



YAMAHA MOTOR CO., LTD. AD & PR DIVISION
2500 Shingai, Iwata-shi, Shizuoka-ken, Japan Tel: 05383 (2) 1111
Telex: Iwata 4263-751 Yamaha J Cable: Yamaha Motor Iwata

LINDA SAILS 10,000 KILOMETERS

The '81 Single-handed Trans-Pacific Race



Ms. Linda Rettie

"Spirit of Suntory," a production Yamaha 33 skippered by American Linda Weber-Rettie, placed sixth in the Singlehanded Transpacific Race '81, held in conjunction with the Portopia Exposition in Kobe, Japan.

Ms. Weber-Rettie, the only woman and the only American in the event, praised her Yamaha for its performance, especially upwind under heavy weather, and solid comfort. A fleet of 11 boats participated in the race. Ms. Weber-Rettie's time for the 10,000 kilometers was 52 days and 17 hours.

In this race Ms. Weber-Rettie took so-called southern course to sail in longer but the constant Trade Winds. Another course could be sailed was the shortest route (Great Circle route) with unpredictable winds and unfavorable currents all the way to off the Japanese coast. Yamaha's sixth place looks even better in

light of the fact that the results were not based on the IOR time handicap. The maximum IOR rating for the race was 28.0 feet and the minimum length value was 7.2 meters (23.6 feet). The winner, "Taiyo," a 38-footer, rated 28.0ft. and specially designed for this race alone as a down wind custom boat. The Yamaha 33 rated only 24.5 ft. It's like a Yamaha XS650 motorcycle racing against a XS1100. In the 1978 Round Britain Race, another stock Yamaha 33 placed second in corrected time against a field of custom boats.

The San Francisco to Kobe Race was the third Singlehanded Transpacific Race since 1969. The first race was won by French boat, "Pen Duick V" (skipper: Eric Tabarly) in 39 days and 15 hours in '69. The second race was won by "Wing of Yamaha" (skipper; Hiroshi Totsuka) from San Francisco to Okinawa. The both were custom boats designed for the Transpac Races.

Ms. Weber-Rettie of Alameda, California teaches at Centerville Junior Highschool for handicapped in Fremont. She lives very close to the dock where her Yamaha 33 is moored. She has been in yachting for ten years and has been sailing Yamahas since '78. Her first Yamaha was the 25 she used to sail on the San Francisco Bay. She and her Yamaha 33 sailed in the 1980 Singlehanded Transpac Race to Kauai, Hawaii from San Francisco. During that race the 33 sailed through 40+ knot gale not only without damage but also with dry accommodations. She is now interested in buying another Yamaha, the 36.

Now, Yamaha has introduced a new model 33, with better downwind performance than the old boat Ms. Weber-

Rettie captained.

The following is the after-race interview with Ms. Weber-Rettie.

Interviewer: When did you first decide to take part in this race?

Linda: Last October, after the Trans-Pacific Single-handed Race to Kauai, Hawaii.

Interviewer: How was the race overall, this time?

Linda: It was a breeze down to Hawaii.



A 10,000-km sea marathon!

Of course I sailed the same course the year before. The latter half, however, the wind and the waves were quite rough, and there were also some lulls, so it became a very tough race.

Interviewer: Did the southern route work out as planned?

Linda: Yes, it did. I figured it would be an easier route than the tougher northern route, so I chose the course going south.

Interviewer: What is your yachting life like?

Linda: I teach at a school for handicapped children, but other than that, all the rest of my life is involved with sailing. I

Inside special feature pages

YAMAHA OUTBOARD MOTORS



Japan has already become one of the largest outboard motor producing nations in the world and it is Yamaha that has continued to lead this flourishing industry in Japan for the past 20 years. Back in 1960, Yamaha produced and marketed its first outboard motor, the 7hp P-7G/K together with its first FRP boats, in order to meet the growing demands of Japanese fishermen. Since then, production and sales of Yamaha outboards have risen steadily, along with the progressive mechanization of coastal-water fishing boats and the remarkable growth of water sports both in Japan and overseas. The special feature pages inside this issue give you a complete and clear picture of the ever-growing Yamaha outboard motor business.



Linda's Yamaha proves to be very dependable.

live just two or three minutes from the sea and I sail my boat almost every day. The Yamaha 33 I sailed this time is a wonderful cruiser with not one problem in the whole trip. At first I was thinking of selling it in Japan, but I've decided to take it back with me after all.

Linda is a cheerful American lady showing her shining teeth in smiles all during the interview. Her height places her one head above many Japanese. When asked, "what do you want to do now?" she responded, "I just want to get a good long rest ... after that I want to enjoy beautiful Japan". One woman against the 10,000km Pacific Ocean, we would like to give our hearty cheers for her successfully finishing the race.

YAMAHA OUTBOARD MOTORS

General corporate facts of Yamaha outboard motor business

1. Introduction to Yamaha Motor Company, Ltd.

Back in July 1, 1955, Yamaha Motor Company, Ltd. was founded as an independent motorcycle manufacturer after separation from Nippon Gakki, now the world's largest manufacturer of musical instruments.

At first, production was confined to motorcycles, but growth was rapid and by 1960 Yamaha's corporate activities had diversified into other fast growing fields as well. Yamaha has now built a solid reputation for a wide variety of quality products developed and produced on the basis of its long proven technology.

In 1960, Yamaha introduced its first boat and outboard motor on the market. This was the start of what would later become the Yamaha Marine Division. Over the past 20 years, the Division has become Japan's largest manufacturer and supplier of marine engines and FRP boats.

The Division builds more than 300 different types and sizes of FRP boats, including ocean-going fishing boats, pleasure craft of all kinds, sailboats, coastal fishing boats and dozens of special purpose vessels for governmental and commercial use. This wide-selection of Yamaha FRP boats meets the needs of every kind of customer all over the world. The Division also makes and markets a complete line of outboards and marine diesels to power the boats it produces.

Other world famous Yamaha products include snowmobiles, racing karts, golf cars, multipurpose engines, portable generators and water pumps. These products are exported all over the world and have won the trust of millions, for whom they have made life more convenient and more exciting.

In fiscal year 1980, Yamaha recorded total sales of more than ¥501,144,000,000. Approximately 70% of this total came from exports to more than 150 countries, which underscores the quality and value inherent in Yamaha products and the company's ability to meet the needs of vastly different markets. Another important factor contributing to Yamaha's international success is the company's extensive service program which gives customers an extra measure of confidence in their Yamaha products.

Yamaha does more than just export products. It also exports technology and production expertise. Today, Yamaha products are built in dozens of different countries and Yamaha has proven itself a good corporate neighbor around the world.

In addition, Yamaha is enthusiastic about promoting the safe, correct use of its products. Programs to train novice motorcyclists how to ride properly from the start and sailors to handle their boats more safely are just part of this effort. Yamaha sponsors races, operates facilities such as sportslands and marinas, and involves itself in dozens of other ways to help its customers get more enjoyment and value from their Yamaha products.

Yamaha Products

- Motorcycles •Mopeds •Snowmobiles
- Racing karts •Golf cars •Water pumps
- Multipurpose engines •Portable generators
- Tri-motos •Outboard motors
- Marine diesels •Motorboats •Rowboats
- Sailboats •Utility boats •Fishing boats
- Special purpose boats •Pools

Corporate Facts of the Company

Founded: July 1, 1955
 Chairman: Gen-ichi Kawakami
 President: Hisao Koike
 Capital: ¥6,201,335,300.-
 Employees: 10,808
 Net Sales: ¥501,144,000,000.-
 Head Office: 2500 Shingai, Iwata-shi, Shizuoka-ken, Japan

Main Plant: 2500 Shingai, Iwata-shi, Shizuoka-ken, Japan
 • Manufacture of motorcycles and automobile engines.

Other Plants: Hamakita Plant
 1280 Nakajo, Hamakita-shi, Shizuoka-ken, Japan
 • Manufacture of motorcycle engines and components.

Sanshin Industries Ltd.
 1400 Nippashi-machi, Hamamatsu-shi, Shizuoka-ken, Japan
 • Manufacture of outboard motors.

Arai Plant
 3380-67 Muko-jima, Arai-machi, Hamana-gun, Shizuoka-ken, Japan
 • Manufacture of small and medium-size motorboats and sailboats.

Nakaze Plant
 4444 Nakaze, Hamakita-shi, Shizuoka-ken, Japan
 • FRP molding.

Yamaha Gamagori Works Ltd.
 24 Hama-cho, Gamagori-shi, Aichi-ken, Japan
 • Manufacture of large and medium-size pleasure and fishing boats, and special purpose boats.

Yamaha Hokkaido Works Ltd.
 70 Nodao, Yakumo-machi, Yamakoshi-gun, Hokkaido, Japan
 • Manufacture of fishing boats and utility boats.

Yamaha Ofunato Works Ltd.
 1-1 Shimomuko, Ofunato-machi, Ofunato-shi, Iwate-ken, Japan
 • Manufacture of fishing boats and utility boats.

Yamaha Shido Works Ltd.
 1298 Dobayashi, Shido, Shido-cho, Okawa-gun, Kagawa-ken, Japan
 • Manufacture of fishing boats and utility boats.

Yamaha Amakusa Works Ltd.
 5995 Nikendo, Himedo-cho, Amakusa-gun, Kumamoto-ken, Japan
 • Manufacture of fishing boats and utility boats.

Enshu Ltd.
 4888 Takatsuka, Kami-mura, Hamana-gun, Shizuoka-ken, Japan
 • Manufacture of marine diesels, snowmobiles and golf cars.

Showa Works Ltd.
 178 Matsunaga, Numazu-shi, Shizuoka-ken, Japan
 • Manufacture of Karts, portable generators and multipurpose engines. Manufacture of snowmobile engines and golf car engines.

Yamaha Body Works Ltd.
 1012 Hayade-cho, Hamamatsu-shi, Shizuoka-ken, Japan
 • Manufacture of motorcycle frames, pistons and clutches.

Hamakita Industries Ltd.
 1066 Nekata, Hamamatsu-shi, Shizuoka-ken, Japan
 • Manufacture of motorcycle parts.

Kuramatsu Industries Ltd.
 2600 Kuramatsu-cho, Hamamatsu-shi, Shizuoka-ken, Japan
 • Manufacture of motorcycle parts.

Moriyama Industries Ltd.
 1450-1 Mori-machi, Shuchigun, Shizuoka-ken, Japan
 • Manufacture of electric parts of motorcycles, outboards and portable generators.

Shimba-Shibori Industries Ltd.
 224 Miyawaki, Kakegawa-shi, Shizuoka-ken, Japan
 • Assembly of scooters and Tri-moto. Manufacture of monocoque frames and other motorcycle parts.

