



# Research Importance: Japanese Case

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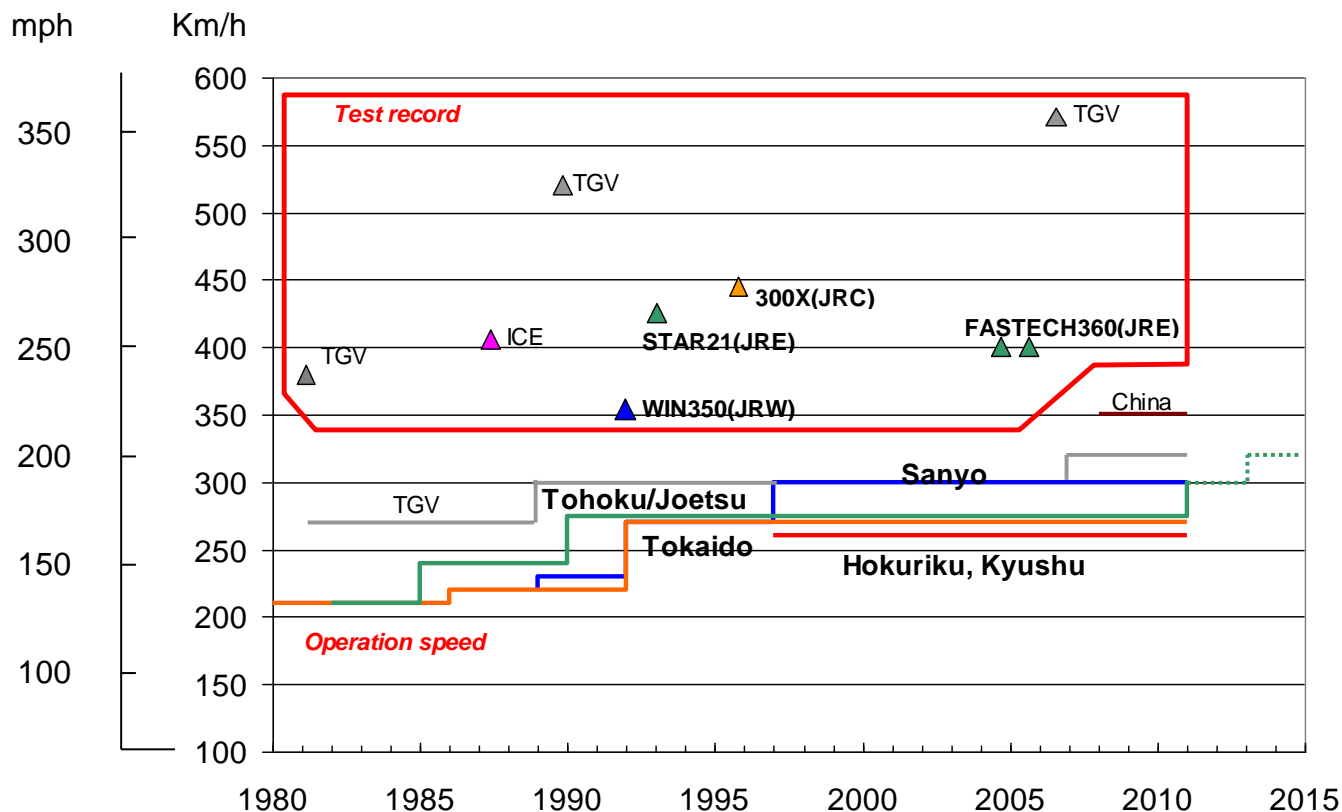
*JR Group Paris Office, Director  
Paris, France*



# Necessity of continuous R&D

- Continuous R&D has allowed for continuous progress of the HS system
- Operators (JNR/JR companies) have always lead the R&D

Ex. Speed history of Shinkansen





# R&D Centers in JR Group



Wind tunnel technical center

Railway Technical Research Institute (Maibara)

