

Our challenge to achieving the utmost level of safety

As part of our efforts to get back to basics of safety at JR East, Masataka Ushijima, General Manager of the Transport Safety Department, spoke with Professor Yotaro Hatamura of Kogakuin University, who advocates “Failure Science”—the science of learning from failure.

Safety is the most important task of management

Ushijima: Since JR East incorporated in 1987, we have made “safety” our top management priority. To date, we have formulated and implemented three five-year Safety Plans. We are currently carrying out the Safety Plan 2008, our fourth five-year plan that began in 2004.

These plans share a fundamental approach of improving safety by changing each employee’s awareness of safety from passively “maintaining” safety to proactively “attaining” it. When we were Japanese National Railways, we had mainly invested in measures to streamline our operations, but today safety is given top priority in capital investment. We have budgeted 400 billion yen over a five-year period to invest in safety, and we are implementing anti-earthquake measures based on our experiences with the Niigata-Chuetsu Earthquake in 2004, as well as ATS-P/Ps automatic train stop systems ahead of schedule.

Hatamura: It struck me as an excellent safety measure taken by JR East that when the Niigata-Chuetsu Earthquake occurred, although a Shinkansen train derailed, there were no major accidents or damage, such as the collapse of elevated tracks. Since JR East had wrapped the supporting columns of elevated tracks in steel plates for reinforcement, even though the surrounding ground was liquefied, the elevated tracks still did not collapse. This is worthy of praise. If one had collapsed, the consequences could have been catastrophic.

Ushijima: The Great Hanshin Earthquake taught us lessons

in seismic retrofitting. We are now analyzing the movements of our trains and structures in detail, in order to utilize our experiences from the Niigata-Chuetsu Earthquake in future measures. We are also verifying what would have happened without that reinforcement.

Hatamura: I conducted my own investigation of the accident on the Uetsu Line last year, and concluded that it may have been due to an unforeseeable natural phenomenon. Through interviews with many local residents, I found that a tornado had been passing through the area. It would have been impossible to expect it from the wind speed at the location of the anemometers.

Ushijima: The Aircraft and Railway Accidents Investigation Commission of the Ministry of Land, Infrastructure and Transport (MLIT) is currently investigating the causes of the accident on the Uetsu Line, but we have also set up a commission for ascertaining the cause and examining the measures of the Uetsu Line accident. The wind speeds recorded by an anemometer on a railroad bridge close to the scene did not exceed 20 meters per second at the time of the accident. We are currently conducting a series of wind-tunnel tests in order to identify how the wind was blowing at the scene of the accident. Even if it turns out that the accident was due to a natural disaster, it is vital that we figure out what we can do in the future against such eventualities, and put that into practice. Although we have some experience of researching disaster prevention measures, we have just created a new Disaster Prevention Research Laboratory to research and develop concrete measures that we can take as railway operators by incorporating the views of experts on meteorology. We have also taken your advice on studying localized weather phenomena in this respect.

Hatamura: Now the key will be how to obtain surface data, rather than just spot data from anemometers.

For example, since the greatest fear for a semiconductor plant is a sudden power outage, it is constantly checking for lightning strikes by obtaining surface data on wind directions and thundercloud movements. Although it will be a fairly difficult task, it should be possible to predict localized weather phenomena by making reference to this technology and combining data from weather satellites and a global simulator.

Yotaro Hatamura

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 Prof. Hatamura is also a Professor Emeritus of Tokyo University. In addition to teaching international basic engineering at Kogakuin University, he has also developed Failure Science through the Association for the Study of Failure. His major publications include *Actual Design, Knowledge Management of Design*, and *Introduction to the Science of Failure*.



To reduce accidents

Ushijima: As of fiscal 2005, we have reduced the number of rail accidents to about a third since our founding in 1987. I believe that this has been thanks to the focus of our safety plans on investment in equipment to counter accidents with a high risk of death or injury to our customers, such as collisions with big dump trucks at railroad crossings. Over the past few years, however, the number of accidents, notably those at crossings, has shown a slight upward trend.

Hatamura: The other day, I had the opportunity to ride in the driver's seat of a train. I learned that the train driver pays due attention to not only the signals, but also cars approaching crossings from the sides. Seeing driver's tension first-hand, I thought that there must be something more that we can do. For example, maybe there could have been bars or something that spring out of the ground to prevent cars from entering the crossing...

Ushijima: We have considered that, but we then have to think about what would happen if a car were to crash into the bars.

Hatamura: That is a common type of argument, but as Japan's population ages, the number of accidents will inevitably increase. I think that some sort of physical barrier to entry is needed.

Ushijima: An ideal solution is the elimination of all crossings, but it is simply not possible to eliminate all of them. For this reason, we have installed obstacle detection systems at approximately 2,500 crossings, and used thicker barriers that are more noticeable than normal ones, which have shown some beneficial results. I think it will be difficult to reduce accidents any further without the cooperation of drivers.

