

YAMAHA MOTOR CO., LTD.

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## A TDM Mountain High

*In the new TDM900, Yamaha has remade the "King of the Mountain Roads" with cutting-edge technology in the new 900cc engine and high-spec aluminum frame. Its combination of performance and handling gives a new definition to the mountain high.*

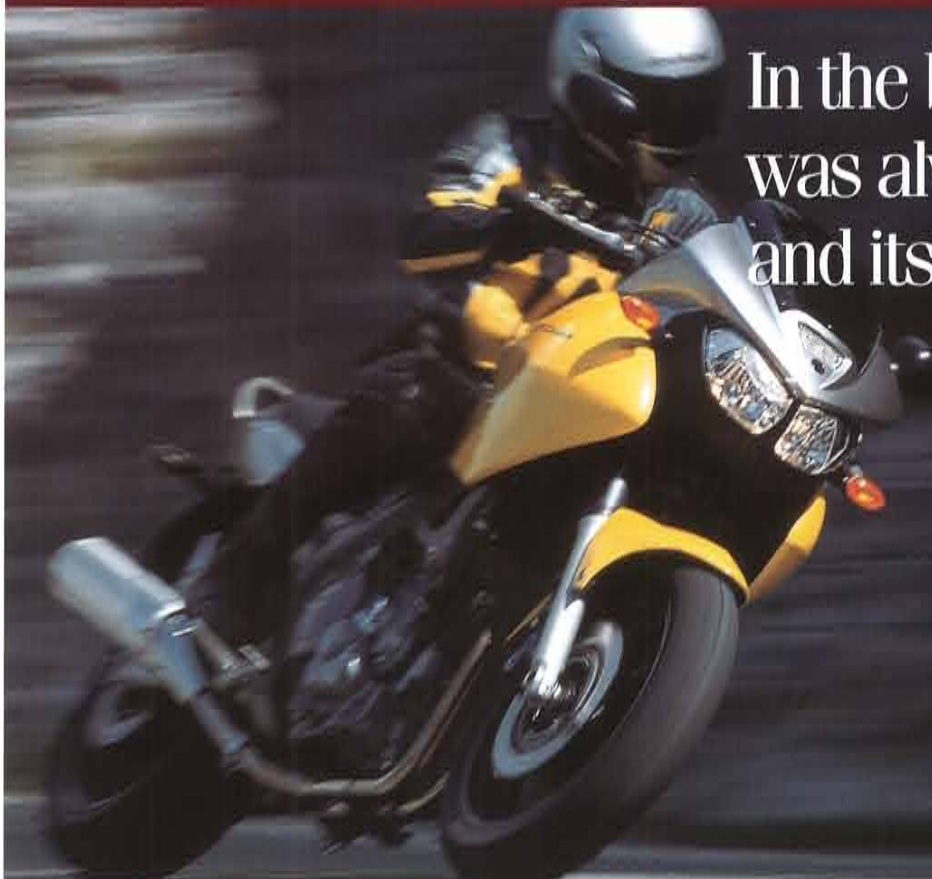


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## TDM900: King of the Mountain Roads

In the boy's eyes there was always Yamaha, and its spirit of challenge



Mr. Matsuki brought all his experience to the job of Project Leader



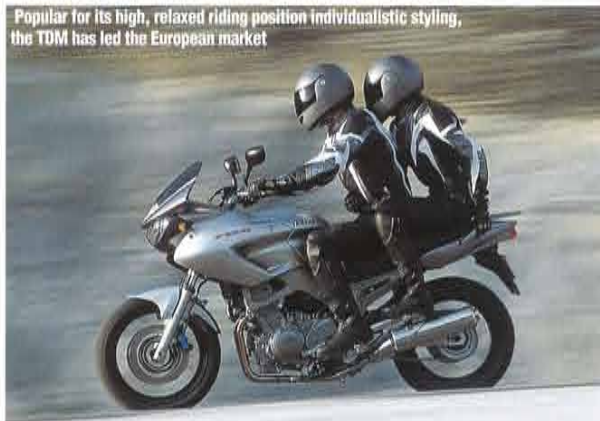
The original TDM became a legend as the "King of the Mountain Roads" thanks to its spirited, sporty performance in nearly any type riding, from mountain roads to cobblestone city streets

**A**s a middle school student it was the designs of the Yamaha "DT-1" and "XS1" that stole his heart. When he was old enough to ride himself, it was a Yamaha "RX350" that carried him over the mountain roads above the Sea of Japan (in Fukui prefecture). "What I loved about Yamaha was the way it was always taking on new challenges that led to revolutionary new designs," he recalls.

After graduating with a degree in mechanical engineering, the young man applied for a job at Yamaha Motor without hesitation. The year was 1978, and his first assignment was to the test division, where he would eventually work on models from the "SR125" and "SR250" to the "FZ400", "XJR400R" and the "XJR1300".

Having matured through good times and bad, having known the joys of success and the pain of failure, Mr. Etsuo Matsuki rose to the position of Project Leader. And it was in the spring of 2001 that he took over as leader of the project to develop the 2002 model "TDM900".

Popular for its high, relaxed riding position individualistic styling, the TDM has led the European market



### The quest for handling ease that moves the soul

In Mr. Matsuki's mind as he took the reigns of this important project were the words of the departing Project Leader, Mr. Komatsubara: "The important thing is to never lose sight of the original machine concept." Mr. Matsuki recalls: "I told myself to make sure through it all that the end product was a true reflection of the design concept of a machine for "fun riding" that expressed the pleasure of motorcycling with the kind of

handling and drivability that Yamaha is famous for." He was also glad that this was a twin he was working on, the kind of bike he loved.

