The themes for this R&D symposium are defined as targeting improvement of customer service, high-speed characteristics, reliability, environmental compatibility, and comfort based on the efforts of increasing speed for the Shinkansen. Also, by taking initiatives targeting implementation of these points at all levels, our aim is to “enable further evolution of the Shinkansen”. Experts outside the company were invited for a panel discussion on the theme “Expectations and Prospects for the Next Generation Shinkansen”, where we were able to receive proposals and suggestions from various perspectives, and it is these proposals and suggestions that are presented below.

1. Introduction

(Endo) As we have introduced the main theme of “targeting further evolution of the Shinkansen” in the first portion of the symposium, Understanding the implementation status of the development project, I feel that all have felt the same excitement as young engineers with respect to the building of a new Shinkansen. Here in the format of a panel discussion, we would like to hear from the experts visiting today of your expectations and perspective concerning the next generation Shinkansen that we are currently moving forward with.

First we would like to hear from Ms. Yokoyama. Ms. Yokoyama has established and is currently working at a marketing company. As Ms. Yokoyama is highly skilled in making connections between the implementation of new technology and the end user’s viewpoint, I am sure she will present us with expectations and prospects expressed primarily from the customer’s standpoint with respect to the Shinkansen. Please go ahead.

2. Introduction and view points of panelists

(Yokoyama) I am Masako Yokoyama from the Max Wald Institute. Our job is viewing of new technology from the standpoint of the end user and connecting new technology and end users. As the theme for
this discussion is the next generation Shinkansen, I would like to present an address based on the changes to feelings of users over the past 15 years.

Based on what I have heard, changes will be made to Tokyo station through the renaissance plan scheduled for completion in 2011. I would like to place a lot of importance on “changes that are being made”. “Making changes” is intellectual work. One hears “times were great in the past” from time to time. I think that those who say this do not want to make any intellectual efforts. If “making changes” is taken positively, it means that “new things” are created. I think this is how things that did not exist previously, and that have a new value, are created.

Therefore, I would like to discuss changes that users have made over the last 15 years. First, a large change that has occurred is that information communication technology has become intimately usable and widespread. Fifteen years ago, “Will computers be introduced to ordinary households?” was a serious discussion. However, today they are used basically without an afterthought. The second point is the “literacy” or capability end users have attained for using various types of media such as cell phones and PCs. Especially through the widespread use of cell phones we can obtain various types of information wherever we are. Recently one-segment television has become available for cell phones and we have become good at using various types of media to their fullest extent in any location. The third point is that people have become skillful in using information. In the past only those who were good at using information devices were able to obtain the merits of the information. However, information has become easy to obtain through the internet and we have become good at using this “in our daily lives” to its fullest extent. The fourth point is that end users have become smarter and more cunning than makers. This is a complete reverse compared to 15 years ago. Fifteen years ago, makers had the standpoint of and were always talking about “educating users”. However, users have become “consumers” that far exceed the consideration of producers. The fifth point is that we have become used to the environment of not having to wait. It may be closer to say that due to various tools such as cell phones and Internet, we no longer have the capacity to wait. It can be said that everyone has become impatient.

Now, I would like to discuss the large changes to Internet users in recent years. For the Internet, transmission tools for end users have increased and it has become possible to perform transmission at various locations. For example, this includes bulletin boards, blogs, reviews, and simple home pages. Furthermore, in addition to capability of transmitting information, our capability of processing information received has also improved. We use the phrase “word of mouth” quite often. However, this far exceeds any previous level of word of mouth communication. A user working hard on their own for receipt and transmission of information and the ability to obtain information for general users nearing that of professionals is a very large change. I think that it can be said that everyone has become a “mini-analyst”, “mini-mania”.

Next, I would like to discuss changes to mobile tools such as cell phones, information can be obtained anywhere and communication is available anywhere. As a result, work can be performed anywhere. Information can be transmitted and received anywhere. It is possible to have private space anywhere. These are the developments that have occurred and I think that this will have a large effect on future space in Shinkansen trains.

These changes have caused significant changes to traveling whether it is for business or pleasure. First, because knowledge of information related to your destination, traveling means, discount information, on-the-spot information etc. is abundant, users can obtain and fully use information by themselves that was previously provided by travel agencies. As a result, traveling can be produced and planned by oneself. Traveling planned individually rather than use of tours has increased. In addition, as options of by railroad, by car, or by airplane have increased, a choice is made based on mood and
Interpretive article

consideration for one’s budget. In addition, the debut of tools such as the cell phone has had a large effect; in the past when someone was traveling, their existence became unknown (blackout condition). Recently however, as cell phones can be used to make connection wherever one goes, traveling and business trips have become just part of the daily routine and have brought a large change. This has made it possible to travel and go on business trips very simply and easily and with a convenience mindset.

I think that this phenomenon will be significantly promoted through increase in speed of the Shinkansen. Taking this “travel becoming part of daily routine” in a positive light, I think it will generate new ideas.

◆Changes to Travel
- Thorough knowledge of destinations and transportation methods
- Self-production and self-planning of travel
- Get many options and compare/select by oneself
- Daily continuity using tools such as portable phones
- Quick and simple, convenience store feel

(Endo) Thank you very much. Next, we will hear from Dr. Suda. I expect that everyone in the technical field knows of Dr. Suda well. As a young and energetic academic, we in the railway industry have come to rely on him significantly. Please go ahead.

(Suda) I am Yoshihiro Suda of University of Tokyo, thank you for the introduction. As there was a careful technical description at this symposium, I don’t feel there is anything technical left for me to explain. I am involved primarily with research related to vehicles at the Institute of Industrial Science Komaba and Chiba as well as at the Center for Collaborative Research. Previously I was handling dynamics, which is an extremely hardware; however, I have recently started working on new research in the field of human interface such as passenger comfort and discussions concerning drivers of automobiles. I had been primarily working on railway train cars; however, recently I have been working on a magnetic levitation system and research for ships and automobiles. Furthermore, I am working on vehicle research and am asked “Are there areas of vehicle research that still need to be performed at a university?” from time to time. As the challenge that I presented a little earlier, beginning with railroads, I think that there are still a lot of things to be worked on for traveling/transport technology. As was presented by Ms. Yokoyama, IT and computer related technology is seeing a very large amount of development. Traveling/transport technology is developing right alongside these fields. Furthermore, as it is human nature to have very high expectations, even if new technology is developed, people will not be satisfied.

