

## INSIDE VIEW:

# DESIGNING QM2

## A conversation with Stephen Payne, Part II

by

**Richard H. Wagner**

**A**lthough Stephen Payne acknowledges that creating Queen Mary 2 was a team effort, he is the one who is credited with designing the ship. In this article, he outlines some of the thinking underlying this great ship and explains why the ship is as she is.

### *The Concept*

When Carnival Corporation purchased Cunard in 1998, it determined that it would have to build a new ship to take over the transatlantic service from the then 31 year-old QE2. But what type of ship to build? "One of the big challenges that I had was to convince everybody that if we were going to continue crossing the North Atlantic, we had to build a true liner and not just a cruise ship. My concern was that in crossing the North Atlantic even in the summer months, at times the Atlantic can really kick up rough. A cruise ship would not be the comfortable and safe base in which to have a scheduled service."

"Going from a cruise ship to a liner involved a quite radical change - - the thickness of the hull, the power that you would need, and the shape of the ship. A modern day cruise ship is as voluminous as possible within her dimensions to maximize the earnings poten-

tial. Suddenly I was saying to the company, if you want to build a transatlantic liner, you have to have this arrow shape forward, especially. You have to move the superstructure back so that it is not vulnerable to damage. There was a lot of resistance because everything you do like that is costing money and losing revenue and the like."

"I showed some pictures of the old Michelangelo crossing the Atlantic and the huge amount of damage that she suffered on one of the crossings. I made the point that if the new Cunard ship were built to a lesser standard than what I felt was necessary and she became damaged during a voyage, she would immediately lose her reputation and it would be a very difficult thing for the company to get over. So I stuck out from the beginning saying: 'If you want to do the transatlantic service, especially from April through to December like they did with QE2, then you needed this proper liner.'"

### *Origin Of The Design*

Although no one had built an ocean liner in decades, people had drawn up plans for one. In fact, in the early 1990s, Cunard had thought about a new liner. "There was a project called the Q5 project. I have, in

fact, a set of the plans for that ship. It was a very unusual ship. A very fast ship, it would have done nearly 40 knots in speed. It had very regimented class distinctions from the normal type cabins right down to very small cabins without private facilities. The idea being that a lot of students and people who wanted to travel cut price would fill up those spaces. For a ship in the modern era, it was a very bold step. It would have been quite big but certainly not past 100,000 tons, something like 80. It did not look like anything that had gone before, either. It was very, very radically different in profile."

Despite its lack of interest in operating ships, Kvaerner had also thought of building a liner. "I immediately saw that a lot of the things that they wanted to do just wouldn't work on a new transatlantic liner from experience with QE2."

Since none of the existing plans would result in a ship that would do what Carnival had in mind, "Micky Arison said 'You design something for us.' And that is what happened "

"I have a personal philosophy that says before trying anything new, you have the best chance of success if you look back at history. Because you have to realize what has worked and what was filed. There is so much about this ship, if you look around closely you can see that it has been done before. All I have done is take all the successful bits from other ships and brought it all together into this one new ship and added a little bit of new technology and new thinking. That has all been packaged together to create Queen Mary 2."

"I first of all took the plans of the QE2 and I laid them out on a desk. I looked at each space critically to decide whether I thought it had worked well over the life of that ship or whether or not we should update it. I looked at what we do in the cruise industry to see if we could incorporate in the ship the modern thinking such as baggage loading, stores, distribution, how we might power the ship, with one proviso - - I wanted to bring as much efficiency as I could into this ship without detracting in any way the transatlantic experience, which was the whole reason that this ship was built."



*Stephen Payne*

"The challenge was to provide a first class experience something akin to the ships of state of the 1930s - - the old Queens, the Normandie, the Rex, the Bremen and the Europa - - but to give that experience to everybody rather than just the select few that were traveling in first class. This ship brings all that together and brings that true first class experience open to everybody."

#### *The Size Of The Ship*

Queen Mary2 was intended from the outset to take over the transatlantic service from QE2. However, QE2 only spent part of the year on the Atlantic. She also did occasional cruises and an annual world cruise. Carnival wanted the ship to have these capabilities as well. "It always was going to be a transatlantic liner that could be used as a cruise ship like the QE2. That is why we kept the same draft as the QE2."

But this presented a problem. On her world

cruises, QE2 went through the Panama Canal. Moreover, when she went through the canal locks there was very little room to spare. Thus, the new ship could be no larger than the QE2 if she followed the same route.

