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Chinese Analysts Assess the Potential for Antiship Ballistic Missiles

CHINA'S ANTISHIP BALLISTIC MISSILE (ASBM) system of systems, which reached the equivalent of initial operational capability by December 2010, is the world's first weapons system potentially capable of targeting a moving aircraft carrier strike group (CSG) from long-range, land-based mobile launchers. Achieving an ASBM capability offers China the prospect of limiting the ability of other nations, particularly the United States, to exert military influence on China's maritime periphery, which contains several disputed areas of core strategic importance to Beijing (e.g., Taiwan). ASBMs are regarded as a means by which technologically limited developing countries can overcome by asymmetric means their qualitative inferiority in conventional combat platforms because the gap between offense and defense is the greatest here.

China's open-source literature does not establish conclusively the extent to which its land-based ASBMs or operational tactical ballistic missiles (TBMs) are capable of effective attacks on surface ships. But while China has not been truly transparent with respect to ASBM development, the different open-source voices do cohere in their own way. This shift in tone suggests that China is conducting advanced flight tests on, and may even be in the process of fielding, an ASBM. In the view of most Chinese and some Western analysts, even the mere perception that China might have achieved an ASBM could repre-

sent a paradigm shift with profound consequences for deterrence, military operations, arms control, and the balance of power in the Western Pacific. In light of these developments, it is useful to survey relevant Chinese writings for possible insights into the challenges that People's Liberation Army (PLA) faces in developing a successful ASBM system, and to explore how the PLA might ultimately seek to use an ASBM system for deterrence purposes—and, in a worst-case scenario, operationally.

Historical Background

For more than three decades, with a slow and uncertain beginning, Chinese leaders and strategists have been thinking of using land-based missiles to hit threatening targets at sea. Figure 1 offers a timeline of these efforts.

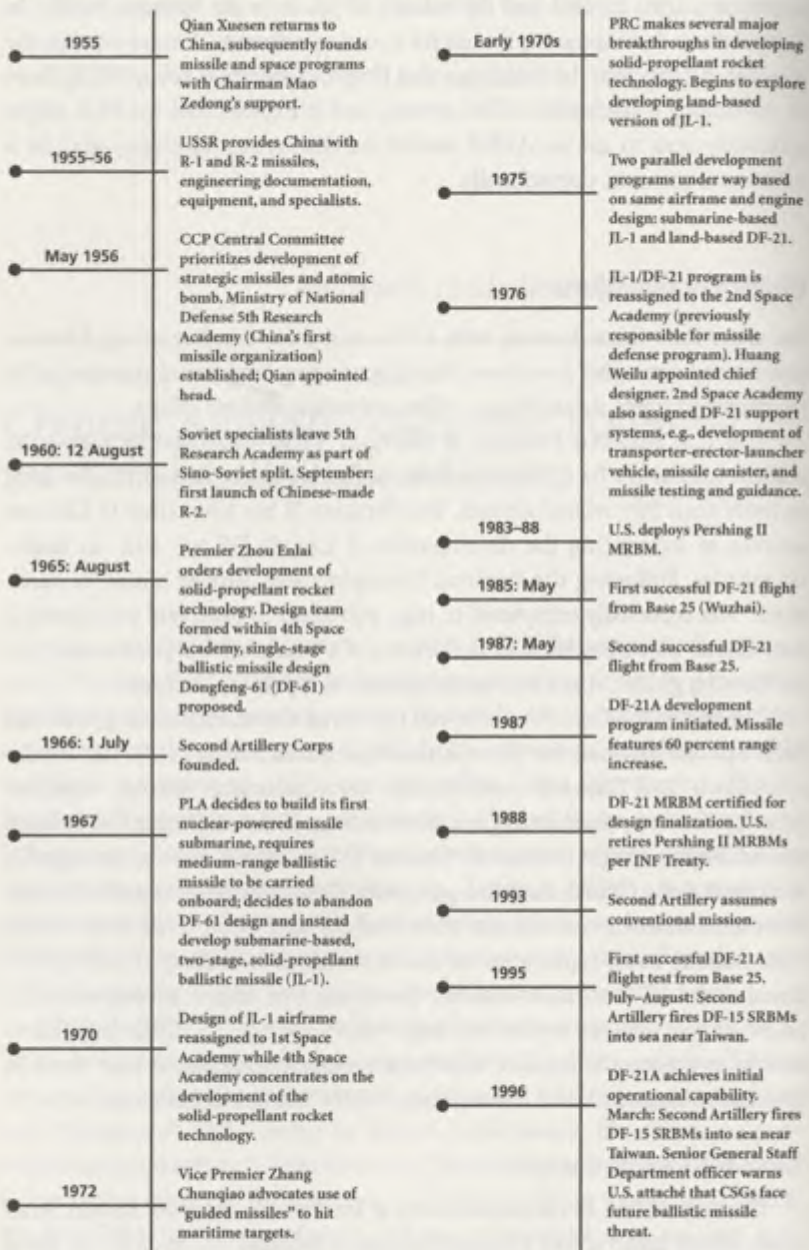
The U.S. *MarVed* Pershing II (潘兴-2) TBM—deployed in 1983—was studied intensively by Chinese analysts beginning in the late 1970s, resulting in more than fifty related articles. The Pershing II has been cited in Chinese sources as influencing the development of China's DF-15C and -21 ballistic missiles. Following the Pershing II's deployment, similar initial "research work" was reportedly completed in 1991, published in 1994, and incorporated into China's Dongfeng missiles in the form of a "warhead that possesses terminal homing guidance and maneuvering control capability" in 1999.¹

The end of the Cold War removed the Soviet threat, eliminating what had been a potent rationale for U.S.–China cooperation; Beijing's 1989 Tiananmen crackdown and Taiwan's concomitant democratization further ruptured what had been a robust strategic understanding. Following these two historic events, Beijing sought to credibly threaten U.S. military access to strategically vital areas along China's maritime periphery. Despite progress toward this end, however, Chinese naval and maritime analysts have written consistently that their nation's naval capabilities remain insufficient to address critical operational threats. For all these reasons, the concept of ASBM development has assumed new urgency as part of a larger effort to deter U.S. CSGs from intervening in a potential conflict. This notion emerged rapidly in later years in Chinese writings and even conversations with Chinese interlocutors.

