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Cross-Strait Island Landing Campaign**



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Mine Countermeasure Operations in a Cross-Strait Island Landing Campaign¹

By Tian Ying (天鹰)

*Sea mines are a type of cheap, easy to produce naval weapon that can be used both offensively and defensively. They have played a huge tactical role and even a strategic role in many wars from ancient times to the present day. Sea mines have low production costs, and they are powerful, simple to use, easy to emplace, and difficult to remove. They are characterized by the long-term threat they can pose to ports and shipping lanes. Countering sea mines is relatively difficult and requires the expenditure of rather large resources by the side conducting mine countermeasure operations.



For years, “Taiwanese independence” forces on the island of Taiwan have continually developed sea mine operations as one of their major “asymmetric warfighting capabilities” in the hope that

¹ 天鹰 [Tian Ying], 渡海登岛战役的反水雷作战 [“Anti-Sea Mine Operations in a Cross-Strait Island Landing Campaign”], 舰载武器 [Shipborne Weapons], (June 2024), pp. 42-48.

Translator’s Note: This source is a magazine published by the 中国船舶集团 郑州机电工程研究所 [China State Shipbuilding Corporation’s Zhengzhou Electromechanical Institute], which is involved in the Chinese naval shipbuilding industry. Tian Ying (天鹰, or “Sky Hawk”) is a pseudonym.

this could be an effective method for delaying or even preventing the People's Liberation Army's amphibious operations, thereby buying them time in a war to wait for "out of area assistance" (*yuwai jiu yuan*). In recent years, "Taiwanese independence" forces have become more predominant,² and they are busily scheming with "Taiwanese independence" elements to use force to reject unification.³ It must be pointed out that when the necessary future day of war arrives to achieve the nation's unification, no matter how long and how hard the Taiwan authorities can resist, their efforts will be basically meaningless, because no matter what, resistance is futile.⁴ But nonetheless our military, at the tactical level, must give serious consideration to all their methods for using force to reject unification, including the use of mine warfare, to ensure we have effective countermeasures and carry out diligent and fulsome preparations.



A new type of minesweeper in the People's Navy

The Taiwan Military is Doing Its Utmost to Improve Sea Mine Warfare Capabilities

In recent years, "Taiwanese independence" forces on the island of Taiwan have gotten external support, and their plot to split the nation is getting farther along. As such, using the method of military struggle to achieve the total unification of our national territory and sovereignty has already become an increasingly probable option. "Taiwanese independence" forces obviously have an objective understanding of the Taiwan military's absolute inferiority in such areas as manpower, weapons, and equipment numbers. But they have embraced the myth that the United States and other foreign forces will militarily intervene when cross-Strait war ignites. Moreover, they have formulated a military strategy of "using force to reject unification" and in wartime will fully exploit the island of Taiwan's special terrain conditions

² **Translator's Note:** the original is 后台开始走上前台 which could be literally be translated as "walking from backstage to the front of the stage."

³ **Translator's Note:** the original is 以武拒统 which is a euphemism describing Taiwan's attempts to improve its defenses against a potential PRC military attack.

⁴ **Translator's Note:** the original is 无论怎么样顽抗都注定会失败 which could also be translated "no matter how hard they resist, it is already preordained that they will fail."

and conduct a layered defense against the People's Liberation Army at sea, along the coast, and into the island's interior to buy time for U.S. military forces to gain access, thereby dragging out the fight in order to obtain assistance from afar.

Emplacing sea mines and obstacles in important defense directions and sea zones has always been one of the Taiwan military's important defense measures for conducting counter-landing operations. The Taiwan military believes that mine warfare is an assassin's mace weapon for underwater defense, which will produce unexpectedly strong effects for port defense, port blockade, anti-submarine warfare, and a blockade of the strait. Especially at the critical time, once they have implemented sea mine blockade operations all around Taiwan, not only could they neutralize the People's Liberation Army's submarine superiority, they could prevent the People's Liberation Army's amphibious landing operations, thereby gaining more time for Taiwan to wait for "out of area assistance."

