NAVY NEWS WEEK 12-3

22 March 2022

Spread Out and Networked: How the Navy Plans to Fight and Win Future Wars

The Distributed Lethality Strategy is designed to be able to let the Navy fight from a distance and without the risks of operating close together.

by Kris Osborn
April 28, 2021

Image: Reuters.

Key point: America is keenly aware of the large challenges that come with competing with China. Here is how the Navy hopes to be able to handle long-range, numerous threats such as anti-ship missiles.

The Navy's now multi-year use of the word "*Distributed*" to explain its fast-evolving maritime warfare strategy is expanding and, in an interesting and significant way, building upon years of recent weapons development placing a not-so-surprising premium upon a need to massively expand its range and speed of attack weapons. "*Ubiquitous and persistent sensors, advanced battle networks, and weapons of increasing range and speed have driven us to a more dispersed type of fight*," Chief of Naval Operations Adm. Michael Gilday writes in his new CNO NAVPLAN strategy paper. Arming the overall fleet with longer range weapons has indeed been a major focus for the Navy for many years now. As long ago as 2015 and earlier, the Navy began announcing and moving on a Distributed Lethality strategy intended, simply put, to massively arm the surface fleet with newer, far more capable and much longer-range weapons. Arming the LCS with deck-launched Hellfire missile to extend ship-based air-defense ranges and giving the ship the new "*over-the-horizon*" NSM missile, strategy also employed on the Navy's new Frigate, emerged years ago as part of the Distributed Lethality concept. The Distributed Lethality surface warfare strategy certainly informed and contributed to the Navy's current strategic thinking, which calls for a similar "***Distributed Maritime Operations***" (DMO) strategy. DMO now forms the basis of the Navy's tactical maritime warfare thinking as it pertains to a number of emerging variables to include the greater use of drones, disaggregated surface warfare operations using large and small manned and unmanned platforms for missions such as amphibious attack. The DMO strategy continues to bear specific and immediate relevance to a growing sphere of emerging U.S. Navy weapons systems. The list of weapons used as part of this broad strategic trajectory is long, as it not only encompasses the introduction of many new weapons but also of course continues to involve continued upgrades of many existing weapons. Software upgrades can not only improve guidance systems and harden attack weapons, at times even expanding targeting purview to enable weapons to destroy maritime targets on the move with missiles such as the Tomahawk and SM-6. Defensive weapons have also been upgraded to expand intercept range and precision, as has been the case with the Evolved Sea Sparrow Missile Block 2 or SeaRAM interceptor. At the same time, weapons range brings only marginal warfare utility if it is not network-enabled, meaning expansive sensor networks are increasingly receiving high-priority attention from weapons developers, as a given missile's flight path can be adjusted or updated with new networked sensor data. Sensor "*node*" networking between platforms and weapons systems themselves is the premise of the now heavily emphasized Pentagon Joint All Domain Command and Control program which endeavours to transmit, secure and extend multi-mode sensor-to-shooter networking across the force. "*Our operating concepts require platforms, weapons, and sensors*

connected in a robust Naval Operational Architecture (NOA) that integrates with Joint All-Domain Command and Control (JADC2)," Gilday writes.
Kris Osborn is the defense editor for the National Interest. Osborn previously served at the Pentagon as a Highly Qualified Expert with the Office of the Assistant Secretary of the Army—Acquisition, Logistics & Technology. Osborn has also worked as an anchor and on-air military specialist at national TV networks. He has appeared as a guest military expert on Fox News, MSNBC, The Military Channel, and The History Channel. He also has a Masters Degree in Comparative Literature from Columbia University. This first appeared earlier and is being reposted due to reader interest.
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Source: https://nationalinterest.org

How many naval ships are to be built in Scotland?

The total number of warships to be built in Scottish shipyards post-referendum up to 2035 now stands at 24, more than the 13 'promised' by politicians.

By George Allison
February 16, 2022

Image; George Allison

In addition to the now built 5 Offshore Patrol Vessels, there are plans for 8 Type 26 Frigates, 5 Type 31 Frigates, 5 Type 32 Frigates and 1 Ukrainian warship to be built in Scotland. Despite the above, as you read this there are 13 warships in build or being procured at Scottish shipyards. However, there are thousands of real people on social media that would promise you that no ships are being built – but why? Well, I try to answer that here.

Why is shipbuilding apparently invisible in Scotland?

Jonathan Chartier, a defence commentator, also took a detailed look at this phenomenon. Anyway, for an idea of what's to be built where, click the below table.