Sales Companies:
 Yamaha Tokyo Sales Company and 24 others nationwide (all owned 100% by Yamaha)

Overseas Corporations:
 Yamaha Motor Corp. (USA)
 Yamaha Motor Canada Ltd. (Canada)
 Yamaha Motor N.V. (Netherlands)
 Yamaha Motor Do Brasil Ltda. (Brazil)

Joint Ventures:
 Indonesia, Pakistan, Iran, Malaysia, Mexico, New Zealand, Sri Lanka, Colombia and Nigeria.

Fig. 1 Yamaha Motor Co., Ltd. Net Sales

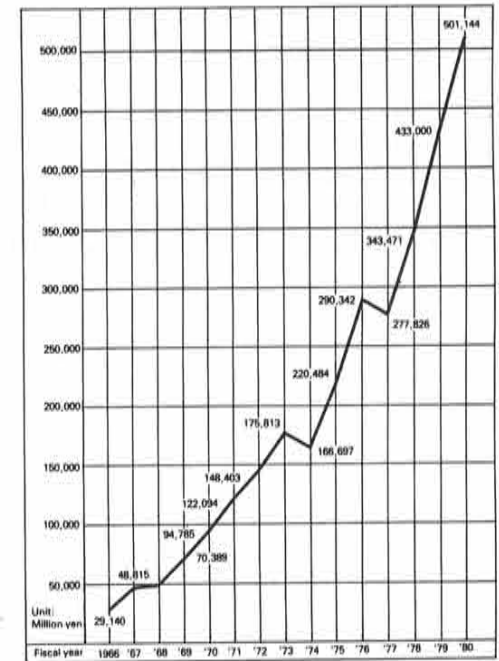
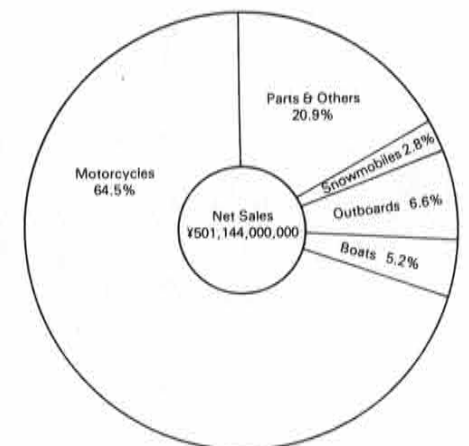


Fig. 2 Sales by Products (%) (May '80 to April '81)



2. Introduction to Yamaha Marine Division

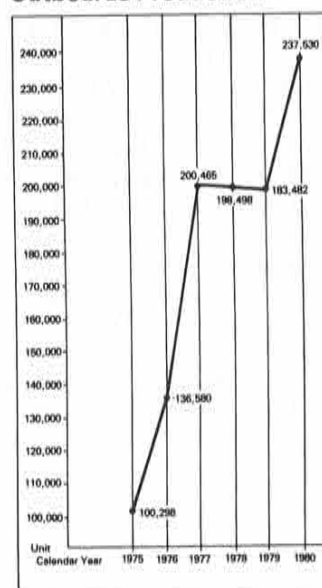
The Marine Division is now Yamaha's largest and most important business group second only to the Motorcycle Division. The Division is positioning itself as a leader in the pleasure and commercial boating field by producing and marketing

a complete line of outboards and marine diesels, together with more than 300 different types and sizes of FRP pleasure boats, sailboats, fishing boats and utility boats. Yamaha is the only manufacturer in the world to produce both marine engines and FRP boats. Yamaha FRP boats have attained new standards of engineering excellence. Yamaha marine engines have been developed on the basis of long proven motorcycle engine technology.

Continuous Growth of the Division

• Outboard Motors
 1960 saw Yamaha produce and market its first outboard motor, the 7hp P-7G/K together with its first FRP boats. Since then, production and sales of Yamaha outboards have continued to expand, along with progressive mechanization of coastal fishing boats and the remarkable growth of water sports in Japan from 1965 on, and also with a sharp rise in export sales from 1972 on. It is important to note that total production reached

Fig. 3 Outboards Production



237,530 units during calendar year 1980. Yamaha outboards have already gained wide acceptance in both pleasure and commercial fields all over the world.

Japan is the largest outboard producing nation with the exception of the United States which makes up about 50% of the world's total outboard production.

Yamaha is the second largest outboard manufacturers in the world.

Yamaha outboards have won this widespread popularity within the short period of 20 years since the first production model was launched on the market. This should be attributed to the fact, that in addition to building quality outboards, Yamaha has persistently striven to promote the correct use of its products backed by an improved after-sale service system.

• **Pleasure Boats**

Yamaha built its first FRP boats in 1960. These were outboard-powered catamaran type runabouts ranging in length from 10' to 21'. About 100 boats were launched on the market, marking Yamaha's modest but successful introduction to FRP boat manufacturing. Full-scale production started the following year.

This was not the first experiment in FRP technology for Yamaha, however. In 1958, Yamaha had developed an advanced FRP archery bow with Nippon Gakki. This experience in the new field encouraged Yamaha to use the material for building boats as well.

Yamaha became the first manufacturer to build and supply truly seaworthy FRP boats in large quantities in Japan, thus sparking the growth of new marine sports enthusiasm.

Today, Yamaha is by far the largest boat manufacturer in Japan and supplies many different types and sizes of FRP pleasure boats. In addition, Yamaha takes a very active role in promoting the spread of pleasure boating by sponsoring boat licence schools, water-ski schools, etc. and operating marine resort facilities.

• **Sailboats**

The first Yamaha sailboat was introduced on the market in 1965. It was a small catamaran dinghy which heralded Yamaha's entry into this highly promising but extremely competitive field. Mass production of these boats started in 1970. Since that year, the Yamaha sailboat range has continued to expand, including such noteworthy racing-cruisers as the Wing of Yamaha (1975 Transpac Single-handed Race Winner); the Yamaha One Tonner; and the Yamaha Quarter Tonner, together

with a number of popular-priced dinghy models, such as the International 470; the Yamaha 15; the Yamaha 14 "Seahopper"; the Yamaha 13 "Cicala" and the Yamaha 11 "Mini-Hopper". At the same time, Yamaha has been enthusiastic about promoting sailing by sponsoring adult and junior yacht schools and races.

• **Fishing and Utility Boats**

In 1965, Yamaha built a 56-foot tuna long-liner claimed to be the largest fishing boat ever made out of FRP in Japan. In 1968, the first open deck FRP boats (utility boats) were built for coastal fishing and seaweed culturing. In 1970, the Yamaha Amakusa Works Ltd. was founded as Yamaha's first plant specializing in fishing and utility boats.

Now the Yamaha fishing and utility boat range consists of nearly 300 different types and sizes of boats which are built at five regional plants. Each of these plants specializes in the type of boat most often used in its locality. The combination of a Yamaha FRP boat and a Yamaha outboard also contributes greatly to the improvement of productivity in fishery and transportation operations.

• **Marine Diesels**

Production of Yamaha marine diesels started in 1976. Yamaha marine diesel-powered FRP fishing boats combine both high, dependable performance and low fuel consumption. The combustion chamber features a direct fuel injection system, pre-combustion system or a swirl combustion system so that high thermal efficiency is ensured at all times. High precision clutch and marine gears enable the operator to select the best reduction ratio for each operation requirement. Sales are now constantly increasing both here and overseas.

• **Special Purpose Boats**

Yamaha's advanced FRP technology is utilized for the manufacture of larger ocean-going fishing boats and various special purpose boats as well. These special purpose boats include maritime patrol boats, self-righting rescue boats and a number of other specialized types.

• **Overseas Production of Yamaha FRP Boats**

Yamaha FRP boats are built in the following countries as well, with Yamaha's technical cooperation and assistance:

- Mexico • Colombia • Argentina
- Venezuela • Sri Lanka • Nigeria

Now Yamaha outboards are fast increasing their share in the pleasure field as well as being the leaders in the commercial field.

Affected by a drastic rise in oil prices during 1978 to 1979, export sales went into a temporary slump. From 1980 on, things have begun to take an upturn once again.

wasted. Yamaha's objective is to fill each cylinder with exactly the right amount of atomised fuel at exactly the right time to meet exactly the right strength of spark.

• **Priority two: Quiet, pleasing engine sound**

Exhaust noise receives considerable attention. More efficient, quieter mufflers come from Yamaha's development people with virtually every new model. Tuning is very important, too, because the proper harmonics are part of pleasing exhaust sound.

Mechanical noise in outboards has been reduced to below the level of consciousness. Most people do not realize that their outboards produce mechanical noise. Still, Yamaha's researchers find new ways to eliminate what little mechanical noise remains ... substituting ball bearings with roller bearings, designing new gear configurations, and putting the gear sets into a completely enclosed oil bath.

• **Priority three: Make the lightest, strongest, most dependable outboard**

An outboard must run full speed in a most hostile environment for hours on end. So much of Yamaha's research goes into fighting corrosion. Salt, water, heat, dirt ... whatever can have an adverse effect on motor performance is used in prototype testing. And every year, Yamaha finds a better way to keep devil corrosion from its outboards.

• **Priority four: Overall improved outboards**

Research and development efforts are continued to bring overall improved outboards in both pleasure and commercial fields, with the particular aim of expanding the pleasure range and of offering better fishery-oriented models including kerosene outboards.

Technical points for outboard design

1. **Portability**

- Compact, lightweight

Every Yamaha outboard features this advantage that brings lower power-to-weight ratio and easier handling.

- Handgrips on four sides

The Yamaha 4 and Yamaha 5 models have handgrips on four sides for extra carrying ease.

2. **Smoother engine start**

- C.D.I. system

Positive ignition spark is supplied to make each engine start smoother.

- Recoil hand starter

Operation is easy and engine starts smoothly.

- Choke type starter

The proper amount of air/fuel mixture is easily obtained in accordance with a change in atmospheric temperature.

3. **Better trolling performance**

- Specially designed combustion chamber

Combustion chamber features a special design for surer ignition and higher scavenging efficiency. Performance is always stable and reliable over the low speed range.

- C.D.I. system

Strong spark is supplied even at low speed.

- Flywheel mass

This is increased for trolling-oriented models.

- Fuel recirculation system

This system sends unburned fuel back to the cylinders for effective reburning so that trolling performance is increased over the low speed range.

- Improved port arrangement

4. **Less fuel consumption**

- 1 : 100 oil/fuel ratio

(European market only)

This has decreased oil consumption by 50%.

- V-type reed valve intake system

This prevents blow-back and saves fuel.

- Energy advisor

This is a new fuel saving device on the throttle lever. The operator can see at a glance whether an increase in fuel consumption is offset by a corresponding increase in speed.

5. **Better maneuverability**

- Multi-stage tilting
- Large-sized rubber damper
- Full pivot/full shift remote control as standard or optional equipment
- All steering equipment are grouped together.