The Taiwan military has published research materials on sea mine warfare, which point out that once the Taiwan military has emplaced sea mines in coastal waters, the People's Liberation Army's probabilistic calculations for landing on Taiwan's coast will become extremely complicated. Due to the potential existence of mine fields, the People's Liberation Army will have no choice but to adjust its preexisting, detailed plans for the organization and methods for the fleet to cross the Strait.⁵ This will create a situation of chaos within the fleet when the time comes to cross the Strait. The existence of minefields could greatly restrict the ability of the People's Liberation Army's Strait crossing fleet to maneuver, leading the fleet to only be able to sail through a few channels that have been confirmed as safe. This in turn would increase the possibility that the People's Liberation Army's fleet could suffer [missile] strikes. If ships are damaged by sea mines, the damaged ships could run into other ships in the Strait-crossing fleet and have accidents. If stricken ships are sunk, they will then become obstacles on the [sea] lanes. Thus, if ships are damaged by mines, it is certain the situation will give the People's Liberation Army's Strait-crossing fleet a lot of trouble.

When the People's Liberation Army's Strait-crossing fleet is forming into waves, even if there are fears that [Taiwan] has emplaced only an extremely low-density minefield, it could still force the People's Liberation Army's Strait-crossing fleet to reduce speed and take other necessary measures to avoid the sea mines. This all will greatly reduce the sailing speed of the People's Liberation Army's crossing fleet. The only way to remove this kind of threat is to use minesweeping vessels to open channels. Mine sweeping work is extremely costly in terms of time and resources, and minesweeping vessels can only do this work while proceeding at slow speeds, making it extremely easy for them to suffer [missile] strikes. If minesweeping vessels suffer attrition, it will delay the People's Liberation Army's landing operations, thereby allowing "Taiwanese independence" forces to obtain more abundant time.

⁵ **Translator's Note:** a literal translation of the term 渡海 would be "sea-crossing." However, since the article is specifically and explicitly referring to an invasion of Taiwan, we can safely assume the 海 is shorthand for 台海, or the Taiwan Strait. As such, based on this context, the term will herein be translated "Crossing the Strait" instead of the more generic "crossing the sea."

The Taiwan military's naval minelaying capabilities are centered on the 192nd minesweeping/minelaying squadron and one underwater demolition unit, which are both based at Zuoying Naval Base. As everyone knows, a minesweeping vessel generally also has the ability to lay mines. As such, the Taiwan military's 192nd Squadron's 23 minesweepers are also minelaying platforms. Its main vessels include: Four MWV50 Type minesweeping vessels acquired in 1991 from Germany, ostensibly as near seas drilling support ships; their speed is 18 knots. Four American-made MSO-268 long-distance minesweepers that entered service with the Taiwan Navy in March 1995; their speed is 14 knots. In addition, according to Taiwan media reports released in April 2019, the Taiwan Navy is carrying out a program to build four fast minelaying vessels. These vessels are based on the Taiwan Navy's "He" Letter Type (*"he" zihao*) landing vessel in order to acquire a simple and mature design. They have a 347-ton displacement when fully loaded and a speed of 14 knots. They can each carry and emplace 72–144 sea mines. The vessels come equipped with simple communications systems, navigational equipment, and Taiwan's self-made automated minelaying system.

The first Taiwan-made fast minelaying vessel was launched on August 2020. Tsai Ing-wen participated in the December 2020 ceremony to mark the acceptance of the first vessel. Taiwan military officers told the media that previously all minelaying operations at sea were conducted by officers and sailors aboard landing craft, who had to manually emplace the mines. Not only did this limit the speed of minelaying, it also made it very difficult to conduct missions in heavy sea conditions. Not only can Taiwan's indigenously researched and developed fast minelaying vessels resist [high] sea states, they are equipped with a world-class "automated minelaying system," using navigational and positioning systems that allow for rapid minelaying across sea lanes to block the coming and going of enemy vessels and their [amphibious] landings. This is an important combat capability for the Taiwan military's execution of asymmetric operations.



Second fast minelayer vessel of the Taiwan Region's Navy.

In January 2022, the Taiwan authorities boldly announced the establishment of a minelaying boat squadron (*buleiting zhongdui*) and said this had two “historic meanings” for the Taiwan Navy: First, it was the Taiwan Navy’s “first time in history to establish a specialized minelaying boat squadron;” Second, it marked the start of a new age of automated minelaying for the Taiwan Navy.

On January 27, 2021, Taiwan military minelaying vessels based at Taiwan’s Kaohsiung and Zuoying military ports carried out a minelaying and minesweeping exercise. The Taiwan military publicly demonstrated Taiwan’s indigenous “Wanxiang I” sea mine and “Wanxiang II” sea mine. According to relevant information, Taiwan’s “National Chung-Shan Institute of Science and Technology” Electronic Research Institute (later called the Information and Communications Institute) has developed three types of “Wanxiang” sea mines since beginning research in the 1980s.

