# CHAPTER 5

# CHINA AND THE EMERGING STRATEGIC COMPETITION IN AEROSPACE POWER

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## INTRODUCTION

Competition is emerging over efforts to secure access to and control of the air and space mediums in the Asia-Pacific region. This competition is being driven in large part by the Chinese development of military capabilities and strategies, which increasingly challenge the ability of regional air-, missile-, and space-defense programs to keep pace. The emergence of aerospace power as a key instrument of Chinese statecraft has implications for the strategic landscape of the region and well beyond.

The military modernization campaign being undertaken by the People's Republic of China (PRC) and the Chinese development, testing, and deployment of advanced aerospace capabilities are eroding the confidence of other regional actors that they will have ensured access to and control of the air and space mediums in the event of a conflict. This is of crucial importance, because the Asia-Pacific region, defined by its vast distances and long-time horizons, is an aerospace theater by its very nature, and access to and control of the air and space dimensions of any future conflict will be critical to achieving political and military successes on the land and the sea.

The rise of China as a major economic, technological, military, and political player is changing the dynamics within the Asia-Pacific region and the world at large. Uncertainty over Chinese intentions is creating anxieties. As Richard Bush of the Brookings Institute notes, "A rising power poses a challenge to the prevailing international system and to the states that guard that system, because the new power's intentions are usually unclear."[1] Against the backdrop of ambiguity and uncertainty of the future, China's aerospace developments merit further examination.

The latest *Quadrennial Defense Review* (QDR), in reference to China, states: "Future adversaries will likely posses sophisticated capabilities designed to contest or deny command of the air, sea, space, and cyberspace domains."[2] Indeed, the People's Liberation Army (PLA) is rapidly advancing its capacity to apply aerospace power to create effects across domains in order to defend against perceived threats to national sovereignty and territorial integrity. Influential Chinese strategists argue that modern conventional aerospace capabilities transcend the nuclear threshold, in that they are powerful enough to deter and defeat formidable enemies without having to resort to the threat of using nuclear weapons.[3] Constrained by a relatively underdeveloped aviation establishment, the PLA is investing in aerospace capabilities that may offset shortcomings in the face of a more technologically advanced adversary. Whoever dominates the skies over a given territory—such as Taiwan; disputed territories in northern India or Japan, and the South China Sea—has a decisive advantage on the surface.

This chapter addresses trends in PRC force modernization intended to exploit weaknesses in regional air, missile, and space defenses, including a growing

ability to maintain persistent surveillance around China's periphery. Included is a brief overview of China's expanding short- and medium-range ballistic missile and ground-launched cruise missile infrastructure. The subsequent section outlines trends in missile defense and long-range precision strike modernization in Taiwan, Japan, India, and the United States. The final section addresses the implications of China's growing aerospace power for regional strategic stability.

## AEROSPACE CAMPAIGN THEORY AND CHINA'S FORCE MODERNIZATION

One of the most significant aspects of China's military modernization program is Beijing's expansion of, and growing reliance on, conventional ballistic and ground- launched cruise missiles as the centerpiece of the PRC's political and military strategy. Large-scale theater missile raids—combined with other enablers, such as anti-satellite (ASAT), cyber, and electronic attacks directed against selected critical nodes within an opponent's command and control structure or air defense system—can enable conventional air operations to be carried out at reduced risk and cost.

Barring the fielding of effective countermeasures, Chinese conventional theater missiles—specifically short- and medium-range ballistic and extended-range land attack cruise missiles (LACMs)—may over time give the PLA a decisive advantage in future conflicts around China's periphery. Ballistic and ground-launched cruise missiles are an attractive means of delivering lethal payloads due to the inherent difficulties in defending against them. Ballistic missiles themselves have a strong coercive effect, as potential adversaries around the PRC periphery have limited defensive countermeasures.