Taiwan: A Central Catalyst

Chinese ASBM development dates at least to the 1995–96 Taiwan Strait crisis, which underscored Chinese feelings of helplessness against U.S. naval power. In July–August 1995 and March 1996, concerns about President Lee

Figure 1: Chinese (Antiship) Ballistic Missile Development Timeline



Timeline (continued)

1997-2002	Major Chinese ASBM conceptual studies published.	August: DF-21D rocket motor factory completed. November: ASBM program broadcast on CCTV-7. ONI's Scott Bray states ASBM "nearing an operational capability." ASBM begins to receive widespread attention in United States.
1999	First Shenzhou spacecraft launch; orbital maneuvering technologies demonstrated. PLA National Defense University publishes ASBM concept chapters.	
2002-06	Limited number of Chinese ASBM studies published openly.	5 March: three Yaogan surveillance satellites placed in similar orbits. 20 May: CASIC 4th Dept. Deputy Director quoted stating DF-21D can hit
2003	Second Artillery publishes ASBM feasibility study.	2010 "slow-moving targets" with a CEP of dozens of meters.
2004	Second Artillery publishes doctrinal handbook; two pages devoted to ASBM use. U.S. Office of Naval Intelligence first mentions Chinese ASBM interest publicly.	July: Second Artillery may be constructing ASBM missile brigade facilities in the northern Guangdong Province municipality of Shaoguan. 24 August: Admiral Robert Willard, Commander, U.S. Pacific Command, tells Japanese media in Tokyo: "To our knowledge, [China's ASBM] has undergone repeated tests and it is probably very close to being operational."
2005	First mention of Chinese ASBM exploration/research in U.S. Department of Defense annual PLA report.	December: Admiral Willard tells <i>Asahi Shimbun's</i> Yoichi Kato that China's ASBM has reached equivalent of "Initial Operational Capability" (IOC).
2006-Present	Major increase in Chinese ASBM publications.	
2007	Chinese ASBM development mentioned in testimony before U.S.-China Economic and Security Review Commission.	

Sources:

Andrew S. Erickson, "China's Anti-Ship Ballistic Missile (ASBM) Reaches Equivalent of 'Initial Operational Capability' (IOC)—Where It's Going and What it Means," *China Analysis from Original Sources*, 30 December 2010, <http://www.andrewerickson.com/2010/12/china%E2%80%99s-anti-ship-ballistic-missile-asbm-reaches-equivalent-of-%E2%80%99Cinitial-operational-capability%E2%80%99D-IOC%E2%80%94where-it%E2%80%99s-going-and-what-it-means/>; Yoichi Kato, "U.S. Commander Says China Aims to be a 'Global Military' Power," *Asahi Shimbun*, 28 December 2010, <http://www.asahi.com/english/TKY201012270241.html>; Andrew S. Erickson and Gabriel B. Collins, "China Deploys World's First Long-Range, Land-Based 'Carrier Killer': DF-21D Anti-Ship Ballistic Missile (ASBM) Reaches 'Initial Operational Capability' (IOC)," *China SignPost* (洞察中国), No. 14 (26 December 2010), <http://www.chinasignpost.com/2010/12/china-deploys-world%E2%80%99s-first-long-range-land-based-%E2%80%98carrier-killer%E2%80%99D-DF-21D-anti-ship-ballistic-missile-asbm-reaches-%E2%80%99Cinitial-operational-capability%E2%80%99D-IOC/>; Andrew S. Erickson, "China Testing Anti-Ship Ballistic Missile (ASBM); U.S. Preparing Accordingly—Updated With Latest Analysis & Sources," *China Analysis from Original Sources*, 25 December 2010, <http://www.andrewerickson.com/2010/12/china-testing-anti-ship-ballistic-missile-asbm/>; Yoichi Kato, "China's Anti-Ship Missile is Nearly Operational," *Asahi Shimbun*, 26 August 2010; 王根彬 (中国航天科工集团四部副总指挥) [Wang Genbin, Deputy Director of the 4th Department under CASIC], as quoted in "审时度势, 大打固本之仗——回顾与思考" [Sizing Up the Situation, Solid-Fuel Is Required for Battle—Review and Reflections], 两弹一星 [Two Bombs and One Satellite], 20 May 2010, <http://gongxue.cn/guofangshichuang/ShowArticle.asp?ArticleID=81143>; John Wilson Lewis and Xue Litai, *China Builds the Bomb* (Stanford, CA: Stanford University Press, 1988); and "DongFeng 21 (CSS-5) Medium-Range Ballistic Missile," *China's Defence Today*, <http://www.sinodefence.com/strategic/missile/df21.asp>.

Teng-hui furthering measures that it associated with Taiwan independence led Beijing to order missile tests and other military exercises near the strait. The resulting U.S. dispatch of the *Nimitz* CSG through the strait in December 1995 and of the *Independence* (CV 62) and *Nimitz* (CVN 68) CSGs toward the region in March 1996 was a move that China could not counter. The PLA Navy (PLAN) "felt pain keenly."² It is reasonable to assume that Beijing vowed such an action, which it perceived as a violation of China's sovereignty, should never be repeated. Leaders such as president and CMC chairman Jiang Zemin reportedly instructed key defense industrial institutions to spare no expense in solving the problem.

Consequently, PLA development in general, and PLAN development in particular, was marked by the emergence of many new platforms and weapons systems beginning in the early 2000s. Asymmetric in nature and anti-access in focus, they are difficult to counter, in our view, because they target specific characteristics and limitations based on immutable laws of physics and thus potentially place the United States on the "wrong end of physics" in terms of the difficulty and expense in attempting to do so. The ASBM differs markedly from the quiet submarines, lethal antiship cruise missiles (ASCMs), and copious sea mines that China has been adding to its inventory. China's ASBM draws on more than a half century of Chinese experience with ballistic missiles; is fired from mobile, highly concealable platforms; and has the range to strike targets hundreds of kilometers from China's shores.

