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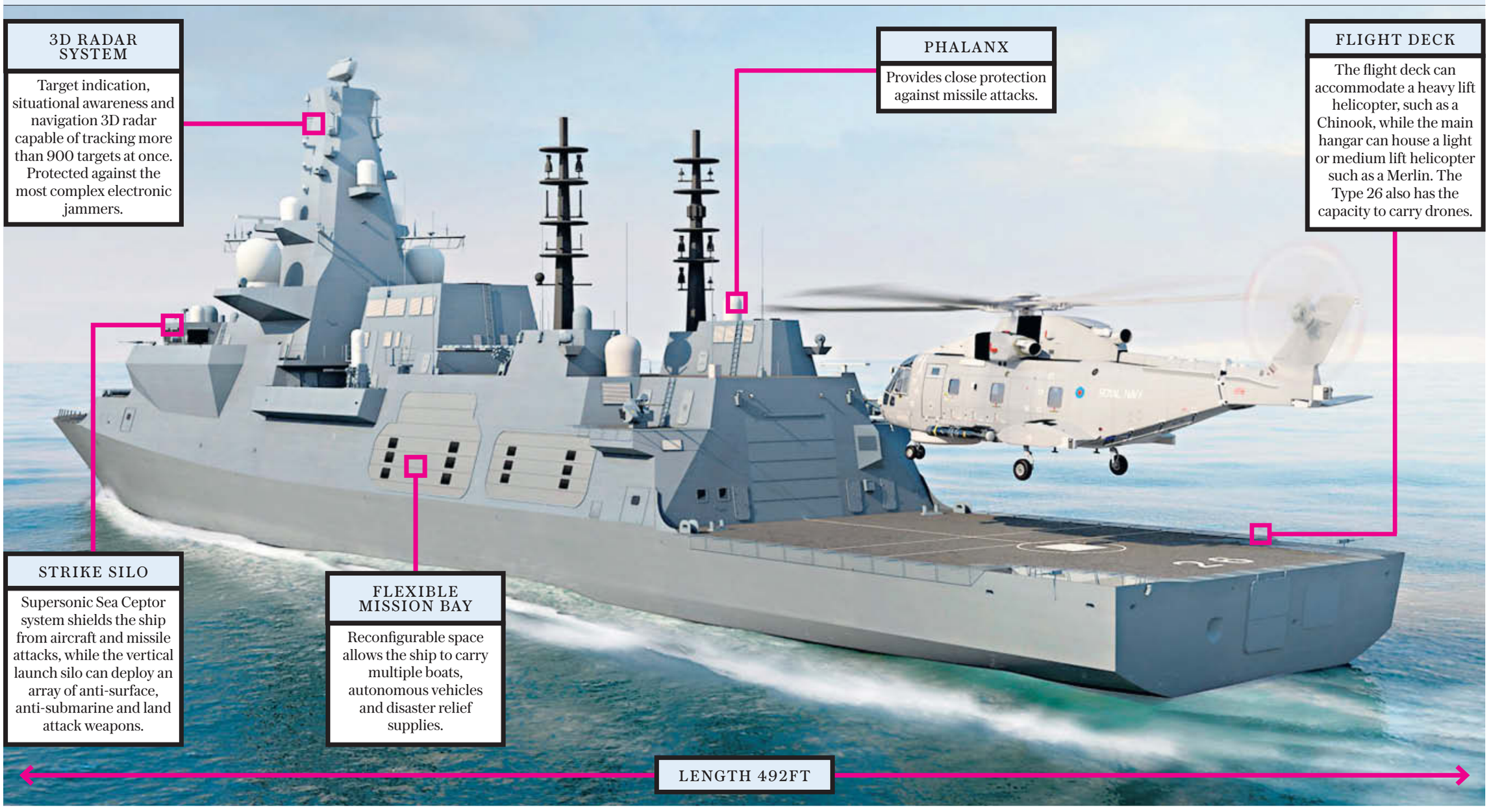
HMS GLASGOW
ON-BOARD THE TYPE 26 FRIGATE WARSHIP



HMS Glasgow: Building the world's most advanced naval ship in Govan

The Type 26 frigates are designed to withstand heavy bombardment and hit back harder, reports *Alan Tovey*

The sun beats down on BAE Systems' Glasgow shipyard as the first of eight of the Royal Navy's new Type 26 frigates takes shape on the quayside.

Inside, engineers work in searing heat on what will be the world's most advanced warship when it is handed over to the military in the mid-2020s.

Scaffolding and cables make moving around tricky, while pipes, studs and other fittings protrude from the floor, walls and ceilings, catching the unwary.

