



Capability: Next generation fighter touches down for pilots and engineers Page 2

Performance: test of vital data link to task group is a success Pages 6



News from the Aircraft Carrier Alliance Issue 10 Summer 2013

# carrierwaves



## The creation of a carrier

Huge progress has been made on HMS Queen Elizabeth with her proud profile now taking shape

### PROGRESS

With a complete flight deck and both islands in place, HMS Queen Elizabeth is now clearly recognisable as the aircraft carrier that will be the centrepiece of the Royal Navy for decades to come.

In the past few months, workers across the Aircraft Carrier Alliance have made huge progress in the

assembly of the first of class.

Watching the aft island being lowered into place, Programme Director Ian Booth said: "There has been a huge amount of visible progress recently. Completing the full length of the flightdeck and lowering both of the islands into place have taken HMS Queen Elizabeth's assembly forward dramatically, and her unique profile is now clear.

"Everyone involved can be proud

of the work that has been accomplished. But there is still a long way to go. Teamwork across the Aircraft Carrier Alliance is crucial as we move into installing and commissioning the complex on-board systems."

Just the final two sponson sections, aircraft lifts and the final ramp sections remain in the mammoth assembly process. And, by the end of 2013, the complete ship will be visible for the first time.

## Contents

[SUMMER 2013]

### Pages 04 and 05

Twin island design becomes a reality

### Page 06

Systems undergo rigorous testing

### Page 8

Innovative solutions are found for two challenges

## Contact

[FOR MORE INFORMATION]

To request further copies or to submit a story for the next issue, please contact John Fyall, ACA Communications Manager, at [john.fyall@baesystems.com](mailto:john.fyall@baesystems.com)

Carrier Waves is available online at [www.aircraftcarrieralliance.co.uk](http://www.aircraftcarrieralliance.co.uk) or contact John Fyall, ACA Communications Manager, at [john.fyall@baesystems.com](mailto:john.fyall@baesystems.com)

You can also follow us on Twitter @ [qclasscarriers](https://twitter.com/qclasscarriers)

[www.flickr.com/photos/qclasscarriers](http://www.flickr.com/photos/qclasscarriers)

[www.youtube.com/qclasscarriers](http://www.youtube.com/qclasscarriers)



© 2013 Aircraft Carrier Alliance. The publishers, authors and printers cannot accept liability for any errors or omissions. Articles or opinions expressed in this publication may not reflect company policy. All rights reserved. On no account may any part of this publication be reproduced in any form without the written permission of the copyright holder, application for which should be made to [john.fyall@baesystems.com](mailto:john.fyall@baesystems.com). Designed and produced by Connect Publications Ltd. [www.connectcommunications.co.uk](http://www.connectcommunications.co.uk)



The first three F-35s will be used for pilot and engineer training

# Third fighter touches down

## F-35 LIGHTNING II

The UK's third F-35 Lightning II has arrived at Eglin US Air Force Base in Florida.

Known as BK-3, the aircraft joins the MOD's other two F-35s already

at the base, and is being used for pilot and maintainer training.

Group Captain Harv Smyth, the UK's Joint Strike Fighter National Deputy, said: "This is the latest step in delivering the F-35's unprecedented capability to UK Defence.

"In less than a year, we have

taken ownership of our first three aircraft and begun both pilot and engineer training."

Meanwhile, Defence Secretary Philip Hammond has announced that the UK's F-35 base will be at RAF Marham, and the famous 617 Squadron, also known as the The Dambusters, will be the first to fly the jet.

"The Lightning II is the most advanced jet our Armed Forces have ever operated, and carries on the tradition of the Harrier, while having far greater range, payload and defensive capability," said the Defence Secretary.

## A vision of the future

A completed HMS Queen Elizabeth is closer than ever. But until all the systems are commissioned and tested, the Aircraft Carrier Alliance has created some new images showing in detail what the finished ships will look like.

