



# STANDING WATCH

*Taiwan and Maritime Domain Awareness in  
the Western Pacific*

**Ian Easton and Randall Schriver**

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## About the Authors

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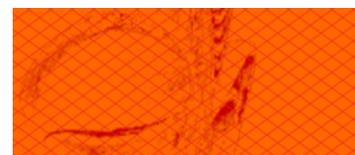
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### About the Project 2049 Institute

The Project 2049 Institute seeks to guide decision makers toward a more secure Asia by the century’s mid-point. Located in Arlington, Virginia, the organization fills a gap in the public policy realm through forward-looking, region-specific research on alternative security and policy solutions. Its interdisciplinary approach draws on rigorous analysis of socioeconomic, governance, military, environmental, technological and political trends, and input from key players in the region, with an eye toward educating the public and informing policy debate.



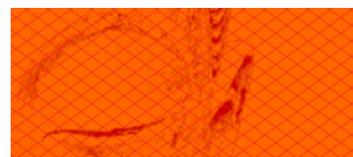
## Introduction

If knowledge is power, then no country in the world is better positioned to influence the course of political and security affairs in the Asia-Pacific region than Taiwan. The importance of Taiwan's strategic location in the heart of East Asia and the Western Pacific for collecting information and monitoring regional events cannot be overstated. Nor can its unique ability to simultaneously access the linguistic and cultural landscapes of the Chinese, Japanese, and English speaking worlds. Moreover, Taiwan's technological prowess, and its special relationship with the United States, gives it access to the most advanced military information and communications technology available.

This all matters now more than ever before because the People's Republic of China (PRC) is pursuing policies that strongly suggest its emergence as a major military power will be accompanied by attempts to shift power balances in a manner not conducive to regional peace and stability. While Taiwan has worked hard in recent years to reduce cross-Strait and regional tensions through pragmatic diplomacy, China has refused to give up the use of force to settle disputes. Taipei's experience indicates that the diplomatic models it used to successfully resolve maritime disputes with democracies like Japan and the Philippines may not work with China's communist leaders. As such, Taiwan has been taking measures to enhance its self-defense and demonstrate resolve in the face of continuing coercion.

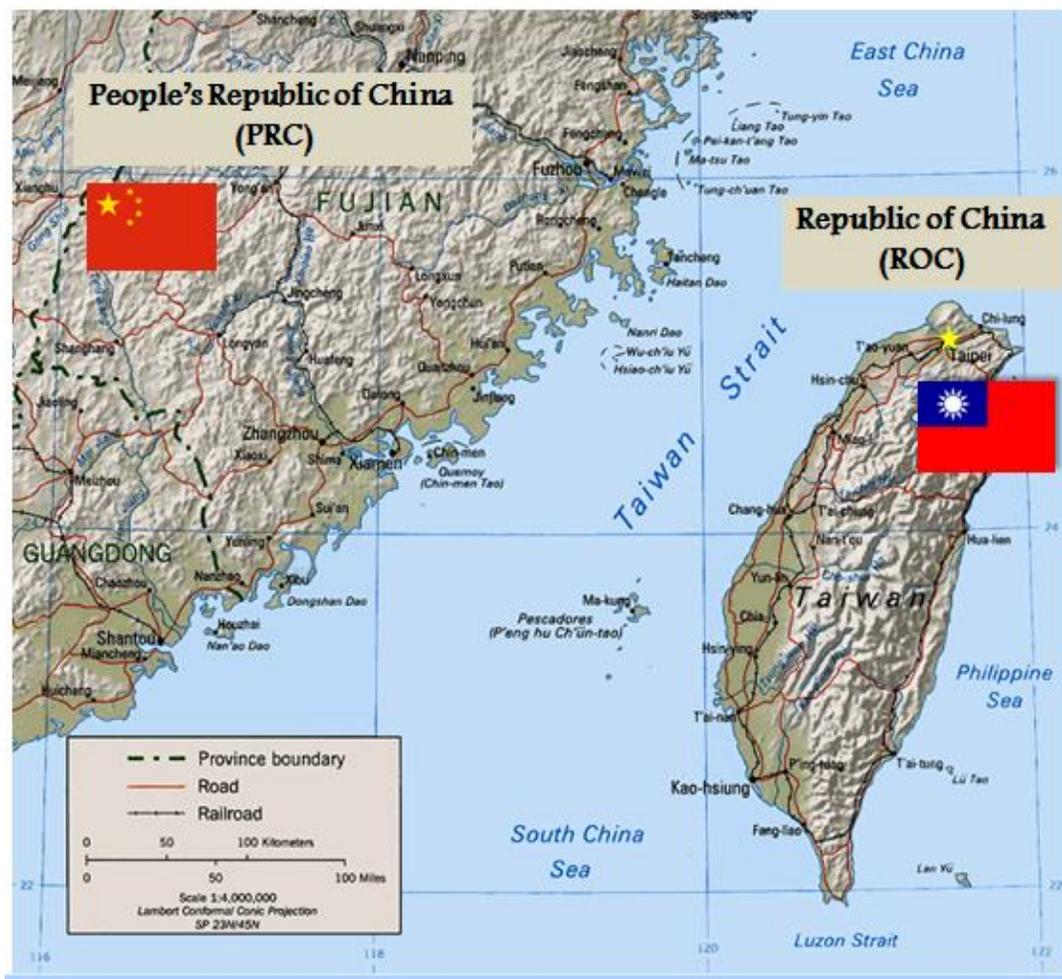
China's ambitious armament program has the potential to rapidly erode the defensive positions of numerous maritime states around its periphery, including but not limited to Taiwan (but perhaps none more so than Taiwan). Indeed, Beijing has made it clear that the most prominent strategic driver of its military build-up is attaining the ability to apply overwhelming force against Taiwan during a conflict, in a manner that would complicate foreign intervention. At the same time, China is engaging in activities in the East China Sea and the Philippine Sea that could undermine confidence in the U.S.-Japan, and U.S.-Korea alliances, and it is aggressively seeking to alter the status quo in the South China Sea for the Philippines, Vietnam, Malaysia, and others.

Recognizing the importance of the maritime domain for military operations in the Western Pacific, Taiwan has been investing heavily in capabilities which allow it to continuously track Chinese activities above, on, and under the surface of its surrounding seas. These capabilities include a large number of maritime intelligence, surveillance and reconnaissance (ISR) assets. In particular, Taiwan's radar and sonar networks, working in tandem with listening posts, satellites, unmanned aircraft, and other sources, provide for indications and warning of adversary actions of concern. Like government decision makers everywhere, Taiwan's leadership places a premium on vigilance to

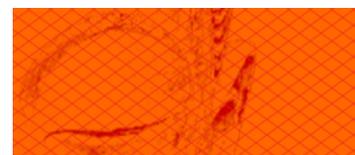


avoid strategic and operational-level surprise. However, the severe national security challenges facing Taipei greatly amplify its perceived requirement for information.

While knowledge of Chinese forces, plans and intentions alone will not ensure success in deterring war or winning a campaign, it could play a decisive part. As leaders in Washington and at the U.S. Pacific Command in Hawaii evaluate future force postures during a period of fiscal austerity and strategic uncertainty, the Chinese defense establishment is making significant advances in developing a force capable of denying access to the maritime area around its periphery. Going forward, the single most valuable asset the U.S. has for adapting to the increasingly risky strategic environment is its allies. In light of the trends, what are Taiwan’s capabilities for monitoring its surrounding waters? What is the potential role of Taiwan in assisting the United States improve its situational awareness during maritime operations? What more can be done? This paper provides a preliminary assessment of Taiwan’s related capabilities and evaluates its role in a future U.S.-led architecture for joint Western Pacific maritime domain awareness.



