



# carrierwaves



LB04 passes under the Forth Bridge

## Steady as she goes

### LB04 ARRIVES

### The QE Class's Lower Block 04 arrives at Rosyth for assembly

The single biggest section of HMS Queen Elizabeth has been successfully transported from Govan to Rosyth.

Weighing in at a massive 11,300 tonnes, Lower Block 04 (LB04) makes up around 20 per cent of the entire ship and is the final hull section to make the journey to the Rosyth assembly site.

At 20 metres high and 80 metres long it dwarfed other vessels as it made its way under the bridges, fas-

tened to a specialist sea going barge.

On arrival it was moored by the non-tidal basin, before the delicate operation to remove it from the barge and float it into the dock began.

Aircraft Carrier Alliance transport manager Gordon Bumley said: "This was the third major section we have transported in this way,

and although it doesn't get any less challenging, or take any less planning, our teams are getting better each time. Floating the section off the barge is technically challenging, but the experience we have had from each previous successful transportation goes in to making the next one that little bit smoother."

Fast work by the teams fixing

the block to the barge meant the section was ready to begin its journey ahead of schedule. However, poor weather conditions in the north of Scotland meant the transport date was rearranged, and the block went south instead, taking it around the coast of England.

"We need to ensure the conditions are right before we set off on the 1,200-mile journey," said Gordon. "So we plan it very carefully and take detailed assessments of what the conditions are going to be at each stage."

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## From the Programme Director

IAN BOOTH

# View from the project office

### ACHIEVEMENT

The last few months have been both testing and rewarding for this programme. The assembly of HMS Queen Elizabeth is ramping up and we have passed some significant milestones across the Aircraft Carrier Alliance.

We've seen several key deliveries to the assembly site, the first Royal Navy crew joined HMS Queen Elizabeth and our missions systems are working through the crucial testing phases.

These missions systems are on an unprecedented scale, and while we use as much experience as we can from other programmes, we are still charting new courses in that area, just as we are in manufacturing and assembly.

You can read about some of this work elsewhere in this issue of *Carrier Waves*.

Looking ahead, 2013 is going to be a crucial year. The first ship



ABOVE: Ian Booth

will come fully into view for the first time and ship two – HMS Prince of Wales – will require more and more time and effort.

We have challenges that range from matching a demanding build programme with multiple yards, to ensuring block deliveries coincide

**“As these ships develop, so does our sense of pride in this achievement”**

Ian Booth, Programme Director

with the right tides. This is a hugely dynamic programme and, as we take into new areas, we are developing and applying new knowledge and lessons learned.

As these ships develop, so does our sense of pride in this remarkable and collective achievement.

These ships are uniquely British. Thousands of people from across the UK are pulling together to make them a reality and, just like the Olympics, they demonstrate the very best of British skills, manufacturing and ingenuity on a global stage.

I look forward to sharing more of our news with you in 2013.

## F-35B heads to Florida after tests

### JSF

The UK's second F-35B Joint Strike Fighter has been delivered to Eglin Air Force Base, Florida.

The short take-off and vertical landing aircraft, which will operate from the Queen Elizabeth Class carriers, was flown to the seaside base by the UK's first operational F-35 pilot, Royal Air Force Sqn Ldr Jim Schofield. It was accompanied by a US Marine Corps F-35 flown



ABOVE: Jim Schofield

by USMC Maj Adam Levine.

An F-35B also conducted the first mid-air refuelling exercise recently with a KC-130J Hercules and the aircraft has also proved its ability to re-start the propulsion system during

flight, a key part of the initial flight test programme.

Sqn Ldr Jim Schofield said: “It's another exciting day for the United Kingdom as we build up the F-35 force. The two UK jets will now become the backbone of test and evaluation at Edwards Air Force Base and we will be adding a third next year.”

The aircraft is the 15th short take-off and vertical landing F-35B to be manufactured to date.

**“It's another exciting day for the United Kingdom as we build up the F-35 force”**

Sqn Ldr Jim Schofield

## David Cameron drops in at Rosyth to check out QE Class progress



### PM praises programme

Prime Minister David Cameron visited Rosyth recently to see for himself the work achieved on the Queen Elizabeth Class aircraft carriers.

Mr Cameron met with staff from Babcock, the Aircraft Carrier Alliance and the Royal Navy before taking a tour of the ship. After a look at the progress of the build, he addressed members of the workforce

and explained his pride in the programme.