In fact, there is specific evidence that the 1996 debacle gave a new impetus to ASBM-related research and development. Dr. Xin Wanqing at China Aerospace Science and Technology Corporation began ASBM feasibility studies and concept demonstration work in 1996, particularly in the areas of guidance and control. A sudden profusion of relevant technical papers by Xin and others starting in 1996 would seem to support these assertions. A 2006 article, published originally on the online portal of the official *China Youth Daily* and subsequently removed, claims that Xin "completed proof of concept work on anti-aircraft carrier ballistic missiles."³ Additionally, in 2003 the Second Artillery published what appears to be a conceptual feasibility study.⁴ Collectively, these factors suggest that related concepts have been under development at the highest levels of the PLA for well over five years, and perhaps for over a decade.

Official Statements

Chinese officials have yet to address their nation's ASBM development directly in an open public forum. They have made a variety of more general

statements, however, that would appear to be compatible with ASBM development. General Xu Caihou, CMC vice chairman, has stated that ballistic and cruise missile development is necessary for mainland China to safeguard its interests vis-à-vis Taiwan.⁵ China's military has publicly provided significant hints of its own ASBM progress. PLAN armament expert Qiu Zhiming states that targeting specific ships in a CSG is the greatest problem in ASBM development but that ASBMs have the potential to damage an aircraft carrier significantly.⁶

Discussions of ASBMs in the Chinese Literature

There are numerous Chinese writings on ASBMs in open-source literature that can be divided into three broad categories in descending level of demonstrable authoritativeness:

- PLA doctrinal publications that describe how ASBMs might be used in operational scenarios; official military doctrinal publications serve as sources of directive guidance for PLA personnel.
- Specialized and narrowly focused technical analyses of specific aspects of such weapons and their supporting infrastructure that involve computer simulations, mathematical calculations, and other technical endeavors regarding specific systems and operations.
- Generalist deliberations and didactic discussions on the technical and operational feasibility of such weapons designed to appeal to a broad audience, typically concerning the feasibility of ASBMs.

Areas of Agreement

While there are clearly differences among Chinese ASBM writings, it is important to examine the issues on which there is no disagreement regardless of forum, institutional affiliation, or individual viewpoint. Chinese commentators agree that an ASBM would be based on an upgraded version of an existing Chinese MRBM, such as the DF-21/CSS-5. Interestingly, some Chinese sources state that the Pershing II ground-to-ground TBM deployed from 1984–88 inspired Chinese research and development relevant to an ASBM. While the United States does not have an ASBM, the Pershing II did have an emerging if distantly related capability in this area. Washington relinquished this capability when it ratified the Intermediate-Range Nuclear Forces (INF) Treaty with Moscow on 27 May 1988, preventing both the United States

and Russia from possessing conventional (and nuclear) ground-launched ballistic (and cruise) missiles. Chinese assessments generally concur that ASBMs, if realized in practice, would offer a variety of operational effects and value for Chinese maritime strategy—particularly vis-à-vis Taiwan. Finally, there is also general agreement over the identification of the key technical challenges, including target acquisition and terminal guidance.

Doctrinal Sources

Three volumes—largely ignored by Western scholarship—deserve special scrutiny as the most authoritative writings available on the use of ballistic missiles in operational and tactical scenarios. The headquarters of the PLA General Staff declares that two of them, *The Science of Campaigns* and *The Science of Second Artillery Campaigns*, have been “printed and distributed to all military forces, colleges, and universities as a training and learning reference.”⁷ A third book, *Intimidation Warfare*, edited by Lieutenant General Zhao Xijun, Second Artillery deputy commander from 1996 to 2003, echoes many of the statements on strategic signaling outlined in *Science of Second Artillery Campaigns*.

The Science of Campaigns was written by researchers at China's National Defense University. The 2006 edition offers a basic overview of conditions under which conventional ballistic missiles might be used to “implement sea blockades” and “capture localized campaign sea dominance” by “implementing missile firepower assault or firepower harassment attacks against important targets on which the enemy depends for . . . sea-based maneuvering,” which aims to “apply great psychological pressure on the enemy” and make him think “that no rules apply, thereby achieving the maximum effectiveness.”⁸

Even more relevant and sophisticated is *Science of Second Artillery Campaigns* (2004). It likely serves as a high-level professional military education handbook for campaign-level command personnel in the Second Artillery and the PLA in general. The document represents the best theoretical work by the PLA's foremost thinkers on the use of ASBMs in operational scenarios with no indication that their approaches are aspirational or beset with insurmountable difficulties. In introducing the section describing ASBMs' potential employment, it states that “conventional missile strike groups” should be used as an “assassin's mace” (or silver bullet)—a term commonly used to describe weapons that match Chinese strengths with an enemy's weaknesses to achieve disproportionately powerful effects.⁹ Additionally, a two-page section describes five ways to use ASBMs against CSGs, a centerpiece of “military intervention by a powerful enemy,” including firing intimidation salvos,

destroying shipborne aircraft with submunitions, or disabling Aegis destroyers' sensor systems with electromagnetic pulses designed to make CSGs retreat or render them inoperable.¹⁰

Intimidation Warfare sheds additional light on China's possible calculus and tactics in various scenarios, emphasizing the value of demonstration training and tests, among other measures to influence the enemy.¹¹ Zhao's team also suggests four methods to deter enemy ships without hitting them directly: conducting test launches that impact near a sea-based target; launching two or more missiles to bracket or encircle a target; exploiting the psychological impact of missiles overflying "strategic targets" when fighting an enemy controlling an island (e.g., Taiwan?); and "launching missiles toward the flanks or the front of the aircraft carrier strike groups that have entered one's territorial waters."¹² Particularly noteworthy of the wide variety of uses suggested for ASBMs against carriers in this publication and in *Science of Second Artillery Campaigns* is that they place less of a premium on high warhead accuracy. Rather, missile range and defense penetration capability seem to be the key factors.