Aside from the publicly revealed “Wanxiang I” and “Wanxiang II,” there is also the newest “Wanxiang III” sea mine. The “Wanxiang I” has a conical-shaped bottom mine variant and a cylindrical-shaped bottom mine variant. The “Wanxiang II” has a moored mine and a bottom mine variant. The “Wanxiang I” conical-shaped bottom mine is triggered by a magnetic sensor. It weighs 635 kilograms, has 295 kilograms of explosives, and can be emplaced in water depths of 10-50 meters by ships or boats. The “Wanxiang I” cylindrical-shaped bottom mine weighs 500 kilograms. Its other specs are the same as the conical-shaped bottom mine. The “Wanxiang II” moored mine is triggered by multiple sonar, magnetic, and pressure sensors that set off the explosion. It weighs 1,110 kilograms



Tsai Ing-wen inspects a fast minelayer vessel of the Taiwan Region’s Navy.

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“Wanxiang I” conical-shaped bottom mine of the Taiwan Region’s Navy.

and has 170 kilograms of explosives. It can be emplaced by ships or boats in 20-300 meters of water. The “Wanxiang II” bottom mine’s sensors and triggering mechanisms are the same as the moored variant. It weighs 615 kilograms and has 400 kilograms of explosives. It can be emplaced in water depths of 10-250 meters by ships, boats, aircraft, or submarines. The “Wanxiang III” sea mine has yet to be publicly displayed. It has been said to be a maneuverable sea mine, propelled to the surface by rockets. The Taiwan military has said, “The ‘Wanxiang III’ sea mine is currently the Taiwan Navy’s most advanced sea mine, which is being tailor-made according to the unique characteristics of the Taiwan Strait to target all types of Chinese Communist ships and vessels, and it is suitable for emplacement in all types of deep water.”

In addition to its indigenous “Wanxiang” series of sea mines, the Taiwan Navy also is equipped with over 10 types of American-made sea mines, including anchored mines (*maolei*), floating mines (*piaolei*), bottom mines (*chendilei*), and attached mines (*fuzhuolei*). In addition, the Taiwan Navy has acquired the American-made M89A2 magnetic sea mine. This type of sea mine, which can be attached to a ship’s hull and exploded, is for “frogmen” to use in underwater attacks on ships in port.

In terms of those surface minelaying platforms beyond purpose-built minelaying vessels, the Taiwan Navy’s “Knox-class” and “Success-class” *Chung Kung* frigates, “Kidd-class” destroyers, and [amphibious] landing craft have minelaying capabilities. In addition, it is said that the Taiwan Navy plans to seize a bunch of Taiwanese fishing boats during times of high tensions and refit them, camouflaging them as Mainland fishing boats so they can stealthily infiltrate China’s sea areas and carry out minelaying against our important ports and sea lanes. In terms of underwater minelaying platforms, the Taiwan Navy currently has four conventional submarines in service: the “Sea Dragon” (*Hai Lung*), the “Sea Tiger” (*Hai Hu*), the “Sea Lion” (*Hai Shih*), and the “Seal” (*Hai Bao*). The Taiwan Navy says that in war time it can secretly execute offensive minelaying or coastal counter-landing minelaying operations. But the “Sea Lion” and

the “Seal” were built by the United States in the 1940s and given as assistance to China’s Taiwan area in 1973. Currently, they are already seriously aged and basically have not been put to sea since 1995.

The “Sea Dragon” and the “Sea Tiger” were built by Holland in the 1980s and sold to China’s Taiwan region. To date, they have already been in service for more than 30 years and have reached their retirement age limit but are still in service because, for many years, the Taiwan military just could not obtain any equipment to replace them. Taiwan’s first indigenous “Narwhal” (*Hai Kun*) conventional submarine had its unveiling ceremony in September 2023, and the plan is to finish work and deliver it by the end of 2024. If everything goes smoothly, this vessel will provide the Taiwan Navy with some improvement in its underwater combat power. The aircraft equipment the Taiwan military could use to lay mines mainly includes 10 American-made MD-500 and S-70C anti-submarine warfare helicopters and 12 P-3C anti-submarine warfare patrol planes. Secondly, its C-130 transport planes could be used to airdrop sea mines.



“Wanxiang II” moored mine (above) and bottom mine (below) of the Taiwan Region’s Navy.