Next, for introduction of the characteristics of railways, there is a blending of fields. In other words, the cooperation between civil engineering related to infrastructure, and mechanical and electrical engineering related to the train car is extremely important.

Masako Yokoyama (panelist)
Representative director - President Max Wald Institute Co., Ltd.
Studied German literature in college and has worked as an editor at a publishing company. Later, while working as a freelance writer, she studied entomology in college. Then, focusing on the point that ecology can be applied to marketing analysis she established her own analytical method. In order to make use of this, this marketing for the information and communication field irresolvable using conventional methods needed to be put to use so she established Max Wald Institute Co., Ltd. in 1992 and has been there since this time.

Max Wald’s strong point is viewing from the standpoint of the end user and making connections with new technology. Commercialization, service planning, development related to information communication. They provide using all types of EC services, electronic money tests, and service utilizing Suica, as well as surveys related to train station equipment, and surveys related to public areas such as train station premises etc.

(Endo) Thank you very much. Next, we will hear from Dr. Suda. I expect that everyone in the technical field knows of Dr. Suda well. As a young and energetic academic, we in the railway industry have come to rely on him significantly. Please go ahead.

(Suda) I am Yoshihiro Suda of University of Tokyo, thank you for the introduction. As there was a careful technical description at this symposium, I don’t feel there is anything technical left for me to
cooperation between industry, academia, and government, enables matching the results of research in the research laboratory and the needs of industry. Furthermore, as an effort at the university related to blending of fields, we are promoting research with the blending of mechanical, electrical and civil engineering. In addition, as a multimode transportation targeting the future, we are starting initiatives for blending of various transportation fields of not only railways, but also automotive as well as a more personal new transport vehicle. Past research results including development of a new self-steering bogie and research related to a detection method for corrugation that occurs on rails, which is a joint development with JR East.

Next I will discuss the joint project that we are currently pursuing alongside JR East. The Center for Collaborative Research (CCR) of University of Tokyo has promotion of cooperation projects with industry as one of its missions and has a system for promoting large-scale projects for cooperation between academia and industry that show merit. Utilizing this system, for the past three years, we have been working on research related to the innovative design of a high-speed railway train car as a collaboration project between CCR and industry. We have worked in a lot of areas in this project. However, I would like to discuss research related to new active vibration control. Development of a new actuator is important for active control. An electric actuator that we made by hand in our research laboratory was mounted on an actual bogie and used to control train car vibration using the bogie testing machine at Research & Development Center of JR East. There are various types of Shinkansen within Japan, and JR East is using full active control, which is the most advanced type of control. However, with full active control, energy consumption becomes an issue, and it is important to achieve the highest performance possible while conserving energy and while keeping environmental issues in mind. We also pursued research concerning the feasibility of further active control using regenerative energy, by converting the vibration energy into electric power. This has been termed “self-powered active control” and actual testing has produced results showing the hypothesized average power consumption to be very small. When used on the bogie-testing machine at speeds up to 360 km/h, the device consumed a very low amount of power and achieved results of a high level of performance. I think that future enhancement of this device to the highest extent possible is one of the development tasks.

Today I would like to adopt a central standpoint between industry and government, and between industry and users, and my presentation will be from an academic viewpoint.

(Yoshihiro Suda)
Professor, Center for Collaborative Research and Institute of Industrial Science, The University of Tokyo

Previously functioned as Special Researcher for The Japan Society for the Promotion of Science, Assistant Professor at Hosei University, and Visiting Associate Professor of Queen’s University at Kingston, Canada. Specialties include machinery dynamics, control engineering, and vehicle engineering. Active in various societies such as the Japan Society of Mechanical Engineers, the Japan Society Electrical Engineers and the Japan Society of Civil Engineers. Public positions include specialist and special member of the Council for Transport Technology in the former Ministry of Transport, Member of the Social Capital Maintenance Council, and the Aircraft and Railway Accident Investigation Commission in the Ministry of Land, Infrastructure and Transport. He is the author of “The Science of Mobility - All Began with Feet” (co-author, Gihodo Shuppan), “Dynamics and Control of Vehicle Systems” (co-author, Japan Society of Mechanical Engineers), “Dynamics of Railcars - Latest Bogie Technology” (co-author, Electric Vehicle Research Council), and “Control Engineering Using Personal Computer” (co-author, Kabundo Shuppan), etc.

(Endo) Thank you very much. Next we would like to hear from Dr. Fukuda. Dr. Fukuda began as an industrial designer and has established his own design company. Since the fall of last year, he has been teaching Engineering and Artistic Designer Training at Tokyo Metropolitan University. He has also participated in many
transportation related designs, and has provided support for the design of various Shinkansen and limited express trains for JR East. Incidentally, the coloring and exterior design of the Fastech 360 were provided by Dr. Fukuda. Today we are hoping to hear a variety of discussions particularly concerning design issues. I now turn the microphone over to Dr. Fukuda.

(Fukuda) Thank you for the introduction. Today I would like to talk from the perspective of the user and the perspective of the designer. An "aesthetic approach" is essential for designing railcars, but in the past I think this has implied planning and technical design. Technical design meetings are referred to in English as design meetings, so our field would be considered as approaching our work from the "Aesthetic Approach". The word "aesthetic" may sometimes give an image of a facial or physical aesthetics, and in France it may suggest a beauty salon, but in the design industry, "aesthetic" is used to mean making our lives comfortable and beautiful. Dr. Suda’s material also used the expression “Innovative Design”, but as designers, I believe that our job is to stand between the engineer and the user, and to use an aesthetic approach in making engineering concepts visible.