Map of Taiwan Strait Area (Source: Wikimedia and the Project 2049 Institute).



## Capabilities

Taiwan, officially known as the Republic of China (ROC), is an island trading nation that is dependent on the sea for its security and prosperity. Maritime domain awareness, a more comprehensive form of naval intelligence, plays a critically important role in the defense strategy of Taiwan. Defined by the U.S. Navy as “the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment,”<sup>1</sup> maritime domain awareness is crucial for preventing or, if necessary, defeating a surprise Chinese amphibious assault or naval blockade. These constitute two of the most stressful military scenarios facing the ROC military.<sup>2</sup> Taiwan’s Ministry of National Defense (MND) in its 2013 Quadrennial Defense Review (QDR) identified its principal objectives in the maritime domain to be the expansion and improvement of surveillance, early-warning, and naval and air intelligence collection capabilities.<sup>3</sup> This underscores the importance of maritime domain awareness for Taiwan’s defense. But the 2013 QDR reveals little of Taiwan’s current capabilities in this area.

Perhaps one of the most authoritative sources of information on Taiwan’s maritime domain awareness capabilities comes from the writings of Chinese People’s Liberation Army (PLA) analysts, many of whom have watched with great interest and concern as the ROC military has developed its current infrastructure for monitoring the Taiwan Strait area. According to PLA assessments, the ROC Navy (ROCN) has a remarkably dense and resilient network for collecting information on Chinese maritime activities, and its coverage ranges from the Sea of Japan to the South Pacific.<sup>4</sup> Taiwan’s capabilities include a large number of land, air, and sea-based radars, signals intelligence (SIGINT) platforms, sonar arrays, human agents, and imagery intelligence (IMINT) assets.<sup>5</sup> We will draw from PLA writings, as well as from other sources, to examine each of these

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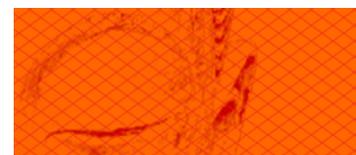
<sup>1</sup> *Navy Maritime Domain Awareness Concept 2007* (Arlington, VA: Department of the Navy, 2007), at [http://www.navy.mil/navydata/cno/Navy\\_Maritime\\_Domain\\_Awareness\\_Concept\\_FINAL\\_2007.pdf](http://www.navy.mil/navydata/cno/Navy_Maritime_Domain_Awareness_Concept_FINAL_2007.pdf).

<sup>2</sup> *Military and Security Developments Involving the People’s Republic of China 2014* (Arlington, VA: Department of Defense, 2014) p. 54-55, at [http://www.defense.gov/pubs/2014\\_DoD\\_China\\_Report.pdf](http://www.defense.gov/pubs/2014_DoD_China_Report.pdf).

<sup>3</sup> *The Republic of China 2013 Quadrennial Defense Review* (Taipei, ROC: Ministry of National Defense, March 2013), p. 47.

<sup>4</sup> Ma Yuanshen, Chen Wenqing, and Zhang Wenjing, “Taiwan’s Naval C3I System Equipment Status Quo and Its Developmental Characteristics (台湾海军 C3I 系统装备现状和发展特点),” *Huoli Yu Zhihui Kongzhi* (Fire Control and Command Control), February, 2004, p. 107. The authors are affiliated with the PLA Equipment Command and Technology Academy in Beijing.

<sup>5</sup> See Jiang Yanyu (ed.). *A Military History of Fifty Years in the Taiwan Area 1949-2006* (台湾地区五十年军事史 1949-2006) [Beijing: Liberation Army Press, 2013], p. 262. Note that this text was produced in partnership with the PLA General Staff Department and assistance from the Academy of Military Science’s Taiwan Strait Military Research Center, the NDU Strategic Studies Department, and the State Council’s Taiwan Affairs Office.



maritime domain awareness capabilities, and explain how they are integrated into Taiwan's broader C4ISR system.<sup>6</sup>

**Radar.** PLA analysts write that ROCN has six coastal radar squadrons that oversee 41 land-based sites for monitoring sea and air traffic on and above Taiwan's surrounding waters.<sup>7</sup> Of these, 20 radar sites are believed to be located on the main island of Taiwan, and 21 radar sites are located on the Penghu Islands and other small offshore islands surrounding Taiwan. One PLA source indicates these ROCN radar bases were reportedly divided into 30 short-ranged, six medium-ranged, and five long-ranged sites, for a total of approximately 85-100 radars with various coverage capacities by 1999.<sup>8</sup> Taiwan's naval radar units are positioned at high elevations to maximize their performance and range. They are tasked with the surveillance of maritime targets, especially Chinese warships navigating the principal sea lines of communication to and from China and Taiwan. ROCN also monitors major Chinese ports across the Taiwan Strait, and provides early warning of hostile Chinese naval activity, to include the preparation for amphibious attacks, blockades or missile strikes.

According to credible Taiwan sources, notable ROCN radar sites are located at: Sanzhi at the northern tip of Taiwan, Huoyanshan in Miaoli's Sanyi Township, Shoushan in Kaohsiung, Alishan in Chiayi County, Wushibi near Fugang Harbor, Little Kinmen Island, Dongsha (Pratas) Island in the South China Sea, and Taiping (Itu Aba) Island in the Spratlys.<sup>9</sup> To improve the survivability of its radar networks in wartime, ROCN has deployed a limited number of road-mobile radar units, probably less than 10, but has plans to significantly increase its mobile radar force in the near-term. These radars can exchange tracking information with ships at sea in the event that static radar sites are destroyed. This is an important development because ROCN's patrol fleet relies heavily on its land-based radars for situational awareness and over-the-horizon targeting.<sup>10</sup> Several of the ROCN's long-ranged radar sites reportedly host ROC Air Force (ROCAF) and coast guard personnel in order to facilitate and coordinate joint air and sea radar intelligence collection.

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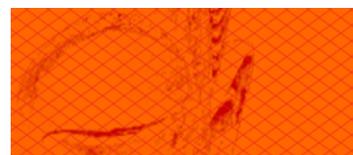
<sup>6</sup> C4ISR stands for command, control, communications, computers, intelligence, reconnaissance, and surveillance. For an excellent overview of Taiwan's C4ISR systems, see Mark A. Stokes, *Revolutionizing Taiwan's Security: Leveraging C4ISR for traditional and non-traditional challenges* (Arlington VA: Project 2049 Institute, February 2010.), at [http://www.project2049.net/documents/revolutionizing\\_taiwans\\_security\\_leveraging\\_c4isr\\_for\\_traditional\\_and\\_non\\_traditional\\_challenges.pdf](http://www.project2049.net/documents/revolutionizing_taiwans_security_leveraging_c4isr_for_traditional_and_non_traditional_challenges.pdf).

<sup>7</sup> Unless otherwise noted, this section draws from Ma Yuanshen, Chen Wenqing, and Zhang Wenjing.