Science of Second Artillery Campaigns states that TBMs extend the Second Artillery's strike range, and it seems to assume that the Second Artillery would have an ASBM inventory sufficient to permit numerous warning shots. Horizontal escalation in the short run, it argues implicitly, can achieve de-escalation in the long run. One section of *Science of Second Artillery Campaigns* also emphasizes the need for "no-fly" and "restricted navigation zones," and calls for the use of "very precise missiles in order to prevent errors in precision or losing control of the missile when it is in flight such that it enters enemy territory (or an enemy-occupied island), or such that it directly strikes an enemy aircraft carrier." Otherwise, such errors "could cause the nature of deterrence to change, giving the enemy an excuse to use force or make follow-up deterrence in a passive situation."¹³

Technical Sources

The Second Artillery dominates available technical ASBM assessments, which implies that it largely, if not completely, controls Chinese ASBM programs. The vast majority of available technical articles devoted explicitly to ASBM issues are authored in full or in part by individuals associated with the Second Artillery Engineering College in Xi'an and the Second Artillery Equipment Department in Beijing. Such involvement may suggest that some degree of procurement, or at least active consideration thereof, is under way.

Generalist Literature

The available doctrinal literature should clearly be seen as the most demonstrably authoritative category of open-source writings, with endorsements by identifiable individuals associated with the Second Artillery, the National Defense University, or the PLA. Nevertheless, care must be taken in extrapolating actual capabilities from these sources. Available Second Artillery technical articles and mathematical feasibility studies devoted explicitly to ASBM issues do not detail concrete Chinese capabilities. In fact, Chinese doctrinal publications often discuss theoretical capabilities as if they existed, which U.S. joint publications typically do not.

Therefore, it is useful to examine the diverse and detailed generalist literature for indications of challenges and dilemmas that China might face in ASBM development and employment. These opinions matter because deploying and perfecting such a weapon would entail resolving a wide variety of complex challenges and policy considerations and the transcending of many industrial and bureaucratic boundaries.

Strategic Rationale and Scenarios.

There is broad (though not complete) consistency in the generalist literature concerning the operational effects of ASBMs and their potential value for Chinese maritime strategy writ large. ASBMs are promoted as a means to overcome conventional inferiority (by exploiting technological asymmetry), deter intervention, give China more maneuvering space, and offer both escalation control and an "assassin's mace" for victory if deterrence fails.

Of supreme importance to Beijing is Taiwan's political status. At the strategic level, Beijing seeks to deter Taipei from declaring independence while progressively constraining its political space and encouraging eventual reunification with a wide variety of hard- and soft-power tools. In addition to their psychological and deterrent effects, ASBMs are believed to offer China a way to exert hard-power pressure and convey strategic signals in scenarios that do not rise to the level of war. This would seem in concert with Chinese strategic writings, although we have not located any Chinese sources that directly mention any scenarios beyond Taiwan.

At the same time, ASBMs are recognized to have significant limitations, even potential dangers. According to one analyst, they "cannot replace aircraft carriers, submarines, and other traditional naval weapons"; they "can be used to destroy enemy forces at sea but not to achieve absolute sea control, let alone to project maritime power."⁴ Two writers in the China Shipbuilding Industry Corporation (CSIC) publication *Modern Ships* go much farther, declaring that

while ASBMs are technically feasible, their employment in practice is fraught with difficulties: they offer limited power projection capabilities, are highly escalatory if employed, and might in fact trigger nuclear retaliation.¹⁵ These can be overcome, in their view, if one is dealing with a minor power but not with a superpower like the United States.

Even if ASBMs were indeed developed successfully, the *Modern Ships* authors contend, a critical problem would remain: whether anyone would dare to use such weapons in an actual conflict scenario. In their view, ASBM employment against U.S. carriers would immediately create a nuclear conflict: "All the major nuclear powers have developed ballistic missile warning systems against possible nuclear attacks, and there has not been a single precedent of a major nuclear power attacking another with ballistic missiles." It must be emphasized that sinking or disabling a ship that is a symbol of American power and has a crew of thousands could provoke a very serious response.

Technological Feasibility: Convergence and Divergence of Views.

Chinese generalist debates about the utility of ASBMs are closely related to widespread disagreements over their technical feasibility. Analysts generally concur that five major technical challenges must be surmounted to achieve a functioning ASBM:

- *Detection.* There is disagreement on whether carriers would be too small relative to the potential search area to be detected easily by satellite images, and too difficult to detect electromagnetically.
- *Tracking.* There exists skepticism about whether requisite satellite coverage and other tracking methods are attainable past China's immediate shores.
- *Target defense penetration.* There is debate on how best to penetrate defenses of an enemy, whether it is slowing the warhead for terminal guidance or via multi-axis saturation attacks.
- *Hitting a moving target.* There is disagreement on whether a ballistic missile's trajectory can make appropriate homing corrections on a moving CSG.
- *Causing sufficient damage.* The conventional wisdom seems to be that the use of a multi-axis saturation attack (to defeat defenses) or submunitions (to distribute damage), delivered accurately, can achieve a mission kill by targeting critical exposed areas, such as the carrier's aircraft, island, and C4ISR equipment.

Assessments

Available Chinese literature follows a logical pattern of ever-widening concentric circles of awareness and, to a lesser extent, involvement. At the center, authoritative PLA publications assume an (eventual) ASBM capability. Further out, a variety of institutes are working to validate specific concepts and perhaps also technologies to support such a capability. Beyond these inner circles, a wide range of individuals weigh in, revealing diverse opinions and institutional interests. There exists a general climate of institutional biases and competition, with individuals favoring precisely the outcomes that would benefit their organizations most. Overall, literature suggests that organizations, analysts, and policy entrepreneurs may be jockeying for position in an attempt to influence the course of decision making on the part of at least two of China's armed services, its military leadership, and ultimately its civilian authorities.

Particularly noteworthy is that direct claims of existing Chinese capabilities in ASBM development are extremely limited; the focus of the discussion is typically on theoretical feasibility. Discussion of terminal guidance technology, for instance, is illustrated largely by examples drawn from the Pershing II missile. It is likely that some Chinese authors do not know what the Chinese capabilities actually are, while others know but cannot say.

Several other issues, though not directly addressed by the Chinese authors surveyed, may merit further attention and are highlighted below.

Possible Interservice Rivalry

The tone of ASBM analyses may be interpreted as signs of Second Artillery-PLAN bureaucratic competition. Momentum, direction, and contention about programs may reflect diverse institutional interests. Articles written by analysts associated with the Second Artillery tend to take the feasibility of ASBM development for granted, perhaps because an ASBM program would be (or now is) controlled by the Second Artillery, furthering its institutional interests.