6. **Higher safety**

- Full cowling
- Kill switch
- Electronic devices to prevent overheating and over-revving
- A device to prevent a fishing line from winding itself round the propeller boss.
- Tilt lock device

7. **Lower noise level**

- Large-sized intake silencer
- Dual exhaust system
- Bevel gears
- Through-the-prop. Exhaust
- Water-cooling system

8. **Anti-waterpollution measures**

- 1 : 100 oil/fuel ratio (European market only)
- Fuel recirculation system to send unburned fuel back to the cylinders instead of allowing it to escape into the water.

9. **Higher power output**

- Dual exhaust system
- Improved port arrangement

10. **Increased reliability and durability**

- Triple coating
- Large-sized water pump
- Anti-corrosive zinc anodes
- Water-cooled engine
- Thermostat/pressure valve cooling system
- Carefully selected anti-corrosive material
- Virtually maintenance-free C.D.I. system

11. **Better acceleration**

- V-type reed valve induction carburetor system
- Ample displacement

12. **Extra operation convenience**

- A wide variety of optional equipment
- A device for cruising in shallow waters
- Fuel tank is available in a separate or built-in type.

As for the low operating cost, Yamaha has always been ahead because many markets have been in countries with high fuel prices. But on more ways Yamaha went one step further to cut operating cost. At present, there are 3 models in the line which run on kerosene rather than on gasoline. In some countries, kerosene is widely available and for a much lower price than gasoline, so consequently, Yamaha puts all its experience together to market outboards specially for kerosene.

Together with gasoline, lubrication oil is also consumed by outboards and mostly in a mixing rate of 50 liters petrol to 1 liter oil. But, in the Europe market where the average quality level of the lubrication oil is good, born out of the desire to protect the environment and to cut operation cost, and Yamaha used its engineering skill to produce an outboard which used an absolute minimum of oil. It resulted in a mixing rate of 100 liters gasoline to 1 liter oil, introduced in 1977 and so far a "Yamaha exclusive" in this market.

Yamaha's future policy will be to make outboard motors for the individual customer, outboard motors that perform better, because they are designed with a specific type of boat in mind. Yamaha engineering starts at the base, on the water, where the outboard motor will be used. This means: customized engines that combine optimum performance with maximum efficiency.

Continued on page 4

3. Export Sales of Yamaha Outboard Motors

In 1980, Yamaha produced 237,530 outboards, 85% of which were exported worldwide.

At first, exports were confined to some European countries (mostly, Holland) and Southeast Asia but over the past 20 years Yamaha outboards have gained wide acceptance all over the world.

4. General Development Policy of Yamaha Outboard Motors

Each and every Yamaha outboard is designed and engineered with the following points in mind.

• **Priority one: Fuel economy**

Take the combustion chamber for example. Thousands and thousands of possibilities have been tested and computer analyzed. Optimum shapes are obtained at the moment, but the search for a better one goes on.

Fuel distribution within an engine can affect fuel consumption considerably. The more evenly it is distributed, the less is

YAMAHA OUTBOARD MOTORS

The technical features of '82 new models

The Yamaha 9.9/15 Increased Trolling Performance & Quieter Operation

Compact portability, ease of handling, safety of operation and fuel economy ... these are the essentials to every quality outboard. But a good boatman demands even more of his outboard to make his marine life as pleasurable and exciting as possible. Yamaha's new lightweight twins, the 9.9 and the 15 have not only these advantages inherent in Yamaha outboards, but also some truly noteworthy new product features, such as increased trolling performance and quieter overall operation. Hours and hours of low-speed trolling can put a tremendous strain on an engine. And, nothing could be more unwelcome than a noisy outboard that sputters and lurches along. C.D.I. system perform better even at low-rev running. The newly designed combustion chamber-works to prevent plug fouling and gives smoother, stronger low-end torque, along with an improved carburetor system and adoption of a wide gap ignition plug. In addition, the inertia of the increased flywheel mass keeps the engine running more smoothly. Intake silencers and a large-sized exhaust muffler keep engine noise to a minimum — whether the engine is trolling at idle or

cruising at medium speed.

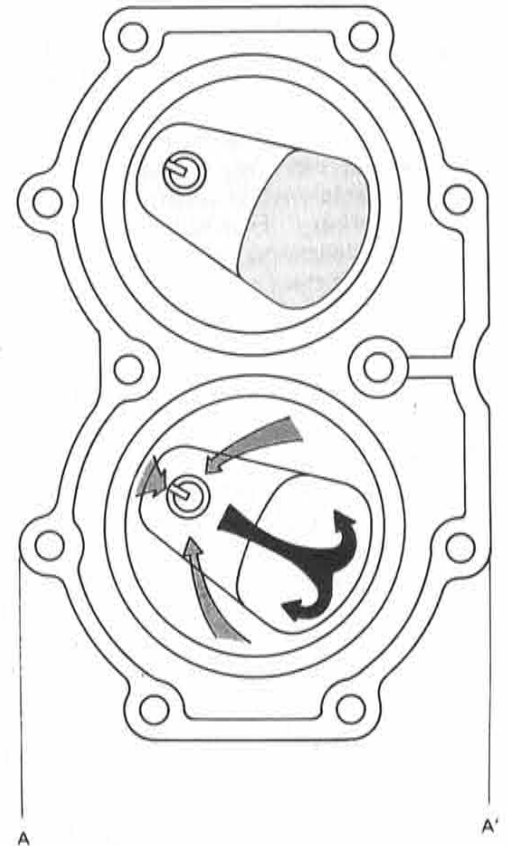
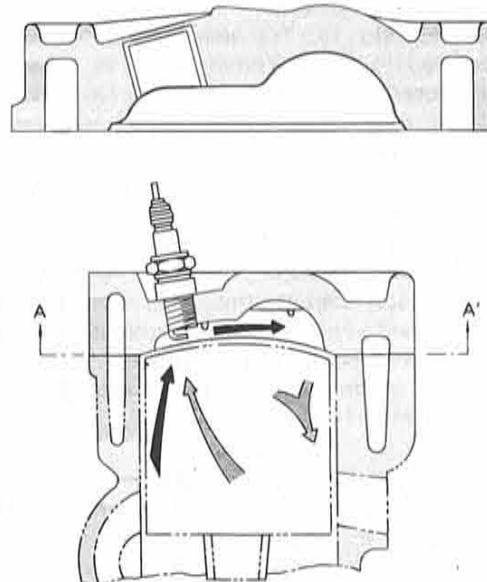
Yamaha Lightweight Twins' Technical Superiority

In a 2-stroke engine, the Schnürle scavenging system is a proven device which discharges burned gases quickly from the cylinder so that stable combustion efficiency is obtained. But, even in this system, the fresh charge of air/fuel mixture sometimes fails to discharge burned gases quickly and smoothly enough over the low speed range as the speed of mixture stream is not increased.

This inevitably spoils ignition efficiency, resulting in unstable combustion. On the new Yamaha, the combustion chamber features a special configuration as shown on Fig. 1. As you can see, the sub combustion chamber with an ignition plug is provided on the opposite side of the exhaust port. The main combustion chamber is provided close to the exhaust port. In this newly designed combustion chamber, the fresh charge of air/fuel mixture is induced into the sub combustion chamber at high speed through both main and sub transfer ports. Ignition is sure

even over the low speed range and flame propagation is also quick and positive for perfect combustion of unburned gases remaining in the main combustion chamber.

Fig. 1 Specially shaped combustion chamber



5. Production System of Yamaha Outboard Motors

Outboard motors must be able to withstand all the hard conditions that will be encountered in their long-life use, while they must also retain their long-lasting dependable performance. Therefore, the stricter the inspections are before delivery, the greater the dependability becomes. In short, outboards must be of extra high quality based on a higher level of technology than engines used on land. Yamaha's outboard production system is completely integrated, incorporating ultra-modern facilities and equipment, to manufacture and market the world's top quality products.

• Small Component Processing, Testing and Storage

An initial prototype is made after the design has been finalized and tested. Further improvements are introduced to this prototype through a number of experiments. Then, a pre-production model is completed. A Single outboard is made from more than 12,000 component parts. All these items are stored in a completely automated warehouse after careful inspections have been made of every single one. And then, they are fed to the assembly line with precise timing by means of a parts supply list controlled by computers.

• Machine Processing

The motor's main parts and drive parts are machine processed and heat treated. There are over 500 pieces of machinery, such as gear cutters, grinders, milling machines, friction welding machines, etc. The most vital parts for outboards are produced to the strictest standards of

quality at this stage.

• Painting

A triple-coated for anti-rust treatment, consisting of under-coating, corrosion-proof painting and finish coating, is given to every motor so as to assure trouble-free operation in every kind of water. Automatic electrostatic painting machines assure that all motors are given the best hard-wearing finish in the handsome Yamaha style.

• Assembly of Drive System

Drive shafts, gears and other components are assembled after stringent tests and measurements are completed.

• Engine Assembly

Pistons, crankshafts, cylinders, etc. are assembled into complete engines. All components are thoroughly inspected and adjusted before assembly.

• Final Assembly

Power units and drive sub-assemblies go from the finish painting stage to the final assembly line for complete outboards.

• Packing and Delivery

All outboards are carefully inspected for appearance. Then, they are packed in such a way that they can be shipped over long distances without damage.

6. After-sale Service System of Yamaha Outboard Motors

Now Yamaha has four overseas corporations and several overseas liaison offices. In addition, Yamaha closely cooperates with its importers in 110 countries to make sure that every motor sold is used in the best operative condition.

Besides, specific emphasis is given to the improvement of the before-sale service system worldwide.

Yamaha's before-sale service activities include:

- Active consultation in each area on vessel types that best meet local needs for fishing and marine transportation.
- Offering technical know-how, in-

cluding how to choose engines, oils, propellers, etc.; how to mount engines in vessels; advice on fishing methods and gear.

- Instruction of local importers and dealers through audio-visual methods on how to set up service and parts supply systems.

The Yamaha Parts Center which is located close to the head office building at Iwata serves as the headquarters of service parts supply activities. All incoming and outgoing parts are computer controlled.