There was another important criterion. This would be a European market model, and the target use was tandem riding on the mountain roads of the Alps. The development goal was to concentrate largely on weight reduction to achieve an ease of handling that would inspire the soul of the rider. To realize this, new technologies were introduced in the engine and throughout the chassis. In the

exterior design, as well, the goal was to attempt a completely new type of Yamaha styling worthy of being called a "new age form."

Despite these new elements, however, this would be a unique development project for the fact that it aimed to re-create the same basic TDM model concept as the original model 11 years ago but using today's technologies. "There are many differences between the way development was conducted back then and today. And, among these differences, the processing and accuracy of



simulations in areas like structural analysis and handling stability analysis made possible by 3D CAD computerization is especially big. There have also been dramatic advances in technologies for optimizing component shapes and for balancing strength and rigidity," says Mr. Matsuki. He also adds that some of the software used in analysis simulations has been developed in-house to reflect Yamaha's design objectives more directly.

"Thanks to CAD simulation technologies, it is much easier for our engineers in the various departments like technical testing, riding tests and manufacturing to work on the same vector during the development, and there is a lot less wasted time. It eliminated the old typical cases of a frame prototype being worked up and tested for handling characteristics by the test riders, only to find later when it went to endurance or strength testing that there were problems and everything had to go back to the drawing board." Besides eliminating wasted time and effort, it also increased the precision and speed of the design process.

In this "TDM900" project, tests were conducted on some 30 different frame designs. "All these designs can be subjected to 3D CAD analysis and the prototype analysis tests when they reach a certain stage of completion. This means we are able to choose from among several times the number, no, several dozen times the number of simulations compared to the old methods. Which of course means a higher level of results," says Mr. Matsuki. He also adds that, "we can also run simulations at the same time for things like durability and strength with regard to riding over bumps so we get a better total picture."

#### Technologies for on-site learning and design modification

These advances in analysis technologies were not the only factor that defined the design of this new model, however. The



Mr. Matsuki and his staff; projects chiefs of 5 sections, and their child, "TDM900"

roots of its new engine actually go back to the modified "TRX850" race machine ridden by the pair of Tadahiko Taira and Christian Sarron in the 1996 and 97 Suzuka 8-hour Endurance Race.

Mr. Matsuki recalls, "Research tests were already being conducted at Yamaha on a larger displacement version of that engine bored out to 897cc, while test staff were also working on ways to lighten the various parts of the chassis for a next-generation TDM. But, since the company had not yet given the go-ahead for development of a new TDM, it seems that a lot of people around YMC were wondering what these guys were up to."

It is often the case that the seeds of product development come from the efforts of technical staff working at the cutting edge of competitive performance. The 270-degree crank angle on this engine is a good case in point. It is the product of development efforts for factory machine for the Paris Dakar Rally. One more example of the many times that things learned in the race arena give birth to new technologies that eventually find their way into Yamaha production models.

On the other hand, there are some things that time doesn't change much. "No matter how much 3D CAD technology may advance, one thing that remains the same is the final work of perfecting the handling characteristics of a machine. Although there are some technologies we incorporate that are in fact "quantification of sensory data," as long as a motorcycle is something that runs by human operation, I believe that the handling characteristics are something that cannot be quantified. At the same time, however, I think that the task of quantifying human sensibilities is something that development engineers need to and are obliged to do to some degree in their work."

When asked to compare his new "TDM900" to a cuisine, Mr. Matsuki says with a laugh, "It goes beyond any single course like meat and potatoes. I would compare it to a full course meal with salad and soup on the side, a solid nutritional balance of the kind that makes you say, 'If I have this I don't need anything else'."

That sounds like the description of a good all-rounder with plenty to savor.

When asked to rate his team's success with this model, Mr. Matsuki pauses. It isn't long after the completion of a new model that developers start to look at the next possibilities. Some of it is second-guessing some of it looking ahead. "Looking back now, I would still give us a solid 90 on a scale of 100." He says with honest modesty. It is clear that the work of the developer is never done. And, many years ago it was probably a distant sense of that ongoing challenge that lured a young middle schooler to the Yamaha world.



The original TDM debuted in 1991 at Paris Motor Show



In 1996 the 2nd-generation "TDM850" appeared with a new engine spec and a crank angle changed from 360 to 270 degrees. The 1st and 2nd generation TDMs have sold a total of some 62,000 units in the European market through the year 2000



The 2002 model "TDM900" is a model that applies today's cutting-edge technologies to achieve a new manifestation of the same model concept the original was built on a decade ago



C. Sarron and T. Taira completed 174 laps of steady racing despite wet condition at the Suzuka 8-hour Endurance Race (1997)



# YMI, first 100% owned subsidiary in Asia

■ Yamaha Motor India Pvt. Ltd. (YMI) ■ Location: Faridabad, Haryana State ■ Employees: 3,542