It is not surprising, then, that the PLAN publication *Modern Navy* and the CSIC-affiliated *Modern Ships* have published by far the most skeptical assessment of ASBM technology. The vast majority of analyses affiliated with the PLAN suggest that ASBM development is technically problematic, or that actual use would have dangerous unintended consequences. Perhaps the Second Artillery's involvement in antiship warfare might compete with the navy's own programs for resources. The PLAN might well prefer to develop more conventional antiship capabilities (e.g., ASCMs, attack aircraft, and

attack submarines) and may worry that Second Artillery monopoly of ASBM stewardship could undermine funding for these more traditional priorities.

A Coercive Quarantine?

Synthesizing the considerations above, it is possible that to the extent that tactical ballistic missiles are employed as antiship weapons, they would most likely be used as part of a multiservice combined arms operation as an added component of a saturation attack to overwhelm a carrier's defensive systems. For this purpose, targeting precision would be less important, and the more general Chinese tradition of numbers over accuracy could be employed to good effect. This tactic could divert carrier defense systems from other threats, such as other ASBMs or simultaneous cruise missile volleys, and perhaps exhaust scarce interceptors. To escape this problem, CSGs might simply opt to stay out of the range of the TBMs.

Messages for the U.S. Military?

Given the sensitivity of the topic, it is possible that the current Chinese literature on ASBM development is a discussion whose parameters are controlled. Information manipulation should certainly be expected, especially considering that most technical analyses reviewed were published in journals fairly accessible to foreigners, complete with English titles and abstracts. Discussion is likely regulated to send a desired signal, rendering different explanations for Chinese writings on ASBMs possible. To the extent that they are manipulated, they could represent a "placeholder" partial deterrent, a reflection of ongoing ambivalence and debate, a targeted effort to obscure actual capabilities, or a statement of conditional intent.

While plenty of discussion surrounding China's ASBM program exists, there has been no official Chinese indication that any weapon of this kind will be tested comprehensively at sea under fully realistic conditions in the foreseeable future. From a signaling perspective, this may be a highly cost-effective way to achieve partial deterrent effect until the capability is fully realized, which may be sometime in the future.

Second, it is possible that the confusion and contradictions among Chinese writings instead signify a larger debate and ongoing ambivalence within China concerning the actual efficacy of ASBMs regardless of their technological feasibility—as appears to have been the case with Chinese aircraft carrier development in recent years.

A third possibility is that strategic articles could be manipulated to obscure or divert attention from an extant capability or one in rapid development.

Manipulating a few strategic articles in journals known to be read outside China might be a particularly effective instrument in an information campaign. A somewhat peculiar two-part series in *Modern Navy* could be a prime example of this, especially as it appears to contain many misused technical concepts and even outright errors.

Finally, the significant and growing amount of Chinese ASBM literature could be part of a larger pattern in which Beijing is becoming increasingly "translucent" (if still not fully transparent) regarding selected capabilities to enhance deterrence. It might regard the ASBM as a weapon whose very evidence of development could alter U.S. military behavior, thereby enhancing China's strategic leverage. It is even possible that there is an effort to send a measured signal—that China may be preparing certain capabilities but has not yet made definitive plans for their large-scale deployment, the actual realization of which will be calibrated in response to American strategic actions (e.g., vis-à-vis Taiwan and China's "near seas").

Testing?

In any case, if and when the DF-21D is developed sufficiently, Beijing might reveal a dramatic weapon test to the world—with or without advance warning—in some way geared to influencing official and public opinion in the United States, Taiwan, Japan, and elsewhere in the Asia-Pacific. Alternatively, unpublicized flight tests could be conducted to deter foreign militaries without alarming foreign publics (though classified information might ultimately be leaked to them). In any case, some sort of integrated over-water flight tests would be necessary to generate Chinese confidence in ASBM capabilities. As figure 1 indicates, China's ASBM has undergone repeated tests that are probably advanced and include flight tests. The fact of a hit on a maritime target, however manipulated and revealed, could change the strategic equation regarding Chinese leverage in the Western Pacific.

Implications

While there is ongoing disagreement as to their feasibility and efficacy, a successful Chinese deployment of ASBMs would probably have the following impact on PLA thinking:

- Reinforcement of continental approaches to maritime security—"using the land to control the sea"
- Reinforcement of centralized approaches to command

- Further emphasis on multiaxis saturation attacks
- Greater confidence in China's ability to restrict U.S. Navy operations and to control escalation

China's ASBM is thus part of a much larger pattern in which the development and proliferation of various antiaccess/area denial weapons systems—such as ballistic and cruise missiles, submarines, and naval mines—threatens to hold U.S. platforms at risk in vital areas of the global maritime commons.

Notes

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CHINESE AEROSPACE POWER

Evolving Maritime Roles

中海

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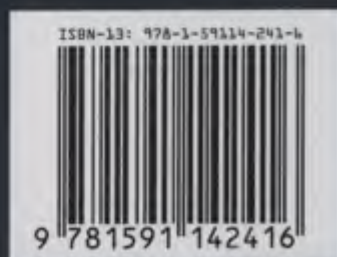
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China's aircraft carrier program is already making major waves well before the first ship has even been completed. Undoubtedly, this development heralds a new era in Chinese national security policy. While *Chinese Aerospace Power* presents substantial new insight on that particular question, its main focus is decidedly broader in scope. This book offers a comprehensive survey of Chinese aerospace developments, concentrating on areas of potential strategic significance previously unexplored in Western scholarship. It also links these developments to the vast maritime battlespace of the Asia-Pacific region and highlights the consequent implications for the U.S. military, particularly the U.S. Navy.

The possibility of a future Chinese expeditionary force operating off Africa under the protective umbrella of carrier aircraft is not without consequence for the global strategic balance. However, a simpler set of aerospace systems, from microsatellites to unmanned aerial vehicles to ballistic and cruise missiles, is already challenging U.S. maritime dominance in East Asia. Cumulatively, progress in all major aerospace dimensions by various elements of the People's Liberation Army Navy (PLAN) signifies a new period in which Chinese forces are now decidedly altering the complexion of the military balance in the East Asian littoral.