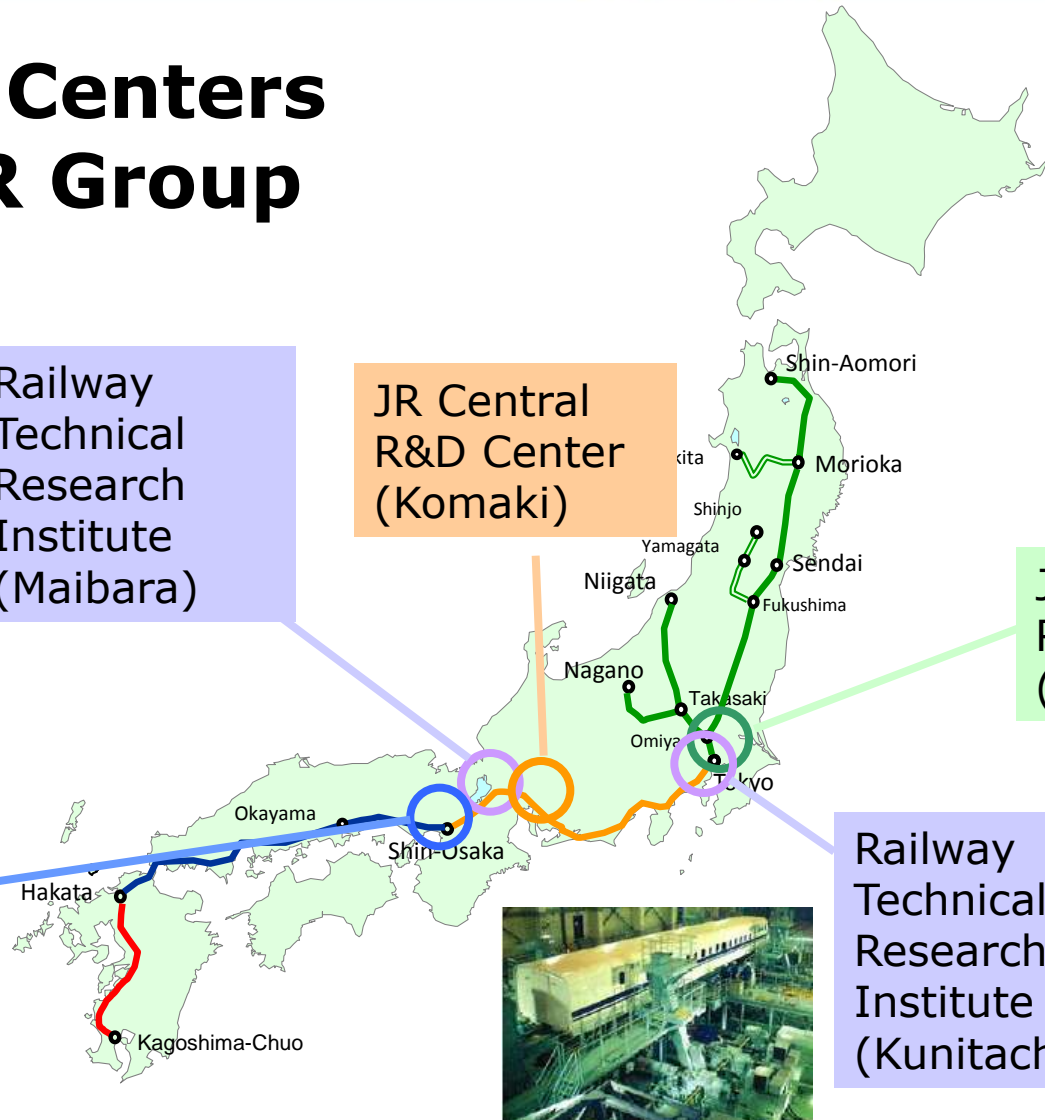
JR Central R&D Center (Komaki)



JR East R&D Center (Omiya)

JR West Safety Research Center (Osaka)

Railway Technical Research Institute (Kunitachi)





## R&D Centers in JR Group

- One dedicated research institute (RTRI)  
From basic to applied research and development
- In-house R&D centers in operators (JRE, JRC, JRW)  
Applied research and development for each operator
- Close cooperation with RTRI and operators' R&D centers
- Competition and cooperation of operators



# Advantages for operator-oriented R&D

Easy access to the field

- Test can be done on the REAL field

- Data acquired on the real field can be verified as the truth

Execution according to the true operator's demand

- Sometimes operator's demand doesn't attract private investment

- >Necessity of operator's leadership

Examples of demand

- Improvement of safety

- Improvement of customer service

- Environment (energy consumption, noise emission, ...)

- Operations and maintenance cost reduction

Close to the customer/passenger

- Operator can make R&D plan according to the customer demand

*BUT, of course operator needs the close cooperation with industry*



## Main technical challenges for high speed in Japan

- Safety
- Environment
- Comfort, Customer satisfaction
- Reliability, Improvement of maintenance method and cost etc.