New bikes come off YMI's advanced-system assembly line



## India

India is the sixth largest country in the world, covering an area of 3 million square kilometers. As a nation it has a long history of unification and division dating back to the ancient Indus civilization. The present-day India was founded as a nation in 1947. The famous Taj Mahal dates from the Mughal Empire of the 17th century. In terms of population, India is second only to China with one billion people, representing widely diverse cultures practicing unique customs and speaking at least 18 different officially recognized languages. Tradition and modernity coexist in this country and because of this situation the country offers unique opportunities and challenges for marketing professionals. The country is roughly divided into four regions; the north-



ern region centered around the capital, New Delhi; the western region centered around Mumbai; the southern region centered around the cities of Bangalore and Chennai; and the eastern region centered around Calcutta. Today a rapidly developing IT indus-



Design and development work employs the latest computer technologies



Yamaha Motor India Pvt. Ltd. (YMI) Head Office

try has become one of the country's representative industries along with a spurt in the service sector, and of course the traditional industries like tea production and agriculture for which India has long been known continue to have a major impact. The climate of India classifies as subtropical, and although temperatures can reach 45 degrees centigrade in the months of April to June, winter brings weather that can be quite cool in the northern cities like New Delhi. India's currency is the rupee (1 US\$ = 45 rupee) and on all the different denominations of currency notes you will see the image of India's beloved hero, Mahatma Gandhi.

The headquarters of our company Yamaha Motor India Pvt. Ltd. (YMI) are located in Faridabad, a suburb of New Delhi in Haryana state, and we also have offices at 15 locations around the country.

## YMI

Since the start of our collaboration with Escorts Ltd., one of India's representative motorcycle manufacturers, in 1983, our company has launched a number of now legendary models like the RX100 on the Indian market. In Nov. 1995 this collabora-







As introduced in our No.3 edition of 2001, the CRUX is used as a police bike in India

tion was strengthened in the form of a 50:50 joint venture. In June of 2001, we got a new corporate start as YMI, the first 100% Yamaha-owned subsidiary in Asia. YMI presently employs 3,542 people and we operate our factories in Faridabad and Surajpur, which are about 45 km away from each other. The motorcycles produced in these factories are shipped not only throughout India but also exported to Bangladesh, Nepal, Sri Lanka, and other markets around the world, including Central and South America and Africa. In this way, we are now playing an important role in Yamaha's global strategy.

### The Domestic Indian Market

The Indian economy has been growing at a steady annual rate of about 6%, and the motorcycle industry is an important mainstay of this economy. This importance of the motorcycle to the Indian economy and the lives of its people was verified by a bill passed by the Indian government this year to reduce the shipment tax on motorcycles by 8% as part of an effort to increase domestic demand. Annual two-wheeler demand in India presently stands at about 3.8 million units. Of this the 100-150cc bikes we call motorcycles constitute 2.1 million units of the demand, and one of the trends characterizing the domestic market in recent years is the increasing number of people switching from scooters to motorcycles. Due to the high cost of gasoline, another major element characterizing the Indian market is the importance a large number of users place on fuel economy in motorcycles. To answer the needs of this type of users, we launched the new 106 cc 4-stroke model "CRUX" in December 2000, and it is selling well. Furthermore, we have recently started increasing our market share with the launch in August 2001 of "CRUX-R" which is a deluxe version of "Crux". As we did so successfully for the launch of the CRUX, YMI organized a "CRUX-R Campaign" that toured 120 major cities around the country, giving customers a chance to see the CRUX-R and become more familiar with the Yamaha brand, while local dealers



The SURAJPUR plant with its safety-oriented plant interior

actively held test-ride events. These two models have started to give us a foothold into the biggest segment of fuel economy seeking customers. Styling is another parameter which is catching customers' fancy these days and manufacturers are responding to this situation by frequently launching variants.

Meanwhile, our manufacturing division was the proud recipient of official recognition of the Yamaha YBX as the highest quality motorcycle manufactured in India in 2001. Building on the confidence we have gained from such recognition, we are determined to secure the reputation as No.1 in quality by redoubling our efforts in TPM activities under the motto of "Surpassing Customer Expectations." At the same time, we are working to strengthen our R&D organization so that we can offer even higher quality in all aspects of our corporate activities in India, from product development to manufacturing and marketing, with the aim of supplying products that truly meet the needs of our customers.

Under our new management led by Mr. Masahiko Shibuya, who assumed the position of CEO this July, our employees, channel partners and vendors are working as one to realize the reforms aimed at better fulfilling our corporate. of "Touching Your Heart" mission.

**Nalin Kapoor**  
Chief Manager, Marketing Div., YMI

### The refreshing design of the new CRUX-R product leaflet





## U.S.A. YMC and YMUS support relief work after U.S. terrorist attacks

General



YMCUS President Mr. S. Kato (center left) hands donations to a representative of the American Red Cross

To support relief activities for the victims of the multiple terrorist attacks in the United States on September 11, Yamaha Motor Co., Ltd. (YMC) in Japan has donated US\$100,000.00 through the American Red Cross, and employees are making their own contribution by col-

lecting donations.

At Yamaha Motor Corp., USA (YMUS) some employees have been giving blood and raising funds since the attacks, and contributed US\$100,000.00 on October 15 as well. In addition, YMUS has given 24 large EF6600 generators, six outboard motors (four 250 hp and two 225 hp) and a WaveRunner for the relief work sites.

## JAPAN Riding classic models back into history

General

On November 3, Yamaha's Fukuroi Test Course was the scene for a "Historic Model Demo Run" event featuring classic Yamaha motorcycle and car models from the collection of the Communication Plaza (CP), the building at YMC's Iwata headquarters that can be called a museum of Yamaha history.