7. Yamaha Outboard Motor line-up

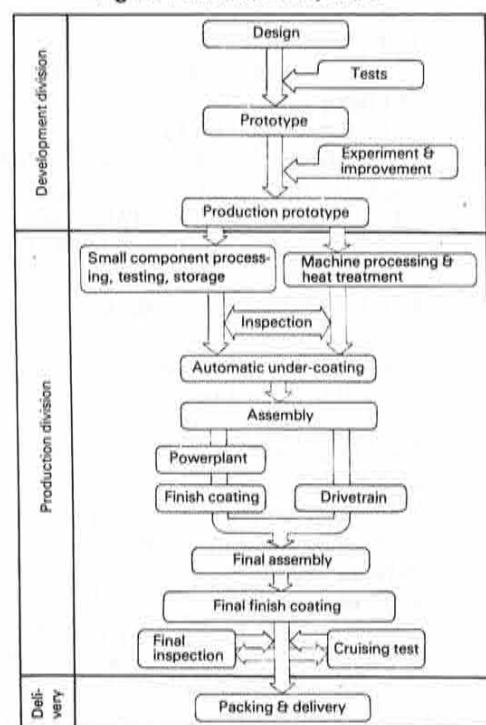
The operating conditions of outboard motors differ from one locality to another. With this in mind, Yamaha has persistently striven to meet individual local needs as much as possible. Yamaha has completed its wide selection line-up by taking all conceivable operating conditions into consideration. The results are:

- Standard series consisting of 19

models from 2HP to 115HP

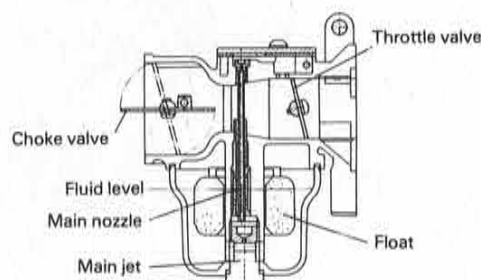
- Enduro series consisting of 7 models
 - Kerosene series consisting of 3 models
- Enduro series models are intended for heavy-duty use, such as transportation, etc. Kerosene series models have been developed for economy-minded people as kerosene is much less expensive than gasoline.

Fig. 4 Production system



The carburetor system has also been improved. The point is an altered slow jet position, resulting in smoother mixing of air and fuel for precise atomization. In addition, both main and slow jets are arranged in the same direction to prevent undesirable mutual interference so that the amount of mixture is smoothly increased when speed is increased from low to medium. The virtually maintenance free C.D.I. system supplies a strong spark for sure ignition at all times even over the low speed range. This also helps to improve trolling performance. The newly adopted wide gap ignition plug prevents oil fouling and the stronger spark can make up for a leaner air/fuel mixture.

Fig. 2 Carburetor's structure

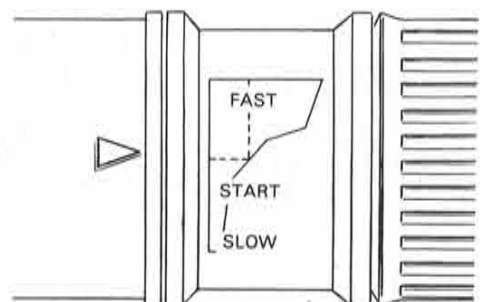
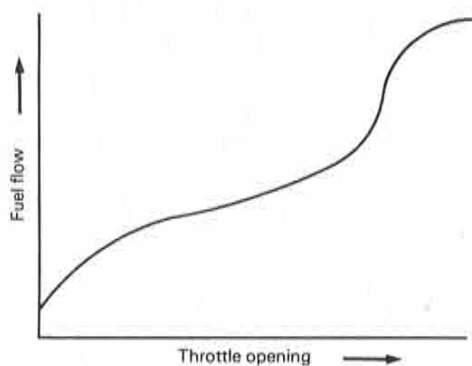


In order to ensure smoother, quieter operation, the 246cc engine features a number of significant improvements. Particularly, on the 9.9, those improvements also reflect on the fuel economy and show, for this engine, up to 30% better consumption results, depending on the engine speed.

Now all twist-grip throttle type Yamaha outboards feature the revolutionary energy advisor to indicate ideal fuel consumption levels. It enables the operator to see at a glance whether an increase in fuel consumption gives a corresponding increase in speed.

A graph showing the relation between throttle opening and fuel flow is printed on the throttle lever.

Fig. 3 Energy advisor



The inertia moment of the increased flywheel mass keeps changes in the crankshaft's revolution speed to a minimum over the low speed range. This keeps the engine running smoothly and with a minimum of vibration.

Exhaust noise is effectively reduced by means of the newly designed 2-stage expansion chamber type silencer to take the place of a conventional single expansion chamber type silencer. This is an advanced silencing system arranged within a limited space. As shown on Figs. 4-5, contraction pipes (2), (4) and (6) link both expansion chambers to multiply the silencing effect. Cooling water is always flowing into expansion chamber (3) to reduce the energy of the exhaust gas. Contraction pipes (2) and (6) are inserted

deep into expansion chambers with the aim of producing a resonant silencing effect (over a specific frequency range) in addition to normal expansion silencing effect. Tail pipe (6) is designed to let the exhaust noise go in a constant direction. The idle hole which faces the water surfaces arrests the spread of exhaust noise.

Fig. 4 Multi-stage silencer

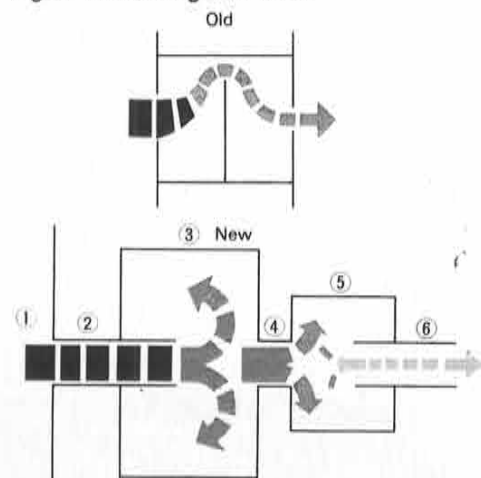
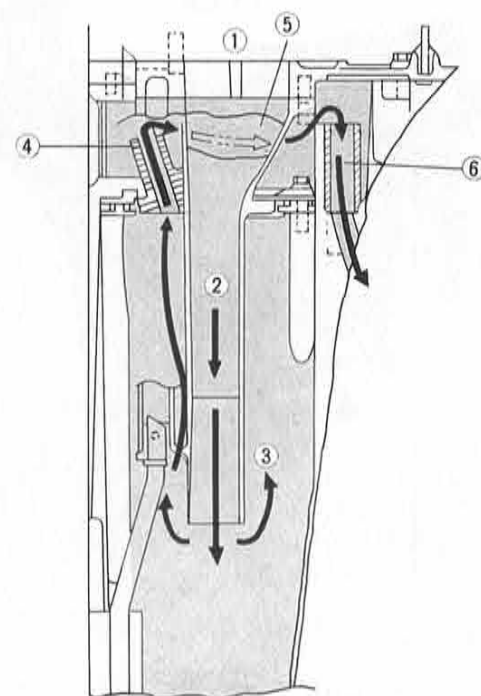


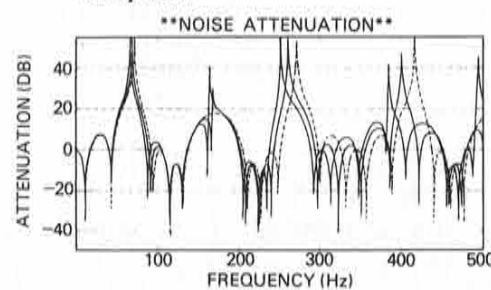
Fig. 5 Exhaust gas passage



Thorough simulation tests have been repeated to obtain the optimum layout configuration and dimensions for this new silencing system.

Below is an example of a graphic display:

Fig. 6 Analysis of silencing effect by computer



Gear friction noise has been reduced by means of spiral bevel gears which take the place of conventional straight bevel gears. By this method, gear and pinion mesh more smoothly and gently because the spiral bevel gear has a larger number of cogs.

Other Technical Features

Along with these refinements we have mentioned, all the engines are built to Yamaha's high quality standards. Each new feature adds to the fun and excitement of boating. The special advantages of the new Yamahas include:

Fuel Economy

- The V-type reed valve intake system is another advantage for the new models. Valve timing corresponds to changes in the pressure of the air/fuel mixture in the crankcase. The intake stroke has been extended so that blow-back is prevented resulting in a denser

air/fuel mixture. This increases combustion efficiency greatly and improves torque characteristics especially over the low to medium speed range.

- 1 : 100 oil/fuel mixture for better fuel economy. (European market only)
- Dual exhaust manifold system for better exhaust efficiency. This also controls back pressure to prevent blow-out of fresh air/fuel mixture.

Convenient Portability

- A carrying handle is integrated into the bracket.

Easy Handling

- Both manual type starter and electric type starter are available. A remote control system is a custom option. Vertical pull starter and top shifter are also custom options for sailboating.

- Yamaha-original dualthrust propeller (optional)

This system is designed to lead the stream of exhaust gas in two directions to prevent the pressure of gas from decreasing the force of propulsion. It adds 60% more power in reverse and 10% when going forward. Suitable for sailboats and displacement type boats.

- Powerful 12V/80W lighting coil (std.) for charging a battery along with a rectifier (optional).

Higher Reliability

- Heavy duty water pump.
- Thermostat controlled watercooling.
- Electronic CD ignition.

Miscellaneous

- Improved design of top cowling; refined styling; protected recoil starter grip, etc.

SPECIFICATIONS: YAMAHA 9.9

Max. prop. shaft power within speed range	7.1 KW (9.7 HP) AT5,000 R/MIN
Prop. shaft power at middle of speed range	7.1 KW (9.7 HP) AT5,000 R/MIN
Cylinders & engine type	2-stroke 2-cylinder in-line
Tilting	4 positions
Full throttle rev/min range	4,500 ~ 5,500 R/MIN
Displacement	246 cm ³
Bore x stroke	56 x 50 mm
Ignition system	Electronic C.D.I. breakerless
Starting system	Automatic rewind handstarter/Electric start version and electric starter kit available
Throttle control	Twist-grip
Carburetion	Single carb with fixed jets
Controls	Full gear shift/Remote control available
Fuel (USE 2 STAR PETROL ONLY)	Premixed oil-petrol 1 : 100
Fuel tank capacity	Separate tank 24 litres
Gear ratio	13 : 27
Standard propeller (blade x diameter x pitch)	3 x 234 x 229 mm (3 x 9-1/4 x 9 in.)
No. of applicable propellers	7
Weight	37.5 kg
Transom height	Standard 380 mm (15 in.) Long 510 mm (20 in.) Super ultra long 637 mm (25 in.)
Lighting coil	Standard 12V 80W
Adjustable throttle friction	Standard
Adjustable steering friction	Standard
Starter safety device	Standard
Shallow water drive	Standard

*Specifications shown here are those for European models.

*The KW(HP) data in these specifications are based on the ICOMIA 28 standard.