<sup>8</sup> Cheng Xiaojun and Cai Qun, "Assessing Taiwan's Military Radar System Operational Capabilities and Weak Links," *Conference paper presented at China's 11<sup>th</sup> Electronics Conference on Electronic Countermeasures*, Hefei (PRC), 1999, p. 431. The authors affiliated with the PLA Electronic Engineering Academy.

<sup>9</sup> Guo Nairi [郭乃日], *The Unseen War in the Taiwan Strait* [看不見的台海戰爭] (Xizhi, Taiwan: Gaoshou Publishing, 2005), p. 35; and Easton's interviews with ROCN and ROCMC officers.

<sup>10</sup> Easton's interview with defense analyst in Washington D.C., December 2014.



According to both American and Chinese assessments, ROCN's land-based radars are deployed in a robust, redundant, and overlapping fashion that covers the entire frequency spectrum, making them more difficult to jam.<sup>11</sup> These land-based radars are supplemented by radars aboard surface ships and submarines, to include Taiwan's four destroyers, 22 frigates, one corvette, 52 fast attack missile boats, and two modern submarines. In addition, Taiwan has six E-2K early-warning and control aircraft, 11 S-2T anti-submarine and maritime surveillance aircraft, and 4 P-3C anti-submarine and maritime surveillance aircraft (with eight more expected by late 2015). While under ROCAF command, Taiwan's early-warning and anti-submarine warfare (ASW) aircraft fleets provide ROCN with long-range maritime awareness and intelligence information.<sup>12</sup>

ROCN's radar units are bolstered by the Taiwan Coast Guard Administration (CGA), which currently has 78 coastal surveillance radars that range up to 24 nautical miles (44 kilometers) and can each track 200 ships.<sup>13</sup> Tasked with monitoring Taiwan's 1,820 kilometers of coastline and 540,000 square kilometers of sea territory, CGA has eight large ships and 60 smaller patrol boats.<sup>14</sup> CGA's seaborne fleet and coastal radars are currently being upgraded. Plans call for the deployment of more heavily armed CGA patrol ships and 114 new radars at 57 coastal sites. In addition, CGA plans to field six mobile radar vehicles and 11 harbor security radars.<sup>15</sup>

ROCN and the CGA would coordinate in wartime with ROC Army (ROCA) coastal radar and reconnaissance units. ROCA's principal mission in the maritime domain is to launch long-range rockets and other lethal artillery barrages against a Chinese amphibious assault.<sup>16</sup> One authoritative PLA source reveals that ROCA has over 150 road-mobile coastal reconnaissance vehicles in its inventory, along with an unknown number of fixed coastal sentry posts that are equipped with electro-optical imagery transmitters, night vision sensors, and video surveillance systems.<sup>17</sup>



Taiwan Surveillance Radar (Source: ROC National Defense Report)

<sup>11</sup> Ibid.; and Ma Yuanshen, Chen Wenqing, and Zhang Wenjing.

<sup>12</sup> "Taiwan Navy," *Jane's Sentinel Security Assessment*, September, 24, 2014.

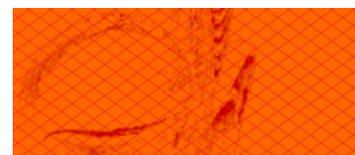
<sup>13</sup> See Ibid. 37-38, and Jason Pan, "Coast guard plans Taiwan-China sea exercise 2016," *Taipei Times*, October 5, 2014, at <http://www.taipeitimes.com/News/taiwan/archives/2014/10/05/2003601339>.

<sup>14</sup> "Taiwan Navy," *Jane's Sentinel Security Assessment*, September, 24, 2014.

<sup>15</sup> "Transas to install Taiwanese coastal surveillance," *Digital Ship*, October 7, 2014, at <http://www.thedigitalship.com/news/electronics-navigation/item/3461-transas-to-install-taiwanese-coastal-surveillance>. See also "Taiwan Navy," *Jane's Sentinel Security Assessment*, September, 24, 2014.

<sup>16</sup> Guo Nairi, p.38-39.

<sup>17</sup> Jiang Yanyu, p. 262.



**Signals Intelligence.** Taiwanese SIGINT capabilities allow for the comprehensive collection of information on Chinese maritime activity along the PRC coast and the waters around Taiwan. Taiwan collects a vast quantity of communications and other electronic information emitted by Chinese satellites, military radios and computers, air defense radars, and other electronic systems aboard aircraft, ships, and submarines. An Australian SIGINT expert has written that:

“With respect to coverage of the signal and electronic activity in the People’s Republic of China (PRC), Taiwan has no peer. It also maintains a very extensive electronic intelligence coverage of the Taiwan Strait, and over critical sectors of the Western Pacific and the South China Sea.”<sup>18</sup>

Analysts believe that Taiwan’s exceptionally detailed efforts to analyze and catalogue the unique electronic signatures of individual Chinese ships and submarines could give Taipei the ability to quickly identify and locate enemy forces during contingencies.<sup>19</sup> PLA analysts write that ROCN has a large number of “technical intelligence” (or SIGINT) collection capabilities in the Taiwan Strait and the South China Sea.<sup>20</sup> Tasked with collecting strategic, tactical, political, and economic intelligence on the PRC, Taiwan’s naval SIGINT enterprise is reportedly commanded by a ROCN electronic warfare squadron that oversees seven major naval intelligence units.<sup>21</sup>

The PLA believes that many ROCN SIGINT units are based on island fortresses in the Taiwan Strait at locations that include Tung-yin, Wu-ch’iu Yu, Kinmen (Quemoy), and Ma-kung. According to PLA assessments, ROCN also has a number of smaller SIGINT collection teams in the Taiwan Strait, including those on Matsu, and on the tiny islands of Dongding and Dadan, which are located just off the PRC coastline and administered by Kinmen. These Taiwanese intelligence units reportedly operate equipment that can intercept, decrypt, and analyze Chinese naval radio, phone, and cable traffic and collect electronic intelligence (ELINT) on radar signals.<sup>22</sup>

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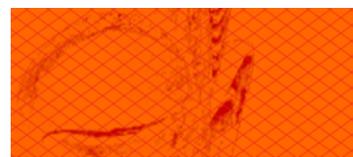
<sup>18</sup> Desmond Ball, “Signals Intelligence (SIGINT) in the Republic of China (Taiwan),” *Strategic and Defence Studies Centre of the Australian National University*, 1995, p. 1. See also Desmond Ball, “Signals Intelligence in Taiwan,” *Jane’s Intelligence Review*, (Vol. 7, No. 11), November 1995, pp. 506-510. For more on Taiwan’s cyber reconnaissance capabilities, see Mark A. Stokes and L.C. Russell Hsiao, *Countering Chinese Cyber Operations: Opportunities and Challenges for U.S. Interests* (Arlington VA: Project 2049 Institute, October 2012), p. 11, at [http://project2049.net/documents/countering\\_chinese\\_cyber\\_operations\\_stokes\\_hsiao.pdf](http://project2049.net/documents/countering_chinese_cyber_operations_stokes_hsiao.pdf).

<sup>19</sup> Guo Nairi [郭乃日], p.55-57.

<sup>20</sup> Ma Yuanshen, Chen Wenqing, and Zhang Wenjing.

<sup>21</sup> Jiang Yanyu (ed.), p. 262.

<sup>22</sup> Ma Yuanshen, Chen Wenqing, and Zhang Wenjing.