Scottish Naval Shipbuilding (2015-2035)

Class	Ship Name	Launch Period	Location
River Class	HMS Forth	2016	Glasgow
River Class	HMS Medway	2017	Glasgow
River Class	HMS Trent	2018	Glasgow
River Class	HMS Tamar	2018	Glasgow
River Class	HMS Spey	2019	Glasgow
Type 26	HMS Glasgow	2020's	Glasgow
Type 26	HMS Cardiff	2020's	Glasgow
Type 26	HMS Belfast	2020's	Glasgow
Type 26	HMS Birmingham	2020's	Glasgow
Type 26	HMS Sheffield	2020's	Glasgow
Type 26	HMS Newcastle	2030's	Glasgow
Type 26	HMS Edinburgh	2030's	Glasgow
Type 26	HMS London	2030's	Glasgow
P50-U	*UKRAINIAN NAVY YET TO NAME*	*2020's*	*Rosyth*
Type 31	HMS Active	2020's	Rosyth
Type 31	HMS Bulldog	2020's	Rosyth
Type 31	HMS Campbeltown	2020's	Rosyth
Type 31	HMS Formidable	2020's	Rosyth
Type 31	HMS Venturer	2020's	Rosyth
Type 32	Ship 1	2020's	Rosyth
Type 32	Ship 2	2020's	Rosyth
Type 32	Ship 3	2030's	Rosyth
Type 32	Ship 4	2030's	Rosyth
Type 32	Ship 5	2030's	Rosyth

CHANGE IN COLOUR REFLECTS DIFFERENT BATCH, YELLOW IS EXPORT ORDER

Currently, 13 of the above 24 ships have been built or are in build, with the rest following. In fact,

there was recently confirmation of the next batch of Type 26 Frigates being budgeted for and long lead items procured for.

A Ukrainian warship?

Ukraine previously signed a memorandum with the UK to secure £1.25 billion in funding to build new military vessels for the Ukrainian Navy, the first ship will be constructed in the UK and the remaining 7 vessels will be built in Ukraine.

Type 32?

The new Type 32 Frigate will be built in addition to the Type 26 and Type 31 Frigates in the hopes of bringing the escort fleet up to 24 vessels from its current 19. The Defence Secretary previously confirmed that Rosyth will be building more vessels than previously planned, with the Type 32 Frigate going into built at the yard after the Type 31 Frigate build finishes. Ben Wallace, the Defence Secretary, recently stated that Rosyth would be building Type 32 Frigates in addition to Type 31 Frigates. *"We are committed to building the Type 26 in the United Kingdom; it is under construction on the Clyde. In Rosyth, work is ongoing to build the facility needed to build the Type 31s* ***and the subsequent Type 32s****. He also knows that I recently re-categorised the future Fleet Solid Support ship as a warship. I intend to make sure that, if not entirely, there is a considerable degree of UK build in that process, subject to tender. I have to be cautious about the contract, because the competition is to begin soon—very soon."* According to the recently released '**Defence Command Paper**', the Type 32 frigates will be designed to protect territorial waters, to provide persistent presence overseas and to support Littoral Response Groups. The first mention of a new Type 32 frigate came in the Prime Minister's 19 November statement. He said: *"We are going to develop the next generation of warships, including multi-role research vessels and Type 32 frigates."* The Defence Command Paper, titled '**Defence in a Competitive Age**', describes the planned programme: *"Type 32 frigates, designed to protect territorial waters, provide persistent presence overseas and support our Littoral Response Groups."* Well, if all is so good why am I writing this? Because despite this information being easily verifiable and heavily reported, people seem unaware of it. A good example would be the comments under any shipbuilding article we publish. Even in response to articles detailing which ship will be built where, when the contract was signed, what type it is etc we'll still get comments claiming that no shipbuilding is being done for the Royal Navy in Scotland, so here we are.

Source: https://ukdefencejournal.org.uk

British assault ship sails for the Arctic

HMS *Albion* has left the UK bound for the Norwegian fjords to take part in the largest NATO military exercise in Norway in more than 30 years.

By George Allison

February 23, 2022

3 Commando Brigade land in Norway.

The Royal Navy say here that **HMS *Albion*** is heading for the Arctic as the spearhead of amphibious/commando forces taking part in **Exercise Cold Response** – a month-long test by land, sea and air of allied forces to operate in one of the most challenging environments on the planet. *"**Albion** prepared for her Arctic mission with intensive operational training in and around Plymouth which culminated earlier this month in a joint disaster relief/civilian evacuation test, working side-by-side with the Dutch Navy's **HNLMS Karel Doorman**. Alongside landing support ship **RFA Mounts Bay, Albion** leads the UK's amphibious input into **Cold Response**, with "a significant level" of littoral strike operations – traditional-style commando raids – staged in the fjords, with the British force integrating with numerous allies, including the US, Norwegians, French, Germans and Italians."* Captain Simon Kelly, **HMS *Albion***'s Commanding Officer, was quoted as saying: *"The UK has long had a very specific roll up in the high north in the Arctic. And it's all part of our routine development of*

that capability. Our ability to plug into and integrate into larger task groups is absolutely the core of all our capabilities, and it's that integration into the bigger piece of NATO, that collective ability which really brings the fighting edge to NATO."