SPECIFICATIONS: YAMAHA 15

Max. prop. shaft power within speed range	10.7 KW (14.5 HP) AT5,000 R/MIN
Prop. shaft power at middle of speed range	10.6 KW (14.4 HP) AT5,000 R/MIN
Cylinders & engine type	2-stroke 2-cylinder in-line
Tilting	4 positions
Full throttle rev/min range	4,500 ~ 5,500 R/MIN
Displacement	246 cm ³
Bore x stroke	56 x 50 mm
Ignition system	Electronic C.D.I. breakerless
Starting system	Automatic rewind handstarter/Electric start version and electric starter kit available
Throttle control	Twist-grip
Carburetion	Single carb with fixed jets
Controls	Full gear shift/Remote control available
Fuel (USE 2 STAR PETROL ONLY)	Premixed oil-petrol 1 : 100
Fuel tank capacity	Separate tank 24 litres
Gear ratio	13 : 27
Standard propeller (blade x diameter x pitch)	3 x 234 x 267 mm (3 x 9-1/4 x 10-1/2 in.)
No. of applicable propellers	7
Weight	37.5 kg
Transom height	Standard 380 mm (15 in.) Long 510 mm (20 in.) Super ultra long 637 mm (25 in.)
Lighting coil	Standard 12V 80W
Adjustable throttle friction	Standard
Adjustable steering friction	Standard
Starter safety device	Standard
Shallow water drive	Standard

*Specifications shown here are those for European models.

*The KW(HP) data in these specifications are based on the ICOMIA 28 standard.

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9.9



15



40

YAMAHA 2



YAMAHA 5C/CS



YAMAHA 8



YAMAHA 25



YAMAHA 55



YAMAHA 85



YAMAHA 4A/AC/AS



YAMAHA 6



YAMAHA 20



YAMAHA 30



YAMAHA 75





60



115

YAMAHA ENDURO 20/25

YAMAHA ENDURO 40

YAMAHA ENDURO 75

YAMAHA 15AK



YAMAHA ENDURO 15



YAMAHA ENDURO 30



YAMAHA ENDURO 55



YAMAHA 8BK

YAMAHA 25CMK

YAMAHA OUTBOARD MOTORS

The Yamaha 40

Quick Response and Outstanding Fuel Economy

Much of Yamaha's reputation for outstanding outboards has come from the Yamaha 40. It has long proved its superior performance and quality in diverse boating fields all over the world. Now this tough, quality model is further refined for a wide range of uses, with a number of significant improvements to its sturdy engine.

Acceleration is sharp enough to satisfy even professional water skiers but fuel economy is not sacrificed. With the new Yamaha 40, this is not a contradiction. Yamaha has achieved this combination by improving the engine and related components.

Better acceleration has been obtained by adopting the following improvements:

- (1) Newly designed combustion chamber
- (2) Altered port timing
- (3) Improved exhaust system

Fuel consumption has been reduced by introducing the following improvements:

- (1) A new port design
- (2) Improved carburetion system

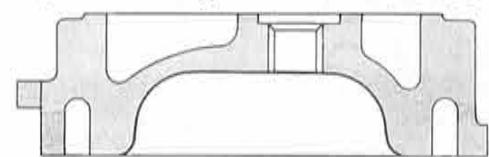
The core of these improvements is a newly adopted twin-carb system. Along with this carb system, a balance tube is also adopted to help improve the intake function of both cylinders. These improvements are aimed at not only torque increase over the low to medium speed range, but also better fuel economy that is essential in today's pleasure boating.

Now combustion is smooth and stable over the entire speed range as a result of improved filling efficiency of air/fuel mixture. In addition, a 10% improvement in fuel economy has been attained.

Powerful Twin 592cc Two-Carb Engine & Advanced Safety Devices

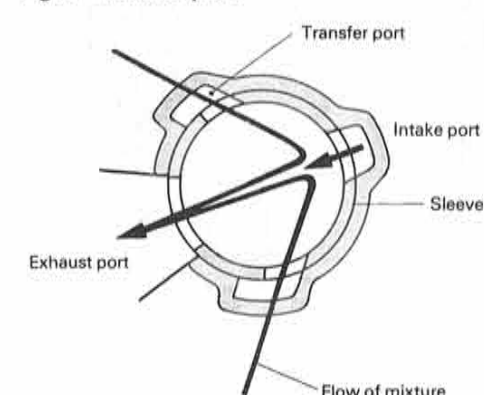
The new two-carb system is a great advantage of this new model. Along with the adoption of this new system, the Yamaha 40 features a new bathtub type combustion chamber instead of a conventional semi-vortex type one. This improvement allows the air/fuel mixture to fill the chamber more quickly and smoothly so that combustion efficiency is improved and power output is increased.

Fig. 1 Bathtub type combustion chamber



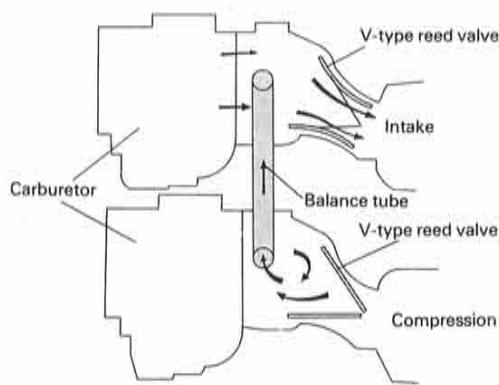
The transfer ports have also been redesigned in an effort to bring torque increase and fuel economy together. The transfer port on the sleeve side is smaller than the transfer port on the cylinder block side. By this method, the stream of fresh air/fuel mixture is given a more effective direction for scavenging as well as increasing its speed so that blow-out is minimized and scavenging efficiency is greatly increased for the maximum of combustion efficiency and better fuel economy.

Fig. 2 Transfer port



The one-carb-per-cylinder system has greatly increased intake efficiency. This leads to more torque and more power. In an effort to improve fuel economy as well, an intake manifold balance tube links the upper and lower cylinders for intake pressure stabilization. Due to this improvement, each cylinder is supplied with the proper amount of air/fuel mixture in accordance with the engine's speed.

Fig. 3 Balance tube on intake manifold



In addition, the exhaust manifold has also been redesigned. The smaller bore but longer contraction tube helps to increase pulsatory effect in the expansion exhaust tube. This is aimed at torque increase over the medium speed range.

Safety devices are also added. Now the C.D.I. system incorporates such noteworthy new electronic safety devices as an over-revolution limiter and overheat warning for the sake of extra operation safety.

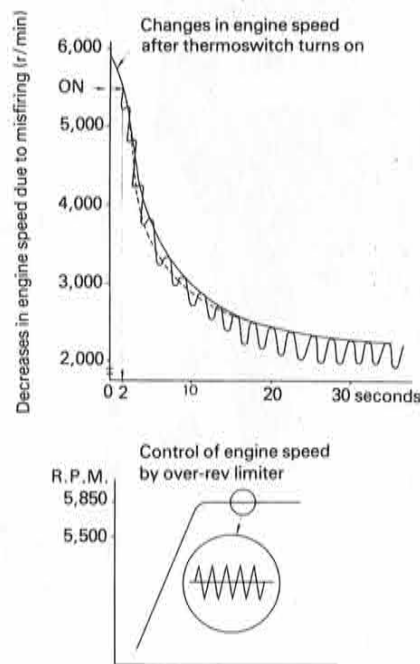
Over-revolution Limiter

This device works to keep the engine from over-revolving by keeping the speed below a specific rpm level at moments when engine load is suddenly changed, for example, when a boat jumps.

Overheat Warning

This device works to gradually lower the engine's speed to a safe level when the cylinder temperature has risen above a specific level. For example, cylinder temperature would rise if the intake of cooling water were blocked by a piece of vinyl or seaweed. This temperature rise is sensed by the thermoswitch on the cylinder-head and relayed to the electronic ignition unit, which reduces the engine speed automatically to a safe level to protect the engine from damage. At the same time, a red light on the bottom cowling warns the operator about the overheating.

Fig. 4 Overheat warning device/over-rev limiter



Other Technical Features

Other technical features include:

Fuel Economy

- Better fuel economy by means of a fuel recirculation system and V-type reed valves.
- Energy advisor on manual handle type.

Anti-pollution Measures

- 1 : 100 oil/fuel mixture. (European market only)
- Oversize muffler, intake silencer and lower case apron for quieter operation.
- Through-propeller exhaust system for better silencing effect.

Reliability

- Better lubrication for big and small end bearings.
- Excellent power-to-weight ratio.
- Die-cast cylinder with iron sleeves; thermostat-controlled water cooling and heavy-duty water pump for better overall reliability.
- Electronic C.D.I. system.

Comfort and Convenience

- Powerful 12V/80W lighting coil for on-board electrical needs.
- Minimized vibration through big capacity rubber mounts.
- Electric starter available.
- Refined top cowling (electric starter model).

SPECIFICATIONS: YAMAHA 40

Max. prop. shaft power M ⁻¹ within	29.4 KW (40 HP) AT5,700 R/MIN
speed range	
Prop. shaft power at middle of	29 KW (39.4 HP) AT5,350 R/MIN
speed range	
Cylinders & engine type	2-stroke 2-cylinder in-line
Tilting	5 positions
Full throttle rev/min range	5,000 ~ 5,700 R/MIN
Displacement	592 cm ³
Bore x stroke	75 x 67 mm
Ignition system	Electronic C.D.I. breakerless
Starting system	Automatic rewind handstarter/ Electric starter version available
Throttle control	Remote control/Tilter handle available
Carburetion	Double carb fixed jets
Controls	Full gear shift/Remote control available
Fuel (USE 2 STAR PETROL ONLY)	Premixed oil-petrol 1 : 100
Fuel tank capacity	Separate tank 24 litres
Gear ratio	13 : 26
Standard propeller	Short shaft 3 x 286 x 356 mm (3 x 11-1/4 x 14 in.) Long shaft 3 x 298 x 305 mm (3 x 11-3/4 x 12 in.)
(blade x diameter x pitch)	
No. of applicable propellers	13
Weight	69.0 Kg
Transom height	Standard 380 mm (15 in.) Long 510 mm (20 in.)
Lighting coil	Standard 12V 80W
Adjustable throttle friction	Optional
Adjustable steering friction	Standard
Starter safety device	Standard

* Specifications shown here are those for European models.

* The KW(HP) data in these specifications are based on the ICOMIA 28 standard.

The Yamaha 60

Big Power Twin Features Outstanding Fuel Economy As Well As Higher Power Output

(The new technical features shown below are exclusive to the European version.)

The Yamaha 60 has been designed and engineered under a new product concept that it should be the first low fuel consumption type 2-stroke model ever built in the world. The most important aim is to find a way to utilize all kinds of technical features inherent in a 2-stroke engine while developing an entirely-new low fuel consumption type 2-stroke model. Yamaha's research and development efforts have been concentrated on the following points:

- (1) To analyze and assort the great store of 2-stroke technical data accumulated through many years of research and development.
- (2) Assort all technical data by categories to see that each category is further improved.
- (3) To find an interrelation between different categories that will give the best possible compromise between them.

This process will be explained in detail in the next chapter.