Indeed, she would have to be smaller. In order to reduce the weight of the ship, QE2 had an aluminum superstructure. "QE2 towards the end of her life suffered greatly because she had a lot of aluminum and that got very brittle and being brittle, it needed a lot of repairs all of the time. With the bending and twisting, the aluminum becomes brittle whereas steel lasts a lot longer before it reaches that point."

Therefore, Payne wanted QM2 to be all steel. But making her all-steel ship within the dimensions required to transit the Panama Canal "would have meant that she was about one deck less than the QE2."

"So I decided that the ship had to be bigger, too big to go through Panama, for the economies of scale because this ship was going to cost so much more than a normal type cruise ship. I thought QE2 only went through the Panama Canal once a year on the world cruises and I thought that was rather a big restriction to place on any new ship just for one voyage a year. In fact, the Panama Canal is in the process of being widened and within a few years time, the Queen Mary 2 will be able to go through the new widened Panama Canal."

Building her larger also meant that she would have a more comfortable ride. "The size of the ship, the length and the width that gives you that stability translates into the ship has half the motions of the QE2. So if QE2 were rolling 10 degrees, this would be rolling five. It is a thing that size really does matter when you are talking about motion."

### *The Profile Of A Liner*

"I tried very hard to make sure that she had the classic pyramid shape of a true liner and that is not just for show. When she is crossing the North Atlantic in storms, it is very important that the weight is distributed along the length so that she does not bend and twist too much and she does not have any structural problems."

Along the same lines, other classic ocean liner features were incorporated into the design. "There is no other passenger ship in the world today that has a bow like QM2. The hull plating on this ship for the most part is nearly twice as thick as you would have on a similar size cruise ship. We have plating of nearly 38 mm in places whereas it is more than likely to be 16 or 18 on most of the cruise ships. That is to enable this ship to travel at high speed through the most atrocious weather without any risk of damaging itself but also to be comfortable for the guests and to have confidence that you are on a well found ship that was designed to cross the

North Atlantic."

### *A New Propulsion System*

"To actually drive the ship through the water, we use a technology called 'pods.'" Pods look something like giant outboard motors. Suspended below the hull, the pods are giant steel structures with a propeller on the front. Inside each pod is an electric motor that turns the propeller. The propeller on the front of the pod pulls the ship through the water rather than pushing it as in a traditional propeller arrangement."

"These give us an enhanced propulsion efficiency of around seven percent over if we just had normal propeller shafts. They are also very much quieter than the normal propeller shafts and we can also use them to steer the ship so we don't need rudders or stern thrusters."

"On Queen Mary 2, we have four of them. They are the largest pods ever built for a ship and they weigh 320 tons each - - the weight of a 747 jumbo jet fully laden taking off. The forward ones are fixed, all they do is drive the ship forwards or backwards. The aft ones can swivel around. They actually steer the ship. We found that we did not need a rudder and if we had a rudder it would cause additional drag and slow the ship down. That is how we propel the ship up to speeds of nearly 35 miles an hour and how we maneuver the ship at sea and away from the dock when we are in port."

"We had them on the early Carnival ships. The last two of the eight Fantasys were, in fact, the first podded ships, the Elation and the Paradise. So we had a lot of experience with them and that had proven a good experience. And we had started considering putting pods on the Holland America ships. Rotterdam, which was my last ship before the Queen Mary, was a shaft driven ship but the sister ship, the Amsterdam, went to pods. So it was an evolutionary process. I felt that the amount of power that this needed for the high speed run, the five or six percent saving that we would get from having the pods in monetary terms, would be sizable. So that is why we went with the pods."

### *A Big Power Plant*

In order to power the electric motors contained within her four pods, her bow thrusters, and the hotel, QM2 needs lots of electricity. These are provided by four diesel engines and two gas turbine engines. "The power plant is enough to power the whole of Southampton."

"Originally, the plan was to have more diesel engines down below. But the amount of uptakes (*i.e.*

chimneys) that they needed, would have cut through the ship. It was the shipyard who said to us, if you just have four diesels, we can have two gas turbines that we can put at the top of the ship. That means you will do away with one of the big uptakes through the middle of the ship. That enabled us to have a much bigger dining room. It also enabled us to have a few more cabins as well."

"We probably wouldn't have had the gas turbines if we [built another liner]. They are very costly to operate. Right now the differential between the fuel we use in the diesels and the gas turbines has grown apart. So if there was a second one, we would put another diesel in."