The PRC also is focused on developing the means to deny or complicate the ability of the United States to intervene in a regional crisis. Authoritative Chinese writings indicate research into, and development of, increasingly accurate and longer-range conventional strategic strike systems that could be launched from Chinese territory against land-, sea-, and space-based targets throughout the Asia-Pacific region in a crisis situation.

Extended-range conventional precision strike assets could be used to suppress U.S. operations from forward bases in Japan, from U.S. aircraft battle groups operating in the Western Pacific, and perhaps, over the next 5 to 10 years, from U.S. bases on Guam. The development and deployment of an anti-ship ballistic missile (ASBM) is an example of an emerging capability. China's research and development community is expanding the nation's capacity for regional maritime surveillance in support of the PLA's missile-centric strategy. Most noteworthy is the development of constellations of intelligence-gathering satellites for the tracking and targeting of ships and mobile air defense systems.

**The Centerpiece of China's Coercive Aerospace Power: Conventional Ballistic and Land Attack Cruise Missiles.**

The PRC's growing arsenal of increasingly accurate and lethal conventional ballistic and land-attack cruise missiles has rapidly emerged as a cornerstone of PLA warfighting capability. Since the official establishment of the PLA's first short-range ballistic missile (SRBM) brigade in 1993, ballistic missiles have been a primary instrument of psychological and political

intimidation, but also potentially devastating tools of military utility. Over the last 2 decades, the Second Artillery's conventional ballistic and land attack cruise missile force—a form of aerospace power that will be critical for achievement of information dominance and air superiority in the opening phase of a conflict—has expanded significantly.

*Short-Range Ballistic Missile Infrastructure*. The Second Artillery's SRBM infrastructure is a central component of the PRC's coercive political and military strategy. In 2000, China's SRBM force was limited to one "regimental-sized unit" in southeastern China. Today, the force has grown to at least seven SRBM brigades. Among these, five are subordinate to the Second Artillery's 52 Base, and the remaining two units report directly to military regions.[4] The number of missiles in the Second Artillery is widely cited as exceeding 1,300 (inclusive of tactical missiles assigned to ground forces).[5] According to reports, the quantity, range, precision, and lethality of China's SRBMS are increasing over time.[6] One example can be seen in the recently deployed DF-16, a new SRBM variant with a range of up to 1,000 kilometers (km) that is reportedly designed for greater penetration of Taiwan's missile defense networks.[7]

*Medium-Range Ballistic Missiles*. Having established a solid foundation in conventional SRBMs, the PLA has begun to extend and diversify the warfighting capacity of the Second Artillery's ballistic missile force. The centerpiece of the Second Artillery's regional mission is the two-stage, solid-fueled DF-21 (CSS-5) medium-range ballistic missile (MRBM). Currently, the terminally guided DF-21C can deliver a 2,000 kiloton (KT) warhead to a range of at least 1,750 km, with a circular error probable (CEP) of less than

50 meters. The system could be used for conventional strikes against targets throughout Japan from east and northeast China; New Delhi, if based in Xinjiang; and western India, if based in Yunnan.[8]

*Ground Launched Cruise Missiles (GLCMs)*. To augment its ballistic missile arsenal, the Second Artillery is steadily expanding its ground-launched LACM infrastructure. GLCMs are powerful instruments of military and political utility, because of the inherent difficulty in defending against them. Within only a few years of initial deployments, the PRC today has the world's largest inventory of extended-range GLCMs. Able to penetrate defenses and strike critical targets on land, out to a range of at least 2,000 km, the Second Artillery's DH-10 GLCMs appear to have enjoyed a relatively high acquisition priority.[9]