While many articles and books have previously been written on Chinese aerospace development and many more discuss future U.S. naval strategy in the Asia-Pacific region, no other book connects the two

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Chinese Aerospace Power

Evolving Maritime Roles

Edited by Andrew S. Erickson and Lyle J. Goldstein



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Foreword

IT HAS BEEN MORE than thirty years since the United States established formal diplomatic relations with the People's Republic of China (PRC), yet those relations remain ambiguous and perplexing. The U.S. government seeks to encourage the PRC's evolution into a responsible stakeholder on the world stage, especially in the Pacific, while the Department of Defense strives to balance military-to-military interaction with the PLA and yet still maintain credible deterrence against China's rapidly increasing military capability.

The chapters that follow address the reality of the emergence of the People's Liberation Army (and People's Liberation Army Navy) as a modern, complex military. They are not intended to assuage either hawks or doves on the controversial issue of China; rather, they provide a broad and objective assessment of Chinese aerospace and maritime power by professional researchers who take their analyses with the utmost seriousness. This is important work.

Is war with China possible? Regrettably, yes. Acknowledging that unfortunate fact and ensuring that the United States is sufficiently prepared to prevent and deter such a conflict is what this volume is about. The most essential work being done today is the broad effort to avoid conflict with the PRC without compromising our national principles. Global economic challenges are daunting, but the threat of a nuclear-enabled Iran and North Korea, or terrorists with weapons of mass destruction, pale in comparison to the potential devastation that might occur if war erupts between the United States and China. Beyond imperiling the

survival of Taiwan, war with China would cause broader physical and economic destruction and could very well spiral into a lengthy global conflict.

The surest way to limit that potential is to mature the relationship between the United States and China, which is currently stuck in the molasses of its modern origins. It is an elaborate ballet of protocol and protest, pirouetting around the status of Taiwan. We must find a way beyond the false formalities of our special relationship with the PRC. To build on the hopeful signs of the first year of the Ma Ying-jeou government and PRC–Taiwan interaction, I suggest the following: the United States government should stress at every turn that U.S. involvement with Taiwan is good for the PRC. During the government of Chen Shui-bian, U.S. pressure on Chen was key to keeping his actions away from PRC red lines. My experience in dealing with Beijing suggests that a candid and direct approach to diplomacy can yield practical solutions to the delicate problems in U.S.–China relations.

Most fundamentally, we should assess PRC military modernization in objective terms for what we know it is—a significant build up in capability well beyond defensive requirements. Special attention needs to be focused on China's undersea capabilities and also its new prowess in the domain of electronic warfare. Moreover, it is crucial that we avoid the presumption that we can know Beijing's intent. We do not know, and we cannot. We must assess the quality of China's hand without trying to predict how Beijing will ultimately play its cards. We are duty bound to continuously evaluate the military balance, considerations of readiness and risk, and the potential for engagement and deterrence.

Those who ignore the lessons of history may be condemned to repeat it, but those who turn a blind eye to the realities of the present, for example by underestimating China's dramatically enhanced aerospace and maritime power, are assuming irresponsible risks for our nation.

LIEUTENANT GENERAL DANIEL P. LEAF, USAF (RET.)

Lyle J. Goldstein

Introduction

CHINA'S AIRCRAFT CARRIER program is making major waves well before the first ship is completed. Undoubtedly, this development heralds a new era in Chinese national security policy. While the present volume presents substantial new insights on that particular question, its focus is decidedly broader in scope. This book instead aspires to offer a comprehensive survey of Chinese aerospace developments, with a focus particularly on areas of potential strategic significance previously unexplored in Western scholarship. It then seeks to link these developments to the vast maritime battle space of the Asia-Pacific region and consequent implications for the U.S. military, particularly the Navy.

Whether some hypothetical future Chinese expeditionary force operating off Africa a decade or two from now does so under the protective umbrella of carrier aircraft is not without consequence for the global strategic balance. But a relatively simpler set of aerospace systems, from microsatellites to unmanned aerial vehicles to ballistic and cruise missiles, are challenging U.S. maritime dominance in East Asia today. Cumulatively, progress in all major aerospace dimensions by various elements of the People's Liberation Army (PLA) heralds a new period in which Chinese forces are now decidedly altering the complexion of the military balance in the East Asian littoral.

Faced with such rapid developments in Chinese aerospace development, the U.S. Naval War College's China Maritime Studies Institute (CMSI) assembled a group of technical specialists—U.S. Air Force (USAF) and U.S.

Navy operators, and regional experts on—10–11 December 2008 for its fourth annual conference, “Evolving Maritime Roles for Chinese Aerospace Power.” Most of the chapters herein were presented initially as papers at that conference, and were subsequently revised substantially to address recent events. A select group of chapters was added to take advantage of the authors’ cutting-edge knowledge of key subject areas. The chapters are designed to offer a wide range of perspectives because constructive academic dialogue and debate is at the heart of CMSI’s analytical philosophy. They may be read sequentially or individually, depending on the reader’s interest.

CMSI is the first undertaking of its kind outside of China. Established in 2006 to increase knowledge and understanding of the maritime dimensions of China’s rise, it supports the research needs of the U.S. Navy. Based at the Naval War College in Newport, Rhode Island, CMSI is located at the nexus of academic, policy, and operational communities. In addition to an annual conference and regular research seminars at the college, the institute focuses on intensive research into China’s future maritime development, based principally on the ever-growing array of Chinese-language primary sources.

CMSI has developed a record of discussing and analyzing in depth the most advanced areas of Chinese naval development; CMSI’s 2005 conference, for example, discussed “China’s Future Nuclear Submarine Force.” The institute has also been at the forefront of developing a positive working relationship between the U.S. and Chinese navies, hosting in 2007 a conference on “Defining a Maritime Partnership with China.” At every step, CMSI has striven to add objectivity and data-based analysis to inform the U.S. Navy’s approach to China. In that spirit, this volume, like its four predecessors, contains many chapters that draw extensively on original Chinese-language sources, many not previously cited outside China. Numerous articles and books have been written on Chinese aerospace development, and many more discuss future U.S. naval strategy in the Asia-Pacific region. But no other volume connects the two issues, simultaneously evaluating the Chinese aerospace challenge and its implications for U.S. naval strategy.