### *A Difficult Funnel*

The exhaust from a ship's engines exits through the funnel on the top of the ship. In the golden age of ocean liners, these structures became quite prominent and were painted to display the company's colors. Furthermore, the distinctive shape of the funnels on great ships such as the United States and the France proclaimed the ship's identity. Thus, deigning a passenger ship's funnel is a matter that goes beyond its engineering functionality,

"I would have dearly have liked to have had a much bigger funnel on the ship because that is after all the visual recognition of both the company and the ship. You think of those great funnels of the QE2 and the Carnival ships, the big winged funnel. I thought we needed a bold funnel on this ship."

"But the ship has to get under the Verrazano Narrows bridge [in New York harbor] and there is only 62 meters from the waterline to the bridge. So the funnel that we have on this ship and the height we have it is in fact the maximum height that I was allowed to build the funnel in order to get under the Verrazano Narrows Bridge."

"The big problem with such a squat funnel is that the smoke has a tendency to come out and roll down and land in the area where we have the swimming pools. The only way we could make this funnel work properly was by having a huge wind scoop, which is much bigger than QE2's. We progressively had to make it bigger and bigger through that iterative process in the wind tunnel before we determined that it was actually working properly."

### *Balconies On The North Atlantic*

In sharp contrast to modern cruise ships, the great ocean liners of the past had few if any balcony cab-

ins. Queen Mary 2, however, has row on row of balconies.

"I was told that the ship had to match as far as possible the return on investment as to build a cruise ship. So with a ship that was going to cost 40 percent more to build and operate than a cruise ship, she really did have to have a high number of high revenue cabins. I was told in no uncertain terms by Micky Arison that the only way the ship could be built was if she had an exceptionally high ratio of balcony cabins. He said: 'We just cannot charge that premium if she is just outside and inside cabins. So the only way that I could do that and ensure that she would not be vulnerable was to completely change the orientation.'"

By placing the two public room decks below the cabins, Payne made the decks with cabins higher above the waterline. To further protect the cabins and their balconies from the waves, Payne increased the height of both of the public room decks. This enabled him to have balconies on the lower cabin decks.

"It was the first time on a Carnival ship that we had the public rooms right at the bottom. There were usually one or two decks of cabins before the public rooms. There was a lot debate amongst the Carnival management whether or not it would work and whether passengers would accept it. I said: 'Once people are on the ship and they get used to it they won't know the difference.' It is like having the lido restaurant or the Kings Court as we call it here on Deck 7, rather than at the very top of the ship. If we have it on Deck 7, we can then have the wrap-round promenade and it all works out a lot better than if we have [the buffet] up top and have cabins on Deck 7. So it was a radical change from everything that we had done before."

### *Single Cabins*

QE2 had a significant number of single occupancy cabins that were very popular with guests. This feature, however, was not brought forward into QM2.

"We tried to convince Carnival to put the single cabins on. But the rationale is that the price of a single cabin to build is more than the double cabins. [Cabins] are built in a factory, mass produced and they are brought onto the ship with a forklift truck, put into position and welded down. To build 20 or 30 different cabins to a different design, cost more per unit than the 1,300 standard cabins. So Micky Arison said: 'If people want single cabins, we'll just sell one bed in a double cabin.'"

### *Spectacular Public Rooms*

"I designed the layout of the ship - - where the

rooms were, how they connected, where the staircases were, the lifts - - and the structure. The pillars and everything I set in stone and I wouldn't allow the interior designers to alter it. I said: 'It is not like a cruise ship where you can remove pillars and hope that everything is going to be all right. I do not want it bending and twisting too much.'

"So I gave them the spaces and the [interior designers] worked on doing the designs. They sort of bounced ideas off me and things like that so we worked as a team. I didn't actually design the interiors but they asked my opinion."

Payne incorporated into the design two large showrooms - - a planetarium/cinema/lecture hall and a Broadway-style theater "The great thing on this ship is the lecture program and [if there were only one large showroom, it] would have been in use throughout the day. Then it is very difficult for the big shows to do any rehearsals. For flexibility, it was decided to have the two big showrooms."

Another large spectacular room is the Queens Room. "That followed on from QE2. You needed a big ballroom for the cocktail parties and the dancing, which is always a feature on the Cunard ships."

Although the main dining room, the Britannia Restaurant, is a large room, it was designed to appeal to diverse tastes "It allows you to have in the middle section the large baronial hall, the splendor of the tiered levels, and the more intimate areas should you wish for a more cozy environment in which to eat. This ship caters to a wide and very diverse clientele."