From what the media has exposed about the Taiwan military’s sea mine warfare plan, we can see that in times of local tensions they are not only prepared to deploy sea mines across Taiwan’s major defensive lines to stop the People’s Liberation Army’s Strait-crossing and landing operations, but they also plan to take advantage of areas of convenience close to the Mainland, such as Kinmen and Matsu, to lay mines across the Mainland’s Fujian coastline, directly threatening the Port of Xiamen and the Port of Mawei. In addition, to harass our military’s offensive and disperse our military’s forces and disrupt the Mainland’s economic development, the Taiwan military also plans to send



The “Sea Dragon” and “Sea Tiger” submarines of the Taiwan Region’s Navy.



The “Narwhal” submarine of the Taiwan Region’s Navy.

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Taiwan Region's Navy conducts minelaying exercise at Zuoying naval port.

minelayers camouflaged as fishing boats to lay sea mines in the Mainland's major shipping lanes, such as the Bohai Gulf, the mouth of the Wusong [River], and the Guangzhou Gulf, harassing and sabotaging the Mainland's sea trade with the world. Some "Taiwanese independence" elements have wildly claimed, "If the Mainland side uses the emplacement of sea mines as a method to blockade Taiwan, well then, Taiwan will just send out all types of fishing boats to waters near Shanghai and use sea mines to blockade Shanghai, putting gigantic pressure on the Mainland."

In recent years, the Taiwan Navy has sought to improve its sea mine warfare capabilities by inviting a group of retired Japanese Maritime Self-Defense Force officers to serve as military advisors, guiding the Taiwan Navy in the tactics and practice of mine warfare. In February 2023, the U.S. Naval Institute published an article on its website, discussing the possibility of using sea mines to defend Taiwan. The author was the U.S. Naval Institute's Dr. Scott Savitz. The article said that minelaying work in the Taiwan Strait area could be conducted by multiple platforms, such as commercial ships fitted with mine rails. One refitted commercial ship could lay a minefield tens of kilometers long. Likewise, airplanes or unmanned aerial vehicles could also rapidly lay mines. These minelaying methods could effectively create minefields at sea in a short period of time, disrupting the People's Liberation Army's Strait-crossing fleet. In his article, Scott Savitz even describes a picture whereby the "Taiwan Navy skillfully lays mines and the Communist fleet recognizes disaster and withdraws."⁶

⁶ **Translator's Note:** the article is available at this link:
<https://www.usni.org/magazines/proceedings/2023/february/defend-taiwan-naval-mines>.

Mine Countermeasure Operations in a Cross-Strait Island Landing Campaign

The first job of mine countermeasure operations is to comprehensively use all types of observation and surveillance equipment against the enemy's minelaying infrastructure and forces (including sea mine manufacturing, storage, offloading sites, critical transportation nodes, and minelaying platforms—especially planes, ships, and submarines) and to conduct intensive reconnaissance and surveillance of his potential minelaying plans and minelaying zones, while at the same time logically allocating observers and defense forces to [our] important ports, shipping lanes, and anchorages.

When it comes to mine countermeasure operations, the most effective operational approach is to quickly stop any enemy from minelaying. The secondary [approach] is to actually carry out mine clearing work, but only when the situation is such that there is no other choice. Sea mine weapons only represent an operational capability when sufficient numbers of them have been emplaced. And the production, transportation, storage, and emplacement of large numbers of sea mines requires the construction of factories, storage depots, transportation routes, and minelaying platforms. The locations of these targets are usually very well hidden. During peacetime, all methods must be used to continually collect and obtain the relevant intelligence so that, in wartime, the [intelligence] can be supplied as an important strategic support [enabling] the surveillance of enemy minelaying activities.

In order to construct a rather dense, comprehensive mine[field], counter-landing sea mine obstacle (*shuilei zhang'ai*) [zones] are generally comprised of front-line sea mines obstacles, basic sea mine obstacles, and shoreline sea mine obstacles.⁷ In order to be effective, the sea mine obstacles must cover a sufficiently large area and be sufficiently dense; they must be composed of a mix of different types of sea mines. This requires a large minelaying force and the expenditure of a large quantity of sea mines and time. This also makes it easy for the side opposing the minelaying to discover [their enemy's] intentions and minelaying activities, allowing them to quickly provide early-warning and take rapid actions to stop them. Mine countermeasure operations include the execution of firepower blockades (*huoli fengsuo*) and firepower strikes (*huoli daji*) against enemy mine storage depots, manufacturing plants, temporary sites for the transfer and storage of mines, and nearby transportation lines [roads and railways] and, at the same time, firepower destruction (*huoli cuihui*) of all kinds of the enemy's potential minelaying platforms (including ships, civilian ships, planes, etc.) in order to weaken and destroy his sea mine warfare capabilities.