As I’m sure you all know, recognition of industrial design received legitimacy at about the same time as American Raymond Loewy was creating a streamlined locomotive in the 1930s. Therefore the early predecessors of Dr. Suda have only been around for at most 70 to 80 years since the industrial revolution began 250 years ago, and this means that while the legitimacy of this field may still be questioned, we are earnestly striving towards enlightenment. Raymond Loewy said, “Please the user to profit the company”. I am not responsible for the profit part but I do consider the position of the user and take a stance that “a rich comfortable life is achieved by creating beautiful attractive objects”.

I have prepared the keywords “from safety to security”. Our role as designers is to replace engineering terminology such as “safety and certainty” with a tangible forms such as “security and reliability”, and we perceive our competency in being able to visualize and express these concepts. Furthermore, the phrase “moving from the 20th century of machines to the 21st century of the environment” is often stated. In order to provide detailed comfortable service to each passenger based on a prerequisite of environment and safety, it is necessary to “create a reassuring system” which grasps human sensitivity, and this is our objective.

The second topic is a “KANSEI design”. As previously mentioned, the final judgment criteria for deciding on a design is in the field of aesthetics, but the root of the word aesthetic originated in the study of sensitivity, and sensory evaluations such as visual or audible evaluations seem to lead us to “a space for feeling”. However, the god of beauty was Muse from which the word music is derived, which is an audible sense.

Let us look at this in more detail. Generally, when we say the word design, the first things that pop into our mind are visual things like form and color. Therefore, things which can be “seen” are very easy to evaluate. In the past, the use of the word design very often pointed to something we could see with our eyes. It is our way of looking at the phenomena of beauty and fashion which reflect human mentality and tastes which change with time. In other words, when we think about comfortable space, it is critical that we consider the conditions of “non-visual elements” as well as visual elements. In other words, the first time we use something we make an emotional judgment called “feeling”. Take for instance the sound we get from “hearing”.

Earlier there was a discussion about noise, but sound quality and sound tone are not something we can express with numbers. Take “touch”. Feeling on the skin and texture may be expressed in such a way as the feel of soft material, or expressed as cold or warm, heavy or centered. These are things that we can grasp with the five senses. I believe that these will become the evaluation criteria of the future, and as previously mentioned by Ms.Yokoyama, these areas are beginning to be evaluated by the world. Furthermore, when these environmental factors are considered, light, sound, and wind in the cabin can be classified and substituted as shown in the following chart. When these points are considered, light, wind, and sound are
important elements for achieving an “environment” that provides an attractive and comfortable space. It is critical that we find the answers by reevaluating fellow humans. Dr. Suda referred to human interface in his lecture, and this is also a related element which is important.

The third item I would like to talk about is comfortable service. Recently the phrase “universal design” has been used frequently. The history of this expression is over 30 years old, but stated simply, it is “achieving an object or concept that can easily be used by anyone”. However, cannot we also take it to mean, “Improvise to naturally provide pleasurable comfort without thinking”? In other words, we would like to create a condition with a subdued essence where we are able to look back and recall it as a pleasing experience, instead of unreasonably and stiffly worrying about things we dislike, or rather than being told what to do or being told how safe something is. For example, when we consider the form of high-speed transportation, we must ask ourselves whether the design and service are really progressing towards comfort space. Since the industrial revolution, the development of objects has progressed by placing priority on mechanical performance, but in recent years there has been an ongoing shift “from mechanical performance priority design to human centered design”. In today’s theme of “faster, more comfortable, and safer on the environment”, if we replace the phrase “safer on the environment” with the phrase “human centered design”, today’s theme could be rephrased as “faster, more comfortable, and more beautiful”. I would like to take an approach where we focus on “the environment is naturally beautiful” when we look at creating beauty between people or creating beauty in the relationship between objects. Furthermore, with regards to the physical elements of feeling claustrophobic and the emotional feeling of boredom, I would hope to create a design that is sensitive and aware of the “passage of time”. For instance, if we consider the evaluation of a chair, we do not sit down and immediately make a judgment of comfort, but rather we must sit for two or three hours before we can respond about the comfort. Similarly we need to make designs while being aware of “time” to some degree.

The fourth issue I would like to present is “beautiful form”. Form and function evolved while reflecting the technology and environment of the times. The design of the steam locomotive has a geometrically modeled beauty by thoroughly pursuing mechanical performance. As previously mentioned, there was a time in the 1930s when this dominated the world. Fast-forward to the current age of Fastech. In this age of increasing speed, organically curved surfaces that focus on environmental performance based on aerodynamic analysis are essential, and as a result, complex forms which simulate living things in nature such as birds or fish are formed, which are extremely interesting. As Murray Hughes mentioned in his keynote speech, even if we look at Next Generation designs such as Italy’s Pendolino or Spain’s AVE, we can take pride that the organic shape of the E2 series Shinkansen which was proposed at the start of the Nagano Shinkansen line was correct answer, and has played a role in setting trends. With regards to the pursuit of an aesthetic form, promoting reconstruction of functions in next generation high-speed cars will result in improved performance in providing a comfortable ride.

The fifth item I would like to discuss is “color”. Color is the first thing that the human eye can sense and recognize, and shapes can be perceived later. Therefore, although proposals for the color of a design are often made surprisingly lightly, in actuality, this is a very critical element. Just as noise is a problem along railway lines, I hope
that we can always achieve aesthetic designs which balance color with the environment. The scenery of the environment along railway lines is original scenery based on Japanese aesthetic sense and color sense. The colors of the E2 series were selected from the first section of Makuranososhi. As you well know, the image of this poem which begins “Haruwa akebono yo yo, ...(In spring, at dawn, ...)” brings to mind these three colors. At that time we were preparing for the Nagano Olympics, and the things that were seen by the people of the world are still fresh in our memories. The three colors are: a grayish color of mist rather than the pure white of floating clouds; a deep purple of an early dawn, separated by the red of the morning sun. The Union Jack from Murray Hughes home country, the Stars and Stripes of America, and the Tricolore of France all use these three colors, so I believe that these colors are well understood by westerners too.