Originally held as test runs designed to keep the CP's exhibition models in running condition, this event became so popular among YMC employees that many volunteered each year to help out in the renovation and testride work just for the chance to see such legendary models as the YA1, YDS1 and RZ250 running on the same track in all their original

glory. That popularity led to the idea of opening the event to the general public this year for the first time.

On event day, enthusiastic Yamaha fans thrilled to the sight of 25 classic production models and nine race machines, as well as the Yamaha-built Toyota 2000GT sports car and the Yamaha Supercar OX99-11. Here and there on the tarmac, groups of people formed around nostalgic models to appreciate and reminisce. In the case of the OX99-11, of which only a few units were ever built, this was the first chance Japanese fans had to see and hear the authentic F1 sound of its V-12 engine.

The line-up of legendary models, in the top photo is the Supercar OX99-11



## SAUDI ARABIA New Yamaha distributor for Saudi Arabia

General



General Manager Saif Sadh al Rassam receives the award from Managing Director Kajikawa of YMC

Al Rassam Trading will take on the Yamaha distributorship in Saudi Arabia. An agreement was made with Yamaha Motor Co., Ltd. (YMC) on September 6 at the Communication Plaza at Yamaha Motor headquarters in Japan.

The market for police bikes is expected to grow, and to date, Al Rassam Trading has received an order for 3,400 Yamaha XV250P police bikes for Saudi Arabia's Ministry of

Internal Affairs' police bike tender.

The Ministry of Internal Affairs is using the police bikes mostly for traffic control of the approximately three million pilgrims from around the world who make the pilgrimage to Mecca in Saudi Arabia. This pilgrimage, known as Hajj, is prescribed as a religious duty for Muslims.

*From Ryosuke Nishijima of Overseas Market Development Operations, YMC*

## JAPAN Yamaha scooter and pool win Gold in Good Design Awards

General

Two outstanding Yamaha products have won the Gold Prize in the Japan Industrial Design Promotion Organisation's 2001 Good Design Awards. The Yamaha TMAX 500cc scooter and Yamaha Swim 21 international certification 50m FRP competition pool were recognized for excellence and originality in design at a ceremony in Tokyo on October 1.

The TMAX scooter is a new-generation commuter model with a 500cc liquid-cooled, 4-stroke, twin-cylinder engine on a sporty body. The Gold Prize recognizes the sleek styling of the TMAX achieved in an automatic transmission model with the fastest running performance ever. Popular in Japan and Europe, the model is applauded for having 'the exterior of a

scooter and the riding performance of a sports bike'.

The Swim 21 pool was the main competition pool for the 9th World Swimming Championships held in Fukuoka, Japan in July 2001. This temporary-facility FRP pool was installed at the event's main venue just for the period of the Championships, and removed once the competition had ended. The Gold Prize recognizes the substantial reduction in construction costs compared with a perma-



Swim 21



nent-facility pool, leaving the pre-fab pool to be reused at another location.

The Good Design Awards cover three areas, Products, Architecture/Environment, and New Fields, with a Gold Prize awarded in each category. Along with the TMAX and the Swim 21, another six Yamaha products received Good Design awards this year. They are the FJR1300 large touring bike, the AeroGear 21-SP boat designed for wakeboard towing, the PAS Smile electro-hybrid bicycle, the Towner PAS wheelchair with an electro-hybrid PAS drive unit, the EF2500i portable generator with inverter function, and Swim Friend, a lightweight, compact pool filtration system.

A Grand Prize is also awarded to the entries judged most outstanding in terms of social, cultural and daily life value, and Yamaha's Swim 21 pool was a nominee for the Good Design Grand Prize.



**PHILIPPINES/JAPAN** Visit from Norkis Trading Chairman Kisanbin and Mrs. Kisanbin

General



(From left) Mrs. Kisanbin, Chairman Kisanbin, President Hasegawa and Managing Director Kajikawa

Norkis Trading Chairman Kisanbin together with his wife paid a visit to Yamaha Headquarters on October 25, where President Hasegawa presented him with a plaque commemorating the fortieth anniversary of the company. Norkis, one of Yamaha's oldest overseas customers, started business in 1962 and since then has been engaged



Chairman Kisanbin and his entourage visited the Tokyo Motor Show

in the production and sale of Yamaha motorcycles in the Philippines, where it plays a leading role in the two-

wheeled vehicle market. The fortieth anniversary will be observed in January 2002, and the plaque was given as a token of our appreciation for its history of achievements. Chairman Kisanbin took the opportunity to both praise and express his gratitude for the Yamaha policy of consistently stressing manufacturing quality and the high quality of our motorcycles. This visit further cements the bond between our two companies, and we hope it will serve as the basis for ever greater business development and expansion.

*From Kazuo Ishikawa of Southeast Asian Business Division, YMC*

**JAPAN/THAILAND** Thai trainees share their culture with Japanese school children

General

Four trainees from Thailand's Yamaha Motor Asian Center Co., Ltd. (YMAC) were guests of an elementary school in Shizuoka Prefecture, Japan on October 11. The trainees, who are undertaking a training program at Yamaha Motor headquarters in Japan, visited the school as part of its Thailand project. The school has been corresponding with a Thai elementary school for the past three years, and has sent gifts such as Japanese stationery to the children there.

The YMAC trainees spent the day exchanging

greetings in Thai and Japanese with 611 children, dancing together to Thai music, and generally enjoying sharing their cultures. They also presented the children with a Thai musical instrument.