Source: https://ukdefencejournal.org.uk

Royal Navy in the News

A final farewell from Royal Navy Hawks

Royal Navy Hawk T1 jets flew around the country this week to say farewell, as these veteran aircraft are retired from service. Based out of Royal Naval Air Station Culdrose in Cornwall, the fast jets have been a mainstay for decades in training Royal Navy and NATO ships in air defence. The BAE Systems Hawks have been used by the RAF for 40 years and the Royal Navy's aircraft date from the 1990s. They were first based at **RNAS *Culdrose*** in 1994 and were incorporated into the re-formed 736 Naval Air Squadron in 2013. It was announced in the Integrated Review last year that the Hawk T1 was to be retired across defence, with the exception of the Red Arrows, and it was decided 736 Naval Air Squadron would be decommissioned at the end of March 2022. On March 17, three jets took off from **RNAS *Culdrose*** and flew around their principal training sites including **HMNB *Devonport***, **RNAS *Yeovilton***, Bournemouth Airport and then **HMNB *Portsmouth***, before heading up to **HMS *Gannet*** at Prestwick in Scotland. The following day, the trio returned home with flypasts of RAF Valley and Pembrey in Wales. Some of the pilots have already joined the training programmes for the UK's next-generation F35B Lightning jets, which operate from the navy's aircraft carriers. Many people gathered to watch the farewell flight as it passed around the UK, including on the seafront at Plymouth and around the harbour at Portsmouth. Instructors from the Royal Navy School of fighter Control watched from the airfield at **RNAS *Yeovilton*** to bid farewell to the Hawk jets.

Commandos start 100-day countdown to Armed Forces Day

Abseiling commandos, Royal Marines Buglers and a Merlin flypast heralded the 100-day countdown to the military's largest public event of 2022.

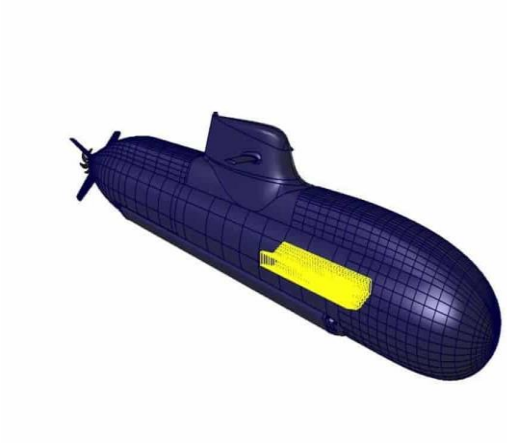
Photos: Crown copyright/MoD

To set the clock running down to Armed Forces Day, a Royal Marines team slid down the side of the castle keep in Scarborough to a fanfare from four buglers of the RM Corps of Drums as a Merlin from 814 Naval Air Squadron buzzed around the ancient fortress. The historic Yorkshire town is the place to be on Saturday June 25 as it hosts the main national Armed Forces Day event. Military personnel from the Royal Navy, Royal Marines, Army and Royal Air Force will parade along the seafront, with cadets and veterans, while the public will get the chance to show their appreciation for those who have served or continue to do so. They'll see a variety of military displays, look around military equipment and, most importantly, meet Armed Forces personnel. The website scarboroughharmedforcesday.co.uk will be the main online source of information about the national event weekend in the town. In the coming weeks the site will be populated with the programme and activity listings, details of how to plan a visit to Scarborough, stories from veterans and Armed Forces personnel, community project information, how sponsors are supporting the event and much more. The event is backed by more than 30 major sponsors, led by retailing giant Tesco and including NAAFI, Babcock,

Balfour Beatty, BAE Systems, McCain Foods, REFA (The Forces Employment Charity), Royal British Legion and Taylor Wimpey. **Source: www.navybooks.com**

World News & Events

Italian Navy's U212 NFS' Lithium Battery System completes System Design Review



SDR core objectives were safety and the increase of the operating capacity of the Lithium Battery System. Photo: OCCAR

The U212 NFS new Battery System (Lithium based) has successfully completed its System Design Review (SDR).

This milestone marks a mandatory step forward in the development, possible production and integration on board of the U212 NFS fleet. SDR core objectives were safety and the increase of the operating capacity of the Lithium Battery System. Next significant step will be the Critical Design Review that completes the design of this innovative as well as strategic energy storage system in line with the Italian Navy operational requirements. The SDR was achieved through a joint effort by all stakeholders such as the OCCAR U212 NFS Programme Division, Submarine experts of the Italian Navy and the whole small and medium-sized enterprises led by Fincantieri.