He said: "It's a huge honour to stand in front of this incredible ship. I get to see some pretty impressive things as Prime Minister but I haven't seen anything as impressive as what is behind me now.

"This is a success story that the whole of the United Kingdom can take great pride in."

# First crew join HMS Queen Elizabeth

#### MAKING HISTORY

Leading Hand Claire Butler (29) made history when she became the first member of crew to join the aircraft carrier HMS Queen Elizabeth.

Claire was presented with the first HMS Queen Elizabeth cap tally by Rear Admiral Steve Brunton at the head of the ships' assembly dock in Babcock's Rosyth facility.

Claire is one of eight Royal Navy staff selected as the first Ship's Company – crew members – to join the ship during the assembly process.

Led by Captain Simon Petitt, the crew will work alongside the Aircraft Carrier Alliance as HMS Queen Elizabeth – the first of two 65,000 tonne ships under construction for the



ABOVE: Claire Butler joins HMS Queen Elizabeth

Royal Navy – takes shape.

Claire said: "Becoming the first member of the Royal Navy to wear

this cap tally is a fantastic honour. When she is fully operational, HMS Queen Elizabeth will accommodate

as many as 1,600 men and women.

"My main task will be to set up the routines and procedures that will allow the rest of the crew to do their jobs. We are all well trained and, as a team, will make sure this warship becomes operational and helps to safeguard the world's oceans."

Ian Booth, Aircraft Carrier Alliance Programme Director, said: "The fact that the Aircraft Carrier Alliance has been joined by Royal Navy crew shows just how much this programme has developed. Thanks to the hard work of thousands of people all over the UK, HMS Queen Elizabeth is now really taking shape."

The role of the ship's company is to bring the ship to life. They will ensure the Royal Navy learns how to maximise the fighting capability of the ship at sea.

Navigation and Bridge System at New Malden



HMS Collingwood man the phones



# It's all systems

## MISSION SYSTEMS

Some people call it the brains of the ship. Others say it's like the ship's own central nervous system, or beating heart.

But whatever it's called, without a top-flight mission system, the Queen Elizabeth Class aircraft carriers won't be able to do their duty.

"A ship is a vessel," says Steve Dowdell, Director of Mission Systems for the Aircraft Carrier Alliance. "But by adding an integrated

## Ship's mission systems are more than meet the eye

suite of mission systems we can turn HMS Queen Elizabeth into a truly world-class piece of military equipment, with the capability she needs to fulfil her duties for the next 50 years."

### So what are mission systems?

"The temptation is to think of mission systems as a collection of top-secret kit the military use for planning and executing operations," said Steve. "But, in reality, it means everything that helps the people on board do their jobs. That includes telephone networks, communications systems, cameras, computer networks, and software.

"The QE Class has to be a home, an office, an airport and a military headquarters. It's the mission systems that allow it to achieve all these things simultaneously."

Steve's team is installing 65,000 separate mission systems parts on both ships. Connecting them together will be almost 2,000 kilometres of fibre-optic cables.

Each part is designed not only to work with all the rest, but with the end user.

"We're designing the operator into the entire process," said Steve. "The phrase we like to use is 'equip the crew, don't crew the equipment', because it is all about putting the people at the very centre of the operation. To do this, we are

## Communications Integration Facility

Since its official opening earlier in the year, teams at Thales' site in Crawley have begun testing elements of the ships' on-board communications systems.

Kit ranging from basic telephone networks to the Tactical Command and Control Voice (TC2V) system and High Frequency Comms (HFC) equipment

will be put through their paces in this new facility over the next two years, making sure they are ready for installation on-board.



Testing tactical voice terminals

Mission System Electro-magnetic Environment test facility



Mission System Integration Facility at Portsdown Hill



## Electromagnetic Environment Test

The aft island, from five deck and above, is replicated at Cowes on the Isle of Wight. Here, teams test the way the transmitters work together and make sure kit such as radios and radar can inter-operate with each other and work smoothly in tandem with other on-board systems.

One goal of the mission systems teams is to ensure systems integration happens throughout the build process. They are continually looking for opportunities to test and evaluate the kit at an early stage to ensure there is ample time to address compatibility and performance issues.

## Equipment Interface Testing

The Mission System Integration Facility at Portsdown Hill is where kit such as the command system, the integrated network and the navigation and bridge system are first put through their paces together. Teams there work alongside industry and operators to prove system functionality.

# go on QE Class

taking lessons learned from other programmes and are working to create a class of ships that is entirely designed around the people who will be living and working on board."

The mission systems are being tested at custom-designed facilities across the UK.