*From Kenzo Kawachi of Engineering Planning Dept., YMC*

Japanese children send 60 boxes of school supplies, clothing and musical instruments to children in Thailand



**VIETNAM** Technical seminar hones skills of dealers and service mechanics

Motorcycle



Yamaha Motor Vietnam (YMVN) has recently conducted a Yamaha Technical Academy seminar for 45 dealers and around 120 service mechanics. The four-day seminar covered the new and improved Global Technical Syllabus for up-grading theoretical knowledge, practical experience and competency in the overall service and repair of Yamaha motorcycles.

Dealer mechanics attend the Yamaha Technical Academy seminar to update their overall competency in service and repair

Participants received instruction in the new direction in effective and productive servicing as part of YMVN's push to boost customer trust and confidence.

In addition, a CCS (Customer and Community Satisfaction) course was conducted to encourage employees amidst today's competitive market to achieve the global Yamaha objective of "We create *Kando* - Touching People's Hearts".

*From Hensley Tan, Service Manager, Yamaha Motor Vietnam, Vietnam*

**INDIA** Yamaha CRUX-R prizes for petroleum company customers

Motorcycle

Yamaha Motor India has participated in a customer service program implemented by Bharat Petroleum in Calcutta by presenting two Yamaha CRUX-R motorcycles for customer prizes, and displaying 12 CRUX-R motorcycles in prominent locations around the city during the 2-month program.

Bharat Petroleum's Pure for Sure program highlights the company's commitment to customers by ensuring purity of fuel and correct measurement. Launched by the Honourable Minister of Cooperative & Consumer Affairs of West Bengal, Shri Narendra Nath Dey on August 24, the Pure for Sure program seeks

to make adulteration and meter tampering at their retail outlets virtually impossible, with such measures as supplies through tamper-proof tankers, surprise checks, regular octane-number checks and calibrated equipment to test the density of petrol and quantity dispensed.

The lucky recipients of the Yamaha CRUX-R prizes will be decided on the basis of a lottery draw.

*From R. K. Bubna of East Zone Supply Corporation, India*



Pure for Sure program highlights the company's commitment to customers

## SINGAPORE Yamaha chosen for Singapore Army off-road fleet

Motorcycle

Singapore Armed Forces purchased 738 off-road Yamaha motorcycles in July this year to replace their existing fleet of another maker's model. Some of the fittings are manufactured locally, so the motorcycles meet the specific requirements of the forces. Yamaha Motor Co., Ltd. (YMC) supported training of Army personnel in riding, as well as servicing and repair of the motorcycles. Over three weeks, 330 personnel completed the training courses.

Mr. Kazutoshi Iwao of YMC's Southeast Asia Business Division was the chief instructor for the advanced off-road riding

instruction, and Mr. Hiroyuki Watanabe of YMC's Overseas Service Department headed mechanical training. According to feedback, participants found the training most



useful and are looking forward to having more training of this kind.

This follows the supply of a fleet of Yamaha motorcycles to the Singapore Traffic Police in 2000, when Yamaha supplied 120 FZ750P and XJ900P motorcycles and associated training.

*From Shigeki Shimizu of Southeast Asian Business Division, YMC*



The students get some 'hands on' instruction in the basic maintenance of the bike.

At the far right is Mr. H. Watanabe (Left photo)

## NEW ZEALAND Women's Motocross Title is dream come true for Satchwell

Motorcycle

New Zealand's top female motocrosser, Tania Satchwell, has taken the American Motorcycle Association's world-ranked Bel-Ray Women's Motocross League Championship on her Yamaha YZ125, beating top motocrossers including well-known Italian Stefy Bau (Honda) and newcomer Steffi Laier (KTM).

The talented 21-year-old rider made her overseas debut in 1998, when she finished 7th overall in championship standings. In 1999 she finished 2nd, before taking 2000 off to focus on winning in 2001, when she raced all over the United States and gained for herself a repu-

tation for speed and determination. Satchwell started out on a 2000 model Yamaha YZ125, but upgraded to the latest 2001 model as she began winning.

Satchwell's World Women's title has made it a good year for New Zealand racers. Other wins by her countrymen include Stefan Merriman's second World Enduro title, and two-time former World 500cc MX runner-up Darryll King claiming the Australian Open MX Championship title in September, and leading the Australian ThumperNats series on his Yamaha.

*From Perry Francis of YMNZ, New Zealand*

Tania in action on her title-winning Yamaha YZ125



## JAMAICA Service technician training a success

Marine



Mr. Hideo Wada, a member of the Caribbean Maritime Institute, Portlands, and Kingston, breaks a bottle of champagne across the bow to christen the biggest training boat the Japanese Government provided to the Institute yesterday. At right is Japanese Ambassador Iwao Hiroshi, who made the presentation, and beside him is Dr. Peter Phillips, Minister of Transportation and Works. ■

YAMAHA, the Yamaha importer in Jamaica, held diesel engine service engineer training at the Caribbean Maritime Institute (Kingston, Jamaica) over five days from August 27 to 31. Mr. Cesar Correa, the service manager of a highly rated dealership service shop in Colombia, was invited to take part. The training focused on the increasing importance of CSI (Customer Satisfaction Index) and was an epoch-making event showing how the Yamaha family cooperates across international borders.

The training sessions dealt with a wide range of topics: electrical components, diesel engine theory, specifications and performance, purchasing, periodic maintenance plans,

engine assembly and disassembly, boat maneuvering skills and techniques for selecting suitable propellers.