Pakistan Navy conducts missile and torpedo firings during Sea Spark 2022

Screenshot from Pakistan Navy's event video

The Pakistan Navy (PN) have carried out live missile and torpedo firings from the surface, air, and subsurface units in the North Arabian Sea during **Sea Spark 2022**.

In an impressive firepower display, PN Fleet units demonstrated combat readiness and warfighting potential by ***Live Weapon Firings*** of anti-ship missiles and torpedoes in the North Arabian Sea. Chief of the Naval Staff Admiral Muhammad Amjad Khan Niazi witnessed the live weapons firings along with senior officers from Tri-services. During the Firepower demonstration, PN Ship, Aircraft and Submarine successfully hit their intended targets thereby re-affirming PN's warfighting capability and combat potential. The live weapons firing was conducted on the culmination of the sea phase of PN's Major Maritime **Exercise SEASPARK-2022**. The exercise was conducted to validate PN operational plans and war preparedness of the Pakistan Navy. **Source: www.navybooks.com**

HMAS *Arunta*, RAAF P-8A Poseidon conclude trilateral training

18 March 2022

By: Reporter

The frigate and the maritime patrol aircraft have wrapped up their contribution to a trilateral military exercise alongside US and Japanese counterparts. Royal Australian Navy frigate **HMAS *Arunta*** and a Royal Australian Air Force P-8A Poseidon maritime patrol aircraft have concluded trilateral

training alongside US Navy destroyer **USS *Momsen*** and Japan Maritime Self-Defense Force destroyer **JS *Yudachi*** in the South China Sea. The exercises, which wrapped up on 15 March, were designed to enhance interoperability and communications between the partners, while also helping to preserve an open, inclusive and resilient Indo-Pacific region. Training involved testing a range of professional mariner skills, including cooperative navigation, communications and helicopter operations. **HMAS *Arunta***'s contribution forms part of a regional presence deployment, the Navy's first for 2022. The deployment commenced in late February, with **HMAS *Arunta*** securing shipping lanes, visiting regional ports and participating in **Exercise Milan 2022** — a multinational military exercise involving 16 navies from across the Indo-Pacific, held in the port of Visakhapatnam, India, and in the Bay of Bengal. The Indian-led exercise provided personnel with experience operating at sea in a large multilateral force. The sea phase followed a harbour phase program in Visakhapatnam, which included an opening ceremony, seminars, briefings, technology demonstrations and training activities. These deployments aim to support the Australian Defence Force's international engagement programs, and demonstrate Australia's commitment to working with regional partners to address shared challenges. **Source: https://www.defenceconnect.com.au**

Russia Strikes Ukraine With Cruise Missiles From Ships In The Black Sea And Caspian Sea

March 20 (Reuters) –
March 20, 2022

The Russian Navy's guided missile cruiser ***Moskva*** and frigate ***Admiral Grigorovich*** are seen ahead of the Navy Day parade in the Black Sea port of Sevastopol, Crimea July 23, 2021. REUTERS/Alexey Pavlishak

Russia struck Ukraine with cruise missiles from ships in the Black Sea and Caspian Sea,and launched hypersonic missiles from Crimean airspace, the Russian defense ministry said on Sunday. Defense Ministry spokesman Igor Konashenkov said Russia had carried out strikes against Ukraine's military infrastructure on Saturday night and Sunday morning. "*Kalibr cruise missiles were launched from the waters of the Black Sea against the Nizhyn plant that repairs Ukrainian armoured vehicles damaged in fighting*," he said. Russia fired Kalibr cruise missiles from the Caspian Sea and hypersonic Kinzhal (Dagger) missiles from airspace of Crimea, the peninsula Russia annexed from Ukraine in 2014, to destroy a fuel storage facility used by the Ukrainian military, Konashenkov said. Russia also hit a Ukrainian military preparation center where foreign fighters joining Kyiv's forces were based. Russia's invasion of Ukraine has killed thousands of people, displaced more than 3 million and raised fears of a wider confrontation between Russia and the United States, the world's two biggest nuclear powers. Russian President Vladimir Putin says the "*special military operation*" in Ukraine was necessary because the United States was using the country to threaten Russia and Russia had to defend against the "*genocide*" of Russian-speaking people by Ukraine. Ukraine says it is fighting for its existence and that Putin's claims of genocide are nonsense. The West has imposed sweeping sanctions on Russia that the Kremlin says amount to a declaration of economic war by the United States and its allies. **Source: https://gcaptain.com**

Russian Forces Are Tightening Their Grip Around Ukraine's Port Of Mariupol

March 19 (Reuters) –
March 19, 2022

Ukraine's defense ministry said late on Friday it lost access to the Sea of Azov "*temporarily*" as invading Russian forces were tightening their grip around the Sea's major port of Mariupol.