The new computer generated pictures show the Queen Elizabeth Class as they will be when fully operational, complete with the F-35B joint strike fighter.

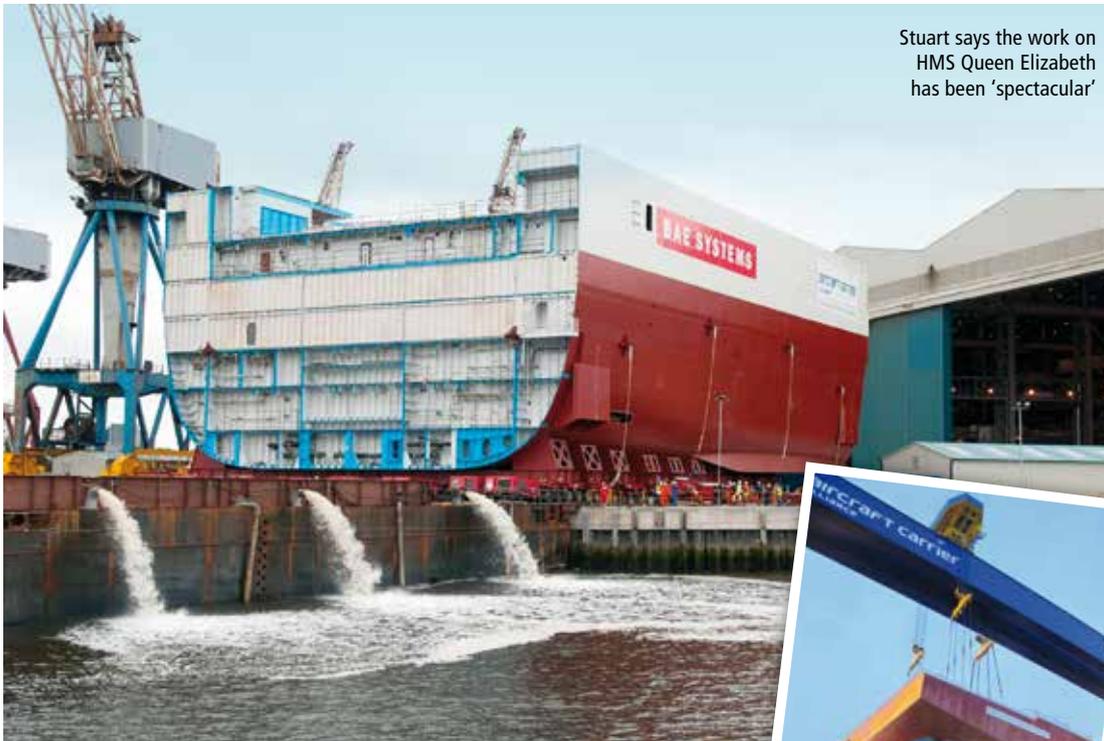
Programme Director, Ian Booth,



said: "There are 10,000 people involved in creating these ships, and understanding what we are all working towards is really

important. We are creating not just two huge and complex vessels, but one of the lynchpins of the UK's future defence strategy."

# 'The scale of this is unprecedented'



Stuart says the work on HMS Queen Elizabeth has been 'spectacular'

## INTERVIEW

Work to assemble HMS Queen Elizabeth is at a peak, with thousands of workers at Rosyth making sure the programme stays on schedule. Stuart Leonard is Assembly Director for the ACA, and his job is to oversee the mammoth task of bringing all the sections together in Babcock's dock at Rosyth.



### Describe your job

I am responsible for the assembly, outfit and testing of the two carriers. I look after the build of the whole ship, furnishing, fixtures and fittings, ensuring these are delivered on time and to cost.

### What has been the most memorable part of your role to date?

I have been working at Rosyth since 1978 and I have seen some huge changes in that time, but the last few months on HMS Queen Elizabeth have been spectacular.

