



The story of SSTH passenger car ferry OCEAN ARROW.  
Constructed by Ishikawajima-Harima Heavy Industries Co., Ltd.

## Introduction

This ship ordered by CATT(Corporation for Advanced Transport & Technology) and Kumamoto Ferry Co.,LTD., is the first ship of the SSTH 70m class car ferries.

And started work of in March, 1997 and launched in November, 1997 and delivered to the shipowner in March, 1998. "Ocean Arrow" has begun to be in service between Kumamoto and Shimabara. This SSTH-70 reduced the Kumamoto-Shimabara sailing time to approximately a half hour from an hour. And the appearance and the interior decoration of the ship satisfy travellers.

## 1.SSTH : Super Slender Twin Hull

SSTH means "Super Slender Twin Hull", and the submerged part of the hull are constructed with two extremely slim hulls.

By reducing the wave-making resistance, the required horsepower was lowered during high-speed navigation and avoiding the wake wash problem and good superior vertical shock performance during a surge.

Because SSTH is buoyancy specifications from a small size high speed ship to a large size high speed ship. SSTH has a characteristic suitable for a comfortable high speed car ferry.



## 2. History of development

SSTH has few indispensability horsepowers and is a ship suitable for a comfortable high-speed car ferry.

It is a model of a vessel that we IHI developed in cooperation with The University of Tokyo, ship ocean engineering department, Professor Miyata who is famous for the design of the Japanese America's Cup yacht.

In this joint research, we conducted a huge tank test and numerical analysis for the study, such as the following.

1. Research on the hull form to minimize the resistance of a single body part
2. Research on the hull and catamaran interval to reduce the wave interference between catamarans
3. Research on the bow shape to reduce the upset
4. Research on the propulsion and maneuverability

Because SSTH model of a vessel was a totally new concept, we performed a global assessment about the speed performance in the true sea area, airworthiness ability, operation performance and the structural strength. In addition, we constructed an experimental ship SSTH-30, 30m in total length, for the purpose of raising reliability by letting a true ship reflect it.

We performed speed examinations, drivenness examinations and airworthiness examinations. And we measured resistance properties during a surge at the time of a cruise, and expected performance was confirmed.

Though it was 30m in total length, there was a notable thing in airworthiness ability to easily get over a wave of around 1-2m.

The data obtained from building of this SSTH-30 and the examinations in the true sea area in 1992 are fed back by the large-scale trial design of the medium-sized SSTH car ferry and Ro-Ro ship.

As for the basic model of a vessel of "Ocean Arrow", this "Trident" is designed to a base.

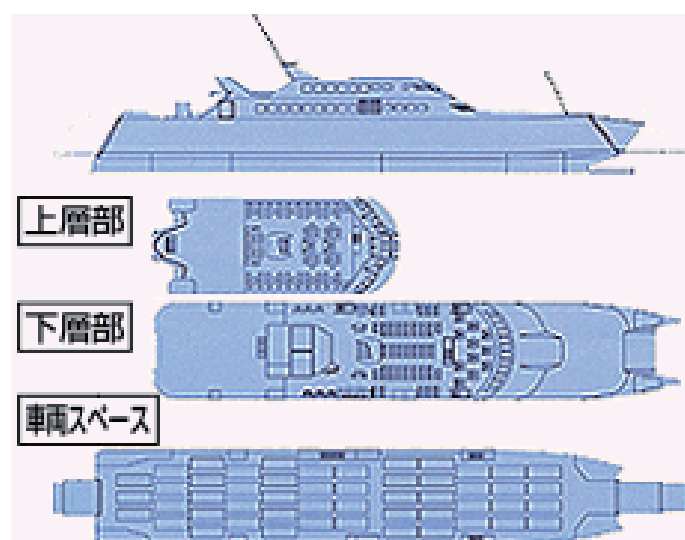
## 3. General arrangement

The general arrangement of the ship is shown in the figure (the lower left).

At the upper deck, there are cockpit and two rooms for passengers.

The lower deck is the vehicle deck for 51 cars or 9 buses.

No supporting pillar is installed on the vehicle deck for smooth loading.



## 4.Specification

- Length(o.a.) : 72.09m   ■ Breadth(mld) : 12.90m   ■ Depth (mld)up to Vehicle Deck : 4.50m

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- Assigned draught (mld) : 2.05m   ■ Deadweight : 204t
- Gross tonnage : 1,674t   ■ Maximum trial Speed : 31.3knots
- Service Speed : 30knots
- Classification&Cruising Range : Japanese government (JG) 950 sea miles

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- Capacity:Passenger : 430persons   ■ Capacity:Vehicle : 51 cars or 9 buses

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- Main Engine : MTU16V595TE70L 2sets   ■ MCR : 5,338PS 2sets
- Propulsion : Fixed Pitch Propeller 2sets



## 5.Exterior design

As for the appearance of the ship, the image appropriate for the high-speed ship which went into service to a sightseeing route of "Kumamoto - Shimabara" was required.