The integrated navigation and bridge system is being developed by Northrop Grumman Sperry Marine. It is the largest bridge system ever produced by the company and the teams at the site

**"The temptation is to think of mission systems as a collection of top-secret kit the military use for planning and executing operations"**

Steve Dowdell, Director of Mission Systems

in New Malden are testing it at full-scale.

Steve Dowdell said: "We're testing all the navigation and bridge systems here, but are also integrating other systems, like the combat management system, an internal network electronics system and a visual surveillance system.

"These are all crucial elements which have to mesh together seamlessly, so we test them extensively before we install them on-board."

## Large Scale Integration Facility

The Queen Elizabeth Class Large-Scale Integration Facility at the Royal Navy training establishment, HMS Collingwood, is the first of its kind.

With the capability to test hundreds of pieces of

equipment simultaneously, it takes mission systems testing and integration to a new level of thoroughness.

Rear Admiral Steve Brunton, Deputy Director Ship Acquisition at MOD, said: "There has never been a mission systems

facility like this one. The scale of the aircraft carriers means we need to be able to test on an unprecedented scale. At HMS Collingwood, with the help of recruits, we can put upwards of 250 video cameras, 34 Combat Management

Consoles and other elements of the system through their paces in real time.

"We need to know how these vital systems respond in 'high load' scenarios. We need to find out where the challenges lie now, not when the ship has put to sea."

# Need a lift? Willie's your man for sure

## INTERVIEW

Since it was first used to move sections of flightdeck into place last year, the 98-metre tall Goliath crane, one of the largest of its kind in the world, has lifted thousands of tonnes of HMS Queen Elizabeth into place.

Babcock Heavy Lift supervisor Willie Richards (pictured below) is part of the team that manages the colossal crane and looks after other large-scale lifting operations at Rosyth.



### Describe your job

I'm one of the Heavy Lift Supervisors. I ensure that operations such as Goliath lifts, or moving sponson units from Appledore to Rosyth, go according to plan.

### How did you get that position?

In my 30 years at Rosyth I have worked on HMS Invincible, HMS Illustrious and Ark Royal, so I've got a fair bit of experience – although the scale of this job takes it to another level.

### Is it dangerous?

It certainly could be, if it wasn't done with lots of care and meticulous attention to detail. There are no second chances when lifting hundreds of tonnes, so we assess the risks, plan the lift, then check all the details – and then check them all again!

### What's the biggest challenge?

The schedules are tight and making sure everyone and everything is in the right place at the right time is demanding, but the team works really well together. Safety is always our number one priority.



MAIN and ABOVE: Carrier construction in full flow



## Island life in Portsmouth

### Island facts and figures

**TIME TO CONSTRUCT**► 70 weeks

**WEIGHT**► 750 tonnes

**DECKS**► six

**WINDOWS**► 37, weighing more than eight tonnes, held in with 1427 screws

**PIPES**► 3101

**CABLES**► more than 65kms

The iconic forward island section of HMS Queen Elizabeth is nearing completion. Over a 70-week build schedule, workers in Portsmouth have created the structure from scratch. Today it weighs in at 750 tonnes, with 105 compartments located across six decks.

The forward island will be home to the bridge, from where all the ship's navigation will be co-ordinated.

Paul Bowsher, the QEC Integrated Project Leader in Portsmouth, said: "The forward island actually has two bridges – the observation bridge on 02 deck and the main bridge on 03 deck.

"The consoles on the bridge have already been installed, ready for the final installation of the electronics and screens in Rosyth. The island also contains a mess and pantry, chart house,

Flag and Yardarm stores, a number of key mission system compartments and accommodation for the Captain and Navigation staff."

Both islands – the aft island is under construction at Scotstoun – are designed so that the Goliath crane can lift them into position. However, their odd shape makes planning the lift complex. To overcome this, engineering teams have designed a special frame that will ensure the island can be lifted smoothly into position. The frame itself weighs more than 70 tonnes.

Paul said: "It will be a proud moment for us all to see the island leaving knowing that when Queen Elizabeth returns as a complete ship, the Captain will be commanding the ship from the bridge we constructed here."

### How many people are in your team?

Right now there are 24 of us.

### How many Goliath drivers are there?

Right now there are five qualified drivers, but each Goliath lift

requires a team of at least six, including banksmen, supervisors and slingers. It's not just about the person in the driver's seat.