Finally, I would like to talk about “development of advanced design”. Railcars are characterized as being long life products. However, with repeated temporary measures for making improvements to solve problems, that is to say, by designing railcars with only “now” in mind, we cannot be expected to create designs capable of surviving new technical innovations and eras. The Next Generation of designs may be required to take concepts from the future. I think that it is only a planning issue, but setting clear goals is the fastest route to achieving our dreams and optimizing solutions.

Tetsuo Fukuda (panelist)
Professor, Faculty of System Design, Tokyo Metropolitan University
Director, Design Advisor, A&F Corporation
Began working as a freelance industrial designer after working at Nissan Motor Co., Ltd. Established A&F Corporation in 1985. Has worked on development of office furniture, chairs, and industrial equipment. In addition to transportation design such as trains, cars, boats, and airplanes, he has also supported design development relating to transportation systems such as airports and train stations. He has also provided training for designers at engineering and art universities and companies. He has served as the Kawasaki Industrial Design Competition Judging Committee Head and as a G Mark Select Committee Member for the Japan Industrial Design Promotion Organization. He has been active in the development of designs for railcars and particularly for the Shinkansen. For JR East, he has provided support for “Tsubasa”, “Hayate”, “Super Hitachi”, “Cassiopeia”, “Fastech 360” and many others.

(Endo) Thank you very much. We really appreciated the insight into design and seeing those illustrations which exceed not only Fastech, but also our own imagination.

3 Current Shinkansen

(Endo) Next, we would like to move into a panel discussion of the main topic. First, before we discuss the expectations of future Shinkansen, we would like to hear your frank opinions about the current Shinkansen.

I believe that the Shinkansen has definitely had various effects on society and people, but beginning with Ms. Yokoyama, please discuss the Shinkansen including viewpoints of the user.

(Yokoyama) Before touching on the Shinkansen, I would like to discuss the significant changes that have recently occurred in commuting to work and school. There have been three major changes over the last several years to how we commute to work and school.

The first is the widespread use of “Suica”. Various values have been added by the creation of Suica. Suica is much more than just a
simple efficient tool that requires a simple touch. In other words, because only people who have Suica can pass through the ticket gate, it creates a sense of “our link to the station” amongst us the users. Furthermore, it creates a sense of familiarity in the customer. It’s like walking into a bar and asking for “the usual” and getting your usual drink, this type of “familiarity” makes a user very happy. Another point is the pleasing tangible feel of Suica. It makes a short beep when touched, which brings a certain sense of accomplishment and pleasure. If this touch beep was not there, I do not think there would be as much enjoyment. This is because it can create a strange sense of “I did it!” in the user.

Secondly, it was earlier mentioned how mobile tools can bring us a great amount of time, and now we have not only mobile phones but we can even watch television or a DVD on a portable tool. This diversity of mobile tools, which can accomplish nearly anything as they are improved and changed, can help us make more effective use of our time.

The third point is the evolution of “enticing stations”. “Ecute” has been established at Shinagawa Station and Omiya Station, and each station has an “Ekinaka” space where users can perform various jobs in the train station without leaving the ticket gate. This changes the time spent in train stations to pleasurable time for the general user commuting to work or school. When I pass through the train station which has an Ekinaka, I meander around without leaving the ticket gate, and it is like a role-playing game where we can discover new things about a town as we discover new things in the train station. Shinagawa Station has things only found in Shinagawa Station, and Omiya Station has things only found in Omiya station, and this creates within us a joy of “look what I found!”. Therefore although the commute to work and school is said to be a mad rush, it is changing so that we can experience our own pleasures. I guess we as users are really quite determined.

On the other hand, our ideas concerning leisure are also changing. It is a very important problem, but overseas travel has grown overwhelmingly as the price of airplane tickets has dropped. Non-daily travel differs from daily travel in that there is a sense of “let’s just pick up and go”, and overseas travel is often the first choice. On the other hand, one-day trips are also increasing. The data is surprising, but trips of one or more nights have dropped drastically. Normally a trip is considered to be one or two nights rather than a day trip, but this type of trip is becoming less popular as the number of one-day trips has increased dramatically. As I mentioned earlier, I believe this is because leisure has become a daily activity as our information has steadily increased. Driving has become more efficient because of car navigation systems. Recent users perceive going out for dinner to be a type of trip. Therefore it can be said that the number of overnight trips we take has been reduced because we are able to easily achieve a sense of satisfaction, as leisure has become a daily activity. From these phenomena, we can observe a “bipolarization of travel”. The two poles are “daily travel” which we take casually, and “non-daily travel” with a sense of “Let’s go!” Each of us will personally rank our travel, and adjust our spending in line with this decision. I feel that this will have a huge effect on the way that the Shinkansen is used in the future.

Next, I would like to talk about “changes to the Shinkansen”. Clearly the Shinkansen has made commuting to work and business travel more enjoyable. In fact, commuting by Shinkansen is more comfortable than commuting within the metropolitan area. I’ve spoken with several people who have experience commuting from regional areas by Shinkansen, and they say that their personal time actually went down when they began to commute from within metropolitan Tokyo instead of using the Shinkansen. Furthermore, they inevitably claim that commuting by the Shinkansen was more comfortable. When we ride the Shinkansen we immediately enter a private mode and think, “what should I do now? How should I spend this time today?”. Commuting by Shinkansen is a representative example of bringing the Shinkansen into our daily lives. On the other hand, business travel has also become very relaxing. Someone once told me an interesting story. “Before the Shinkansen, I used to drink beer inside the train during business travel, but with the Shinkansen, I arrived so quickly that rather than drinking in the train, I return home and have a drink at my favorite spot.” Business travel is typically becoming a daily occurrence, but it seems that the way we ride the Shinkansen is also changing.

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free time, not only is persistent improvisation required on the user side, but I also believe we must create this environment for the Shinkansen of the future.

(Endo) Thank you very much. We appreciated hearing about changes in leisure and how the Shinkansen is helping to provide diversification to society. Changing the subject slightly, 42 years have passed since the Shinkansen opened in 1964, but today’s Shinkansen is also the result of continuous evolution since then. Dr. Suda, what do you think about these changes?