The Japanese government provided a total of \$83,000 through its Grant Assistance Grassroots Projects program to the Jamaica Maritime Institute to fund the "Assistance on Training Programme for Small Boat Marine Engine Course." Local newspapers covered the ceremony attended by the Jamaican Minister of Transportation and Works and the Japanese ambassador at which a training boat was presented.

*From Ryuji Seki of Overseas Market Development Operations, YMC*

## NEW ZEALAND Yamaha diesel engines power RIB to tow America's Cup yachts

Marine

Team New Zealand's America's Cup yachts have a new RIB (Rigid Inflatable Boat) to tow them to and from races. Team New Zealand (TNZ) recently launched the 63ft high-speed RIB, constructed by New Zealand's Rayglass Protector Boats with a Salthouse design hull. The craft, one of the biggest RIBs to be built, is powered by twin 435hp Yamaha ME690TI diesel engines.

The purpose of the RIB craft is to daily tow the TNZ America's Cup yachts several kilometers

to and from the race in the Hauraki Gulf. Each America's Cup yacht has an approximate displacement of 25 tons, and at 1700 rpm the RIB tows two yachts at 12 knots. The craft's second function is to act as a backup carrying sail changes, spare boom, spinnaker pole, as well as salvage equipment pumps and safety gear.

RIBs are known for their rapid response capabilities in various conditions and for their manoeuvrability.

*From Greg Fenwick of YMNZ, New Zealand*



TNZ adopts Yamaha ME690TI diesel engines



Designed to offer a whole new world of motorcycle enjoyment as a "performance cruiser," the 2002 North American market model "Road Star Warrior" is catching the attention of motorcycle fans everywhere. Motorcycle magazines have catered to this interest with detail test-ride reports, but here we introduce a unique report about concept and manufacturing technology behind the "super-thin fuel tank" that is one of the distinctive design features of this exciting new model.



## The technology behind the Road Star Warrior's super-thin fuel tank

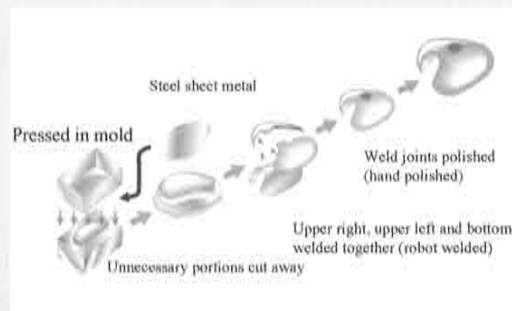
### Even the tank shape has its unique concept

During the development stage, the concept behind the design of this distinctive fuel tank was that of "A lion waiting to pounce with sleekness and flow of line." One of the designers who worked on the development comments: "The fuel tank on a motorcycle is a component that can accentuate the engine as the power source of the machine. With the fuel tank of this model we made the leading portion of the tank express a "ball" as a point of strength, then we shaped the rest to give the appearance of the that ball in a flowing motion. In doing this we created "flow lines." The fact that the rear portion of the tank near the seat is narrower is another unique characteristic that allows the rear end of the head to come into the rider's line of view."

All of this was vital to the realization of the Warrior's original product concept. And, in this the development team had set for themselves a very high goal of an extremely thin tank that exceeded the limits of what had ever been achieved in a production model to date. Because they believed that an extremely flat tank with flowing lines was essential to the design image of the machine as a whole.

### The shaping process for the tank's three steel plates

Usually, the tank of a motorcycle is divided into three parts that are shaped from thin steel sheet metal. The three pieces become (1) the right half of the upper portion, (2) the left half of the upper portion and (3) the bottom portion of the tank. Until now the tank on the Yamaha V-Star 650 was said to be the limit of what could be achieved with a mass-production cruiser model. This is because attempting to make one any flatter would require sharper curves that would bring the danger of cracking or wrinkles forming in the steel during pressing. Meanwhile, besides its contribution to the styling of a bike, the fuel tank is an important component that houses the fuel pump and various sensors and also greatly influences the machine's dimensions and the riding position.



So, what are the factors limiting the mass production of an extremely thin tank? One factor is the limit of the malleability of the steel itself. Press-

ing a 0.8mm piece of steel sheet metal into shapes that exceed its limit of tolerance can result in excessive stretching and the formation of wrinkles.

Another factor has been an over-dependence on the use of clay models in the design process. In the conventional design process a new clay model has to be created for each design proposed, in order to visually verify its actual appearance from a design standpoint and also its production feasibility. This tedious, time-consuming process also had to be repeated with every minor change made to the design.

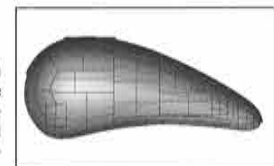
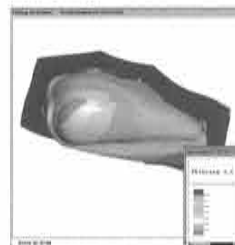
### The two technological factors that made the Warrior tank possible

In order to clear the two obstacles stated above for the creation of this super-thin tank, Yamaha's engineers (1) developed a new steel alloy with greater malleability, and (2) made use of styling CAD (Computer Aided Design) software.