**Anti-Satellite Weapons.**

China successfully tested a direct-assent, kinetic-kill ASAT missile on January 11, 2007. The test was followed with revelations that China had conducted ASAT missile tests on three previous occasions and had reportedly tested a high-powered laser ASAT weapon system on U.S. satellites during the previous year.[10] On January 11, 2010, 3 years to the date of its successful direct-ascent ASAT test, China tested a mid-course interceptor, which represented an inherent leap forward in its ASAT capability.[11] China is also reportedly developing other ASAT weapons that could also be potentially difficult to detect and defend against, such as co-orbital micro satellite weapons (also known as parasite satellites); high-powered microwave and particle beam weapons; high-performance radar and electronic jammers; and cyber attack capabilities that

could be directed against satellite tracking and control stations. In short, China's ASAT weapons programs are of a broad nature and are expanding in scope.[12]

*Anti-Ship Ballistic Missiles and Beyond*. China's ASBM program was officially confirmed to be in the testing phase in March 2010,[13] and ASBMs were reported to have been deployed in Southeastern China in December 2010.[14] Barring deployment of effective defenses, an initial ASBM would give the PLA a precision strike capability against aircraft carriers and other U.S. and allied ships operating within 1,500-2,000 km from China's coast. Over the longer term, Chinese technical writings indicate the preliminary conceptual development of a conventional global precision strike capability. The accuracy and range of the PLA's conventional ballistic missile force is also expected to improve significantly over the next 10-15 years, as missiles incorporate more advanced inertial and satellite-aided navigation systems, sophisticated terminal guidance systems, and increasingly powerful solid rocket motors.[15]

**Sensor Architecture for Regional Surveillance.**

The PLA's ability to conduct strategic and operational strike missions is likely to be restricted by the range of its persistent surveillance. To expand its battlespace awareness, the PLA is investing in at least three capabilities that could enable it to monitor activities in the Western Pacific, South China Sea, and Indian Ocean.

**Space-Based Surveillance.**

Increasingly sophisticated space-based systems are expanding the PLA's battlespace awareness and supporting potential strike operations further from Chinese shores.[16] Space assets enable the monitoring of naval activities in surrounding waters and the tracking of air force deployments into the region. Space-based reconnaissance systems also provide imagery necessary for mission planning functions, such as navigation and terminal guidance for ASBMs and cruise missiles. Satellite communications also offer a survivable means of transmission, which will become particularly important as the PLA operates further from its territory.

China's regional strike capability appears to rely heavily on high-resolution, dual-use space-based synthetic aperture radar (SAR), electro-optical (EO), and electronic intelligence (ELINT) satellites for surveillance and targeting.[17] In a crisis situation, China may have the option of augmenting existing space-based assets with microsatellites launched on solid-fueled launch vehicles. Existing and future data-relay satellites and other beyond line-of-sight communications systems could transmit targeting data to and from the theater and/or the Second Artillery's operational-level command center.[18]

*Persistent Near-space Surveillance***.** Chinese analysts view the realm between the atmosphere and space—"near-space"—as an area of future strategic competition.[19] Over the decade, near-space flight vehicles[20] may emerge as a dominant platform for a persistent region-wide surveillance capability during crisis situations. "Near-space" is generally characterized as the region between 20 and 100 km (65,000 to 328,000 feet [ft]) above the earth's surface.[21]

While technical challenges exist, the Second Artillery and China's defense research and development (R&D) community have become increasingly interested in near-space flight vehicles for reconnaissance, communications relay, electronic countermeasures, and precision strike operations.[22] In order to overcome technical challenges, China's aerospace industry—specifically the China Aerospace Science and Technology Corporation (CASC) and the China Aerospace Science and Industry Corporation (CASIC)—have established new research institutes dedicated to the design, development, and manufacturing of near-space-flight vehicles. Establishment of a dedicated research institute for leveraging the unique characteristics of near space signifies the importance that China places on this domain.[23]

*Over-the-Horizon Radar*. In addition to space-based and near-space sensors, over-the-horizon backscatter (OTH-B) radar systems would be a central element of an extended-range air and maritime surveillance architecture.[24] Managed by the PLA Air Force (PLAAF), an over-the-horizon (OTH) radar system could define the range of China's maritime precision strike capability. Skywave OTH radar systems emit a pulse in the lower part of the frequency spectrum (3-30 megaherz [MHz]) that bounces off the ionosphere to illuminate a target—either air or surface—from the top down. As a result, detection ranges for wide-area surveillance can extend out to 1,000 to 4,000 km.