The People's Liberation Army, which began seriously preparing for military struggle to oppose separatism starting in the mid-1990s, can rely on the state's world-class aerospace, aviation, and electronics reconnaissance technologies to carry out continuous and vigilant surveillance of Taiwan military movements on the island of Taiwan. In space, tens of satellites can maintain unbroken reconnaissance and surveillance of the island of Taiwan and the surrounding seas. In the air, unmanned aerial vehicles, early warning aircraft, and tactical reconnaissance planes can

⁷ **Translator's Note:** based on the context, the term "sea mine obstacles" generally appears to refer to sea mines alone, but it may also refer to a combination of sea mines and underwater and/or beach obstacles. Such obstacles could include blockships, wave breakers, Belgian gates, steel hedgehogs, junkyard cars, oil drums, fire pits, tank traps, concertina wire, net entanglements, etc.

conduct real-time information support across the operational area. At sea and on land, all kinds of radars can be deployed to cover the entire frequency spectrum.

As is well known, when it comes to satellite applications and technologies, the state has already reached advanced international levels and, in recent years, has been frequently launching large numbers of high-resolution electro-optical, infrared, and radar satellites for remote sensing and the observation of Earth's surface, giving [us] the technological capability to conduct continuous, 24-7, all-weather observation of important surface areas from outer space.

As long-endurance, unmanned aerial reconnaissance aircraft with relatively strong stealth capabilities come into service, the People's Liberation Army will in peacetime be able to effectively make up gaps that exist in satellite reconnaissance and obtain large volumes of signal intelligence, imagery intelligence, measurement and signature intelligence, video and signals intelligence, etc. As can be seen, the People's Liberation Army has absolute superiority over the Taiwan military in surveillance technologies and capabilities—and has already achieved one-sided transparency.⁸ Taiwan military deployments undertaken anywhere in Taiwan to resist armed unification will be carefully marked and stored, along with the positions of all the Taiwan military's air and sea warning radars arrayed against the Mainland, their operating and



Sea mines have a serious impact on war at sea and amphibious operations.
All world navies very much emphasize countering sea mines.

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⁸ **Translator's Note:** The term “one-sided transparency” (*danxiang touming*) refers to the (likely false) assertion that the PLA can clearly see everything the Taiwanese military does, but the Taiwanese military cannot see what the PLA is doing.



Test launch of one of our ballistic missiles.

communications signals, military camps, missiles, artillery positions, and the layout of beach obstacles in each coastal area. In wartime, the People's Liberation Army can employ even more and different types of reconnaissance and surveillance methods to strengthen its ability to collect on all manner of Taiwan military situations. As such, given the People's Liberation Army's long-term and vigilant observation and surveillance with advanced aerospace reconnaissance systems, it will be very difficult for the Taiwan military's sea mine manufacturing, storage, loading/offloading sites, transportation nodes, and minelaying platforms to avoid being exposed.

And in terms of operational capabilities to conduct firepower strikes to support crossing the Strait, according to public reports, currently, the People's Liberation Army Rocket Force, Air Force, Navy, and Army are equipped with long-range, precision strike weapons. This includes a huge quantity of "Dong Feng" tactical ballistic missiles and hypersonic missiles, "Long Sword" long-range cruise missiles, multiple types of ship and aircraft-delivered long-range, precision guided, land-attack strike weapons, and modular, large caliber, super long-range multiple launch rocket artillery. These have ranges that number in the hundreds and even thousands of kilometers; they come in many variants and are powerful and excellent capabilities. In wartime, large numbers of long-range weapons deployed along the Mainland coast and interior will be sufficient to place all military targets on Taiwan within effective striking range. Of note, in recent years, large numbers of super long-range multiple launch rocket artillery have entered into the inventory, giving the People's Liberation Army's artillery units the ability to conduct joint firepower strike operations with the other services.⁹ The cost to [acquire] and operationally employ this equipment in combat is far lower than ballistic missiles and cruise missiles; its firepower is flexible and continuous.

Since the turn of the 21st century, the state's microelectronics technology, satellite navigation and communications technology, and computer technology have rapidly developed. Millimeter wave,

⁹ **Translator's Note:** Here the author is likely referring to the PCH191 modular long-range rocket launcher. For a detailed discussion of this system, see China Maritime Report No. 32, by Joshua Arostegui: <https://digital-commons.usnwc.edu/cmsi-maritime-reports/32/>.

laser, infrared, television, microwave, infrared imagery, satellite and single or multiple seeker technologies have been applied in the state's indigenous long-range strike weapons. The People's Liberation Army's services and branches have already seen a revolutionary change in their weapons for long-range operations, including in terms of launch methods, strike distances, guidance types, and strike precision. The circular error probable (CEP) of multiple strike weapons is already approaching zero.