Seeing the Goliath crane erected was incredible. The double docking of two huge hull sections, as well as the skidding together of these blocks, was truly fantastic.

The skill and technology involved was very impressive.

### What does the rest of 2013 hold for you?

It's a crucial time for my team as we focus on completing the first of class. Once all the major sections are in place we will work on the shaft integration and paint work, and, of course, prepare for the ship leaving the dock in 2014.

### What takes up most of your time?

The scale of this project demands close day-to-day management. I spend a lot of time ensuring we have the right processes in place and, of course, overseeing the ships' assembly and everything that goes with it.

### So you need to make sure things happen as quickly



### as possible?

No, we all make sure things are done as *safely* as possible. Safety is at the forefront of absolutely everything that we do here, and I have seen huge improvements in the last 12 months. We are working on best practice approaches and put a lot of care and attention into high risk operations. We have a good safety record, which we want to continue to build and improve on.

### Biggest challenge?

There have been a lot of 'firsts' on this programme and the scale is unprecedented, so ensuring everything is working as it should and the teams for each job are properly prepared is crucial. The most important thing is teamwork, and bringing together skilled people with the clear focus on delivering two world class warships.



## Moles will make munitions efficient

The first mole has been spotted on board HMS Queen Elizabeth, but not the furry kind that upset gardeners and golfers.

Mole is the nickname for the electric vehicles which will 'burrow' down into the ship's magazine and retrieve munitions, bringing them up to the flightdeck where they can be fitted on to aircraft.

Ship's crew simply need to select the kind of weapon required, and the mole will scurry off and retrieve it.

Now, in another milestone for the programme, the first mole has been installed on-board.

"They could be described as a vending machine for munitions," said Integration Manager David Arthur. "

A total of 26 moles will operate on rails, so aircraft can be properly equipped with the right weapon, fast. What's more, this new level of automation means it takes far fewer crew to carry out the delicate task of moving munitions, making HMS Queen Elizabeth one of the most efficient warships in the sea."

# Two new Islands in the

HMS Queen Elizabeth's unique twin-island design has become a reality



When completed, the HMS Queen Elizabeth will be largest and heaviest ship ever to set sail under the white ensign

## TWIN ISLAND MILESTONE

The Queen Elizabeth Class ships are designed like no other aircraft carrier. Twin islands give the ships unprecedented flexibility. The bridge, on the forward island, will give the captain and staff the perfect position to navigate the ship from, while the aft island will provide the air traffic controllers with a bird's eye view of the flightdeck as they manage flight operations.

### Defence Secretary gets it started

In March, the Secretary of State for Defence Philip Hammond started the final stage of the operation to lower the forward island section

into place. Mr Hammond said: "The addition of the forward island is a significant milestone for HMS Queen Elizabeth, which is now entering the final months of her construction. The workforce at Rosyth should be proud of their involvement in developing the largest and most technologically advanced warships the UK has ever had.

"The Queen Elizabeth Class of Carriers will be in service for up to fifty years, providing the Royal Navy with highly

versatile and potent capability that will enable the UK to project its power and carry out a wide range of tasks around the world."

The section was constructed at BAE Systems in Ports-

mouth. It weighs 700 tonnes – slightly less than the aft island – and houses the ship's bridge, stores, a galley and accommodation for the captain and navigation crew.

Then, in June, as airhorns echoed across the dockyard and hundreds of staff looked on, the final stage in the massive job to lower the aft island into place was completed.

The 750-tonne section was carefully lowered into the position it will occupy for the ship's lifespan.

And a plaque containing the emblems of each of the UK Armed



Embodied within are the emblems of the Royal Navy, The Royal Air Force and the British Army, the three services which together protect the United Kingdom, her overseas territories and crown dependencies across the globe.  
June 22  
2018

# The Firth of Forth



The aft island was lowered into place

## The heaviest ship in the history of the RN?

The addition of the aft island takes the weight of HMS Queen Elizabeth to more than 46,000 tonnes.