The attractive external appearance is the fruit of the collaboration of IHI and the exterior designer (Mr. Tetsu Tanaka: right photo).

The slender shape is used many a curved surface and sharp lines and the coloring is based on bright blue reflecting the image of Ariake Sea. Not only person using this ship for sightseeing but also person visiting the port enjoys the beautiful figure.



## 6.Structure & material

For hull weight reduction, high speed ship tend to use the aluminum alloy. All the main hull and the superstructures of this ship are constructed in A5083P-0. In addition, we use as possible pre-rib materials; combination of board H321 and bone H112.

The structure style adopted an assistant bone method long with the main hull and the superstructure.

For drivers, there is a good point that the vehicle deck of the ship have no pillars. Therefore, examination by the vibration is important as well as strength. We calculated a characteristic frequency using the latest analysis tools and techniques, and avoided the resonance condition of the main vibratory force.

When we had constructed the ship, we prepared for a building for the large aluminum alloy ship to secure welding quality and produced all the main hulls indoors.



## 7. Outfitting

We established the mooring place in front and behind a guest room part of the spar deck. We place two windlass and two mooring arrangements in the mooring space of the front part, and place three mooring arrangements in the rear. And the space is large for labor saving.

Because this ship regarded beauty of the appearance as important as stated above, we unified color with deck and the equipment of a ship product except the lifesaving appliance.



## 8. Machinery

Because this ship was with a catamaran and a slim model of a vessel, we adopted a high speed diesel engine of the amount of small size light weight output to put a main engine. The vibration of the main engine is suppressed well, because it is supported the elasticity with protection against vibration rubber.

The width of the engine room of each hull is not wide at all, but devise placement; and for check work of the trouble secured space so that there was not it. We can always watch it from a cockpit by the surveillance camera in the engine room of each board.

We established the hatch in main air two places of the vehicle deck and central one place of the spar deck rear to be able to take it out of a ship for the check of the main engine.



### 【Specification of engine】

- Main Engine : 4cycle High-speed diesel Engine  
MTU16V 595 TE70L : 2sets  
MCR 5,338PS/1,750rpm
- Reducer : 2sets
- Propulsion : Fixed Pitch Propeller×2sets

## 9. Electric

Two diesel engine generators are equipped. There is a generator in the engine room of each hull, as the main power-supply unit of this ship.

One on normal operation, but we have been with two parallel operation only when using the bow thruster.



### 【Specification of electric】

- Electric Generator : 290kW/1,800rpm/AC450V/3cycle/60Hz : 2sets
  - Transformer : 450/105V/3cycle(Ex. air conditioning) : 2sets  
450/215V/3cycle(air conditioning) : 1set
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- Battery : DC24V/200AH : 1set   ■ Gyrocompass : 1set   ■ Radar : 1set
  - GPS Plotter : 1set   ■ Aerovane : 1set   ■ Depth gauge : 1set   ■ Broadcasting equipment : 1set
  - Maneuvering command device : 1set   ■ ITV device for monitoring : 1set   ■ Marine VHF radio : 1set
  - Ship service telephone : 1set   ■ Radiofax : 1set   ■ TV broadcast device : 1set

## Epilogue

"Ocean arrow" has become the new artery which linked Nagasaki to Kumamoto.

For local further development by the interchange of people and products, the activity of this ship is expected in future.

We accumulated many techniques by a 30m passenger ship of SSTH, the building of the 70m grade car ferry. We are convinced that we can cope with a demand of future various high-speed marine transportation using SSTH model of a vessel.





## The Car ferry for high speed, comfortness and low cost.

**Comment: Kumamoto Ferry Co.,LTD. Director Masao Ide**



### High speed

Shimabara is only 21km distant from Kumamoto, and it is almost same distance between Kawasaki and Kisarazu across the Tokyo Bay. This is the shortcut route across the Ariake sea, instead of the route on the road. The ship of the general coastwise service route takes approximately an hour at 14 knots - as for approximately 26 km/h, 1 knot=1.852 km/h; - on this route.

It is quite slower than moving by car. We got their ideal travel time by the questionnaire. The result was "a half-hour". We decided on a high-speed ship of 30 knots - 56 km/h - in correspondence with the result.

### Comfortness

There had been no ports in Kumamoto city. Though the Kumamoto port has opened in 1993, the sea was not popular to citizens in Kumamoto. We wanted them to get a chance to enjoy leisure on a ship willingly by Ocean Arrow. Therefore we wanted to break the image of the conventional ferry design and custom-ordered seats by not only the beautiful appearance but also the interior and aimed at the novel, luxurious thing.

### Low cost

However, we cannot say it even if performance is no matter how superior to use it at the high rate by all means. Therefore we have realized the aim of the low fare by company efforts. We wish that many visitors enjoy the comfortable cruising that is the powerful charm of the sea voyage.