The nonstop development of these weapons and equipment technologies have allowed the People's Liberation Army to make its cross-Strait strike weapons more guided and precise. The [PLA] emphasizes the use of informatized weapons and munitions, as it is advantageous to use smaller munitions against targets in wartime and produce less collateral damage. The People's Liberation Army's large-caliber, super long-range, multiple launch rocket artillery and aircraft-delivered long-range precision strike weapons are examples of cross-Strait strike weapons that can continually cross the Strait to strike high-value and important targets all the way across the depth of Taiwan island, including early-warning, command, communications, and airport air defense systems, and sea mine storage depots. [They] can also cross the Strait anytime to strike and destroy any low-value or time-sensitive Taiwan military target.

As the People's Liberation Army's ability to conduct informatized operations has rapidly increased, all military targets on the island of Taiwan have fallen into its observe-acquire-fire kill chain, and it has already become possible to shorten the discover, identify, attack, and destroy loop down to seconds. As such, before launching its landing operations, the People's Liberation Army has the ability to conduct firepower blockades and firepower strikes against enemy sea mine depots, manufacturing plants, and minelaying platforms, stopping them from laying large minefields before battle, reducing and even destroying their sea mine warfare capabilities.

As for enemy minelaying activities that have already been discovered, [the PLA can] find a way to obtain information on the numbers of all the mines that have been laid, their positions, and their types—and rapidly provide warning of sea mines. And then [it can] apply the methods of mine hunting and netting to confirm the enemy's minefields, positions, and understand the capabilities and basic information about their mines. Unmanned underwater vehicles and other advanced technologies and equipment could be used to conduct reconnaissance, looking for mines along the designated landing routes and sea areas for debarkation and the assault, confirming that there are no sea mine obstacles along the routes, or allowing the operational landing units to quickly change their landing routes and landing points according to the threat level, doing their best to avoid the enemy's counter-landing mine obstacles, while also preparing for follow-on minesweeping work. The first wave assault units can use helicopters and other new type assault equipment to avoid sea mines and all the other threatening obstacles in the water.

In recent years, the People's Liberation Army's army aviation helicopters and the Marine's air transportation equipment have continually increased in number, and they now already have the ability to execute large-scale, cross-Strait mobility operations from the air. In a possible future armed unification campaign, the People's Liberation Army's helicopter forces could rapidly carry assault units over the Taiwan military's coastal defenses to insert them into the depths [of the island] in coordination with ground forces landing [on the beaches] to occupy and strengthen lodgments. And they can fly at extremely low-levels to provide air cover for ground units

throughout the entire course of the landings. And on some landing zones or landing [beaches] (or sea zones where sea mines and obstacles are relatively dense), the People's Liberation Army could transport forces with hovercrafts, ground effects vehicles, and other landing platforms which are impervious to the sea mine threat. Of course, in a massive cross-Strait landing campaign, heavy equipment and follow-on forces will still need to make [traditional] surface landings, and they could still face the threat of sea mines. Mine countermeasure forces will still be needed for comprehensive mine and obstacle clearing to open landing routes.

The enemy has minelaying platforms that include surface minelayer vessels and aircraft, as well as submarines and disguised civilian ships that are easy to hide and can rapidly lay mines. Given that, and in spite of the People's Liberation Army's reconnaissance and surveillance, there will still exist the possibility that the enemy will be able to execute minelaying in some of their coastal waters around the war zone. Moreover, during a war, the enemy's counter landing mines and obstacles will typically be joined with defensive, counter landing firepower on the island to form a counter landing defense system. This is a major part of their system for carrying out counter landing defense [operations]. As such, one of the important missions of landing operations is to clear away sea mine obstacles in the coastal waters along the shorelines where surface landings will be executed.

When mine countermeasure forces are sweeping mines and obstacles, [they will first] need to conduct a survey of the sea mine threat posed by the enemy's minefields, finding the locations and extent of the sea mine arrays as fast as possible. Concurrently, [they must] use unmanned minesweepers and unmanned underwater vehicles that are equipped with mine detection and mine capturing devices to do the initial mine detection and sweeping, helping understand the characteristics of the mines in a relatively short period of time. Once the necessary information has been obtained for mine countermeasure operations, [they must] comprehensively use all manner of mine countermeasures to rapidly carry-out minesweeping work.