### So when Goliath isn't in action, are they just sitting about waiting?

Not a chance! We co-ordinate all the heavy lifts here – and there are plenty of them! In fact, we've just altered our shift system so we can provide almost 24/7 coverage. This job is the biggest any of us have been involved in and we're kept really busy!

BELOW: One of the massive generators



#### Power facts and figures

- Power Generation 2x Rolls-Royce MT30 Gas Turbine Alternator sets
- 4x 11,600kw Wartsila diesel generating sets
- HV System 11kV
- Propulsion 4x GE (Energy) 20,000kw Advanced Induction Motors
- 2x shafts
- 2x Rolls-Royce propellers
- L-3 custom designed Integrated Platform Management System
- Each ship will be capable of generating 110 megawatts – the equivalent of 230 Formula One cars

# Power lifted into place

Portsmouth teams lift two 160-tonne generators in place

#### PRINCE OF WALES

HMS Prince of Wales took a big step forward when teams in Portsmouth successfully lifted two diesel generator sets into place on Lower Block 02.

Each of the massive generators weigh in at more than 160 tonnes. Because of their size and their location in the ship, the installation is a critical milestone.

Project Manager Claudia Roberts explains: "These diesel generator sets are huge pieces of equipment, and their size means they actually



ABOVE: Diesel generation team

span two decks. Getting them installed is a huge moment for HMS Prince of Wales because they have to be in place so we can continue with the build. As 'lock out' items, the rest of the ship will be constructed around them!"

The huge generators were swiftly lowered into place with the teams

using everything they learned on HMS Queen Elizabeth to ensure the process went smoothly. "We made absolutely sure that everything was in place and we were ready for the installation. Dimensional control teams even travelled to the factory to take precise measurements before the generators arrived, so we could

be entirely sure all the work we were doing was completely accurate.

"We wanted no surprises, and all the planning paid off."

Now the generators are installed, teams in Portsmouth can continue working on the engine room, fitting walkways and pipes, and insulating the bulkheads.

## How the carrier keeps its cool

A complex system of fans, heaters and coolant is being developed that will keep everyone onboard HMS Queen Elizabeth at the right temperature.

And in a milestone for the ship, this system has entered the

commissioning phase, and is now being tested onboard. The complex programme includes over 1000 pieces of lock-out equipment, 10,000 minor parts and 40,000m of vent per ship. Stuart Howie, Major Subcontract Programme Manager,

said: "This milestone required lots of elements to get to this stage, including Engineering, Operations, Commissioning, Balfour Beatty and Imtech; and represents the first of over 2000 fans that form the Phase 1 HVAC Commissioning Scope."



ABOVE: A complex system of fans

The Duke of Edinburgh



# By Royal appointment

Princess Royal and Duke of Edinburgh visit Rosyth

## ROYAL VISIT

It was all hands on deck at Rosyth when HMS Queen Elizabeth received some Royal visitors.

The first member of the Royal Household to visit the ship was HRH the Princess Royal.

The Princess, who is Admiral and

Chief Commandant for Women in the Royal Navy, as well as Commodore-in-Chief of HMNB Portsmouth, was given a briefing from the Aircraft Carrier Alliance management team and a tour of HMS Queen Elizabeth.

Then, just one week later, HRH the Duke of Edinburgh – who is Lord High Admiral of the Royal

RIGHT: HRH the Princess Royal at Rosyth

Navy - became the second member of the Royal family to view the assembly site first hand.

Programme Director Ian Booth said: "It was a great honour to host the Duke of Edinburgh and the Princess Royal. As two of the most senior members of the Royal Navy, they were particularly interested to learn about the build process and what life will be like on board.

"The Duke of Edinburgh, who has seen active service, was particularly keen to learn more about the way the ships are being constructed, and how they will operate when they join the fleet.

"As the work to assemble the first of class progresses, the scale of these ships is becoming more and more apparent, and we will have more opportunities to showcase the tremendous achievements that are being made across the Aircraft Carrier Alliance."



## Health and safety to the fore at SHE Conference

As part of the Aircraft Carrier Alliance's commitment to health and safety, more than 50 managers and team leaders took part in the annual Safety, Health and Environment (SHE) conference in Rosyth. The

theme was behavioural safety and guest speakers included the ACA's SHE Ambassador Jason Anker and Paul Burns, who were both seriously injured in workplace accidents. David Gartside from



the Health and Safety Executive also spoke at the event. Andy

Forbes, Head of Health, Safety & Security, said: "It was a great opportunity to get so many people from across the ACA together to look at how behavioural safety programmes can help us reduce risks."