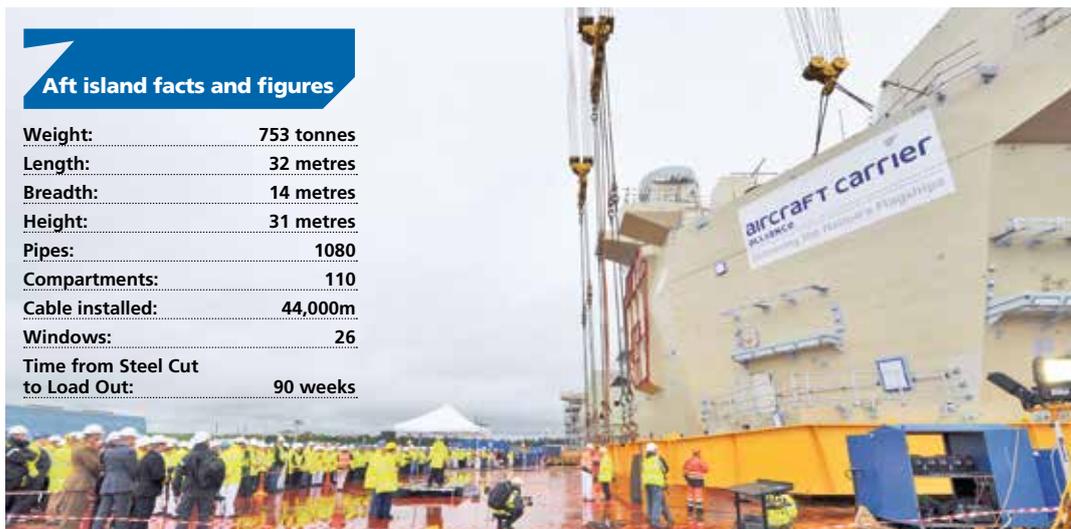
This makes her heavier than HMS Vanguard, which is historically the heaviest ship in the Royal Navy. Decommissioned in 1960, that battleship tipped the scales at 45,200 tonnes at standard displacement. So is HMS Queen Elizabeth a record breaker?

“Sadly no, at least not just yet!” explains Engineering Director, David Downs. “HMS Vanguard at full displacement – that’s with a full complement of crew and equipment – weighed more than 51,000 tonnes.

“This means that HMS Queen Elizabeth still has a little way to go before she can claim the title.”

But claim it she will. When complete and at full ballast, HMS Queen Elizabeth will weigh in at 65,000 tonnes, making her the largest and heaviest ship ever to set sail under the white ensign.

Aft island facts and figures	
<b>Weight:</b>	753 tonnes
<b>Length:</b>	32 metres
<b>Breadth:</b>	14 metres
<b>Height:</b>	31 metres
<b>Pipes:</b>	1080
<b>Compartments:</b>	110
<b>Cable installed:</b>	44,000m
<b>Windows:</b>	26
<b>Time from Steel Cut to Load Out:</b>	90 weeks



Forces was positioned between the island and the flightdeck, sealing them within the ship.

ACA Systems Delivery Director, Steven Carroll, was at the event. “This was a special day in the programme,” he said. “The unique profile of HMS Queen Elizabeth with her twin island design became reality for the first time. We have all seen the computer generated images, but to see it with my own eyes was an unforgettable moment.

“By sealing the emblems of the three UK Armed Forces into the very body of the ship, we have underlined the incredibly important role she will play in representing and defending the UK across the globe.”



## Testing times

The medium-range radar Artisan 3d, which will give the Queen Elizabeth Class a clear view of activity to more than 200km away, has been installed on the mock-up of the aft island, making it a key part of the testing facility on the Isle of Wight.

A full battery of tests will ensure it is ready for installation on the real aft island later this year.

Meanwhile, more of the aircraft carriers' crucial mission systems equipment has been put through its paces.