Russian jet fighters fly over a bridge connecting the Russian mainland with the Crimean Peninsula with a cargo ship beneath it after three Ukrainian navy vessels was stopped by Russia from entering the Sea of Azov via the Kerch Strait in the Black Sea, Crimea November 25, 2018. REUTERS/Pavlishak Alexey

REUTERS

"*The occupiers have partially succeeded in the Donetsk operational district, temporarily depriving Ukraine of access to the Sea of Azov*," Ukraine's defense ministry said in a statement. The ministry did not specify in its statement whether Ukraine's forces have regained access to the Sea. Russia said on Friday its forces were "*tightening the noose*" around Mariupol, where an estimated 80% of the city's homes had been damaged more some 1,000 people may still be trapped in makeshift bomb shelters beneath a destroyed theater. Mariupol, with its strategic location on the coast of the Sea of Azov, has been a target since the start of the war on Feb. 24 when Russian President Vladimir Putin launched what he called a "*special military operation*." The city lies on the route between the Russian-annexed peninsula of Crimea to the west, and the Donetsk region to the east, which is partially controlled by pro-Russian separatists. Russia claimed as early as March 1 that its forces had cut off the Ukrainian military from the Sea of Azov.

Source: https://gcaptain.com

The **Cantiere Navale Vittoria** built offshore patrol vessel **P71** for the Armed Forces of Malta during her last tests before the delivery!

Norwegian Armed Forces Track Russian Ships In The Barent Sea

A Norwegian P-3 Orion aircraft observed two large Russian naval vessels (a Kirov-class cruiser and an Udaloy-class ASW destroyer) north of Finnmark on March 14 during a routine patrol flight. Russian ship movement and the declaration of a "*live fire exercise*" come after the NATO task force exercise assembled off Norway this week for **exercise COLD RESPONSE**

On Sunday afternoon, the Norwegian P-3C Orion maritime patrol aircraft was on a routine mission in the High North. During the mission, the Norwegian aircraft identified a Russian Kirov-class nuclear-powered cruiser and a Udaloy-class anti-submarine destroyer north of Finnmark. The two Russian vessels were in international waters. In addition, two other Russian

military vessels are currently operating north and south of Lofoten and Vesterålen, not far from allied naval forces participating in the Norwegian military exercise Cold Response 2022.

Not abnormal

Russia has requested the establishment of a NOTAM (Notice to Airmen) area in the middle of the Norwegian Sea, and it is possible that these ships will use this area. It is important to emphasize that this activity is not a drama. The Russian ships were legally sailing in international waters, and it is not unusual for us to see such activity in connection with major exercises such as **Cold Response**. However, it is important for Norway to follow the Russian ships. Norway is responsible for large maritime areas in a strategically important part of the world, and we, therefore, need to know and understand what is happening in these areas. One of the most important tools for ensuring a good understanding of the situation is the Norwegian P-3C Orion maritime patrol aircraft. The aircraft's main task is to monitor maritime areas and enforce Norwegian sovereignty. In addition to maritime surveillance and reconnaissance, the P-3C also conducts searches for foreign submarines and participates in search and rescue missions. Starting in 2023, Norway's new P-8 Poseidon maritime reconnaissance aircraft will take over Evenes' role. The first Norwegian P-8 landed on Norway on Feb. 24, and the next two aircraft are scheduled to arrive before the summer.

Source : Naval News

Gliders with Ears: A New Tool in China's Quest for Undersea Security

March 21, 2022

By Ryan Martinson

Today, Chinese underwater gliders operate throughout the Indo-Pacific, from the Bay of Bengal to the Bering Sea, from high seas to sovereign waters. These winged, torpedo-like submersibles are being deployed in droves to collect information about the marine environment. Traveling underwater in a vertical sawtooth pattern, gliders use onboard sensors to measure characteristics of the ocean such as temperature, salinity, dissolved oxygen, and current speed at different depths to generate water column profiles. This data indirectly bolsters the capabilities of the People's Liberation Army Navy (PLAN) by expanding its tactical understanding of the ocean environment.

The guided-missile frigate ***Zhoushan*** **(Hull 529)**, together with the guided-missile destroyers ***Taizhou*** **(Hull 138)** and ***Hangzhou*** **(Hull 136)**, steam to designated sea area in East China Sea during a maritime training exercise in early January, 2021. (eng.chinamil.com.cn/Photo by Liu Yaxun)

Scientists and engineers based in the People's Republic of China (PRC) are also developing a new generation of gliders that could play a far more direct role in naval combat by detecting enemy submarines. Since 2014, experts at the PLAN Submarine Academy, working with colleagues at civilian institutions, have been equipping Chinese gliders with passive acoustic sensors. Chinese language records of their activities show a determined effort to adapt this technology for anti-submarine warfare (ASW), an enduring weakness for the PLAN—one that, if remedied, could shake U.S. conventional deterrence in the Western Pacific.

Why Gliders?