This volume is divided into six thematic sections. The first section establishes the maritime context for China’s rapid aerospace development. Andrew S. Erickson leads off with a survey of current developments and concludes that “Chinese aerospace capabilities are improving in a rapid, broad-based fashion that can properly be described as a ‘revolution.’” Mark A. Stokes and Ian Easton follow with an in-depth analysis of both the organizational underpinnings of China’s aerospace development and its regional implications. They find that, “largely driven by a Taiwan scenario, mainland China’s capacity to

conduct a successful aerospace campaign to swiftly gain a decisive air advantage is surpassing defenses that its neighbors, including Taiwan, Japan, perhaps India, and even U.S. forces operating in the Western Pacific, can field." Wayne A. Ulman reveals that "all indicators point to the continued improvement of both the PLAAF and PLA naval aviation over the next decade, to the point where China will have one of the world's foremost air forces by 2020." Kevin Pollpeter concludes the section by exploring Chinese writings that reveal "an ambitious plan to fully integrate space into Chinese warfighting," with an understanding that this approach could "hold an [adversary's] economy hostage and . . . undermine an opponent's will."

The second section surveys the roles for Chinese aerospace assets in promoting Chinese intelligence, surveillance, and reconnaissance (ISR) and in denying these capabilities to China's potential adversaries in conflict, as well as corresponding maritime implications. Anthony J. Mastalir surveys China's space development, including especially its 11 January 2007 antisatellite (ASAT) test, and concludes that if Beijing's approach in this sensitive domain is not to become the twenty-first century equivalent of the destabilizing German dreadnoughts, then Washington requires a more comprehensive approach to space policy regarding China. Peter A. Dutton discusses China's new initiative to restrict military operations in the airspace over its exclusive economic zone (EEZ), concluding that such efforts must be strongly contested because "information is inherently stabilizing," so that such operations are actually very much in China's own national interest. Richard D. Fisher Jr.'s analysis reveals yet another Chinese ISR capability, noting that "the PLA has apparently committed to investing in a world-class unmanned [aerial vehicle] systems capability," as suggested by the more than twenty-five prototypes or major projects that were unveiled at China's 2010 Zhuhai Airshow. Garth Hekler's extensive research in Chinese sources reveals a similarly robust Chinese effort in the areas of both defensive and offensive airborne electronic warfare—another key element of the evolving ISR environment along the East Asian littoral.

The third section considers prospective maritime missions that might develop further in the future as the result of advances in Chinese aerospace. Dennis J. Blasko investigates helicopter development in the PLA and finds that this process is "still in the rudimentary phase" though the "force is expanding in size and scope of its missions." Lyle J. Goldstein, Miguel Martinez, and William S. Murray address a related theme, Chinese airborne antisubmarine warfare (ASW), and likewise conclude that Chinese capabilities are not robust—with the caveat that China's navy seems to be prioritizing airborne ASW given the amount of ongoing research in this area evident in Chinese

sources. Similar limitations are evident in the development of China's aerial refueling capabilities, according to the chapter by Gabriel Collins, Michael McGauvran, and Timothy White, who conclude that "even major AR [aerial refueling] improvements over the next ten to fifteen years will not give the PLA a capacity resembling the global power projection capability the United States has with its more than four hundred tankers." Nan Li and Christopher Weuve take up the issue of Chinese aircraft carrier development. Noting the possible options that Beijing might pursue, they determine that various necessary conditions appear to have been met, including endorsement by the central leadership, affordability, a concise naval strategy incorporating the new platforms, and the availability of the requisite technologies. Daniel J. Kostecka surveys the potential spectrum of Chinese deck aviation development. He concludes that "between now and 2020, the acquisition of aircraft carriers will afford the PLAN the capacity to conduct force projection operations in East Asia."

Section four of this volume examines the emerging threat from Chinese prowess in fielding advanced cruise missiles. Roger Cliff begins by surveying the latest developments in capabilities, doctrine, and missions for China's air forces. He finds that "China's air forces have made substantial strides over the past decade" and "have the potential to present a significant obstacle to U.S. success in such a conflict." Kevin Lanzit and David Chen evaluate the maritime strike mission among China's air forces and note that China already has 570 strike aircraft, which are armed with lethal antiship cruise missiles and capable of operating 1,200 km or more from China's coast. Andrew S. Erickson and Jingdong Yuan describe these missiles in detail, observing that China is no longer reliant on Russia to deploy these advanced weapons. Michael S. Chase focuses on the latest dimension of the cruise missile threat, arguing that major progress in Chinese land-attack cruise missiles could allow Beijing "to at least partially address the asymmetry in conventional strategic warfare capabilities that currently prevents the PLA from retaliating in kind if the United States launches conventional attacks against targets on the Chinese mainland."

First among Chinese antiaccess/area denial systems in potential strategic significance is China's DF-21D antiship ballistic missile (ASBM), which Admiral Robert Willard, commander, U.S. Pacific Command, declared in December 2010 to have reached the equivalent of initial operational capability.¹ The vital issue of Chinese ASBM development is addressed in section five of the present volume. Ron Christman describes the conventional force of the PLA Second Artillery Corps as seven times larger than the nuclear forces component of the service. Andrew S. Erickson and David D. Yang probe the writings of Chinese analysts concerning China's emerging ASBM capability and

conclude that this concept has a long and well-developed history in Chinese strategic thought. Toshi Yoshihara examines Chinese perspectives on the ballistic missile defense architecture and finds that China views Aegis missile defense systems as a highly lucrative target for striking U.S. Navy carrier strike groups (CSGs) in a conflict scenario. Paul S. Giarra then evaluates the implications of Chinese ASBM development for the U.S. Navy and comes to the stark conclusion that the deployment of an effective ASBM by China could alter naval warfare to an extraordinary extent, comparable to the introduction of aircraft and submarines in the twentieth century.