Teams from the ACA and the Royal Navy staged a series of major tests for kit, including the Combat Management System (tactical and air traffic control), Navigation and Bridge systems, Friend or Foe Identification and the meteorological system.

Integration Manager, Steve Brown, said: "Rigorous tests are a key part of our programme. We make the tests as thorough as possible."



The radar Artisan 3d is being tested on a mock-up of the aft island on the Isle of Wight

# Data link up is a success

## AGILE THUNDER

An aircraft carrier never works alone. Instead, these valuable assets always form part of incredibly powerful and capable task groups, typically including destroyers, fast jets, helicopters and other air, sea and land assets.

Now, for the first time, the Aircraft Carrier Alliance, together with the Royal Navy and the F-35 team, has put the complex equipment that will allow the Queen Elizabeth Class to communicate with the task group through a series of gruelling tests.

The testing event, called Agile

Thunder, included four simulated F-35 cockpits and a simulated Sea King helicopter in Lancashire, the Type 45 test system in Hampshire and the Queen Elizabeth Class Combat Management System on the Isle of Wight.

Jonathan Brunton said: "Using the secure tactical data link we proved sophisticated Command and Control between the key platforms, running a series of realistic scenarios and giving everyone involved a clear picture of the operation.

"A typical test saw a radar signal picked up by the Type 45 and the Sea King. This was communicated to HMS Queen Elizabeth and a

Royal Navy staff running exercise Agile Thunder



combat air patrol was scrambled, the threat was assessed and, if hostile, an engagement was planned, cleared and executed, either by the F-35 or the Type 45.

"The system worked just as it should, and although there is still

work to do before final installation on the ship, we proved successful interoperability.

"In each scenario involving a simulated hostile threat, it was dealt with hundreds of miles away from HMS Queen Elizabeth."

# 'Challenging and rewarding role'

As Aviation and Air Weapons Integration Manager Rod Steel has a close eye on operations and logistics

Rod is a highly experienced engineer and former Royal Navy Fleet Air Arm pilot



## ON THE JOB

Although the Queen Elizabeth Class are huge ships, they are tiny compared to almost any airport. And as they will be home to some of the world's most advanced aircraft, making the best use of space and planning how on-board operations will work is critical.

The Aircraft Carrier Alliance aviation team at Bristol, led by Thales UK's Rod Steel, is examining every potential flying scenario, operation and logistical situation down to the smallest detail.

A highly experienced engineer and former Royal Navy Fleet Air Arm pilot, Rod was made a Fellow of the Institution of Mechanical Engineers (IMechE) in 2011.

He says: "As the Aviation and Air Weapons Integration Manager, I hold a wide portfolio of design integration

and design authority responsibilities. This covers the design development, ship integration, procurement project management of the Highly Mechanised Weapon Handling System (HMWHS), and Aviation facilities, from design support through to build, test and commissioning."

Aviation facilities means deck lighting, visual landing aids to get pilots down safely, day or night, and even hangar layout to ensure aircraft can be properly serviced and prepared

**"I hold a wide portfolio of design integration and design authority responsibilities"**

Rod Steel, Aviation and Air Weapons Integration Manager

for flight. The HMWHS is unique to the Queen Elizabeth Class. It uses custom-designed electric vehicles which run on rails, ferrying munitions safely and swiftly from the magazine to the point where they are installed on the aircraft. See page three for more on the 'moles'.

Rod said: "Creating an effective functioning military airfield at sea is much more than simply building a floating airstrip.

"It's the job of my team to make sure everything the ships will need to operate different aircraft types is in place.

"The unique way the Aircraft Carrier Alliance is structured means we are well under way in delivering a new capability that will serve the UK for generations to come.

"It's a challenging but highly rewarding role in the build and delivery of the nation's future Flagships."