**Regional Impact.**

The PRC's expanding capacity for conducting an aerospace campaign in the Asia-Pacific region would likely be a variable of its territorial disputes with states

around its periphery. As its military strength increases relative to those of its neighbors, the PRC could feasibly become more assertive in its claims. Along this trajectory, miscalculations, accidents, disputes over sovereignty, or other unforeseen events have the potential to escalate into armed conflict between the PRC and its neighbors. Each defense establishment in the region appears to be approaching the challenges differently, although most are attempting to balance interests in maintaining healthy relations with Beijing while at the same time hedging in the event of a future conflict.

*United States*. There are indications that the United States views China's aerospace power capability developments as its most challenging long-term conventional military threat, and is seeking ways in which to ensure an adequate defense for its forward-deployed troops in the West Pacific and its allies in the region. According to the 2010 *Ballistic Missile Defense Review* (BMDR), "One regional trend that particularly concerns the Unites States is the growing imbalance of power across the Taiwan Strait in China's favor. China is developing advanced ballistic missile capabilities that can threaten its neighbors and ASBM capabilities that can attempt to target naval forces in the region." Chinese ballistic missiles "will be capable of reaching not just important Taiwan military and civilian facilities but also U.S. and allied military installations in the region."[25] As such, the United States is seeking to strengthen its missile defense partnerships in the region, most notably with Japan, while also developing and deploying a range of land-, sea-, and air-based missile defense systems supported by space-based early warning and missile tracking sensors.

At the high end of the spectrum, the United States is deploying a space-based ballistic missile defense (BMD) system in the form of the Space-based Infrared System (SBIRS) and its integrated ground components. When complete, SBIRS will consist of four SBIRS-high satellites in geosynchronous orbit (GEO) high over the equator and two in highly elliptical orbits (HEO) that provide for coverage of higher latitudes.[26] These satellites provide a revolutionary early warning system that is sensitive enough to detect and target mobile missile launchers from their engines' heat signatures and will have a crucial role to play in missile defense.[27] SBIRS satellites are currently augmenting the Defense Support Program (DSP) satellites in GEO, which they are designed to eventually replace.[28] This combination of SBIRS and DSP satellites has been utilized in the creation of the theater event system (TES) in order to increase defense against growing theater ballistic missile (TBM) threats, of which China represents the largest in terms of size and sophistication.

In the Asia-Pacific region, space-based BMD systems are augmented by long-range ground-based warning sensors such as the Perimeter Acquisition Vehicle Entry Phased Array Weapons System (PAVE PAWS) sensor site at Beale Air Force Base, California,[29] and the mobile Sea-Based X-band radar in Alaska.[30] The U.S. Navy is also deploying *Aegis* BMD cruisers and destroyers with advanced surveillance sensors and missile interceptors.[31] On Guam, the U.S. Army Air and Missile Defense Command is in the process of deploying a missile defense task force for the Pacific region. This would include a Terminal High Altitude Area Defense (THAAD) battery and a Patriot Advanced Capability-3 (PAC-3) battery for ballistic missile defense, along with a surface-launched advanced

medium-range air-to-air missile (SLAMRAAM) battery for cruise missile defense.[32]

U.S. Forces Japan (USFJ) has been increasing its deployment of BMD units to Japan. USFJ deployed a mobile X-band radar system to Shariki Air Base in Aomori Prefecture in June 2006, and, in September 2006, deployed a PAC-3 battalion to Kadena Air Base on Okinawa.[33] In August 2006, the United States began forward deploying BMD capable, *Aegis* destroyers armed with Standard Missile-3 (SM-3) interceptors in and around Japan.[34] In October 2007, a Joint Tactical Ground Station (JTAGS) was established at Misawa AB in Aomori Prefecture.[35]