At the present time, many navies commonly use a combination of minesweeping, mine hunting, mine destruction, and mine detonation methods to clear sea mines.

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Minesweeping includes contact minesweeping and non-contact minesweeping. Contact minesweeping is conducted with minesweeping vessels that form into teams and go into minefields dragging fishnet-like minesweeping devices (to capture floating mines) or entanglement minesweeping devices (to capture moored mines). Minesweeping devices that are dragged along can clear a certain width across the water and are operated at certain set depths to sweep floating mines in the water, or they have entanglement devices for minesweeping that will contact the lines attached to anchored mines and pull them along until they break, causing the sea mine to automatically float up to the surface, where minesweeping vessels can destroy them with their guns or explosive charges.

Non-contact minesweeping refers to when minesweeping vessels use mine clearing weapons that use magnetic or sonar minesweeping devices that produce powerful magnetic fields, sound fields, or even water pressure to detonate and clear mines without contacting them. It is mainly used to clear bottom mines that have detonators that activate at only certain times, after a certain

number [of ships pass overhead], or via a combination [of conditions are met to trigger the weapon]. Because the positions of bottom mines are more easily concealed and they use magnetic, sonar, and water pressure triggers to explode, they do not need the ship to run into them; they can blow up as soon as the enemy ship is within a certain distance of them, making them more threatening. As such, they necessitate non-contact minesweeping methods, like using directional sound minesweeping tools that can produce sound fields to explode mines that have sound sensor triggers. And sea mines that have magnetic sensor triggers can be exploded with magnetic minesweeping tools that produce a magnetic field over a large area.



Ship captain Wang Xiang (汪洋), of vessel 8182, performs upkeep of minesweeping equipment.

When the above two minesweeping tools are being used, sea mines can be cleared that have sound triggers, magnetic triggers, and joint triggers (*lianhe yinxin*). When clearing non-contact minefields, minesweeper vessels will typically use horizontal or side-to-side horizontal formations, dragging non-contact minesweeping tools along. They work by applying electric [signals] through the minesweeping tools, producing fields with certain physical characteristics that can detonate a mine in the water by matching signals to the mine's various triggers. However, when facing large minefields, minesweeping alone will take a lot of time and face threats from the enemy's coastal defense fires while sweeping back and forth. Even if large numbers of unmanned minesweeping vessels are deployed at the same time, it will be difficult to satisfy mission requirements when the main landing units are racing against the clock to get ashore and every second counts.

Mine hunting refers to the process of detecting, discovering, capturing, and destroying sea mines. More technologically advanced, new generation smart mines are making traditional minesweeping tools ineffective. New smart mines have strong target discrimination and anti-tampering capabilities. They can even have joint sensor and triggering mechanisms set to attack only certain targets. Most minesweeping tools that produce directional sound fields or magnetic

fields won't cause them to explode. This situation has given birth to a new mine countermeasure weapon: mine hunting systems.



A helicopter in the 75th Battalion of a certain air assault brigade of the People's Liberation Army Ground Force performs live-fire exercise at sea.

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Specialized mine hunting vessels are equipped with mine hunting systems comprised of mine hunting sonar, mine hunting monitors, precise positioning and guidance systems for maneuvering, mine destroying tools, and professional mine hunting divers. The mine hunting process is as follows. First, mine hunting sonar will be used to search for and detect a suspicious underwater object. Second, close-in inspection and mine destruction equipment (like a remote-controlled unmanned submarine) will be lowered into the water. Then, operators onboard the mine hunting vessel will guide the mine destruction equipment close to the mine. Next, they will capture imagery to confirm the target is a mine and emplace an explosive charge, and the mine destruction equipment will automatically float back to the surface and return to the mine hunting vessel. Finally, operators aboard the mine hunting vessel will remotely trigger the explosive charge, destroying the sea mine.

In the course of minesweeping work, mine hunting systems can capture a mine to conduct autopsy research, allowing our side to understand how the mine's triggering system works. This is advantageous for clearing other mines of that type. It also could allow for directly clearing any mine, including those using a water pressure trigger. But this type of mine hunting is too slow

and not well suited to mine clearing operations right in front of the enemy. By itself, mine hunting will struggle to meet the speed requirements of amphibious operations.