Taiwan's surface ships, submarines, fixed-wing aircraft, and rotary-wing aircraft also contribute to the maritime SIGINT collection enterprise. For example, ROCN operates two S-70C Black Hawk helicopters that are specially modified for electronic warfare and SIGINT collection.<sup>23</sup> ROCN also benefits from the ROCAF's 20<sup>th</sup> Electronic Warfare Group's E-2Ks, C-130HE, and other transport aircraft that have been especially modified to conduct electronic warfare and collect SIGINT.<sup>24</sup> One article in an official PLA Navy (PLAN) publication claims that Taiwan's electronic warfare community includes "cutting-edge" military hacker units that can protect Taiwanese systems while infiltrating and corrupting PLA computer networks.<sup>25</sup>

PLA analysts write that ROCN has two naval direction finding (DF) stations at Pingtung and Taichung that work with radar and SIGINT sites to identify and track ship movements. According to one PLA assessment, Taiwan's comprehensive naval SIGINT capabilities allow it to: (1) track Chinese ships as they enter and exit port; (2) monitor PLAN activities at sea; and (3) obtain PLAN mission orders in advance. This same assessment pessimistically asserts that Taiwan's capabilities have "noticeably increased [Taiwan Navy] operational capabilities. The main example is with reaction times. Their ships can flush out of port within five to 30 minutes of a sudden incident occurring."<sup>26</sup> The PLA believes that ROCN intelligence units are responsible for monitoring, collecting and decrypting electromagnetic signals within 300 nautical miles of Taiwan. They also assert that some Taiwanese SIGINT capabilities have interception ranges up to 740 kilometers (400 nautical miles).<sup>27</sup>

**Sonar.** An authoritative PLA source states that Taiwan currently has a chain of seabed listening posts located around the island forming an underwater sonar surveillance system (SOSUS).<sup>28</sup> Yet the source offers no details on the system. One Chinese state-run media report published in 2001 claimed that Taiwan's then-emerging SOSUS network was part of a joint program with the United States. According to the report, ROCN's underwater arrays were to be centered at Su'ao Naval Base on Taiwan's northeast coast, with spurs that run north to near the Senkaku/Diaoyu Tai Islands, and south across the Bashi Channel to the Philippines. Both ends of the cable network were to be linked to U.S. Navy and Japanese Maritime Self Defense Force sensors for tracking Chinese

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<sup>23</sup> See "Taiwan Navy," *Jane's Sentinel Security Assessment*, September, 24, 2014.

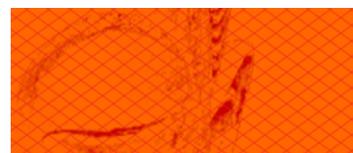
<sup>24</sup> See Desmond Ball; see also "Taiwan Air Force," *Jane's World Air Forces*, September 24, 2014.

<sup>25</sup> Wei Zhuang and Wang Qing, "Taiwan Military Electronic Warfare Units: How Much do They Know? (台军电子战部队知多少)," *Dangdai Haijun* (Modern Navy), June 2011, p. 58.

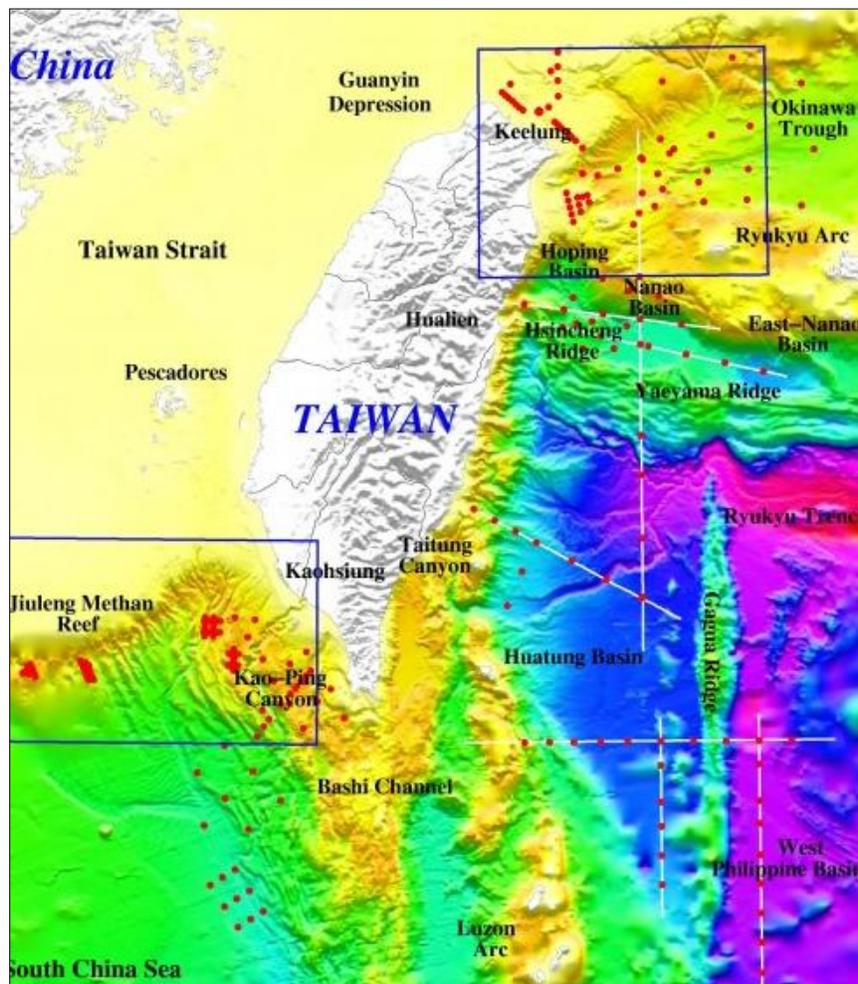
<sup>26</sup> Unless otherwise noted, this section draws from Ma Yuanshen, Chen Wenqing, and Zhang Wenjing, p. 107

<sup>27</sup> Jiang Yanyu, p.262-265.

<sup>28</sup> Jiang Yanyu, p.261.



submarine and surface ship movements through the first island chain.<sup>29</sup> More recent details on the status of the system were not available in Chinese media reports and PLA writings. One Taiwanese military journal article suggests that the program may have been canceled.<sup>30</sup> While little is known about potential naval SOSUS capabilities, National Taiwan Ocean University has been openly deploying hundreds of seabed “oceanographic sensors” for monitoring earthquakes and surveying natural resource deposits in some areas near Keelung and Kaohsiung that would be relevant for Taiwanese ASW operations in a Chinese blockade scenario.<sup>31</sup>



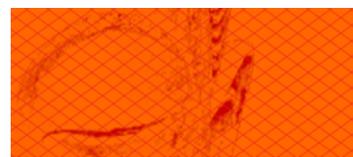
**National Taiwan Ocean University Seabed Arrays**

(Source: NTOU at <http://meda.ntou.edu.tw/obs/>)

<sup>29</sup> Zhu Xianlong, “Building Military Alliance to Monitor Our Naval Ships, U.S. and Taiwan Secretly Lay Seabed Cable (构筑军事同盟 监视我军舰船 美台密谋铺海底电缆),” *Renmin Ribao* (People’s Daily), June 15, 2001, at <http://www.people.com.cn/GB/paper68/3582/447092.html>.