A New Design Concept for The Yamaha 60

With this new model, the 60HP engine's displacement is 798cc. This means the engine has plenty of performance reserve that can be directed toward the improvement of acceleration and fuel economy. The most important aim was to find the best possible interrelation between power output and fuel consumption. The engine has a maximum power output of 60HP. The initial fuel consumption target was set at 300 gr/HP/h or better (270 gr/HP/h was eventually attained). In principle, fuel economy is obtained by decreasing the amount of air/fuel mixture but this method is inevitably accompanied by a loss in per-liter power output. Much more

Careful setting is needed to bring both high performance and fuel economy together.

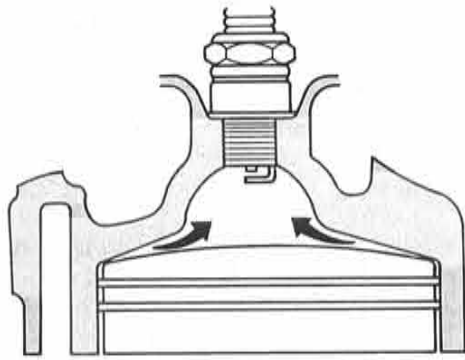
Yamaha has adopted the following method:

- (1) Newly designed combustion chamber for better combustion efficiency.
 - (2) Improved scavenging system.
 - (3) Improved exhaust system.
- and in addition,
- (4) Improved cooling system.
 - (5) Improved lubrication system.

Combustion

- Newly designed combustion chamber
Optimum chamber configuration is ensured and squash area is increased for better overall combustion efficiency.

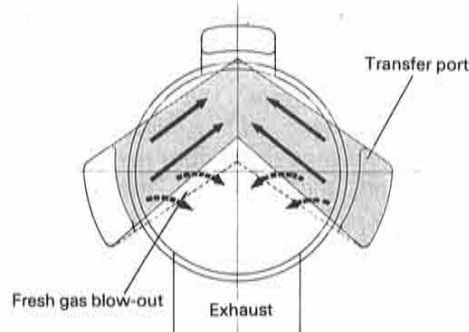
Fig. 1 Newly designed combustion chamber and squash



Scavenging

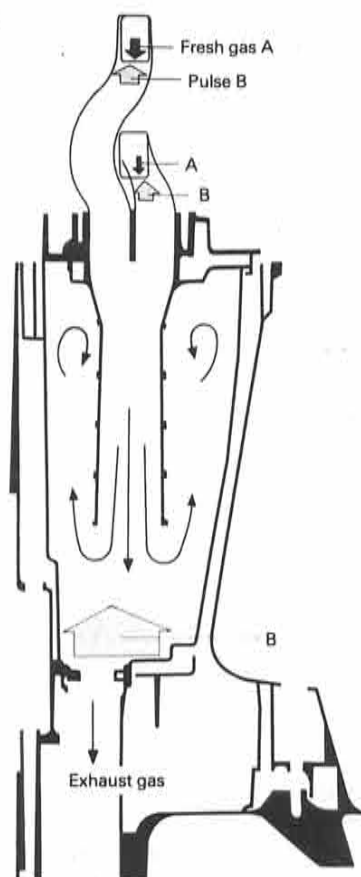
- Newly designed transfer passage
This design induces a fresh charge of air/fuel mixture more quickly and smoothly to minimize blow-out and increase scavenging efficiency.
- Altered scavenging and exhaust timing
Scavenging and exhaust timing are changed so that blow-out is prevented and combustion efficiency is increased.

Fig. 2 Transfer port



New: Fresh air/fuel mixture follows the route indicated by the solid lines.
Old: Fresh air/fuel mixture follows the route indicated by the dotted lines.

Fig. 3 Exhaust system



Exhaust

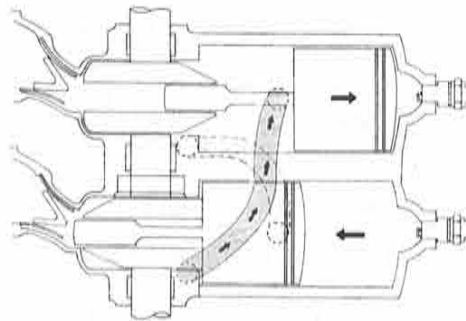
- Improved exhaust passage on cylinder
This lets exhaust gases go more smoothly and quickly to increase power potential.
- Expansion pipe for better exhaust efficiency and higher power output, over-size muffler for better silencing effect; contraction pipe on muffler side for blow-out prevention by means of exhaust pulsation.

The above improvements have increased fuel economy. But, this has been accompanied by another problem, that is, poorer cooling effect for the power-unit. Yamaha has taken the following measures to provide a solution to this problem:

Cooling/Lubrication

- Cylinder's cooling water passage
The newly designed water jacket protects both cylinders against a rise in temperature.
- Piston
Materials and shape are well selected for better heat conductivity.
- Forced lubrication
Forced lubrication is applied around the exhaust port, which is exposed to high temperatures, by means of the stream of fresh air/fuel mixture utilizing the difference in pulse timing in the twin crankcase.

Fig. 4 Forced lubrication



When the stroke is in above position, the air/fuel mixture follows the route indicated by solid lines. When piston positions are inverted, the dotted line route is taken.

Hydro Tilt Lock System

Newly designed feature of the Yamaha 60 is its compact motor bracket featuring a hydraulic cylinder which combines several important functions. It holds the engine in tilt down position, by simply closing a small lever attached to a hydraulic valve. If the lower unit of the engine hits an obstacle or the boat runs into shallows, the valve releases automatically with the force of impact and the engine tilts up. To prevent the engine from dropping down too quickly, which may damage the boat's transom, the cylinder works as a shock absorber and moves the engine gently back into running position. When tilting the engine by hand, the cylinder is filled with pressured gas, which reduces tilting weight significantly. This multi-functional cylinder is integrated in the mounting bracket and can be replaced by an electric hydraulic trim/tilt installation available as optional equipment.

Overheat Warning

This device works to lower the engine's speed to a safe level gradually when the cylinder temperature has risen above a specific level. For example, cylinder temperature will rise if the intake of cooling water is blocked by a piece of vinyl or seaweed. This temperature rise is sensed by the thermoswitch on the cylinder-head and relayed to the electronic ignition unit, which reduces the engine speed automatically to a safe level which will protect the engine from damage. At the same time, an audible alarm in the remote control unit warns the operator about the overheating.

List-up of Features

- Engine displacement 796cc.
- Through-prop exhaust and special baffler reduce noise.
- Standard electric starting with the start panel in remote control box.
- High performance through V-type reed valves, Schnürle scavenging and dual exhaust ports.
- 1 : 100 oil/fuel mixture.

(European market only)

- Over-revolution limiter.
- Overheat warning.
- Gas pressure supported tilt cylinder.
- Special coatings, zinc anodes reduce corrosion.
- Power trim and power tilt (option).
- Options that include full instrumentation and choice of propellers.

SPECIFICATIONS: YAMAHA 60

Max. prop. shaft power M ⁻¹ within	42.7 KW (58.0 HP) AT5,500 R/MIN
speed range	
Prop. shaft power at middle of	40.5 KW (55 HP) AT5,000 R/MIN
speed range	
Cylinders & engine type	2-stroke 2-cylinder in-line
Tilting	5 positions
Full throttle rev/min range	4,500 ~ 5,500 R/MIN
Displacement	798 cm ³
Bore x stroke	84 x 72 mm
Ignition system	Electronic C.D.I. breakerless
Starting system	Electric starter
Throttle control	Remote control
Carburetion	Double carb fixed jets
Controls	Full gear shift remote control standard
Fuel (USE 2 STAR PETROL ONLY)	Premixed oil-petrol 1 : 100
Fuel tank capacity	Separate tank 24 litres
Gear ratio	14 : 24
Standard propeller	Short shaft 3 x 279 x 381 mm (3 x 11 x 15 in.)
(blade x diameter x pitch)	Long shaft 3 x 292 x 330 mm (3 x 11-1/2 x 13 in.)
No. of applicable propellers	13
Weight	89.0 Kg
Transom height	Standard 380 mm (15 in.) Long 510 mm (20 in.)
Lighting coil	Standard 12V 80W
Starter safety device	Standard

*Specifications shown here are those for European models.
*The KW(HP) data in these specifications are based on the ICOMIA 28 standard.

The Yamaha 115

Newest Entry in the Big-Power Class

With the introduction of the Yamaha 115, an all-new powerful, V-4 engine of outstanding performance capabilities, we are happy to inform all pleasure-boaters, sports fishing fans and professional watermen the world over that, at last, Yamaha has entered the big-power class of outboards with enthusiasm and determination. In response to the growing demand for a high-powered outboard with the smooth, sure and safe operation and high ratio of power-to-fuel efficiency that have enhanced the Yamaha reputation in the up-to-85 HP categories over the past two decades, and with the same total involvement in all aspects of boating, from sailboats to marine diesels, that we have enjoyed for even longer, we have invested our best technology and most advanced engineering resources in the Yamaha 115 to make it worthy of the Yamaha name. The information provided in this issue is prepared as a basic introduction to the Yamaha 115, the development concept that led to its creation, and its highlighted features.

The Muscular Yamaha 115

At long last, Yamaha has entered the big-power class in outboards with its new 115, a V-4 model marking a significant step up in muscle and multi-purpose versatility from the popular Yamaha 85, 3-in-line model. The Yamaha 115 features an exceptionally quiet and efficient power plant, based on the 2-cycle, 4-cylinder format. Its precision-forged, solid aluminum block has a V-4 configuration to afford considerable savings in size; the V-angle, determined by means of typically thorough Yamaha prototype development, is an exact 90°. Yamaha's objectives in the creation of the 115 were to provide the same level of fuel efficiency, reliability and ease of handling

which have earned Yamaha's lower-powered models the respect of sports-minded and professional watermen all over the world. Achieving all this in an engine as powerful as the new 115 was no easy trick of engineering, to be sure. But as test reports show, the engine has plentiful power reserve and can put a boat "on the step" in a surprisingly short time, regardless of the boat's load or hull configuration — a real boon to water skiers and other boating fans who demand this kind of acceleration. Additionally, the 115's high power-to-fuel ratio gets any craft to its destination faster, not only at full throttle but at ordinary cruising speed, on less fuel than other outboards. Yamaha's V-reed valves, high-precision carbs and fuel-recirculation innovations that have contributed so much to the field, are used in the 115 with impressive results. Another major achievement is in the reduction of vibration — in part by the carefully calculated 90° angle of the V-4 block, and elsewhere through the use of a monoblock alloy crankshaft, heavy-duty split connecting rods, strategically placed rubber dampers and so on — which in turn means considerably fewer maintenance headaches, not to mention a smoother, quieter ride. Technically minded boaters will take interest in the numerous special features offered in the Yamaha 115. The makers have employed various time-tested Yamaha exclusive designs, as well as many that are unique and newly-developed just for this model, to afford adequate cooling even in the muddiest of waters, significantly reduce air-intake, idling and exhaust noise, and provide safe, stable handling. Little things, like an anode terminal on the mounting yoke to equalize electrical potential between yoke and engine and thus discourage corrosion, and like a protective cover on the

YAMAHA OUTBOARD MOTORS

flywheel/magneto head to help you keep your fingers attached to your hands while you're tuning up with the cowling off — these are details that a boating-wise manufacturer like Yamaha can be proud of. And bigger little things, like a new C.D.I. ignition, complete with high-technology micro-electronics that sound an audible alarm and trigger automatic de-rev to prevent overheating, are examples of what Yamaha means when they say that although they are relative newcomers to the big-power class of outboards, they have entered the field with enthusiasm and determination. "Stay out in front with Yamaha!" That's the promise Yamaha's making for their muscular new model. And knowing, Yamaha, it's a promise that can be taken very seriously.