The U.S. missile defense buildup in the Asia-Pacific region is being driven primarily by the potential threat that China's ballistic and cruise missiles present to U.S. forces and allies in the region, most acutely illustrated by China's development of an ASBM system. China's ASBM program could jeopardize U.S. ability to conduct air operations in the West Pacific in the near- to mid-future, potentially challenging U.S. defense commitments in the region.[36] China's long-range anti-ship cruise missile (ASCM) and LACM programs could also have similar effects.[37] For this reason, the United States is developing a number of potential solutions to this unprecedented challenge that go beyond the current BMD architecture. Potential missile defense capabilities under development include air-launched hit-to-kill interceptors, directed energy systems, and land-based SM-3 interceptors.[38]

*Taiwan*. Taiwan faces the most difficult ballistic and cruise missile threat in the world. Despite a recent warming in cross-strait relations, Mainland China continues to increase its missile buildup vis-à-vis Taipei, both quantitatively and qualitatively.[39] Underscoring

this point, the head of Taiwan's National Security Bureau has stated that a significant majority of China's military exercises continue to be directed against Taiwan.[40] A senior Taiwan intelligence official has also stated that China plans to increase the number of missiles deployed against Taiwan to at least 1,800.[41] As a result, Taiwan continues to build upon its existing missile-defense infrastructure comprised of both U.S. missile defense systems obtained through Foreign Military Sales (FMS) channels and indigenous missile-defense systems developed with U.S. assistance.

Taiwan currently fields three PAC-2 air defense batteries with 200 missiles deployed around Taipei and has developed a number of road-mobile Tien Kung-II (TK-II) air-defense missiles with a 300-km engagement range. These systems augment Taiwan's static, silo-based Tien Kung-I (TK-I) air-defense missiles, and 13 batteries of aging Improved-Homing All-the-WAY Killer (I-HAWK) missiles. Taiwan intends to begin replacing some I-HAWKs with TK-II systems.[42] To improve its missile-defense posture, Taiwan is upgrading its PAC-2 batteries to PAC-3 configuration, and purchasing new PAC-3 batteries. This could provide Taiwan with around 400 PAC-3 missiles.[43] These will augment Taiwan's approximately 500 TK-I and TK-II missiles, as well as its next-generation TK-III system, which is under development and scheduled to be deployed in 2012.[44]

Taiwan is also investing in early warning and upgrading its missile-defense sensors and command and control systems to undercut the coercive utility of China's theater and cruise missiles. Taiwan's initial step has been procuring a long-range early warning radar able to detect both air-breathing[45] and ballistic targets at extended ranges through U.S. FMS channels. Build-

ing on existing PAVEPAWS technology, the radar system is to be situated on a peak in the Central Mountain range and will be able to provide early warning of ballistic missile launches at distances of as far as 3,000 km. The radar is also designed to monitor air targets over the Taiwan Strait and beyond at ranges of less than 200 km, depending on the target's altitude and radar cross-section.[46] The radar will augment existing and new radar systems deployed throughout Taiwan and its off-shore islands.[47] These systems will provide early warning against threats to the new Anyu-4 air defense system, comprised of regional operations control centers (ROCCs). In the event of a threat, the ROCCs will select the appropriate interceptor from a menu of air defense systems.[48]

In addition, Taiwan has long maintained an ability to carry out deep strike missions against military targets in southeast China. To counter PRC coercion, Taiwan stresses maintenance of the necessary military strength, the ability to survive a first-strike attack, and an ability to carry out a second-strike retaliation.[49] In the past, the Taiwan air force has earmarked a limited number of its fighters for strike missions, should a decision be made to do so. However, with PLA air defenses growing increasingly sophisticated, Taiwan has been developing other means to maintain a limited strike option. PRC sources indicate that Taipei has been developing its own answer to the Second Artillery's DH-10 GLCM—a land attack variant of the HF-2 anti-ship cruise missile, the HF-2E.[50]