<sup>30</sup> Laio Wenzhong, “War on the Pacific Seabed: US Navy New Generation ASW and Countermining Recon System (太平洋海底戰爭美國海軍新一代反潛反雷水下偵察系統),” *Quanqiu Fangwei Zazhi* (Defence International), No. 253, September 2005, at <http://www.diic.com.tw/mag/mag253/253-64.htm>.

<sup>31</sup> See “Oceanographic Survey based on Ocean-Bottom Seismometer,” at <http://meda.ntou.edu.tw/obs/>.



**Human Intelligence.** Taiwan has long used its close cultural, linguistic, and economic ties to China for collecting traditional human intelligence (HUMINT), including naval intelligence. Western analysts understandably focus on the Chinese intelligence threat to Taiwan, but often overlook Taipei's successes in penetrating targets in the PRC.<sup>32</sup> Some Chinese sources suggest that Taiwan's HUMINT capabilities in China are the most effective in the world.<sup>33</sup> In the maritime domain, the ROC military stations special operations teams, including amphibious reconnaissance "frogmen", on its offshore islands close to the Chinese mainland. These units have a tradition of clandestine insertion operations into China to collect intelligence.<sup>34</sup>

Perhaps Taiwan's first reported naval HUMINT success came in 1962, when a ROC agent "behind enemy lines" obtained information showing that Soviet fast attack missile boats were being built in Shanghai.<sup>35</sup> More recently, Taiwan has reportedly collected intelligence on PLAN nuclear submarine developments and shared them with Japan.<sup>36</sup> Official PLAN publications have warned Chinese sailors that Taiwan's Military Intelligence Bureau (MIB) has a program, code name *Xianji* or "Firstline Bases", for collecting early warning intelligence on PLA naval ports, command and control centers, communications centers, and other military facilities across from Taiwan.<sup>37</sup> In October 2014, it was reported that from 2009 to 2013 Taiwan had penetrated the Chinese party, military and security apparatus with over 40 agents at 15 provincial and municipal locations across the PRC.<sup>38</sup> Some of these cases apparently involved Chinese intelligence officers sent to Taiwan disguised as exchange students, but then recruited by the ROC government to serve as "double agents."<sup>39</sup>

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<sup>32</sup> For an excellent article on the PRC espionage threat to Taiwan, see Peter Mattis, "China's Espionage Against Taiwan (Part 1): Analysis of Recent Operations," *China Brief*, Vol. 14, Issue 21, November 7, 2014, p. 4, at [http://www.jamestown.org/uploads/media/China\\_Brief\\_Vol\\_14\\_Issue\\_21\\_2.pdf](http://www.jamestown.org/uploads/media/China_Brief_Vol_14_Issue_21_2.pdf).

<sup>33</sup> For example, see Wen Dong-Ping [聞東平], *The Intelligence War Now Underway* [正在進行的諜戰] (New York: Mirror Books, 2009).

<sup>34</sup> Wendell Minnick, "Taiwan Modernizes, Streamlines Spec Ops," *Defense News*, December 20, 2011, at <http://minnickarticles.blogspot.com/2010/12/taiwan-modernizes-streamlines-spec-ops.html>; and Wendell Minnick, "Taiwan Updates Spec Ops Units," *Defense News*, May 19, 2008, at <http://minnickarticles.blogspot.com/2009/10/taiwan-updates-spec-ops-units.html>.

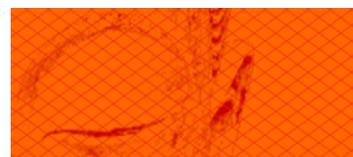
<sup>35</sup> Gao Zhiyang, "Lost History of Taiwan Strait War: Taiwan's Electronic Warfare Development (失落的台海戰史：台灣電子戰發展歷程)," *Yatai Fangwu* (Asia-Pacific Defense Magazine), January 2009, p. 69.

<sup>36</sup> Hu Taomin and Hu Shiqing, "Sixty Years of Cross-Strait Spy War (兩岸諜戰 60 年)," *Zhong Wai Wengao* (China and the World Digest), No. 8, 2011, p. 27.

<sup>37</sup> Sun Lihua, "Looking at Taiwan Spy Reporting Capabilities from Case of Fallen Female Spy Net (从落网女谍看台湾谍报能力)," *Dangdai Haijun* (Modern Navy), October 2011, p. 55.

<sup>38</sup> For example, see Luo Tianbin, et al., "China's State Media Accuses Taiwan Spies of Recruiting Chinese Students (中國官媒控台諜策反中生)," *Ziyou Ribao* (Liberty Times), October 28, 2014, p. A1-A3.

<sup>39</sup> Ibid. Note that Zhou Yongkang, former PRC intelligence czar, was arrested in December 2014 for corruption and leaking secrets. It is not known if Taiwan agents were involved. See Ben Blanchard, "China



**Imagery Intelligence.** Taiwan collects high resolution imagery of the PRC and the Taiwan Strait area using satellites, manned reconnaissance aircraft, and unmanned aerial vehicles (UAVs). Working with U.S. technical assistance, Taiwan reportedly began constructing a military ground station for receiving satellite imagery in 2001 at a site in Linkou.<sup>40</sup> It is thought that Taiwan’s military and intelligence services have been able to receive and process near real-time, high resolution imagery from a number of international commercial satellites and Taiwan’s own indigenous remote sensing satellites since 2003.<sup>41</sup> Taiwan’s Formosat-2 remote sensing satellite was launched in 2004, and continues to provide high resolution imagery. However, it is running many years past its designed lifespan and there are concerns it might fail at an unexpected time in the future.<sup>42</sup> It is not clear whether or not Taiwan plans to launch a replacement soon. ROCAF flies a number of specially modified F-16 and F-5 reconnaissance fighters capable of collecting IMINT, and ROCN has deployed new maritime surveillance UAVs capable of sending encrypted real time imagery to mobile command and control vehicles.

PLA analysts report that Taiwan’s advanced Chung Shyang UAV program includes aircraft equipped for ISR and electronic warfare missions over the Taiwan Strait. An early variant of this aircraft is thought to have a range of 500 kilometers and the ability to stay airborne for 10 hours.<sup>43</sup> PLA writings indicate that Taiwan’s emerging maritime UAV capabilities integrate stealth technologies, and have the ability to strike coastal radar sites as well as collect intelligence.<sup>44</sup> One PLA Air Force (PLAAF) assessment states that Taiwan’s UAV units are mobile, making them a very survivable battlefield capability. Furthermore, the PLAAF report judges that ROC military UAVs have the ability to conduct short take-offs and landings, resist adversary jamming, and avoid infrared and radar tracking.<sup>45</sup>

UAVs offer Taiwan a number of advantages such as low purchasing cost, low operating and maintenance cost, low manpower requirements, and no risk of pilot casualties. Moreover, UAVs do not require Taiwan to alter its organizational structure or update its infrastructure, which is usually the case with “big-ticket” programs. Although not operationally valuable as P-3Cs, Taiwan’s UAVs will significantly improve Taiwan’s

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arrests ex-security chief for corruption, leaking secrets,” *Reuters*, December 5, 2014, at <http://www.reuters.com/article/2014/12/05/us-china-corruption-idUSKCN0JJ1RV20141205>.

<sup>40</sup> Zhu Xianlong, “Building Military Alliance to Monitor Our Naval Ships, U.S. and Taiwan Secretly Lay Seabed Cable (构筑军事同盟 监视我军舰船 美台密谋铺海底电缆),” *Renmin Ribao* (People’s Daily), June 15, 2001, at <http://www.people.com.cn/GB/paper68/3582/447092.html>.