The Yamaha 115 Technical Features

V-4 Engine

Yamaha's newest, biggest outboard is powered by a newly designed V-4 engine. The 90° angle of the V-configured, forged aluminum block has been scientifically determined as ideal in the reduction of vibration for smoother, quieter operation, higher fuel efficiency and a long service life. Yamaha's advanced metallurgy techniques and design expertise have combined to make the Schnürle scavenging system highly efficient. For instance, the scavenging passages in the block which have been designed in the shape that allows the most natural flow of the fuel mix, are at the same time strengthened to prevent distortion of the cylinder sleeves while adding to the high ratio of power-to-fuel economy.

Fig. 1 V-4 configuration at 90°

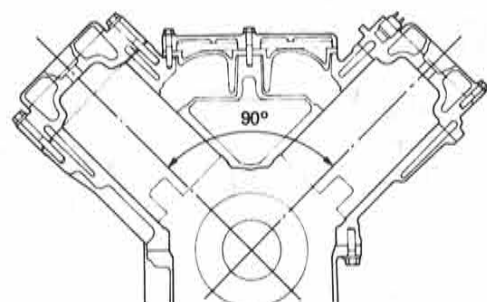
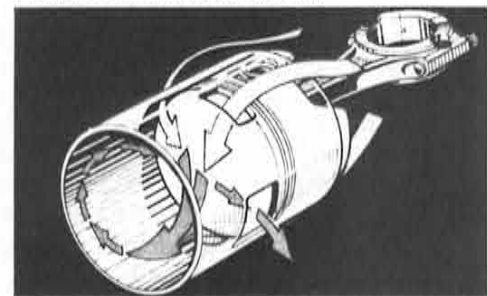


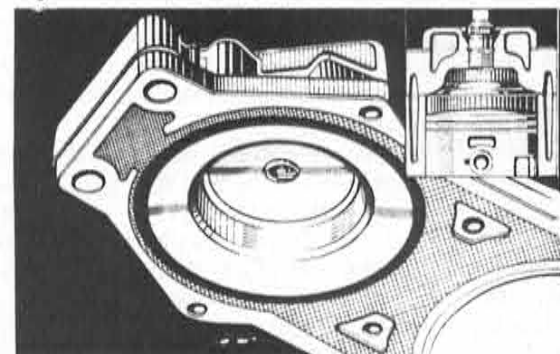
Fig. 2 Schnürle scavenging



Other important points include:

- "Pancake" combustion chambers to get the most from every drop of fuel and cut down on exhaust impurities.

Fig. 3 Pancake chamber



- Monoblock crankshaft and heavy-duty split connecting rods to reduce vibration and further improve reliability.
- Oversized bearings extend service life and assure high-torque performance.
- Drain plug, positioned to aid effortless oil change with engine in up-tilted position.

tion, is also magnetized to keep crankcase oil free of metallic foreign matter which could shorten gear and bearing life.

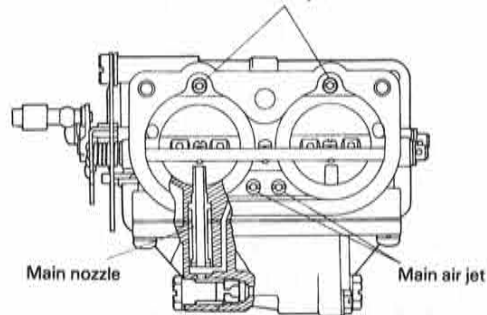
Electronic Ignition

An improved C.D.I. (Capacitor Discharge Ignition) system is employed for accurate spark timing. The high-technology micro-electronic circuit incorporates a fail-safe detection/alarm function and an automatic decelerator device to prevent damage from overheating for still greater safety, the ignition coil is fully protected from moisture and has a lead line to permit secure grounding.

Twin-Bore Carburetors

The pair of high-precision carbs are designed with single-float chambers to ensure an optimum, well-balanced and stable supply of fuel mix to the left and right pairs of cylinders. Also, Yamaha's original V-reed intake valving ratios fuel dependably for better low-end torque and effectively prevents "blow-back" to the carburetors. Other important points include:

Fig. 5 Twin-bore carburetor

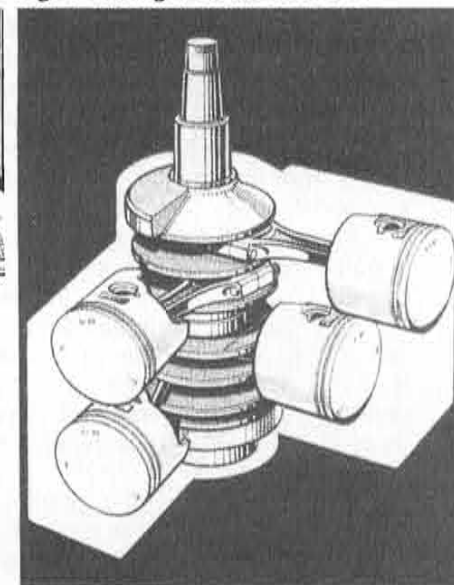


- High-capacity fuel pump for stable fuel supply.
- Dual air intake and large air intake silencer form a watertight team and guarantee an adequate supply of air to the carbs in all weather/water conditions. The special Yamaha design reduces operating noise without compromising performance.

Fig. 6 Dual air intake



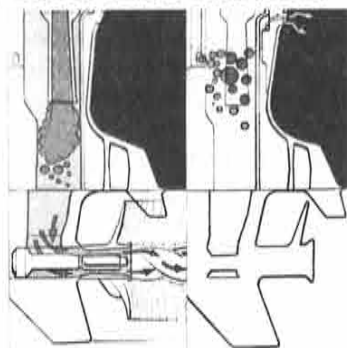
Fig. 4 Stronger crank and rods



Thermostat-Controlled Cooling System

Overheating problems are prevented, even in muddy waters, by this thermostatically monitored system, featuring an accurate, heavy-duty pressure valve for effective operation. The oversized impeller key in the water pump assures sufficient coolant flow, while the pump's tough resin housing is corrosion-resistant for durability. Of particular importance to effective cooling, and to the reduction of noise, is the double-walled water jacket, through which exhaust is forced by the natural pulse of the combustion cycle to muffle sound and remove exhaust impurities.

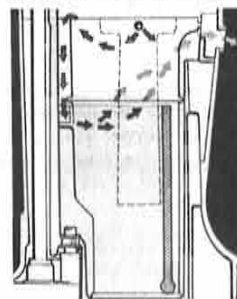
Fig. 7 Double-walled water jacket



Additional Noise-Reduction Systems

The remarkably quiet operation of the Yamaha 115 is further assured by the anti-vibration damper of thick rubber placed between the muffler and the upper casing of the engine, by the Yamaha jet prop exhaust design, the acoustic damping and baffling of the engine cowling, and by the specially engineered idling gas exhaust system, combining to make boating more enjoyable for all.

Fig. 8 Quiet and efficient exhaust system



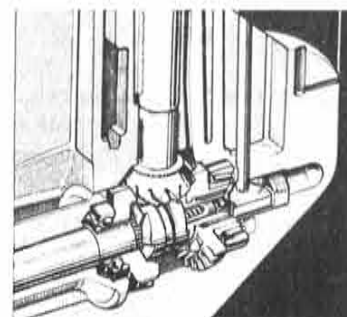
Power Assisted Hydraulics and Other Features

A compact and efficient system of hydraulically cushioned tilt mechanisms receives its power from the engine itself to make handling easier and safer. This ingenious system includes a trim gauge to automatically return the motor to its correct position should it tilt upon striking any obstruction in the water. The Yamaha 115 is equipped with all standard connections required in full remote control operations and has a 35° steering angle to the

left and right for better maneuverability. Remote steering, single or dual throttle (left or right handed) and many other Yamaha accessories are available as options. Other standard features include:

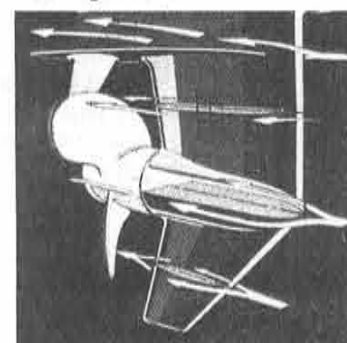
- High-output Bendix motor for faultless electric starting.
- Improved gear shift for faster, smoother shifting from forward through neutral to reverse and back.

Fig. 9 Gearshift mechanism



- Flywheel/magneto cover to prevent mishaps.
- Large mounting rubber to further dampen vibration.
- Trim tab to provide stable and firm steering control, even during speed and trim changes.
- Low-drag casing for the protection of the drive-chain; its carefully calculated hydrodynamic design reduces water resistance and represses splash for a smoother wake — an important plus for skiers.

Fig. 10 Hydrodynamic lower casing configuration



- Anti-corrosion treatment for the entire engine includes the Triple-Coating method used with success on other Yamaha models. Before the coating is applied, the engine — including the water jacket — is subjected to electrolytic action (anodization). Then, anode terminals are provided: the one on the lower casing is connected to the one on the mounting yoke so that corrosion is prevented both underway and at dockside. These special points help keep the Yamaha 115 looking as smart and running as smoothly as the day it hits the water — assuring always the powerful performance boaters everywhere have come to expect from Yamaha.

SPECIFICATIONS: YAMAHA 115

Max. prop. shaft power M ⁻¹ within	84.6 KW (115 HP) AT5,500 R/MIN
speed range	
Prop. shaft power at middle of	80.9 KW (110 HP) AT5,000 R/MIN
speed range	
Cylinders & engine type	2-stroke 90° V4
Tilting	5 positions
Full throttle rev/min range	4,500 ~ 5,500 R/MIN
Displacement	1,730 cm ³
Bore × stroke	90 × 68 mm
Ignition system	Electronic C.D.I. breakerless
Starting system	Electric starter
Throttle control	Remote control
Carburetion	2 dual barrel carbs
Controls	Full gear shift remote control standard
Fuel (USE 2 STAR PETROL ONLY)	Premixed oil-petrol 1 : 50
Fuel tank capacity	Separate tank 24 litres
Gear ratio	13 : 26
Standard propeller	3 × 330 × 533 mm (3 × 13 × 21 in.)
(blade × diameter × pitch)	
No. of applicable propellers	16
Weight	142 Kg
Transom height	Long 508 mm (20 in.) Ultra long 637 mm (25 in.)
Lighting coil	Standard 12V 120W
Starter safety device	Standard

*Specifications shown here are those for European models.