(Suda) I would like to talk about the change from conventional railway to the Shinkansen from the viewpoint of technology. Earlier Mr. Hughes discussed the history of high-speed railway in detail, but I believe the biggest technical issue was how to achieve high speed. There are photographs of test trains in France running at 331 km/h, and the tracks were twisted after running at this speed. The railway term for this effect is self-induced vibration called “hunting”. In other words, there is clearly a phenomenon where vibration occurs without forces from the outside, and this is what caused the track to become twisted. I believe that overcoming hunting was probably the biggest issue. It was Japan that was able to develop and implement this technology. However, the technology of the Shinkansen that is still changing the world today is not just the technology to run faster, but also other significant changes in a variety of technical fields. The style of a locomotive pulling passenger cars has been replaced by the electric train system, and the train engineer driving based on signal lights has changes to the use of internal signals. Even though we say internal signals, it was not red, yellow and green lights inside the train, but rather a speed display. The design of this internal signal was ingenious. Train crossings were eliminated, train rails were lengthened, and branching equipment which could handle high speed was developed. Achieving high-speed railway was the result of making system changes in many areas. Recently the phrase “grand design” has become popular, but from the viewpoint of engineers, it appears that the limits of technology are pushed back by the demands of society. In other words, technical limits are not physically determined, but are actually determined by the demands and needs of society.

(Endo) Thank you very much. Your explanation that technological targets are to some degree determined by the demands and needs of society provides great insight. Next we would like to hear a discussion on the design of the Shinkansen both current and past. Dr. Fukuda, could you tell us about the design of the Shinkansen from the initial 0 series which was introduced in 1964?

(Fukuda) Earlier, Ms. Yokoyama talked about “enticing stations” and “touch feel”, and these clearly relate to the five senses that I would like to talk about. Train stations that touch our hearts and a nice “touch feel” relate to how we interface with objects, and these issues are now being questioned. Let’s move this discussion further. Recently, there has been much focus on other functions of the brain. In other words, we’re talking not about visual and audible, but about the more primitive functions of taste, smell, and touch. Intellectually and physically, the world is established by what we see and hear, but what may have previously been considered as our lower capabilities of taste, smell, and touch actually play a critical role in each of our lives. For instance, when we talk about taste, we often refer to the bipolar world of the gourmet boom and so-called slow foods. Eating itself has evolved from a time when just being able to eat was sufficient to the current age when we consider various vectors about how to enjoy the food more. With regards to smell, there are also the bipolar approaches of aromatherapy and perfume free cosmetics. With regards to touch, we have massages, shiatsu, and sport gyms where we can work up a sweat.

In this manner, just as we begin to pay attention to our own health, our concern about the environment will increase and I believe this is a similar vector. I sense that these issues will probably come into play in the demand for comfort on trains.
transportation is by bike. I would advise taking the tram in Warsaw, the bus in Rome, and the Metroliner in Sydney. I have used a wide variety of transportation systems in many different cities. During Mr. Hughes’ talk about high-speed railway in Europe, I strongly felt a desire to make my next trip to Europe and use the high-speed trains. Train travel was the starting point for my travel. As a student, I would take long journeys twice a year using a “Wide Excursion Ticket”. Even overseas, I like to travel by rail in order to see the peculiarities of that country at that time. Countries change, the scenery changes, the signs change, the meals change, and these are the excitement of travel by rail. Just as the text on the sign for a cafe changes from “CAFE” to “KAFE”, I enjoy the sense that “this is a different country”.

If I could take a long vacation, I would like to take a trip on the luxurious Eastern Oriental Express, which travels from Bangkok to Singapore. The journey takes several days and this may be difficult for people with jobs, but I love Asia and this would be my dream trip. The journey travels through deep jungles and flooded rice paddies. I’ve heard that the type of meals that are served changes to match the country you are passing through. I would love to experience the extremes of such a rail vacation. However, I like to travel alone so one of the problems with such a trip is safety. Travel by rail is extremely safe in Japan. Even if you leave your luggage to go to the bathroom, it is not a problem. I was supposed to talk about overseas rail systems, but instead talked about my own personal travel mania. Please excuse me.

(Endo) Earlier we heard from Mr. Hughes about global trends and about the status of high-speed railways around the world, especially in Europe, but now we would like to change the viewpoint slightly and discuss overseas railways while comparing these high-speed railway systems and standard railway systems with the Shinkansen.

Ms. Yokoyama, could you lead off our discussion please? (Yokoyama) I was sad that there were fewer long weekends last year, because I almost always take an overseas trip on my long weekends. Often I travel straight to work from the airport on Monday morning. What I find most fascinating overseas are the markets and the train stations. If my arrival is not at night, I go out that day and look at the previously unknown markets and train stations. I observe what are being sold in the markets as well as how they are sold and purchased. All of the people are locals so it provides great insight into the mannerisms of the people of that country. This is an expeditious way of getting to know the city. In the train stations, I look at the travelers, the commuters, and even the workers. Carefully observing the markets and train stations is a very effective way of getting to know about the lives of the local people.

I avoid taxis as a transportation means and always choose to use public transportation. This allows me to see and feel the lives of the people in that country and the peculiarities of that country. Normal transportation methods are different depending on the country. Tokyo is very hard to understand, but when I recommend transportation that helps a foreigner understand Tokyo’s peculiarities, I would probably recommend the subway system or the Yamanote line. For example, by leaving the station from the Oedo Line, we can see the peculiarities of Edo period (1603-1867) Tokyo. If we get off the Yamanote line, we can experience the atmosphere of the surrounding cities outside of the Yamanote Line.

In New York City and Seoul, the subway is probably most appropriate, but in Ho Chi Minh City or Phnom Penh, the best
presented earlier by Mr. Hughes, there are steep inclines and it feels like riding a roller coaster. It is not that this system is superior to operating at high-speed with no curves on a flat surface, but the perspective has changed dramatically to allow curves and inclines during high-speed operation.