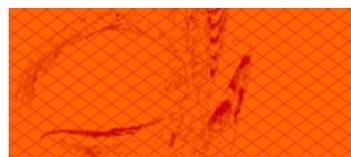
<sup>41</sup> Guo Nairi, p.126-127.

<sup>42</sup> Easton’s correspondence with Taiwanese military expert in Taipei.

<sup>43</sup> Jiang Yanyu (ed.), p. 261.

<sup>44</sup> *Ibid.*, p. 264.

<sup>45</sup> Xu Ti, “Analyzing Taiwan Military Use UAVs (台湾军用无人机探析),” *Compilation of papers presented at 2006 China UAV Symposium*, Beijing, 2006, p. 122. The author is affiliated with the PLAAF Armament Research Academy’s Information Institute in Beijing.



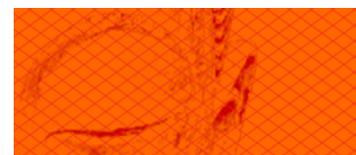
ability to identify unknown radar contacts and expand the range and duration of Taiwan's maritime ISR patrols. Looking ahead, ROCN may also pursue ship-launched UAVs.<sup>46</sup>



Taiwanese Maritime Patrol UAV at Unidentified Airfield

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<sup>46</sup> The authors are indebted to Mr. Craig Murray for these points.



## Integration

Taiwan faces an adversary in the maritime domain that is close to its territory and equipped with dozens of attack submarines, hundreds of strike aircraft, thousands of offensive missiles, and tens of thousands of sea mines. All of these weapons are made even more concerning by PLA's first strike doctrine. As a result, Taiwan's government places a premium on early-warning to avoid strategic and operational-level surprise. Here the integration of all sources of information is critical. Under the Po Sheng program, Taiwan's naval maritime domain awareness capabilities were unified by the Ta Cheng system, an indigenous automated command, control, communications, and intelligence (C<sup>3</sup>I) network that allows for the sharing of a common operational picture across the ROCN, and with the other services.

First established in the early 1980s, PLA writings suggest Ta Cheng is centered at the ROC Navy Headquarters' Combat Operations Center in Taipei where it integrates naval ISR, command and control, and communications into a unified system.<sup>47</sup> The PLA believes that Ta Cheng receives and processes a vast quantity of data to produce an integrated picture of the sea area around Taiwan, including the Taiwan Strait and the Fujian coastline. It then facilitates the sharing of relevant intelligence and the sending of orders to local units. The Ta Cheng system's communications reportedly travel on redundant land-based and ship-based networks that also use naval satellite communications. PLA analysts assert that Ta Cheng can operate both independently and jointly with the ROCAF Qiang Wang (Strong Net) system and the ROCA Lu Zi (Land Data) system, which together form an integrated national C<sup>4</sup>ISR system that is centered at the Hengshan Tri-Service Command Center, a massive tunnel complex in Taipei's mountainous suburbs.<sup>48</sup>

PLA analysts writing in the mid-2000s described the ROC military's C<sup>3</sup>I system as being "world-class" and assessed that its "communications trunk lines are complex and multi-dimensional...dense, well laid-out, redundant and survivable; a communications network with strong assurance capabilities."<sup>49</sup> PLA analysts describe the initial engineering phase of the project in the following terms:

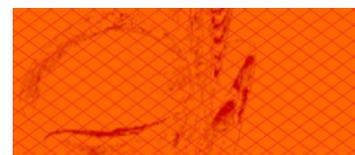
"[Taiwan] employed camouflage, concealment, deception; dispersal; great levels of redundancy; frequent routing changes and other measures. They established wartime underground command centers, including primary sites, underground tri-service wartime reserve sites, and missile defenses; and they engaged in

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<sup>47</sup> Unless otherwise noted, this section draws from Ma Yuanshen, Chen Wenqing, and Zhang Wenjing.

<sup>48</sup> See Ian Easton, "Taiwan, Asia's Secret Air Power," *The Diplomat*, September 25, 2014, at <http://thediplomat.com/2014/09/taiwan-asias-secret-air-power/>.

<sup>49</sup> Ma Yuanshen, Chen Wenqing, and Zhang Wenjing, p. 108.



hardening and camouflage. Their protection capabilities have been massively elevated.”<sup>50</sup>

ROCN is currently phasing the aging Ta Cheng system out in favor of a more advanced system-of-systems under the Syun An program.<sup>51</sup> The new architecture will likely take five to ten years to integrate into every unit and platform, but the transition is well underway. With multiple centers for correlation and dissemination, Syun An is more distributed, and therefore more survivable, than Ta Cheng. It also exchanges information in a more timely fashion, allowing for an improved near-real time common operational picture.<sup>52</sup>

Looking ahead, PLA analysts view the development of Taiwan’s future naval C<sup>3</sup>I system as emphasizing continued hardening and resiliency, with a particular focus on further developing satellite communications, early-warning, surveillance, and electronic warfare capabilities, as well as improved ASW capabilities. Recent PLA writings on Taiwan’s C<sup>4</sup>ISR infrastructure continue to evince a sense of concern and respect for the ROC military’s capabilities in this area.<sup>53</sup> American analysts have also praised Taiwan’s C<sup>4</sup>ISR system, remarking “Taiwan has the best common tactical picture in the world today, outside of the United States.”<sup>54</sup>