In most Yamaha fuel tanks we use steel with an extremely low carbon content, but for the Warrior tank we developed an alloy with even better expansion and contraction characteristics. The conventional alloys contain titanium and niobium and boron, but for this new alloy the boron was excluded and the percentages of titanium and niobium were adjusted to achieve an alloy with superior malleability.

The second important breakthrough came with the use of styling CAD. This enabled our engineers to conduct numerous computer simulations, virtually instantaneously and exploring the full range of possibilities, aimed at achieving the optimum balance of exterior design and structural strength and rigidity. It also enabled highly precise design of the pressing molds. Until now, surface data for a tank shape was taken from the clay models, but with the new CAD process data was created directly from the initial design drawings and the shape tested via simulation. Then the tested shape was finally made into a clay model to verify the final detail curvatures not attainable with CAD alone, making for a much more efficient development process.

In this way we were able to create a mass-production tank with a thinness that until now had only been possible as custom-built items. What's more, we were able to ensure the high level of quality control only a production machine can offer. What this achievement represents is a new kind of Yamaha technology that you might call "digital craftsmanship," taking work that until now had been done by hand, transposing it into digital data and then using that data to establish a new mass-production process.



#### Image explanation

A shape simulation using "styling CAD." When a curve becomes excessive it causes localized thinning of the sheet metal. The "styling CAD" is used to verify the resulting sheet metal thickness and thus achieve the desired curves while maintaining the necessary thickness. (Darker areas show where the sheet metal is thinning)

#### Journalists Rave!

At the end of October, just prior to the U.S. market launch of the Warrior, Yamaha Motor US held a press testride event in a suburb of San Francisco. Members of the motorcycle and general press took part in test rides. YMUS's staff was impressed by the meticulous detail with which the journalists checked out all aspects of the new Warrior's performance. From almost all the participants the same comments were heard time and again: "The kind of acceleration performance you can get from one turn of the throttle is truly exceptional." "This handling completely overturns all conventional ideas of what a cruiser feels like." "This is a machine that you can really enjoy taking in and out of the turns." "You can ride with the assurance of knowing that this machine directly reflects Yamaha's R Series technology." "It will be exciting to see the market's reaction."

# "OTODAMA" sculpture is centerpiece at the Giving visitors a unique experience of the sound and pulse of a 4-stroke V-engine

Motorcycle fans filled the Yamaha booth throughout the run of the 35th Tokyo Motor Show from Oct. 24 to Nov. 7, (October 24 to 26 for press and special guests only).

Like at the recently held big European shows in Milan (debut of the new '02 YZF-R1) and Paris (intro of the new '02 TDM900), the Yamaha booth continued the basic theme of "Touching Your Heart." And, in order to give visitors to the Tokyo show a sense of the Yamaha design and engineering concept of "Man-Machine Excitement" that places special importance on the sensual aspects of the motorcycling experience, a special sculpture titled "OTODAMA" (Sound Spirit) was created as a centerpiece for the Yamaha booth.

Within a visually striking white hanging-sheet divider, an "Octaphonic" 3-D sound system and sound simulators created a pulse sound that combined with lighting to produce a unique motorcycle environment flush with a rhythm inspired by the Yamaha concept of "Man-Machine Excitement." Standing in the center of this space is a stylized sculpture of a V4 engine, epitomizing the awesome power of a large-displacement multi-cylinder engine. It exudes a beauty that transcends the conventional image of a power unit, based on the concept of a synchronization of the pulse of the human heart and the sound of an engine. Encompassing this sculpture, the

"OTODAMA" space becomes an "incubator" nurturing this potent power.

## Expressing the pursuit of craftsmanship and the joy of motorcycling

At the press briefing that opened the Yamaha booth, YMC's President Toru Hasegawa rose to give a message that began with a summary of the present outlook in the world motorcycle market and proceeded to an explanation of the direction of efforts to relax laws governing motorcycle use in Japan. Then he went on to announce YMC's adoption of a "Revolution in Product Building" that takes as its top priorities the strengthening of R&D capability to develop products that truly fit the needs of each market and mobilization of our global network to ensure ideal procurement and manufacturing for optimizing cost competitiveness that will define a new corporate stance for the 21st century. He went on to explain to the media that this "Revolution in Product Building" aimed at the realization of our corporate mission of "Touching Your Heart" is rooted in our ongoing challenges based on the ideal of "Man-Machine Excitement," a belief that the true fun and excitement of motorcycles lies not in the specs and performance that can be expressed in numbers, but in the human senses and sensibilities.

Visitors to this year's Yamaha booth showed special interest not only in the 2002 versions of such popular models as the European market models TDM900 and YZF-R1 but also the 2002-season 4-stroke GP racer model YZR-M1, the concept model "Tricker" and the new TW225.

During its two-week run, the show attracted more than 1.27 million domestic and foreign visitors. One European motorcycle industry journalist commented: "After seeing the Milan, Paris and Tokyo shows I found in Yamaha's special exhibition model "Tricker," with its orientation toward the "X-Game" concept, a vision of a new direction for motorcycles of the future. It seems to me that this kind of trial bike is one that both new and return riders will be very receptive to. I hope that Yamaha will continue to develop it into a production model." An American parts manufacturer commented: "Unlike the other makers who seem to be competing simply on the basis of bigger engine displacement and greater speed, Yamaha clearly communicated the fact that its creative passion is focused on machine handling, the joy of riding and design. I am very interested to watch the developments in the U.S. market where Yamaha is now introducing the "Warrior" with its super-thin fuel tank made possible by exclusive new manufacturing techniques."