*The KW(HP) data in these specifications are based on the ICOMIA 28 standard.

YAMAHA MOTOCROSS SCHOOL

Thanks from overseas participants

From Iwata: As reported in issue No. 7 of Yamaha News, five guest riders from four countries took part in the 1981 All Japan SL Motocross Meeting which was held as part of the grand summer festival program at Sportsland Sugo on August 2.

These guest riders had chanced to finish the course of Yamaha Motocross School in Japan prior to the SL Motocross Meeting.

They state their impressions of this school in their letters received by the Yamaha Sports Promotion Center as follows:

An invaluable experience!
Lee Yang Chung Richard
(Hong Kong)



This training course has enabled me to learn much more about motocross techniques. Training seemed very short but I think it let me know my weak point on my riding and also during racing. But it was too hard to improve a lot within such a short period of time so I must continue efforts to improve my motocross techniques.

Also, on the racing day I saw much difference in top riders' techniques and it is very hard to get this kind of experience in Hong Kong.

I thank my best teachers, Iwao and Kawachi very much for their excellent teaching. I promised to do it much better in the future. I hope I can join the race next year, too.

Now I am as tough as my machine

Patrick Chin Chee Woon
(Malaysia)



This is my second time I have come to Japan for training. Last year I came here in October and it was much colder than in my country. I didn't do very well last year but I could learn a lot during my one-month stay in Japan. I was trained at Hamakita, Tenryugawa and Sugo.

I was surprised to know that I could come to Japan this year. This time I was well prepared for it. And the climate was almost the same in my country. After 2-day training at Hamakita, I felt that I did it very much better than last year. In particular, cornering and braking techniques were greatly improved. Last year these techniques seemed too much for me. But now I have the guts to do so. During my 3-day training at Sugo, I found my techni-



ques much improved. The Sugo track was very tricky. Almost all the corners were slippery and body balancing and throttle operation needed plenty of efforts. Mr. Iwao advised me how to do and I followed it. The result was truly excellent.

I am most grateful to my teachers, Iwao and Kawachi for their best teaching efforts.

Greatly improved techniques

Bambang Prabowo (Indonesia)



I joined the training at Hamakita and the summer festival race at Sugo. This experience was very useful to improve my techniques. Mr. Iwao and Mr. Kawachi, both Yamaha instructors, gave better technical instructions during the training, that is, in curving, descending and right/left turns. I think they are the best obtainable motocross instructors. They taught us how to cover two laps and dismantle the machines for inspection within 30 minutes. We learned a lot about motocross while taking part in the summer festival motocross. I had a chance to compete with many top riders including champions in this race. Their techniques were wonderful. I will make the best of what I learned in Japan for the growth of motocross racing in Indonesia.

Last but not least, I have to apologize for any mistake made during my stay in Japan and hope you will give your continued support to our motocross.

Start is very important

Simon Low Wai Wing
(Hong Kong)

First of all, I was very happy to have a chance to watch a Japanese motocross race where many top riders took part. I think I could learn much from their advanced techniques. Mr. Iwao and Mr. Kawachi proved themselves to be excellent motocross instructors. They showed me how to ride a machine correctly and how to prepare a machine. At the same time, my own weak points were pointed out. Motocross tracks were too much for me as I was just a motocross beginner. What I learned in Japan is very



useful and I am most thankful to Mr. Iwao and Mr. Kawachi.

I hope I can improve my motocross techniques by correcting the weak points as pointed out by them.

Young riders will also be taught what I have learned

Chaleamsak Thongyam
(Thailand)



This was my third time I have come to Japan for motocross training. In the previous cases (1978 and 1980) I had been with my friends, Wachara Punhamul and Anop Kamsobat respectively but this time I was the only rider from Thailand. I was trained in advanced motocross techniques under the instruction of Mr. Iwao and Mr. Kawachi. I felt my techniques much more improved this time. Motocross tracks in Japan seemed much more tricky than those in my country but I was pleased to attack various difficult sections by making my improved techniques in full play. I had a chance to compete with Japan's top motocross riders in the summer festival motocross held on the hilly Sugo circuit. I believe I could learn a lot in this race. All that I acquired in Japan can be applied to our motocross tracks and I will teach what I have learned to many young riders who wish to start their motocross career. I am most grateful to both instructors and all other Yamaha people for their excellent instruction and cooperation.

Contributions wanted

We at the Editorial Room of Yamaha News are always looking forward to having you supply us with various editorial materials so that we can make Yamaha News more instrumental to your business. Any sort of news or information would be highly appreciated if it is about Yamaha. Newspaper or magazine clippings will also serve to help us. Please attach some photos, colored or black/white to your news or information wherever possible.

Address: Editorial Room of Yamaha News, Advertising & Public Relations Overseas Markets, Yamaha Motor Co., Ltd. 2500 Shingai, Iwata-shi, Shizuoka-ken (Japan)

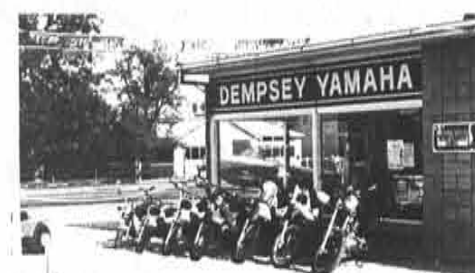
A LETTER FROM OUR READER

Better dealer back-up

Mr. Paul Dempsey, a Yamaha dealer in Renmark, South Australia, is doing a good business assisted by the better dealer back-up and service given by the Pitman Brothers organization as follows:

Dear editor,
In response to contributions wanted for Yamaha News, I am enclosing some photographs of my recently built premises. I say recently built premises, which it seems like only yesterday that I opened my new shop but as I sit here writing I realize that it is almost two years since I opened the new shop. I have been running my own business now for six years and have been a Yamaha dealer for three years. Having no dealership until Yamaha, I only carried out repairs on all makes and models, "procuring" parts, etc. I am most proud to say that in the years I have been associated with Yamaha I have had no major problems in procuring any parts with warranty claims, etc.

Until now I am yet to speak of the main reason for the writing of this letter, and it is, that I cannot speak highly enough of the dealer back-up, and service given to me by the Pitman Brothers organization. I have dealt with many companies in the past and many motorcycle distributors, and not one of them even comes close to Pitman's Yamaha.



I also sell firearms and Mariner outboards. For the recent duck shooting season I have set up a display of a locally built aluminum boat and 15 HP Mariner, ET500 generator and an AG175 complete with shot gun scabbard and shot gun. This display created much interest.

The sheep station is 1,000 square miles in size and is two miles away from my own home. A large majority of my sales and service are to large properties like this and as you would already know they all pray for a 250cc four stroke (XT type) machine with a shaft drive and mag wheel, but I guess the demand for this type of bike is not great enough, but maybe one day it will be? With slight modification I fitted an AG 175H seat and carrier onto the XT250. The fitting of these was necessary to the owner because he needed the carrier for transporting his sheep dog from one section of the station to another. With a single seat, the carrier can be mounted forward so as to place the weight of the carrier over the rear axle. This makes the bike much more suitable for sheep station work. The reason they do not use the AG175 with all the standard equipment is because the 4-stroke machine handles the long distance runs better than the 2-stroke machines. In the summer time all the water troughs have to be checked every second day and the bikes cover a distance of approximately 400km each trip. To do this, the higher cruising speed, plus the better handling make the XT a more suitable bike.

Yours faithfully,

Paul Dempsey
Paul Dempsey Motor Cycles
156 5th Street, Renmark, S.A.

Ever-growing Yamaha outboard motor business



Exciting new model tests!



Yamaha O/M distributors are greatly interested in the powerful Yamaha 115.



Product features are explained.



Dinner party



Mr. Hideki Sawada, President of Yamaha Motor N.V. announces the Yamaha O/M marketing policy.

Monte Carlo

The European outboard motor press & distributors conference is brought to a success!

Yamaha Motor N.V. the head office of which is located in Amsterdam, Holland, organized the first European conference in Monte Carlo, Monaco from Sept. 11 through Sept. 13, with an attendance of 30 Yamaha O/M distributors from 14 European countries and South Africa and 30 journalists from 12 European countries. The first Yamaha European conference was one of the largest events of its kind ever organized in Europe. During the distributors meeting and the press meeting the staff of Yamaha Motor N.V. gave an account of Yamaha's position in Europe, and '82 market trends while announcing the planned improvements for 1982.

Yamaha's position in Europe

The total O/M market in Europe has remained dull for the past few years due to the worsened economic situation in almost all countries.

But even throughout this period the sales of Yamaha outboards have maintained a constant rise.

The reasons for this favorable development for Yamaha are:

- * All distributors' continued efforts to improve the Yamaha dealer and service network.
- * Yamaha's strengthened small HP range with the new 4, 5 and 20HP models.
- * Very good success in promoting the sales of Yamaha kerosene models for commercial and pleasure use in some countries.
- * Benefiting from these favorable factors and gaining firm confidence in the Yamaha outboard range, all distributors and dealers concerned are enthusiastic about exerting even greater efforts to further increase their sales in the future.

'82 market trends

The outlook for the 1982 season shows little signs of improvement. The economic situation in almost all European countries will remain hard at best. The calculating and thoughtful customer will inevitably look for the best buy in the market.

That means:

- Best in fuel economy
- Best in performance and durability
- Lowest in operating costs
- Most up-to-date features

In addition, the big HP customer will consider the operating costs more carefully before he decides what brand to buy. With this outlook Yamaha expects that all competitors will do their utmost to hold or regain customers, which will make the sales war much more intense, especially in the field of fuel economy, performance and other important product features. It is in these areas that the Yamaha outboard must be the best!

Planned improvements

To be successful in this tough market, Yamaha will have to concentrate on the following measures:

- * Improvement of distribution network
- * Improved information and education
- * Supplying the best available product
- * Opening of new markets

All these improvement measures will be carried out in close cooperation with all distributors. Even greater efforts will be directed toward the long established pleasure market while exerting every possible effort to advance into the non-pleasure market in Europe. Yamaha will have the right models at the right time, from 2HP to 115HP including inexpensive kerosene models.

Mr. Hideki Sawada, President of Yamaha Motor N.V. requested all distributors to renew their determination for another leap forward in the eighties.