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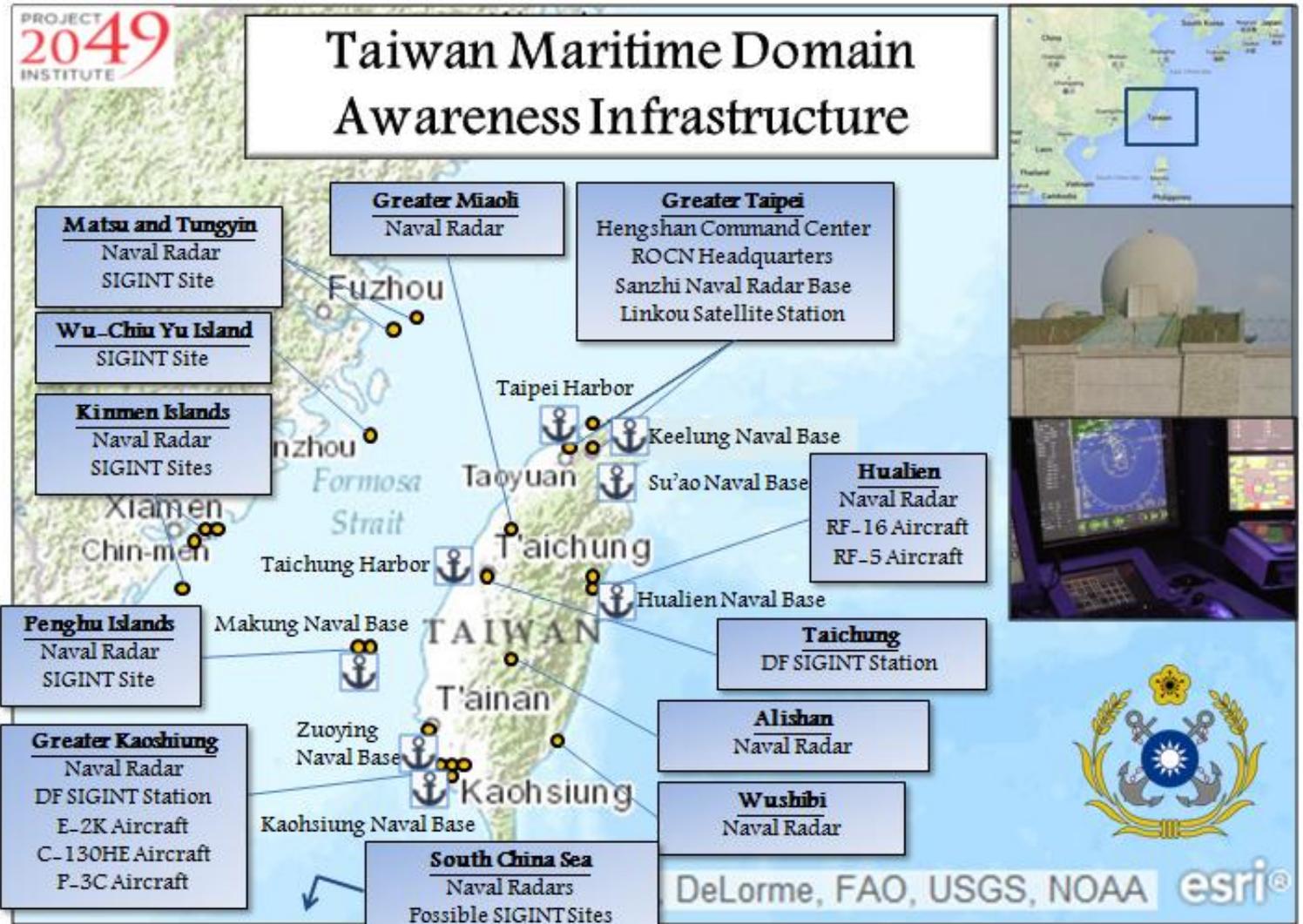
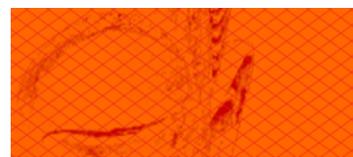
<sup>50</sup> Ibid.

<sup>51</sup> Easton’s interview with ROC military official in Arlington (VA), November 2014.

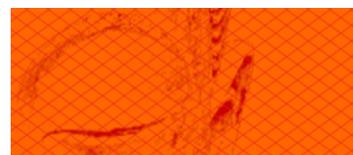
<sup>52</sup> Easton’s interview with military analyst in Washington D.C., December 2014.

<sup>53</sup> For example, see Jiang Yanyu.

<sup>54</sup> Stokes, p. 19.



\*Please note that the above image is incomplete. PLA writings and other open source materials only provide the locations of a relatively small number of Taiwanese maritime domain awareness assets.



## Regional Role

Taiwan has an important, but often underappreciated, role to play in the maritime component of the U.S. rebalance to Asia. First, as a capable security partner, Taiwan can provide the Pacific Command with critical indications and warning information. Second, the ROC Navy, Air Force, Army and Coast Guard can work jointly with their counterparts in the U.S. and other friendly maritime nations in the Western Pacific to form a common operational picture of the maritime domain. Third, Taipei can improve its ability to operate with U.S. forces in responding to natural disasters and other crises. Each of these three points will be briefly discussed below.

**Indications and Warning.** Providing advanced warning of PRC preparations for an attack on Taiwan or its principal security partner, the United States, and providing warning that an attack may be underway are the highest priority for all ROC military information collection platforms.<sup>55</sup> Indications and warning (I&W) is essential during peacetime to prevent China from obtaining the advantage of surprise. As has been demonstrated repeatedly over the past two decades, I&W information is especially critical during periods of crisis or limited conflict to provide strategic warning of the imminence of attack or the escalation of armed hostilities. Taiwan's timely and reliable I&W greatly contributes to good decision-making, allowing leaders to take appropriate steps ranging from increasing the readiness levels of forces to activating contingency plans.

Information about Chinese naval activities obtained from Taiwan's radar and sonar systems can be combined with information collected by other sources as a basis for action by Taiwanese and American decision makers. Large numbers of maritime domain awareness capabilities fielded by Taiwan have the potential to contribute important I&W information. However, it is not clear how closely Taiwan's capabilities are linked to, and integrated with, U.S. Navy and other allies' systems in the Western Pacific.

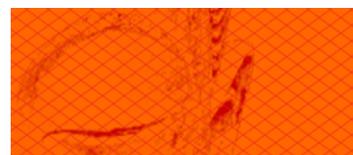
**Common Operational Picture.** The U.S. Department of Defense (DoD) defines a common operational picture as "a single identical display of relevant information shared by more than one command that facilitates collaborative planning and assists all echelons to achieve situational awareness."<sup>56</sup> Taiwan has an important role to play in helping the U.S. and other friendly maritime nations, such as Japan and South Korea, form an improved common operational picture of the maritime domain, including the

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<sup>55</sup> This section draws from Easton's *Able Archers: Taiwan Defense Strategy in an Age of Precision Strike* (Arlington, VA: Project 2049 Institute, September 2014), p. 30, at

[http://www.project2049.net/documents/Easton\\_Able\\_Archers\\_Taiwan\\_Defense\\_Strategy.pdf](http://www.project2049.net/documents/Easton_Able_Archers_Taiwan_Defense_Strategy.pdf).

<sup>56</sup> *Joint Publication 1-02: Department of Defense Dictionary of Military and Associated Terms* (Arlington, VA: Department of Defense, 15 August 2014), p. 47, available online at [http://www.dtic.mil/doctrine/new\\_pubs/jp1\\_02.pdf](http://www.dtic.mil/doctrine/new_pubs/jp1_02.pdf).



air and space domains above the Western Pacific. Taiwan's ISR could drastically improve U.S. and other allied nations' situational awareness in the Taiwan Strait and the South China Sea where their capabilities are constrained by distance and basing limitations. In return, Taiwan could receive information from U.S. and other allied sources. Much of the "hardware" for exchanging near real-time data over military tactical data exchange networks, such as Link 16, is already in place. Yet while Taiwan is technically capable of operating jointly in coalition with the U.S. and allied forces thanks to shared equipment, there are significant shortcomings when it comes to the human "software" components that underpin true interoperability.

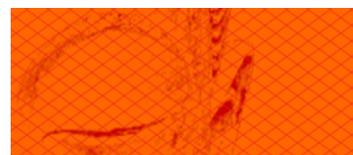
**Interoperability.** DoD defines interoperability as both (1) "the ability to operate in synergy in the execution of assigned tasks," and (2) "the condition achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users."<sup>57</sup> Taiwan and the U.S. likely have satisfied the latter definition, but they would struggle conducting coalition operations in response to a natural disaster or other crisis because the conditions needed to meet the former definition have not been met. PACOM would be better positioned to *operate in synergy in the execution of assigned tasks* with the ROC military if it began inviting Taiwan's navy and air force to participate in bilateral and multilateral air and maritime events.

To further improve interoperability in the event of a natural disaster or other crisis, PACOM should begin conducting port visits in Taiwan. It also should increase bilateral academic exchanges by sending American personnel to ROC military service schools for degree programs. The ROC military has played an important role in supporting U.S.-led disaster relief and humanitarian assistance operations, for example, by being the first responder to arrive after Typhoon Haiyan devastated parts of the Philippines in November 2013.<sup>58</sup> But, as we will argue in the following section, more can and should be done to improve both latent and continuous interoperability between the respective forces of the United States, Taiwan, and other allies.