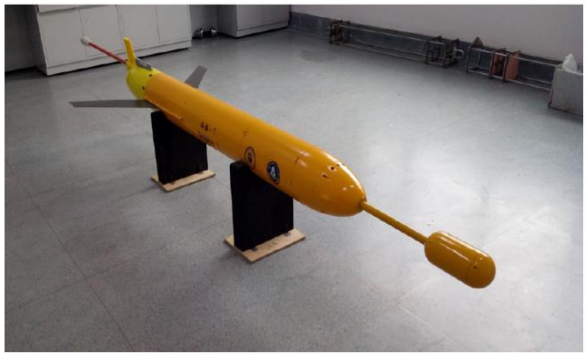
The PLAN has a very difficult time detecting advanced foreign submarines within Chinese-claimed maritime space. Modern submarines are stealthy, the ocean is vast and complex, and ASW is inherently difficult—for any navy. But the stakes are especially high for China, given the perceived threat that foreign submarines pose to China's maritime security. PRC experts often lament that China's "*underwater front door is wide open*" (水下国门洞开). China's 13th Five Year Plan for Innovation in Marine Science and Technology frankly admitted that China "*still lacks the ability to resist hostile threats from the deep sea*." One PLAN analyst declared, "*the threats our country faces in the maritime direction mainly come from the undersea [domain], and the main gap with the powerful enemy [the U.S.] is also in the*

undersea [domain]." To shrink this capability gap, the PRC has invested heavily in new ASW capabilities for its fleet while looking to the U.S. Navy as a model. The PLAN has built ocean surveillance vessels like the **USNS *Effecti**ve*** to tow acoustic sensors designed to detect submarines. The PLAN has also procured sub-hunting maritime patrol aircraft, similar to the U.S. Navy's P-3 "Orion," and it may soon begin equipping the fleet with an ASW variant of the Z-20 helicopter, often described as a close copy of the MH-60 "Seahawk." The PRC is also taking steps to build a network of sensors, some mobile and some fixed, to detect foreign submarines in operationally important areas. Together, these sensors would constitute an "undersea alert system" (水下警戒体系). Some ASW platforms use traditional hydrophones, which only capture information about the frequency (hertz) and intensity (decibels) of sound. However, to localize the source of the sound, multiple hydrophones are often combined into an array, which can be large and unwieldy. A single vector sensor, in contrast, is capable of determining the direction of a sound source. China is very keen on pursuing a new generation of piezoelectric vector sensors, which are far smaller than previous types. Their compact size also allows their installation on much smaller platforms like underwater gliders. Gliders move up and down in the water column by adjusting their buoyancy while their "*wings*" enable them to move forward at an angle. As ASW platforms, gliders offer several advantages. Due to their low power requirements, some gliders can operate at sea for months at a time. Because of the simplicity of their design, gliders are also comparatively cheap—an important attribute since they must be deployed in large numbers to be effective. Unlike fixed undersea sensors, gliders can move to where they are needed (albeit very slowly, at just about one knot). Lastly, gliders can maintain regular communications with their operators by transmitting their location (and other information) and receiving new commands when they surface at the end of a dive. How might the PLAN use acoustic gliders? According to the PLAN researchers working on the project discussed in this article, they would be used to "*complete tasks such as autonomous detection, tracking, attribute discrimination, and sending back information on moving targets in sensitive waters or areas of denial (拒止区域)*." The program director, Rear Admiral Da Lianglong, likened them to a front-door "*security system*" (安保系统). One of his briefing slides from a 2019 presentation suggests that the PLAN intends to deploy them in the relatively quiet, deeper waters of the Philippine Sea and northern South China Sea, operationally-important areas where China lacks islands to build fixed undersea arrays.

Rear Admiral Da Lianglong with colleagues at the PLAN Submarine Academy (Source: 81.cn)

The Dolphin Project

While the advantages of gliders seem obvious, there are also many technical challenges that must be overcome before they can be used in ASW. Since 2014, the PLAN Submarine Academy, working in conjunction with scientists and engineers from Tianjin University and the Qingdao Pilot National Lab for Marine Science and Technology have methodically surmounted many of these challenges and now possess a capable prototype glider, the "*Dolphin*," which has already undergone several rounds of testing in the South China Sea. The Dolphin is based on the Haiyan glider developed by researchers at Tianjin University. Like most sea gliders, the Haiyan is a tubular robot with wings and a visible antenna. However, it is somewhat unusual in that it is equipped with a small propeller, a useful feature if needed to surface quickly in the event of a potential submarine contact. Chinese oceanographers have already deployed Haiyan gliders within the first island chain and beyond. A specially designed Haiyan variant (Haiyan-X) is capable of diving to tremendous depths, including the bottom of the Mariana Trench. Another variant (Haiyan-L) has been built for greater endurance, purportedly up to five months of continuous operations.