The above was pure technical discussions, but I would like to conclude by introducing a difference from the perspective of convenience. Ms. Yokoyama talked about leisure travel, but when I travel overseas, it is generally for business travel and I want to arrive at my destination as fast as possible. From this perspective, the fundamental difference between Japan’s Shinkansen and overseas Shinkansen is the connection to the international airport. I want to strongly stress this point and have prepared a slide. As I’m sure you know, there is an ICE station at the Frankfurt airport, and there is also a TGV station at the Charles de Gaulle Airport in Paris. Therefore, when I arrived in Europe from Japan at around noon, I can travel by express train that same day and arrive at a regional city that has no airport on the same day. For example, I can simply hop on the ICE and travel to Brunschvicg in Germany. France is no different. Earlier we heard how planes and the Shinkansen were competitors, but international routes and rails are more like partners than competitors. In Europe, the international airports are connected by high-speed railway, and maybe this is the difference. In the past, Japan also had a plan for a Narita Shinkansen that would travel to that airport, and I wish that we could somehow resurrect the Narita Shinkansen to improve our standing in the world. If this could be achieved, travelers from overseas could arrive at the Narita airport and travel on to Nagano, Niigata, or Akita that same day. I believe this would be very attractive. Therefore, I would strongly encourage that we investigate linking to the international airport as the next phase for the Shinkansen.

Interpretive article

Thank you very much. We appreciate the new proposals and enjoyed the very appropriate comments about the differences between the TGV, ICE, and Japan’s Shinkansen.

Next, Dr. Fukuda. It seems to me that overseas high-speed railways each have a peculiar design or aesthetic characteristic, if you will. Could you share with us your impressions concerning aesthetics, and how Japan’s Shinkansen compares with overseas rail lines?

(Fukuda) The city of Frankfurt was brought up earlier, but just last year I had the opportunity to travel to Cologne from Frankfurt, and I was able to use Germany’s ICE3. They handled my entire luggage and it was a very comfortable trip. I was able to immediately pick up my baggage at the Cologne Central Station and then travel by taxi to my hotel. The planes and trains are closely connected and it felt extremely convenient. When traveling from Frankfurt to the Cologne-Bonn airport using domestic lines, a great deal of time was spent just getting from the airport to Cologne, and there was also considerable expense for taxis.

When comparing the differences in train cars between Europe/America and Japan, the national characteristics of each country can be seen from the design conditions. So, when I take a ride for the first time I try to enjoy the trip from those design conditions. Earlier we heard a difficult discussion from Mr. Hughes about "suspended", and "unsuspended". This is true from both the perspective of achieving a comfortable ride but I believe it also shows the differences in the culture of Japan reflecting the use of partitioning and compartments.

Next, I would like to talk about "preparations for travel". When we think about exterior and interior, exterior issues are very technical, and the shape of the lead car generally has a shape with a square cross-section which slopes down into a sleek rounded form. I seem to recall that Germany’s ICE was originally the same, but it has now changed to have a more organic flow like a cocoon. Furthermore, AVE was also that way until recently. The bird atrium at the Ueno Zoo has a display showing samples of bird bones and skulls, but when I was looking at the display earlier, I was surprised to see that there was a sample that looked very similar to the Next Generation Pendolino. The same is true for automobiles, and although European automobiles are very individualistic and there are probably
differences in thinking between engineers, we now have a wide variety of automobiles on the market. In this age, much focus is placed on safety and environmental performance, and European cars have changed dramatically from the aerodynamic look of the 1970s. Therefore, future issues involved how to create individualism and how do become environmentally friendly in the global sense of the word. It is not a cultural anthropological observation, but when we think about the word “interior”, we often get into discussions about the design such as “this is a little too dark” or “this is too bright”, but the way we look at things can differ depending on whether it is through the eyes of a Japanese person, or through the eyes of someone from another culture.

This is not like Tetsuro Watsuji’s “Climate”, or fudo in Japanese, but there is also a problem with humidity. The demands of an air-conditioning system differ between Europe and Japan, because Japan has high temperature and humidity causing differences in the strength of the air conditioner’s blower. If it is just an exceptionally hot summer, there may be unbearable moments but we must always try to create designs and apply them while being conscious of these issues.

Thank you very much. Next we would like to move on to what may be the main topic of today’s discussions which is “Expectations for future Shinkansen”.

Currently the first mission of this project is to reduce the time to arrival and increase the running speed, and in this area we would like to first hear from Ms. Yokoyama.

First, when we bring up the topic of time to arrival, I believe the biggest competitor is the airplane. Recently, airfares have dropped dramatically and more companies are beginning to use planes instead of the Shinkansen for business travel from Osaka. The biggest difference between planes and the Shinkansen is that planes connect point-to-point. In other words, we are transported directly from one location to another location. During that time, we are above the clouds so there is no scenery and no train stations to enjoy. The biggest problem with airplanes is the lack of a sense of self-control. When you sit down, you must fasten your seat belt and although it may appear comfortable, in fact we are actually tied down by some type of restraint. Furthermore, you just sit there while the flight attendant prepares and brings everything to you, but there is no sense of satisfaction. I believe that this is because there is no sense of self-control. Everything is selected for us and there are no choices to make. It is basically endurance time for the sake of travel. We are at the will of the airlines and our seat is more like sitting on a surgical table. It is clearly not enjoyable.

As for the Shinkansen, one point for which expectations are steadily increasing is the opportunity to have personal space. I believe that the Shinkansen of the future will be even more capable on this point. Self-control of commuting and travel is one very attractive point. How we use this self-control will be ever-increasingly determined by the user. I hope that the Shinkansen becomes a place where users can find satisfaction, and will provide a location for enjoyable time. For instance, I would be happy if we could choose the seating layout and the environment in the passenger areas.

Furthermore, the Shinkansen is a place where we can adjust our feelings and can have a change of heart concerning fade-in and fade-out. This is a surprisingly important point. All kinds of concepts and business ideas can pop into our minds as we stare out of the windows. This is extremely neutral space where we are free to do as we like. This type of space is extremely rare in today’s world. Therefore we can say the Shinkansen transcends simple transportation space and becomes our own individual space.

