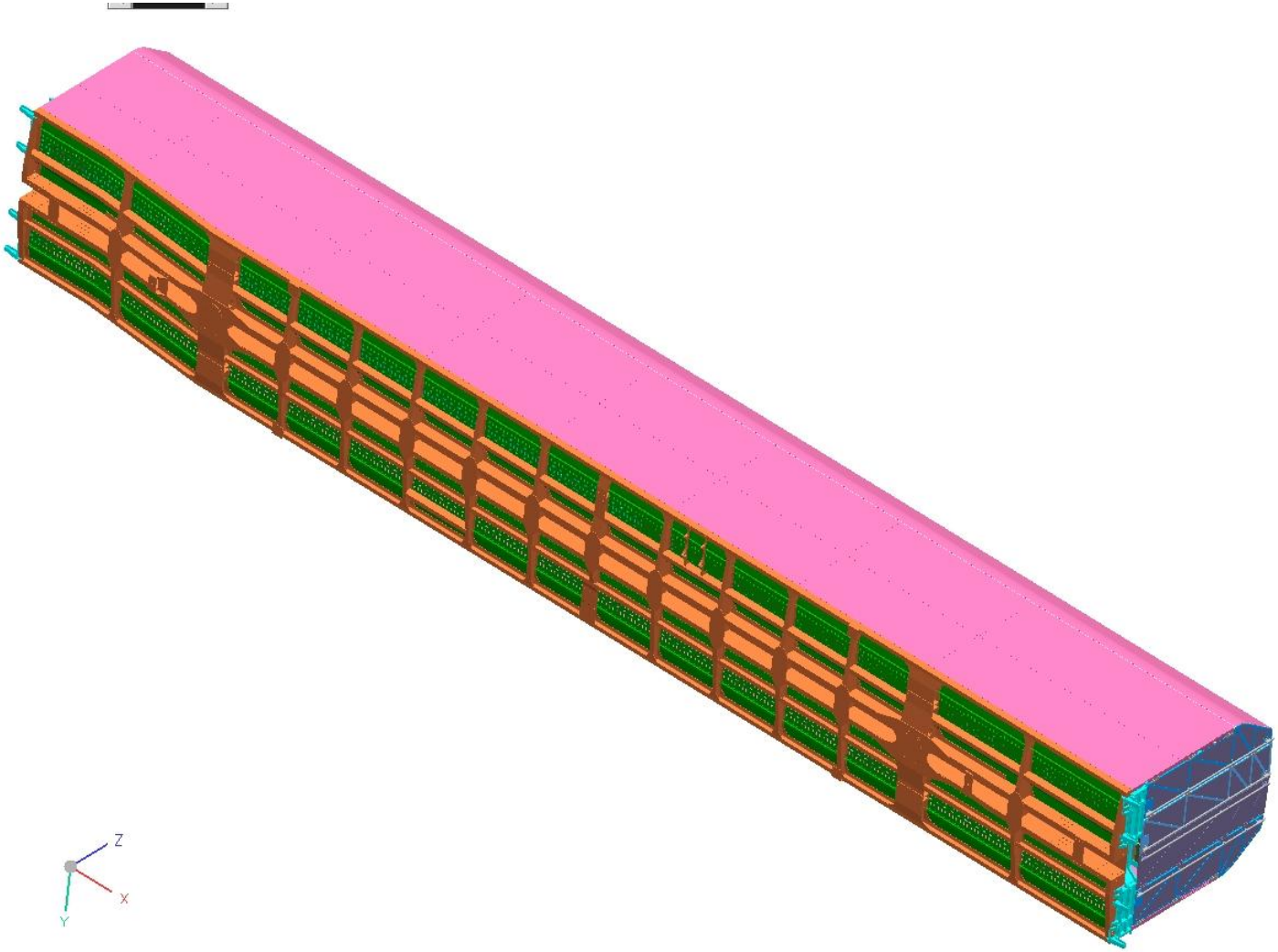


Movement of Middle Deck
With minimal human effort
Using Counterweight pulley mechanism