Speed increase should be realized after these issues are assured



## Example of an R&D project: FASTECH





## Example of a R&D project: FASTECH

- JR East R&D center lead it in close cooperation with RTRI and suppliers
- Period: 2002-2009
- It aimed at increasing the commercial speed to 360km/h (225mph)
- First, analysis for future HS system was done
- Test trains (FASTECHs) were designed and tested on the field to assure high speed, safety, environmental friendliness and comfort.
- Developments were done both for rolling stock and infrastructure.
- Rich knowledge was acquired with remaining problems.
- Results have been reflected in the design of commercial trains E5 and E6.





## Examples of R&D

- Safety

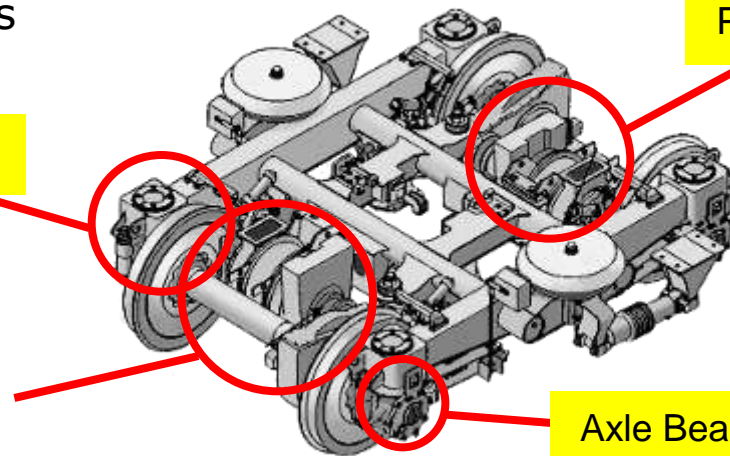
Development of bogies

Mechanical Brake Devices

Wheel and Axle

Power Transmission Gear

Axle Bearing



Testing site in JR  
East R&D Center

Endurance Test on bogie testing site : 375,000 miles (600,000km)

Endurance Test by the test train Fastech: 375,000 miles (600,000km)



# Examples of R&D

- Safety for natural hazard

Ex. Snow



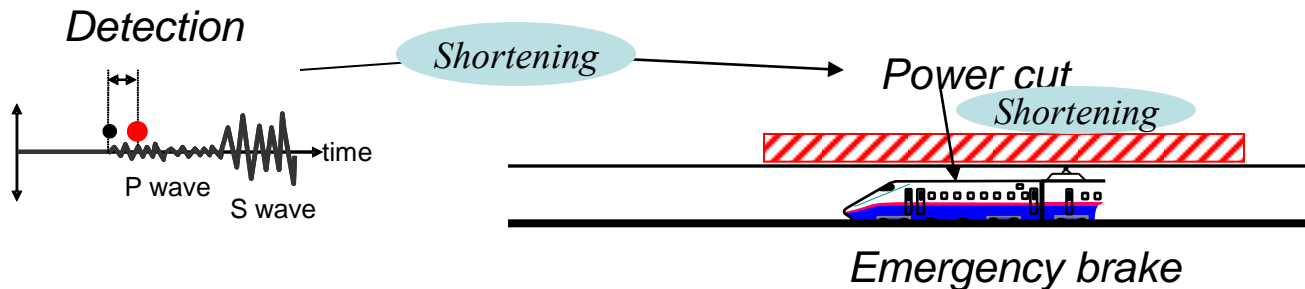
*Prevention of snow adhesion on the train*  
*Snow melting system*