## Home Care and Rehabilitation Equipment Expo

Opening on the same day as the Tokyo Motor Show, (Oct. 24) at the Tokyo Big Sight venue was the 28th International Home Care and Rehabilitation Equipment Expo. With its special focus on "Home Care & Rehabilitation," this year's show attracted some 130,000 visitors over its 3-day run. Certainly contributing to the especially large number of people from the welfare and health care industry was the implementation

last year of Japan's new Home Care Insurance program.

As one of 634 exhibiting companies from 14 countries, Yamaha Motor teamed up with Yamaha Corp. (music) to mount a booth in which we contributed to the "barrier-free" environment by offering wheelchair battery charging services and wheelchair ramps. As another appeal for greater visitor convenience an adjacent "Y's Gear" booth was set

up that also handled parts for Yamaha PAS and other products.

In the booth YMC displayed its senior citizen-oriented handlebar type wheelchair "MY MATE." Visitors were impressed with its numerous features, including a swivel type seat for easier mounting/dismounting, front and rear wheel suspensions for a more comfortable ride, puncture-free tires, a large headlight and convenient recharging cord.

## Small EVs point the way to the future

From Nov. 1 (Thursday) to 3 (Saturday), the same Tokyo Big Sight was the venue for the "2001 Tokyo Bicycle Show" and Yamaha mounted a booth designed around the theme "Small Electric Vehicles (EVs) for the World, for the Future."

Ever since their release as a world's first in

Japan in 1994, Yamaha's PAS electric power-assist bicycles have continued to evolve with each new technological advance in answer to the needs of the customers. Drawing visitor attention at this show were an impressive lineup of products designed for specific purposes like the new-concept model "PAS Smile MH

Super" and the "PAS SuperLight U," as well as the easy-operation wheelchair "My Mate" that makes getting out and around more enjoyable, and the "Towny PAS," a power-assist wheelchair designed for optimum user friendliness, both for the care-giver and the patient.



Visitors get a good look at the "OTODAMA"



# Yamaha booth -35th Tokyo Motor Show-



President Hasegawa makes an address

## TOUCHING YOUR HEART



A long line of visitors waiting to experience the sound simulation



Ardent fans are pleased with the Yamaha display policy that lets them touch and experience the products



The prototype "Tricker" base on the "X-Game" concept was a popular center of attention



Fans were attracted to the bold but detailed exhibit of the YZR-M1



## Three Big Titles for Yamaha 4-stroke Motocrossers in 2001!

Ever since Hakan Anderson won the 250cc class title in the 1973 Motocross World Championships, Yamaha has continued to be strong and influential presence in the motocross world, winning big titles in everything from the World GP to the AMA championships. In all, an amazing 36 Yamaha riders have won such titles over the years. As we have already reported, Yamaha has won the WMX500 title and the AMA Supercross 125cc title thus far in the 2001 season. And now, we are proud to announce another big title in the All Japan Motocross 125cc class was won in October. These titles bring Yamaha's all-time totals to 14 in WMX, 28 in AMA and 21 in All Japan championships.

The All Japan 125 title winner this season was Hisashi Tajima. After winning the season opener, Tajima went on to win points in all but one of the 20 heats in the ten-round series. That one heat was the second heat of the 3rd round in Hiroshima where he got caught up in a multiple-bike crash. The fact that Tajima won 11 of the 19 heats he finished and never finished lower than 4th is certainly not just a matter of good luck.



Hisashi Tajima captured the title with an awesome record of 11 heat wins (All Japan Motocross 125cc class)

If there was one thing that characterized Yamaha's 2001 motocross season, it was the performance of the 4-stroke machines. Although numerous riders had excellent seasons in the WMX 125 and 250 and AMA championships on the 2-stroke YZs as well, all three of the Yamaha titles this season were won by 4-stroke riders.

Yamaha introduced its first 4-stroke machine in WMX competition in 1997 with the YZM400F. At that time, interest focused on how the 4-stroke would compete against the dominant 2-strokes in the 500cc class. Now, the tables are completely reversed. About 80% of the machines competing in this class in the 2001 season were 4-strokes. That first Yamaha 4-stroke was the spark that changed the trend in the WMX scene.

What led to this epoch-making shift to 4-

strokes? It was a Yamaha development policy that threw out the old concept of trying to build a motocrosser from the base of an enduro machine and instead started from scratch to build a machine with the capability to be a winner specifically in motocross. Here is what one of our engineers involved in the development of the YZM400F that debuted in '97 says about the project: "Our goal was to build a machine with performance potential equal to the 250cc 2-stroke machines that at the time were said to be the fastest motocrossers, and to do that in a machine that was equal in weight or even lighter than the 2-strokes. Since we were determined to use the YZ250 body as our base machine, we had to develop an engine that was no bigger in its vertical dimension than the YZ250s. So, we went to a 5-valve format which enabled a lower head design than the conventional 4-valve engine."

The technologies developed for that revolutionary model went on to be incorporated in the YZ426F and YZ250F production models and the WR series, while for the '01 season we introduced the new YZ500FM for the 500cc class as our next evolution of the 4-stroke motocrossers. The YZ500FM that Everts rode to the title in 2001 mounts a 503cc engine on an aluminum double-cradle frame. And now, motocross fans everywhere are waiting anxiously to see what Yamaha will unveil as its next-generation motocrosser.



Everts shares his excitement at winning the title with the fans. His race machine (above)