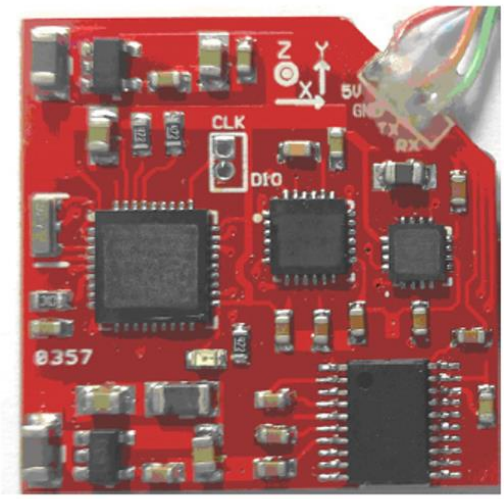


The Dolphin Acoustic Glider (Source: KNS.CNKI)

The *Dolphin* looks like a typical Haiyan glider, except for a vector sensor protruding from its nose. Within the body of the glider, forward of the batteries, is its signal processor. indicating that the platform is designed to autonomously detect, classify, and locate undersea targets, not merely to record and transmit raw data for interpretation elsewhere. The Dolphin project is led by the Naval Undersea Warfare Environmental Research Institute (海军水下作战环境研究所) at the PLAN Submarine Academy. It is overseen by the Institute's Director, Rear Admiral Da Lianglong, perhaps the PLAN's most accomplished expert on undersea science and technology. Rear Admiral Da has won numerous national, provincial, and military awards for his work on how the undersea environment affects sonar performance and submarine tactics. Under Rear Admiral Da's leadership, the Environmental Research Institute has shrewdly leveraged civilian organizations to help advance its mission. In 2013, his institute turned its attention to vector sensors. Then, in 2016, it joined with the Qingdao Pilot National Lab for Marine Science and Technology to create the Joint Lab for Civil Military Integration in Qingdao, with Rear Admiral Da as its director. This allows the Submarine Academy to benefit from the expertise, access, and resources available to the civilian marine science community. When Xi Jinping visited the Qingdao Pilot National Lab in June 2018, he spoke about the importance of civil-military integration in marine science. Rear Admiral Da stood beaming in the audience, the embodiment of Xi's ideal.

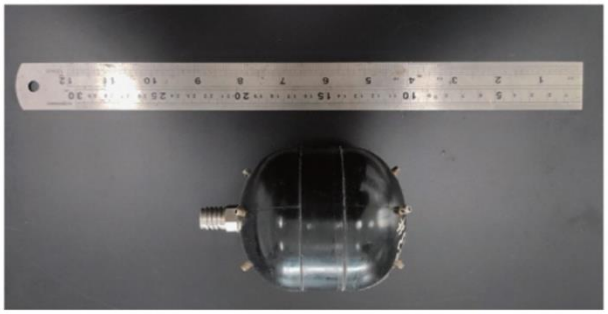
Milestones

The team at the Submarine Academy overcame several technical challenges to make the Dolphin a viable ASW platform including self-noise, contact localization fidelity, and overcoming the immense pressure water pressure of deep dives. The first was self-noise. Researchers originally built the Haiyan glider for oceanographic research, where self-noise is far less of a concern. However, when detecting submarines, it is vital that an ASW platform be as quiet as possible to make it easier to distinguish the relevant signatures from other noises and thereby maximizing the signal to noise ratio. This is especially important when that signature is extremely faint, like those emitted by modern submarines. The Haiyan produces noise at the bottom of its dive, when a pump activates to increase buoyancy needed for the ascent. It also produces noise when the propeller engages. These noise problems, however, are simple fixes since the glider can be programmed to turn off its vector sensor during the brief periods when the pump and propeller are on. For the Chinese researchers, the real challenge was reducing the noise generated by the mechanisms used to maintain the glider's course and attitude. Researched overcame this challenge by changing the position of the glider's internal battery packs. Through a series of tests conducted at first in specially designed pools followed later by tests in the South China Sea, the researchers were able to optimize attitude and course adjustment mechanisms to reduce this self-noise. Slight changes to the attitude of the glider presented a second challenge that had to be overcome: errant localization. The vector sensor receives data about the direction of a target in relationship to the attitude of the sensor at the time of detection. For this information to be tactically valuable, the glider required a tiny attitude sensor that would enable an onboard computer to locate the target relative to the surface of the ocean. Scientists at the PLAN Submarine Academy, including Da Lianglong himself, successfully developed a sensor for this purpose and it now equips the Dolphin glider.



Attitude sensor developed for the Dolphin (Source: KNS.CNKI).