Hatamura: No matter how much equipment you install, and no matter how much attention your drivers pay to the signals, there will be accidents as long as people continue to enter crossings. In fact, while the drivers must of course maintain safety, it is also necessary to create a culture with high levels of cooperation with the people using the crossings to prevent accidents. In order to get local residents to cooperate, it is vital for JR East to communicate to the public how serious you are about preventing accidents.

Ushijima: One physical measure we are taking is the replacement of our automatic train-stop (ATS) systems with the even safer ATS-P system. In the second year after we incorporated, we had a train collision at the Higashi Nakano Station that caused the death of one customer. Taking a lesson from this accident, we have accelerated the pace for installing these systems. Currently, we have installed this system at nearly all locations within a 100-km radius of Tokyo, and on some lines within a 200-km radius.

On the human side, the Higashi Nakano accident spurred us to create the Safety Research Laboratory and General Training Centers at each of our branch offices to provide regular, repeated training for our train crews. For example, our train drivers and conductors undergo two days of training every two years.

Individual knowledge and shared knowledge

Ushijima: In our driver-training program, we do not assign our employees as train drivers as soon as they obtain their



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licenses. First, they must continue with their training as we judge their suitability and skills. It is only then that they are assigned to driving trains.

Hatamura: Rather than simply following orders, it is vital for train drivers to be able to make independent decisions and act on them as conditions change. You should include hypothetical exercises in your training, asking trainees "What would you do if such and such happened?"

Ushijima: The General Training Centers at each of our branch offices have simulators that are close to the real thing to conduct accident-prevention training under a wide range of scenarios. Our fundamental approach is that safety is maintained through collaboration between people, equipment, and rules. It is not enough for our employees to simply follow rules; they must use them proactively, with an understanding of why each rule is in place, and what would happen if it were not obeyed. We aim to instill this independence and autonomy in our employees through these training programs.

Hatamura: Educating your employees to have them realize the need to think about the big picture on their own is of crucial importance. "Passive safety"—where people simply follow orders—is not enough. You must thoroughly practice "active safety"—where people think and act for themselves to ensure safety.

Ushijima: All of our employees must, on their own initiatives, think about safety, as well as near misses and concerns that could be the root of an accident in their day-to-day work. They must then discuss what they have noticed or thought of with their workplace teams. Discussion could help improve our organization. In order for the culture of discussion to take root at all workplaces, we have run our company-wide Challenge Safety Campaign since 1988.

Hatamura: That can be summarized into one phrase: “think individually, and then share the thought with group members.” I describe this with the terms “individual knowledge” and “shared knowledge.” I recommend using these terms, since they communicate the concept very clearly.

Ushijima: I picture an upward spiral, where our employees think individually, and share the thought with group members, which in turn spurs each member of the group to think more deeply. It is my hope that this will then improve the capabilities of the workplace as a whole.

Hatamura: That is right. We have got to put high expectations on our employees at the workplace, and they must know that they are trusted. And more important, I think we must always encourage them.

**United as a single team,
from the workplace to top management**

Hatamura: What you must also incorporate into your education is to teach your employees the fact that on the back of these safety systems and rules you have created, there have been many tragic accidents that received high levels of criticism from the public. When you are inside a company, you tend to lose sight of the perspective of society, as well as the victims and their families. Each employee must recognize the trust that society has placed in the railway industry, and have a clear awareness of its relationship with society.

Ushijima: We have established the Accident History Exhibition Hall in the JR East General Education Center, in order to teach our employees what accidents we have had in the past, what incidents our current safety equipment, mecha-

nisms, and rules are meant to prevent, and what approaches we are taking for safety. At the exhibition hall, we have also set up a Victims’ Testimony area, as a venue to learn the terrible human cost of accidents and the weight of our duties through the comments from the victims of tragic accidents and their families.

Hatamura: That is really important. You should make efforts to achieve the level where the victims’ families as well as society can actually recognize how serious you are about your safety commitment.

I must also add that solid organizational management is what ensures true safety. For this reason, I believe you should have a human-resources policy that does not allow your employees without safety-related job experience to take important positions in the company. I know you have a lot of bottom-up efforts, but it is also vital to have well-designed organizational initiatives. You have to establish a system that enables the views of safety-oriented employees to be reflected in your safety management.

Ushijima: Our goal is to achieve the utmost level of safety. Our employees working at railway sites are truly dedicated to ensuring safety from their own viewpoints. I think it is critical for us to manage our employees who are approaching to safety from various perspectives. The role of line managers is vital, but it is also important for planning departments at our Head Office and branch offices to join in and support their efforts. I also recognize that the Transport Safety Department has a huge responsibility to cross-departmentally promote safety assurance. We are committed to achieving the utmost level of safety, by uniting everyone in the company from the boardroom to the workplace.