Acting on our own in the state which matches our feelings is the biggest difference between the Shinkansen and an airplane. I hope that the Shinkansen will provide even more space where we can feel like we are in control.

I would like to move on to new issue. An airplane provides a point-to-point connection, but the Shinkansen has a line-to-surface connection. In other words, the line-to-surface connection means that rather than moving from one point to another point such as with an airplane, we are able to observe and interact with a great deal of objects and information as we travel through. Along the way we see scenery, tourist points, history, and gain knowledge, and furthermore we can enjoy the local products and meals from each location. Rather than aiming for point-to-point travel like an airplane, I hope that we can train users to appreciate the line-to-surface features of the Shinkansen along our journeys. I do feel a sense of this “surface” by the meals which are currently being sold in
the Shinkansen, but I’m sure that a great deal of more detailed research is being done at research and development centers. I would hope that we could find some way to differentiate from the point-to-point characteristic of airplanes, and utilize the attractiveness of the line-to-surface characteristics of the Shinkansen.

I would like to make one more point. The increasing speed of the Next Generation Shinkansen should improve access to other local regions. If the trend towards day trips continues in the future, regions which were previously inaccessible may become within the scope of a day trip because of the faster speed of the Shinkansen. Therefore by skillfully linking access to regional areas, we can create a sense that travel is simple and convenient, and travel which had previously not been possible will become possible. With government and private industry working together, we can start a renaissance of tourism and can create a system of “charismatic tourism” where people will reevaluate their thinking about the attractiveness of regional areas. I hope that they will successively announce new areas of travel made possible by the Next Generation Shinkansen. Families can face each other and enjoy eating lunch while traveling by Shinkansen. This is impossible when traveling by car or airplane. I hope that the increasing speed of the Shinkansen will influence travelers who are prone to overseas travel to turn back and rediscover Japan.

(Fukuda) Since we’ve been hearing about airplanes, I would like to continue with that discussion. Previously, while designing the “Super Hitachi”, I was working with an organization known as the Transportation Design Organization (TDO). At that time, the shape of the Super Hitachi was said by various members of the mass media to look “like an airplane”. This was probably because of the hat rack type shelving, and I believe that “like an airplane” was intended to have a good meaning by the members of the mass media. I don’t mean to repeat the previous discussions about seat belts by Ms. Yokoyama, but the fact that you can freely walk around inside the Shinkansen is a major difference from an airplane. I think that the ability to travel at high speed without feeling vibrations is an outstanding technical accomplishment, and 360 km/h would be an incredible speed to experience without the protection of roof, walls and floor.

Earlier there was a discussion about “preparations for travel”, but I would like to talk about airplanes a little more from the viewpoint of service. For instance, offering candy before the flight can function to cause us to swallow saliva, which helps our ears adjust for the difference in air pressure, and politely offering coffee or tea during the flight is to help compensate for the intrinsically low humidity. These services have evolved because of the environment in the cabin. Furthermore, as seat belts were previously mentioned, the airlines provide entertainment to help us forget our seat belts are fastened, and even passing out newspapers and magazines may have the same effect. Whenever I ride I always listen to the comedy channel and so I can recall quite a few comical stories, but I think even this is to help us forget that we are wearing our seat belts. Therefore this reflects on the issue of “sensitive design” that was discussed earlier. In other words, negative factors such as lighting, air-conditioning, and jet noise have been converted over the years to positive factors by the airline industry. In the previous discussion, the fact that members of the mass media made those comments showing that an airplane has an image of being comfortable shows the results of great effort by the airline industry. Even the great waste of time from leaving the gates until landing has been carefully cleared in history by the airline industry.

Here is a sketch of in-flight service that does not occur with domestic flight, but even a boring 10 plus hour-long flight passed by quickly while I was drawing. In the past, three full meals were provided and each of these services were provided individually, but as shown in the upper right corner, one can freely have a cup noodle or a rice ball, and service has become more detailed to match each individual. People who do not want to eat are free to sleep, and this level of service is provided even in economy class. Just as we discussed earlier in the design section, the meaning of “acting on the five senses” refers to how we spend our time in beauty and comfort. I believe that these will become increasingly more important in the future and the style of service on the Shinkansen should be able to provide greater variety because there are no concerns about seat belts.
(Endo) Thank you very much. Your talk clearly suggests that creating a Shinkansen that affects the five senses is an important issue for all of us.

Next, we would like Dr. Suda to discuss technical proposals for the future Shinkansen, with particular focus on safety and reliability.

(Suda) We have been talking about comfort, and I would like to discuss this from a variety of viewpoints. Earlier there was discussion about the struggles associated with Fastech, but from a technical perspective I believe that environmental problems are the biggest hurdle. At the same time, we also have issues with monotonous sounds and noise in the passenger areas. I believe that these are clearly connected to achieving a comfort space. From another technical perspective, another area where the Shinkansen differs from planes and other forms of transportation is the fact that trains require infrastructure known as train tracks, and I hope that we will be able to take advantage of this characteristic in the future. The airlines may own their own airplanes, but they do not own the airports and air traffic control is managed by the government. For roads, traffic laws are managed by the police. However, for the case of rail, the railroad company owns and manages the entire infrastructure including the rail lines and signals. I hope that we can make use of this strength. In other words, by careful coordination between the infrastructure, signals, and vehicles, I hope that we can move to resolve problems at the boundaries. I believe that this may be one of the biggest strengths of the railways.

A variety of new approaches have been implemented into Fastech. From an academic perspective, repeating known facts is not interesting, so I would like to talk about several dreams. The first is “active control” which can improve riding comfort. Currently we are performing research from the viewpoint of conserving energy, but our next target will be not only active control of the vehicle, but active control of the tracks as well. This was mentioned earlier, but a system that does not require energy is referred to as “self-powered”, and there is a future concept known as a “self-maintenance system”. It is intrinsic with the use of objects that the more they are used the more they degrade, but we hope to develop systems which can improve with use instead. Not only are the train tracks improved, but the more the train car is used, the more deficiencies can be identified and automatically strengthened, and we are working to develop this totally new concept technology. I believe that we can achieve this new concept of Shinkansen. These are my expectations.