Ex. Earthquake



*Prevention of derailment*  
*Safety after derailment*





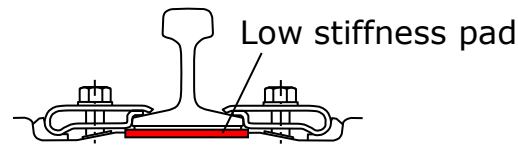
## Examples of R&D

- Environmental issue

Ex. Outside noise



*Noise absorption structure*



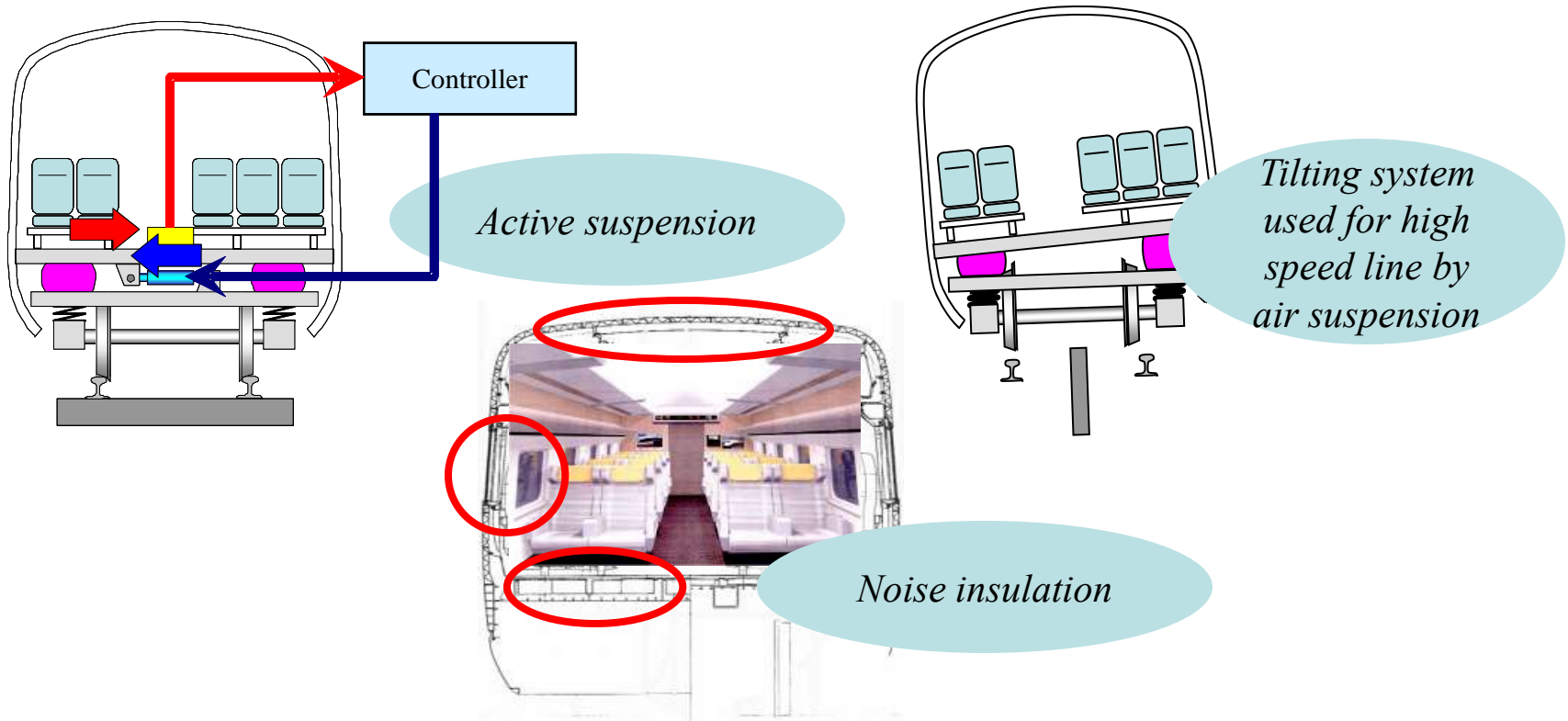
*Reduction of rolling noise*





## Examples of R&D

- Comfort





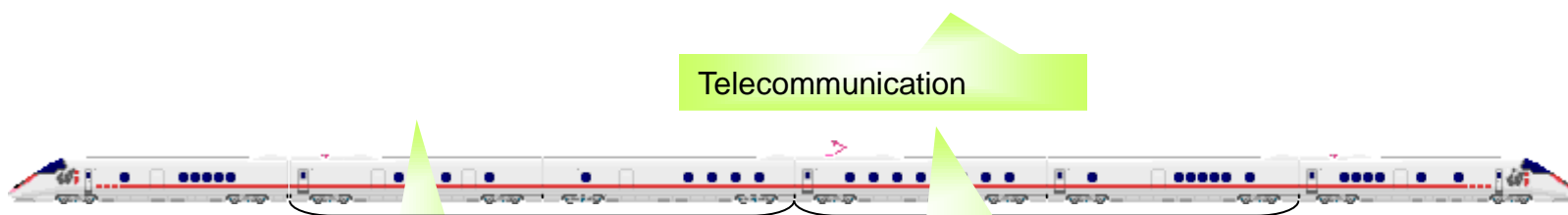
# Examples of R&D

- Improvement of maintenance

Development of inspection train

Ex. East-I for JR East

- Inspection by running at the same speed as a commercial train.
- Run about every 10 days.



Track geometry

Power supply & Signal





Track 101

## Series E5





## Remarks

- R&D is the key factor for the progress of the HS system.
- It is important to have the R&D function in the railway sector.
- A holistic approach is important because HS is a SYSTEM even if it is divided between the operator and the infrastructure manager. Close cooperation between the sectors will be useful.



**Thank you very much  
for your attention**