Concluding chapters in section six develop more comprehensive assessments. Eric Hagt develops the sobering assessment that "time (and money) appears to be on China's side. Although the United States will remain the dominant military power at the global scale for decades to come, in the regional context of Taiwan, China's near seas, or even within the second island chain, the demands for power projection are far less onerous for China." James R. Holmes posits that "since the dawn of carrier warfare, U.S. naval strategy has viewed command of the air as a prerequisite for surface fleet operations" and asserts that this assumption is increasingly questionable regarding any possible conflict in the East Asian littoral. Larry M. Wortzel judges that the "U.S. Navy and Air Force . . . will likely be hindered in carrying out some . . . missions in the Western Pacific, particularly within proximity of China." Xiaoming Zhang and Sean D. McClung argue that much improvement is needed in U.S. studies of Chinese air and space power, which is "being transformed." They demonstrate that the PLAAF faces challenges both in upgrading its own forces and in competing with the General Armament Department and the Second Artillery Corps for ownership of space-based platforms: "Given the PLAAF's limited ownership and control of space assets, Chinese military theorists have recommended that the service concentrate on building facilities and institutions to receive satellite services for communication, weather, navigation, and global positioning." Jeff Hagen evaluates the implications of China's growing aerospace capabilities on U.S. influence in the Asia-Pacific region, and suggests a variety of countermeasures, including "increas[ing] the number of air bases and their hardness; solidify[ing] regional basing arrangements; improv[ing] long-range strike capability; increas[ing] operational coordination between the U.S. Air Force and U.S. Navy; continu[ing] modernization of [the] fighter force; [and,] to the greatest extent possible, encourag[ing] Taiwan and other partners to pursue defensive systems that are more survivable and effective against attack." In his concluding chapter, Eric A. McVadon carefully weighs the motivations behind, and implications of, Beijing's aerospace development.

While he is careful to note the substantial areas in which the United States and China share interests and may build on them further, he also emphasizes that the U.S. Navy and fellow services should make substantial, “innovative” preparations to ensure that their forces do not become outmoded. For instance, “the pending development of maritime UAVs such as the land-based broad-area maritime surveillance (BAMS) UAV- and carrier-based unmanned combat air system (UCAS)” can ameliorate the risk to the CSG or other units posed by the MaRVed MRBMs under development by China.

For now, it is hardly controversial to conclude that revolutionary change is under way in the skies above the East Asian littoral. China’s space technology prowess, as demonstrated by its 2007 ASAT test and suggested by rapid progress in microsatellite development, poses a major challenge to heavy U.S. reliance on space capabilities. China’s growing inventory of strike aircraft is complemented by newly advanced weaponry and ISR capabilities to support those aircraft. The breadth of this effort is demonstrated by Beijing’s efforts in the legal arena to establish greater control of the airspace in its EEZ. The potential deployment of ASBMs is most troubling, however, since this weapon has the potential to render surface forces in the region all but obsolete in a single stroke.

At the same time, this balanced assessment acknowledges that certain real limitations continue to hinder China’s aspirations in the aerospace domain, especially as they pertain to the maritime strategic balance. For example, Chinese aircraft have to date lacked reliable, indigenously built jet engines. Moreover, it should be noted that certain Chinese advances in aerospace technologies, processes, and systems (e.g., aerial refueling, as it gradually advances; and increasing reliance on such space-based assets as the emerging Compass satellite navigation-positioning system) may also open up new vulnerabilities to adversary countermeasures. Most fundamentally, the point is made by many contributors that China’s naval air arm, like Chinese aviation in general, remains the “poor cousin” of Chinese aerospace, and progress has been moderate or even slow in developing key areas (e.g., doctrine for integrated aerospace operations in the maritime domain).

A key finding of this volume and also the December 2008 conference is that the U.S. armed forces as a whole must come to grips with enhanced Chinese long-range precision-strike capabilities that are now coming to fruition and that pose a significant threat to forces in the Western Pacific theater. The development of such capabilities as the ASBM strongly suggest that America’s future fleet must reduce its vulnerability to long-range strike, with an emphasis on undersea capabilities as well as unmanned systems in order to preserve survivability in a more challenging threat environ-

ment. Additionally, evolving Chinese aerospace capabilities raise the salience of deterrence initiatives as well as the imperative to develop effective crisis-management mechanisms, not to mention a robust, long-term cooperative engagement strategy. Although American and Chinese aspirations for the twenty-first century are not so different, creativity and determination are nevertheless required to find ways to cooperate in meaningful ways on the seas and in the air and space above them. Indeed, many at the 2008 conference suggested that enhanced military-to-military engagement could reduce the mistrust that might fuel arms racing in the aerospace dimension.

The editors of this volume wish to thank, above all, the researchers who have contributed to it. Here it must be emphasized that all opinions expressed in this book are those of the authors and editors alone and in no way represent the policies or estimates of the U.S. Navy or any other organization of the U.S. government. We also are tremendously grateful to those who helped to organize the December 2008 conference, including especially Dalton Alexander, Leah Averitt, Gigi Davis, Julia Gage, Christina Hartley, Albert Lawton, Jim Lewis, Debbie Maddix, Brian Pagel, and Michael Sherlock. CMSI wishes to thank Raytheon Integrated Defense Systems for its support of the conference through a generous gift to the Naval War College Foundation. Timely and thorough assistance from key members of the Naval War College's Information Resources Department, including Mike Carroll, Neil Davis, Luke Desrochers, Dave Fields, Kerrie Hull, John Neves, and Rodham Smith, was essential to enabling Andrew S. Erickson to edit the manuscript from Seoul, South Korea; as were facilities generously provided there by Major Christopher M. Heber, USAF, and Major Cheree S. Kochen, USAF. The support of Naval War College leadership has been critical to the success of CMSI and in enabling the creation of research products such as the present volume. Finally, we wish to thank Naval Institute Press for its professionalism and dedication in publication of the series "Studies in Chinese Maritime Development," of which this is the fifth volume.

Notes

1. Andrew S. Erickson, "China's Anti-Ship Ballistic Missile (ASBM) Reaches Equivalent of 'Initial Operational Capability' (IOC)—Where It's Going and What it Means," *China Analysis from Original Sources*, 4 January 2011, <http://www.andrewerickson.com/2011/01/china%E2%80%99s-anti-ship-ballistic-missile-asbm-reaches-equivalent-of-%E2%80%9Cinitial-operational-capability%E2%80%9D-ioc%E2%80%94where-it%E2%80%99s-going-and-what-it-means/>.