The scene could be described as chaotic.

Not so, says Sir Simon Lister, managing director of BAE's naval ships business, as he gives *The Daily Telegraph* a tour of HMS Glasgow – a future-proofed fighting vessel designed to withstand heavy bombardment and hit back harder – during her construction at the company's Govan shipyard.

"Look at this," he says, pointing to a two inch stud welded to a bulkhead. He explains it wasn't on the original digital plans, but was added by veteran shipbuilders who saw that cables needed to be directed around what will become the frigate's operations room.

"Now it's on the plan. We can track every nut, bolt, cable on this ship," he says, explaining that accounting for such minor details is critical to the project being on time and budget.

Sir Simon says that in the past ships, such as the first-in-class HMS Glasgow, were "fettled" during construction. Shipyard staff would improvise workarounds when the plans didn't fit. This meant each ship had variations, complicating operation and maintenance.

The Type 26, which will be known as a City class frigate, avoids this problem. It has been designed using advanced computer-aided design (CAD) systems which allow engineers to virtually "fly" through a digital version of the vessel, examining every nook and cranny, seeing how parts and systems work and fit together.

This means every component is tracked so engineers know exactly where it is, whether that's under construction by a supplier, in transport, sitting in the dockyard, or fitted in the ship. They also know how close each part is to being finished and who is working on it.

Changes are uploaded to make sure every part of the ship is on record.

"This plan was updated at 6.30am this morning – we update the design every day," says Kevin Williams, principal engineer leading a virtual tour of the ship's interior on a giant screen. He effortlessly passes through decks and bulkheads, isolating systems such as piping.

Input into the Type 23's design has come at all levels. Williams took his system on the road, touring naval bases so even the most junior sailors could help identify issues.

"Any bad design is going to have an impact for decades as these ships will be in service until at least the 2050s," says Williams.

The frigates which the City class will replace had an issue with a high-pressure air system that required regular maintenance, says Richard Dingley, BAE integration director.

"[This] meant removing the one ton freezers it was behind, so you had to either run down the freezers or eat all the food in them," he adds. "The one thing you don't want to do is disturb sailors in the habitable areas. This system means we can avoid that."

Back on board, Sir Simon explains the Type 26 has been designed to take an unprecedented amount of hits and keep fighting.

"These ships are the opposite of Snatch Land Rovers," he says, referring to the Army's old and notoriously under-protected vehicles. "They are designed to go in serious harm's way and fight through it."

He drops to the floor of what will be the ship's bridge, pointing to a bracket on which equipment will be mounted, absorbing impacts that could knock out sensitive kit. "This ship will fight through shock," he adds.

The tour continues to one of the ship's key features, the mission bay. This large space with cranes overhead will accommodate small boats and shipping containers which can plug into the frigate's networks.

Being able to quickly take on board equipment is what future-proofs the Type 26, according to Sir Simon.

While modifying a ship with new systems generally requires a shipyard visit, being able to fly in new kit in self-contained shipping containers via the flight deck provides a huge advantage.

Pointing to the mission bay's large hinged doors, Sir Simon says: "What comes out of there in the future is what will worry the enemy. Will it be marine, drones, new surveillance kit or something we haven't even thought of?"

But the Type 26 hasn't been without problems, despite winning praise from the National Audit Office, which said the £3.7bn contract for the first three vessels was a year ahead of schedule – something which raises eyebrows at Glasgow.

As *The Daily Telegraph* visits, workers are preparing to cut a huge hole in the ship's side to install a gearbox, which is eight months late. The digital design was supposed to eliminate such problems, with massive items such as this installed in the block building stage.

"I can guarantee we absolutely haven't seen the last problem or what it will be," says Sir Simon. "But we know we can fix them."

That experience should also help reduce costs. The £3.7bn for the first three works out at £1.3bn in development and design, with each ship costing £800m to build. Lessons learned from each vessel could allow BAE to cut the price per hull by a fifth.

It could be expensive for BAE if it doesn't: the company is on a "target cost incentive" deal, meaning it shares the gain if costs fall, but also the pain if it blows the budget.

But for Sir Simon, who "learnt his trade in frigates, but then served in submarines up close and personal with the Russians", HMS Glasgow means far more than a manufacturing project.

There's an old saying that submarines see every other sort of warship as a target, but the ex-submariner turned industry chief isn't so sure.

"As a former submariner, it's a target to avoid, not go after."

GEOFF PUGH FOR THE TELEGRAPH

'What comes out of there in the future is what will worry the enemy'

The warship under construction at BAE Systems' dockyard. It has been digitally designed