For space-based surveillance, Taiwan has co-developed and operated two dual-use imagery satellites, the now-retired Formosat-1 and the Formosat-2. Taiwan also purchases commercial satellite imagery from a number of sources to augment its space-based recon-

naissance program. However, Taiwan currently faces a gap in domestic satellite imagery coverage because its next-generation imagery satellite, Formosat-5, has suffered repeated delays and will not be launched until the end of 2013 or the first part of 2014.[51] Revelations that Mainland China exploited a commercial Singaporean communications satellite that the Taiwanese military was using during exercises have prompted Taiwan to consider building its own communications satellite to guarantee secure communications. However, for budgetary and technical reasons, it appears unlikely that such a satellite would be developed in the near- to mid-future.[52] Taiwan is currently seeking to establish the technical foundation to conduct its own satellite launches. As part of this program, Taiwan began launching sounding rockets in 1998, with seven launches having been conducted as of 2010.[53]

*Japan*. Unlike those of Taiwan, Japan's security concerns are primarily directed at North Korea. The chances for armed conflict between the PRC and Japan are relatively slim, despite historical animosity and budding nationalist sentiments. However, unresolved territorial disputes and a more assertive China could lead to a crisis in the future. According to Japan's White Paper on defense, "In the event of an armed attack on Japan, such attacks are likely to begin with surprise air attacks using aircraft and missiles."[54] North Korea is viewed as representing an increasingly dangerous ballistic missile threat to Japan, and China's long-range ballistic and cruise missile developments are viewed with growing concern. As such, Japan has been taking a number of steps to improve its air defense posture, which includes upgrading its air defense radars, deploying a space-based intelligence network, integrating itself in the U.S. BMD shield, and centralizing its air defense command headquarters.

Japan's Air Self Defense Force (JASDF) maintains 28 ground-based, air defense radar sites.[55] Japan in recent years has begun the deployment of four FPS-5 next-generation missile defense radars, and seven improved FPS-3 radars. These radar sites and their associated air defense units are organized into six air defense missile groups, which are grouped geographically with their associated air wings and central aircraft control and warning wings into four air defense forces—each of which will maintain one advanced FPS-5 missile defense radar site.[56] These four Air Defense Forces are unified at Japan's Air Defense Command Headquarters, which will complete its move from Fuchu Air Station to Yokota Air Base in 2011.[57]

Japan has been actively integrating itself into the U.S. BMD shield, co-developing and deploying ballistic and cruise missile defense systems. Japan has begun equipping its *Aegis* destroyers with SM-3s for upper-tier ballistic missile interception. Japan is also deploying PAC-3s to various strategic locations around the country.[58] Looking ahead, Japan's Ministry of Defense (MOD) intends to link four BMD-capable *Aegis* destroyers[59] and 16 PAC-3 Fire Units (FUs) to its new FPS-5 radar sites and upgraded FPS-3 radar sites via a command, control, and communications (C3) network known as the Japan Aerospace Defense Ground Environment (JADGE).[60] Eventually, Japan plans to have eight *Kongo*-class *Aegis* destroyers equipped with SM-3 missiles.[61]

In a move strengthening the U.S.-Japanese missile defense partnership, all elements of Japan's air defense network will be unified at Japan's Air Defense Command (ADC) Headquarters at Yokota Air Base by the end of 2011, when JASDF's ADC completes its move from Fuchu Air Station. About 800 Japanese

personnel will transfer to the new ADC headquarters building, which will be the supreme command authority for Japanese air and ballistic missile defense.[62] The JADGE C3 network and other advanced communications links will be used by the command when the relocation is complete.[63]