(Endo) The proposal of “self-maintenance” is extremely attractive, and it makes me want to join in the development.

(Fukuda) As we are working towards conclusion, I would like to move forward towards tying up the panel discussion. We have discussed convenience and comfort requirements of the Shinkansen considerably already, especially comfort. However, I would like to focus a little more on these subjects and hear what you have to say. Furthermore, we don’t necessarily need to completely limit this to the Shinkansen. If there are any requests or suggestions for something that you would like to see for the JR East Group or JR East’s research and development, then we would like to hear your comments. Therefore, Ms. Yokoyama, please go ahead.

(Yokoyama) I fully consider that JR East is a company with an advanced technical team and I have recently come to consider that when this advanced technology is channeled, JR East comes up with very cute products. These include both Suica and Fastech. As most are likely aware, a figure of the new Shinkansen Fastech 360 is on sale. I purchased one of these. The figure appears to be out of animation, where the front can be changed and has ears that can be extended. In other words, with the pursuing of the edge of technology, this has entered into the “kawaii” culture within Japan. Japanese anime, clothes, and small items have made it onto the global scene along with the term “kawaii” and I consider it very interesting that while this research has been being performed for a long time, it has become a part of the cute culture unique to Japan. I expect that ease of use was also considered for the Suica, but the first Suica that had a penguin design became a sought after item and was being traded for at high prices on Internet auctions.

In this manner, while focusing on the cutting edge of technology, the ability to create characters this skillfully requires instinctive talent. I think that pursuing the cutting edge of technology touches people and therefore I am looking forward to this development with considerable anticipation. Lastly, I am looking forward to being pleasantly surprised with something derived through superior technology.

(Endo) Thank you very much. Next, we would like to hear from Dr. Suda.

(Suda) In the recent introduction to Fastech, there was reference to the achievement of the maximum level of comfort, and this is where I am placing my anticipation. In the research of comfort, I feel that “comfort is irreversible”. If one experiences something they like once, they will not return to previous status. Human senses are non-linear and as this is the case, we must “continue to evolve”. Therefore, I would like to see you continue with research enabling this never-ending evolution.

Another serious discussion as the issue for 2007* is how to pass on technology that has been learned. JR East is the exemplary railway company in Japan and I would like to see a “reliable method for passing on technology” be implemented by this railway company. Lastly I would like to bring up the discussion of “global deployment”. It is my understanding that the E2 series Shinkansen will be exported to China. I would very much like to see Japanese technology opened up and made available to the world.

(Endo) Thank you very much. Mr. Fukuda, please go ahead.

(Fukuda) We have been talking about comfort, and I would like to discuss this from a variety of viewpoints. Earlier there was discussion about the struggles associated with Fastech, but from a technical perspective I believe that environmental problems are the biggest hurdle. At the same time, we also have issues with monotonous sounds and noise in the passenger areas. I believe that these are clearly connected to achieving a comfort space. From another technical perspective, another area where the Shinkansen differs from planes and other forms of transportation is the fact that trains require infrastructure known as train tracks, and I hope that we will be able to take advantage of this characteristic in the future. The airlines may own their own airplanes, but they do not own the airports and air traffic control is managed by the government. For roads, traffic laws are managed by the police. However, for the case of rail, the railroad company owns and manages the entire infrastructure including the rail lines and signals. I hope that we can make use of this strength. In other words, by careful coordination between the infrastructure, signals, and vehicles, I hope that we can move to resolve problems at the boundaries. I believe that this may be one of the biggest strengths of the railways.

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(Fukuda) As we are working towards conclusion, I would like to...
briefly introduce the color of the Fastech in conjunction with my conclusions. Ms. Yokoyama just discussed unique Japanese culture and Dr. Suda brought up the passing on of Japan’s technology. I also wanted to bring up these things. The sensuality of the Fastech includes a lot of diversity concerning the term “green” or “midori” in Japanese. One of the meanings is never ending greenness, while on the other hand the colors or hue from Japan’s climate of high humidity can be associated with the mist from green mountains disappearing into the sky. We are normally living in an environment where we feel this way and within this culture, climate and natural feelings, I would like to reach alignment with respect to color.

This high-speed railroad began its quest in Japan in 1964 and I feel that the issue before us currently is how best to tune it at this stage. I feel that the limits of the tuning only limited by the imaginations of those within JR East and this is where my expectations lie.

We received very helpful suggestions and proposals concerning the upcoming Shinkansen from each of the panelists here today. I also think that the people who participated in the audience will be able to take new ideas home with them. I would now like to close this panelist discussion. Thank you for your time and for listening to the discussions that have been presented.

(Endo) Thank you very much. Thank you very much for your discussions, rich with suggestions and proposals. As we have heard from panelists with distinct, rich personalities, I would like to close with what I feel is key and points that I feel are important.

Ms. Yokoyama brought up that she would like to see the Shinkansen that has shape and surface not available in the airline industry. I understood this to be a very important point from the standpoint of building the next generation Shinkansen. Mr. Fukuda presented that he would like to see the Shinkansen have the ability to please people through all five senses, not just seeing and hearing. I would like to take this into consideration and make the Shinkansen comfortable and convenient from the basis of all five senses. Also, Dr. Suda brought up that for people, the desire for comfort continues to grow and is irreversible. I would like to take into consideration these words provided by Dr. Suda and have determined to look forward and continue to grow. In addition, as Dr. Suda considerately brought up JR East’s railway technology, and the passing on of these developments and information to future generations, we will continue to move forward while keeping his kind words in our hearts.

* This is a general reference to all the various problems resulting from the retirement of workers who were born in 1947, the year in which the largest number of the “baby-boom generation” were born, and who will turn 60 in 2007. It is feared that corporate activity could be substantially impaired for various reasons, including the deterioration in the vitality of corporations as a result of an inability to impart the know-how of long-time employees and the skills of “professional” craftsmen to their replacements. Based on material from the Nikkei BP Biz Board website.