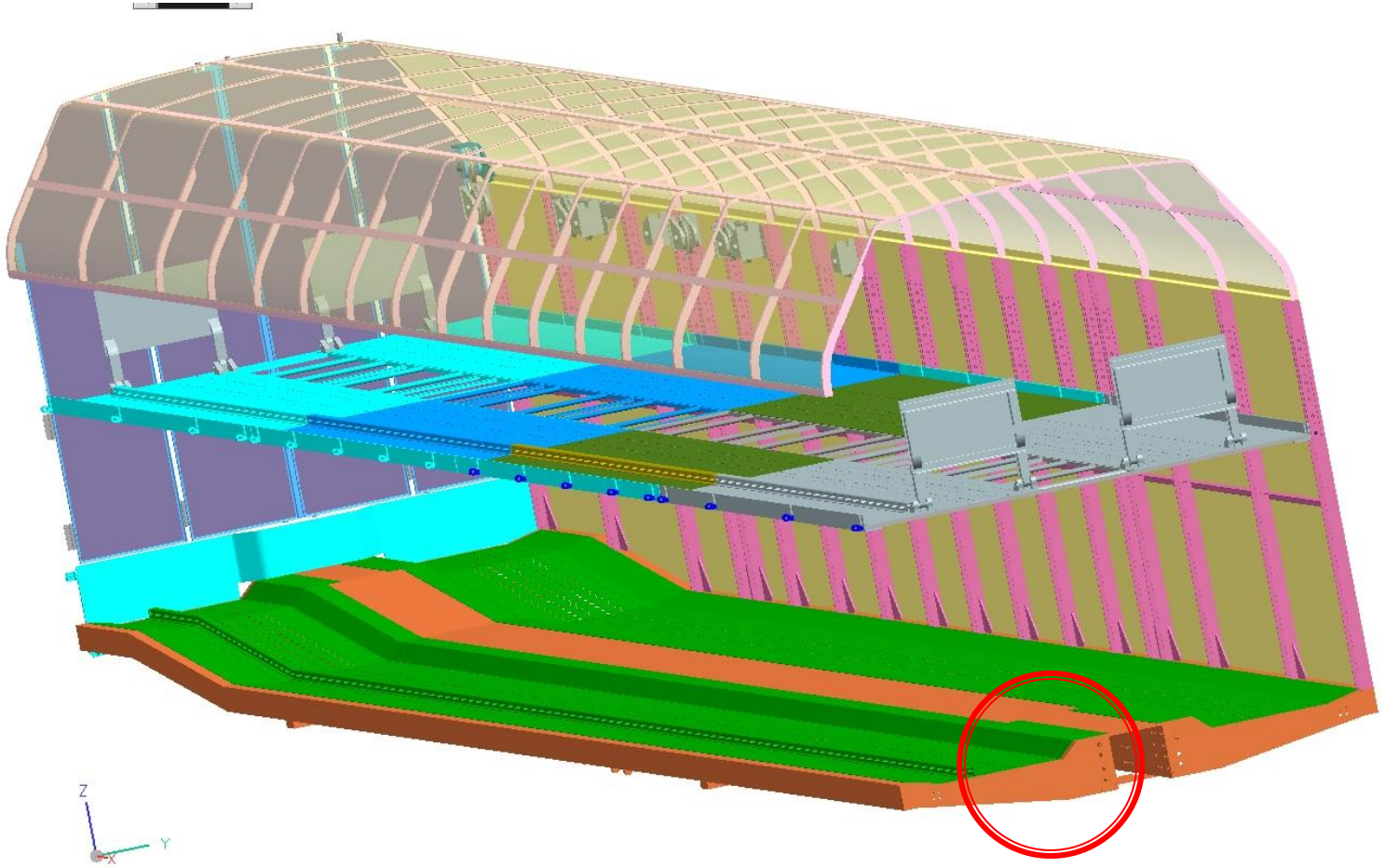
BCACBM : Generic view



BCACBM – Light innovative U/F



How additional height was created?



Extra height of 90 mm gained exploiting ground clearance of 160 mm in cars…..

BCACBM : Amenability for Loading



Auto Hubs required to install loading ramps



Representative Pictures from USA

New Autocar Wagon – BCACBM : Roadmap

- Prototyping by Ms MSIL :15th Feb, 2012
- Oscillation Trials by RDSO :30th Mar, 2012
- Series Production : Apr, 2012

RDSO's Commitment to bring a Wagon from Design Inception on the Tracks and clearance within 14 Months.

BCACBM would continuously improve….

An innovation is one of those things that society looks at and says, if we make this part of the way we live and work, it will change the way we live and work

- Dean Kamen

Thank You

The credit for innovating many firsts in this Wagon Design go to the team of RDSO Wagon Designers led by Shri G R Sharma, ADE/Wagon

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