Mine destroying mainly refers to the use of old commercial ships that have been refitted to make them into especially hardened mine destroyers and sending them into minefields to set off sea mines. Mine destroyers are basically just regular ships that have all the characteristics of surface vessels, which undergo refitting to make them very hard to blow up and hard to sink, and give them a larger size field (*wulichang*). As such, they can set off those mines that have all manner of triggers and cannot be cleared any other way. They can be guided into mines, opening routes [to the beaches] for the landings. Although, once mine destroyers are damaged or sunk, they become a new obstacle on the landing routes. And mine destroyers cannot rapidly clear mines set to explode only after multiple passes overhead. As a result, mine destroying methods are better applied to examining the effectiveness of minesweeping and emergency route clearing.

Mine demolition refers to when mine countermeasure forces use explosives or depth charges to directly demolish sea mines. This method of minesweeping does not require a particularly high level of technical proficiency, and it avoids any need to rely on, or target, any specific type of mine triggering mechanism during the course of mine countermeasure operations. Depth charges produce sufficient explosive pressure to blow up mines or break their triggering mechanisms. The continuous launching of depth charges can demolish all types of mines, and it's a reliable and fast way to completely destroy mines. Not only can mine demolition clear all types of mines, it can blow away counter landing obstacles spread across a large area in a short period of time from a rather long distance. [This method] has a rather high level of effectiveness when it comes to clearing large minefields.



Minesweeping squadron of the People's Navy explodes a sea mine during exercise.

In theory, as long as enough explosives are used and they are deployed accurately, any minefield can be cleared. This method of minesweeping is particularly effective in emergency situations

before landing against the enemy, or when there's an urgent need to breakthrough the enemy's mine blockade of a port or a base. Surface vessels can be used as platforms to execute mine demolition missions; planes can be too. In recent years, video images have emerged of People's Liberation Army amphibious exercises that show unmanned obstacle demolition vessels (*wuren pozhang ting*). In the videos, unmanned obstacle demolition vessels carrying over ten rocket-propelled depth charges (*huojian shendan*) are shown entering selected mission areas at high speeds, firing rocket-propelled depth charges off both sides and quickly clearing a path to shore for the landing units. However, mine demolition has its shortcomings. Mine demolition requires the depletion of large stocks of explosives, and it requires lots of manpower, is rather difficult to organize and carry out, and does great damage to navigation channels. It's also not suitable for all waters and settings.



Unmanned obstacle destroying vessel of People's Liberation Army Navy conducts obstacle destroying exercise at sea.

When it comes to mine countermeasure operations during a landing campaign, all of the above minesweeping methods have their limitations. As such, it will be necessary, based on the actual situation, to comprehensively apply all mine removal techniques and methods, including mine detection, minesweeping, mine-hunting, mine demolition, and mine destruction, to open lanes to the shore as quickly as possible for our military's heavily armored, main force units. Considering that in wartime the enemy military will employ shore defense firepower and other methods to oppose, harass, and destroy our military's minesweeping operations, our military's mine countermeasure operations, in reality, will not just be readied in tandem with the landing campaign's large-scale firepower [strikes]; they will be carried out in tandem. Precise and fierce firepower strikes to suppress the enemy's various resistance operations during the entire course of the mine and obstacle clearing can provide reliable cover for our side's minesweeping operations.

Without doubt, as soon as the situation develops such that the People's Liberation Army has no choice but to conduct large-scale, cross-Strait island landing operations to realize the complete unification of state sovereignty, military targets and productive forces across the entire island of Taiwan will first receive continuous strikes on an unprecedented scale from all manner of long-range, precision strike weapons, such as the People's Liberation Army's tactical ballistic missiles, cruise missiles, long-range rockets, and aircraft-delivered, long-range, guided weapons. The Taiwan military's important fixed targets and infrastructure, such as early-warning, command and control, communications, airports, docks, and air defense systems will be turned to ruins by the People's Liberation Army's first round of precise, concentrated, and continuous firepower strikes across the Strait. Then, large numbers of the People's Liberation Army's unmanned aerial vehicles will fly low over each mission area on the island of Taiwan, conducting battlefield observation and reconnaissance, firepower [target] spotting, anti-radiation missions, and integrated reconnaissance-strike operations. Taiwan military ground targets will be continuously searched for and ferreted out. All Taiwan military resistance operations will be suppressed by the People's Liberation Army's firepower. As such, the day that the People's Liberation Army's cross-Strait island landing campaign is launched will mark the coming of doomsday for the island's "Taiwanese independence" forces. Regardless of whether they are conspiring to use force to seek independence or use force to reject unification, all will be made futile by the People's Liberation Army's powerful attack.