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<sup>57</sup> Ibid. p. 132.

<sup>58</sup> "Relief Aid Extended by the Republic of China to the Philippines in the Wake of Typhoon Haiyan," *Ministry of Foreign Affairs Factsheet*, at <http://www.mofa.gov.tw/Upload/WebArchive/1304/8cdc1037-5708-4eb2-8f82-c33d8c006c6f.PDF>; see also Lin Xingjian, "Documenting Our Ship's Humanitarian Assistance to Philippines," *Central News Agency*, November 29, 2013, at <http://www.cna.com.tw/news/firstnews/201311290043-1.aspx>.



## Recommendations

The following recommendations relate to the importance of improving the U.S.-Taiwan bilateral military and security relationship, especially in the Western Pacific maritime domain. Given Beijing's ambitious political-military aims, and the increasingly unstable environment it is creating around its periphery, it is imperative that regional maritime states with shared defense interests continue to advance their security partnerships. The historical results of three major cross-Strait crises (and several minor ones) demonstrate the critical role that the U.S. has to play in deterring or limiting aggression against Taiwan. Likewise, Taiwan is the single most underutilized asset the U.S. has for adapting to the increasingly risky maritime environment in the Western Pacific. Only by working together with allies and partners like Taiwan will the U.S. be successful in its response to a growing number of potential natural and man-made disasters in Asia.

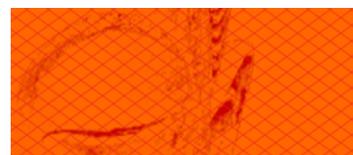
Taiwan has contributed much in recent years to the reduction of cross-Strait tension and the resolution of regional maritime disputes. President Ma Ying-jeou's East China Sea Peace Initiative and Taiwan's bilateral fisheries agreements with Japan, in particular, represent landmarks in regional maritime diplomacy. However, Beijing has refused to give up the use of force in resolving disputes, and the threat of Chinese aggression against Taiwan continues to loom. In August 2014, for example, PLA intelligence gathering aircraft violated the Taiwan Strait centerline on four separate occasions in the same day.<sup>59</sup> Taiwan's response to the worsening security environment has been to demonstrate it will improve its self-defense capabilities. Two key examples include Taipei's recent announcements that it will move forward with an indigenous defense submarine program and increase spending on its missile defense programs. Taiwan's efforts, both diplomatic and military, deserve the strong support of American policymakers.

Indeed, Taiwan's critical geostrategic location has long made it a natural ally for the U.S. government. Further adding to its appeal, Taiwan is a liberal democracy that plays a positive role in regional security. Reflecting the importance of Taiwan to the rebalance policy, there has been an increase in the number of military exchanges between the U.S. and Taiwan. For example, around 3,000 U.S. military visits to Taiwan are reportedly expected to occur in 2014, hundreds more than the year prior.<sup>60</sup> Significant numbers of

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<sup>59</sup> According to Taiwan's MND, the violations occurred on August 26, 2014 at 0823, 1056, 1431, and 1657, local time. The Chinese aircraft were identified as Y-8 SIGINT/ELINT planes. See "Chinese Yun-8 Electronic Reconnaissance Aircraft Repeatedly Violate Our Air Defense Identification Zone [中國運八電偵機連續進犯我防空識別區]," *Quanqiu Fangwei Zazhi* (Defence International), p. 21.

<sup>60</sup> Easton's interview in Arlington (VA) with defense official, November 2014. For background, see testimony before the U.S.-China Economic and Security Review Commission, June 5, 2014, at [http://www.uscc.gov/sites/default/files/Easton\\_USCC\\_Taiwan\\_Hearing\\_Statement\\_2014.pdf](http://www.uscc.gov/sites/default/files/Easton_USCC_Taiwan_Hearing_Statement_2014.pdf).

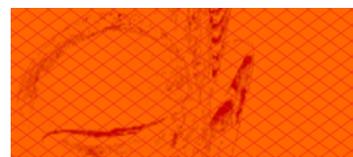


U.S. military personnel are involved in the approximately 300 bilateral programs that exist to assist Taiwan further develop highly specialized military skills.<sup>61</sup> Yet while the U.S.-Taiwan defense and security relationship is already one of the strongest in the world, it is still not strong enough. Much more can and should be done. Our recommendations are as follows:

1. It is in the American interest to integrate Taiwan's maritime domain awareness capabilities into a joint infrastructure for shared indications and warning (I&W) and regional situational awareness. This would include the exchange of everything from radar and sonar data to intelligence derived from signals, human agents and imagery, as appropriate and warranted by events. However, both the U.S. and ROC militaries should continue to maintain their respective abilities to independently collect information as well. This ensures that redundancy is built into the system and no side become overly susceptible to the political vagaries of the other in a crisis.
2. The U.S. and Taiwan should continue to work toward the ability to better share a common operational picture that would allow them to seamlessly work together as coalition partners during a crisis or conflict. While the equipment needed, such as shared digital data links, appears to be in place, serious human "software" challenges remain. These challenges can only be mitigated by improved government-to-government, military-to-military, and people-to-people contacts.
3. Washington must stop isolating Taiwan from bilateral and multilateral exercises and security events in order to appease or "reassure" Beijing's communist party leadership. Such a policy, in effect, undermines American security interests in Asia. U.S. Navy ships should conduct port visits in Taiwan, and DoD should invite Taiwan to the Rim of the Pacific (RIMPAC) Exercise and other maritime and air warfare events. The stakes are too high for Washington to continue policy behavior that undermines its long-term strategy.
4. The U.S. has plans for operating alongside the ROC military in the event that known contingencies occur. To ensure that these plans could be successfully executed, U.S. military leaders at the two-star rank and above with significant joint experience should regularly visit counterparts in Taiwan and learn about the Western Pacific battlespace firsthand. Nobody understands the local landscape better than Taiwan.

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<sup>61</sup> Ibid.



5. As a further means of building trust and interoperability, PACOM should expand and deepen its military exchanges with Taiwan as part of the rebalance to Asia. Taiwan should be renewed as a hub for training personnel in the Chinese language and culture. Taiwan's National Defense University and other professional military education institutions should be leveraged by American military officers and civilians studying regional security affairs.
6. The U.S. government should ensure that Taiwan's advanced early-warning radar systems have software properly enabled so that Taiwan has a maritime, air *and* space tracking capability. This would allow Taiwan to contribute to the shared monitoring of Chinese warships, aircraft, and ballistic missiles as well as space debris and naval ocean surveillance satellites.
7. The U.S. should strengthen its relationship with Taiwan in the area of integrated undersea surveillance systems. A joint SOSUS system could be a key component of an all-hazards situational awareness network in the Western Pacific that could monitor earthquakes, tsunamis, illegal-trafficking, adversary surface ships (including minelayers), and submarines.
8. Washington should clearly signal to Taiwan and the U.S. defense industry its intention to approve licensing for American industrial participation in Taiwan's indigenous defense submarine program. In addition to other missions, such as ASW and anti-surface operations, submarines are a critical part of an integrated intelligence architecture. The strategic benefits of new diesel-electric submarines and the range of missions they could undertake as part of coalition operations, merit full U.S. support for whatever submarine program Taiwan decides to pursue.