Finally, Chinese scientists also had to develop a vector sensor that could reliably operate in the high-pressure environment of the deep ocean. Since many countries prohibit the sale of acoustic sensors to China, researchers could not simply import a foreign product. Since the early 2000s, experts at Harbin Engineering University have conducted pathbreaking research on vector sensors. The team at the Submarine Academy built off their work to develop a deep water vector sensor. In 2019, researchers tested the new sensor in the South China Sea at depths of 800 meters and 1,200 meters with promising results. That same year, Rear Admiral Da and several other colleagues at the Submarine Academy patented a vector sensor that could effectively operate down to 4,000 meters. According to their patent application, the sensor could be particularly suited for unmanned platforms like gliders "for use in submarine detection."



Deep water vector sensor developed for the Dolphin (Source: KNS.CNKI)

Since 2018, the Dolphin has undergone multiple tests in the South China Sea, in the deep water northwest of the Paracel Islands. To date, Chinese researchers have only tested the glider's ability to detect surface ships, which are obviously much louder than submarines. Two series of tests conducted in May and June of 2018 focused on reducing self-noise. Since then, the team has sought to refine the capabilities of the glider's onboard systems. The most recent known tests conducted in January of 2020 offer a gauge of the Dolphin's current capabilities. They also show the scale of the PLAN's commitment to developing these platforms. During the January 2020 tests, a Dolphin glider successfully tracked the movements of a 50 meter research ship (***Haili***) traveling at 8 knots at a maximum range of 6.5 km. As part of the same series of tests, a Dolphin glider also tracked a 60-meter merchant ship traveling at 11.7 knots at a maximum range of 11.4 km. The Dolphin also tracked the movements of a 192-meter container ship traveling at 15 knots at a maximum range of 11.2 km. Additionally, in January of 2020, a Dolphin glider tracked a 99-meter rescue and salvage ship, the ***Nanhaijiu* 116**, steaming at 14 knots at a maximum detection range of 14.4 km.

Next Steps

To be effective, a glider like the Dolphin would need to work in concert with other such platforms. A single glider would not be enough, since detection ranges will be very short and gliders are not very mobile. The PLAN will likely want to fill an operationally important area of the ocean with dozens of gliders, which will need to be coordinated to ensure efficient coverage. This will be further complicated by the fact that gliders, due to their slow speeds, are vulnerable to undersea and surface currents. Therefore, if one glider drifts out of a given area, another glider will need to move in to fill the gap. Researchers at the Submarine Academy and the Qingdao Pilot National Lab already completed simulations to address the challenge of optimizing the deployment of multiple gliders for target detection. However, these efforts have not yet been tested at sea. Another challenge is autonomy in signal processing. Gliders will need to analyze the raw acoustic data they receive and determine if what they are "hearing" contains the signature of a target of interest. That task is fairly easy if the target is a 190-meter commercial ship traveling at 12 knots. But it becomes extremely difficult when it is a modern submarine operating at slow speed in the noisy waters of the South China Sea. Detecting and classifying targets has traditionally required humans (i.e., sonar technicians) in the loop. Developing systems that can mimic human intelligence will be vital for any autonomous ASW platform, and Chinese experts have been working on this problem for years, again, most notably at the Harbin University of Engineering. Researchers there claim they have developed unmanned platforms capable of autonomously detecting surface and undersea targets at long range and have tested them in lakes and at sea. In October 2018, the University signed a cooperative agreement with the Submarine Academy, although it remains uncertain if this will include collaboration on underwater gliders. In the meantime, researchers from the PLAN Submarine Academy and the Qingdao Pilot National

Lab are proceeding with their own efforts to improve autonomy in target detection. This relates to another huge challenge of filtering out false detections. Failing to detect an enemy submarine is bad, but declaring the presence of an enemy submarine where none exists could be potentially worse for the PLAN. It might deploy manned ASW assets to the area of false contact, wasting time and resources. Acoustic gliders will likely not be deployed for real-world operations until the PLAN is reasonably certain that onboard systems are sophisticated enough to keep false detections to an absolute minimum. In this situation, redundancy in the undersea alert system (i.e., many sensors in a given area) could help strengthen confidence in a target detection.

Conclusion

Writing in early 2013, before substantive work on acoustic gliders began in China, an expert at the 710 Research Institute boldly predicted—in his words, "*without the least bit of exaggeration*"—that the future development of underwater gliders would leave submarines with "*no place to hide*" (无处遁形). Almost ten years later, the PRC is still nowhere close to that. However, the PLAN has come a long way in a short period of time. This achievement has been made possible through a talented, dedicated, and well-funded research team at the PLAN Submarine Academy, a successful approach to civil-military integration, and institutional commitment to redressing China's weaknesses in ASW. China now possesses a viable prototype acoustic glider that has undergone multiple rounds of testing in the South China Sea. China clearly intends to shut its "*underwater front door*," and acoustic gliders will be one tool that helps it do just that.

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Source: https://cimsec.org