## News in brief

### Works of Art



Scottish artist, Lachlan Goudie, has been commissioned by the Aircraft Carrier Alliance to record the progress of the ships' construction. Lachlan said: "I have visited a few of the yards involved, but now HMS Queen Elizabeth is truly taking shape I have been working to record her development in the Rosyth dock. Although I think I'm going to need a bigger piece of paper!"



### Ministerial visit

The Minister for Defence Equipment, Support and Technology, Philip Dunne, visited the programme just ahead of the aft island being lifted into place. Systems Service Director Steven Carroll said: "The Minister was impressed with the work that has been accomplished in the last few months."

### On board and online

The Aircraft Carrier Alliance's award-winning website, combined with its Flickr, YouTube and Twitter channels, provide a constant update on what's going on across the programme.

And now a publication that used to be limited to programme staff is now being made available online each week.

The ACA weekly communication bulletin gives a detailed run through that week's progress at sites across the UK.

Download the latest edition at [www.aircraftcarrieralliance.co.uk](http://www.aircraftcarrieralliance.co.uk)

## Ski jump ready in quick time

The first section of ramp, or 'ski jump', that will give fast jets additional lift on take-off has been fitted to the flightdeck of HMS Queen Elizabeth – almost three months ahead of the original schedule.

And the Minister for International Security Strategy, Andrew Murrison, was one of the first people to see the section in place.

The ramp is in five sections, with each part weighing in at around



The first section of the ramp

80 tonnes. The next section is scheduled to be lifted into place next month.

Aircraft Carrier Alliance Integration Manager, Tom Gifford, said: "The hard work of everyone on the team, from designers to fabricators, means we have been

able to move this important part of the assembly schedule forward."

The ski-jump ramp – a British innovation first used with the Harrier jets – is designed to give the F-35B additional lift as it uses its downward thrust for short take-off operations.

## Waste gets treatment

When you are managing a floating airport, home to 1,600 men and women and many miles from dry land, dealing with waste safely and responsibly becomes an important issue.

Whether it is oily water, sewage, or 'grey' water from showers or laundry, waste often needs to be stored on-board before being treated on land.

Now, in a first for any UK warship, the Queen Elizabeth Class is being fitted with an Integrated Waste Management System (IMWS) which can transform some waste into water clean enough to meet strict standards for discharge at sea.

Babcock's Defence Systems Technology Managing Director Jeff Lewis said: "The IMWS is the first coherent integrated waste management system on a warship. It minimises the manpower needed to deal with waste."

## Royal visits

HMS Queen Elizabeth has been the subject of Royal attention. HRH the Duke of York became the fourth member of the Royal Family to view HMS Queen Elizabeth when he visited the assembly site in July.

He followed visits from The Princess Royal, The Duke of Edinburgh and the The Earl of Wessex (pictured).



## Mast lowers for bridge

The Queen Elizabeth Class will be the tallest ships to serve in the Royal Navy. But guarding their exit from Rosyth is an obstacle – the Forth Bridge – whose span is 10-metres lower than the height of the ship!

Aircraft Carrier Alliance engineers have come up with an ingenious solution – they have designed a mast that can be lowered hydraulically, to provide a comfortable clearance.

The system can raise or lower the 19-metre high, eight-tonne mast in just eight minutes. The power of the system is immense: during final stages of raising and securing the mast, the power pack pulls a downward force of about 750 tonnes.

## Proud to be safe

The top priority for the Aircraft Carrier Alliance is keeping everyone in the workforce safe.

Head of Safety, Health and Environment, Andy Forbes, explains: "Everyone in the Aircraft Carrier Alliance should feel proud to work safely. The programme has twice reached a milestone of one million hours worked without a reportable incident.

"With so many people

involved in this programme working in potentially high-risk environments, making sure everyone understands the importance of working safely is vital. We co-ordinate campaigns around everything from following procedure when dealing with high-voltages, to wearing the right protective gear for the job, and even staying well-fed and hydrated."