This move strengthens early warning and bilateral command and control, and the relocation will help facilitate joint cooperation between U.S. and Japanese forces, as the new bilateral air operations center will link up with the 613th Air and Space Operations Center (AOC) at Hickham Air Force Base, Hawaii, which synchronizes all U.S. air, space and cyberspace missions in the theater.[64] The JASDF ADC complex will also be physically linked by a tunnel to a basement control hub under the headquarters of the USFJ. The Bilateral Joint Operations Coordination Command Center (BJOCC) under the USFJ headquarters building can hold up to 150 people in wartime, and every position on the main floor has a Japanese counterpart working alongside U.S. personnel to foster bilateral cooperation and augment bilateral operability.[65]

Japan began a space-based satellite reconnaissance program in response to North Korea's test firing of a short-ranged ballistic missile over Japanese territory in 1998. Currently, Japan is believed to operate three electro-optical (EO) reconnaissance satellites, and plans to launch two next-generation synthetic aperture radar imagery (SAR) satellites in 2011 and 2012, respectively, as well as two next-generation EO satellites in 2011 and 2014, respectively.[66] Japan is also seeking to develop a number of other space-based command, control, communications, computers, and intelligence surveillance and reconnaissance (C4ISR) capabilities—such as a dedicated military communi-

cations satellite, an infrared early warning satellite, a signals intelligence (SIGINT)-collection satellite, and an independent navigation and positioning satellite network.[67]

*India*. While India and China today maintain cordial official relations, tensions simmer under the surface. The PRC's territorial dispute with India is over two tracts of land in eastern and northern India-Aksai Chin, which is currently administered by the PRC under the Xinjiang Uyghur Autonomous Region (UAR); and Arunachal Pradesh, which is currently administered by India. While competing claims are unlikely to erupt in a future conflict, the two nations did fight a war over these claims in 1962, and that experience has severely conditioned Indian threat perceptions of China. For all the PRC's attempts to resolve border disputes with its neighbors, the one with India is still outstanding. India is enhancing its aerospace power with significant investments into air force, theater missile, and missile defense modernization.

The Indian Air Force (IAF) is developing a layered, hardened air defense C3 network called the integrated air command, control, communications system (IACCCS), which draws from reconnaissance satellites, early warning radars, unmanned aerial vehicles (UAVs), and Airborne Warning and Control Systems (AWACS). By 2016, the IAF plans to acquire 67 low-level air transportable radars; 18 long-range active phased array surveillance radars; and 12 aerostat-mounted active phased array radars. These radars will be deployed with the IAF's existing 32 mobile control and reporting centers; 12 air defense control centers; and approximately 40 base air defense zones on India's western and northeastern borders. These will progressively replace current radars, which were

acquired during the 1970s and 1980s. The IAF also acquired two long-range tracking radars in 2001. Three AWACS, modified Ilyushin IL-76, were delivered in May 2009, with two more expected sometime in 2010.[68] When complete, this radar surveillance network will be linked to joint air traffic control and reporting centers that will be operational at 29 IAF air bases.[69] The IAF is currently looking to upgrade 39 of its 80 strategic air fields along India's borders with China and Pakistan to improve network centricity and mobility.[70]

India's IACCCS will support the nation's air and missile defense architecture. The IAF plans to acquire 2,000 long-range (120 km variant) Barak-2 surface-to-air missiles (SAMs), beginning in 2011. The Indian Army plans to acquire up to 1,500 medium-range (70 km variant) Barak-2 SAMs. Each launcher will have 12 missiles.[71] IAF also expects 18 Spyder SAM systems to be delivered by the end of 2012.[72]

Starting in 2006, India has conducted a series of high-altitude interceptor tests and intends to build a multi-tiered BMD system around its mobile, indigenously built advanced air defense (AAD) or "Prithvi" interceptor missile system.[73] Four of India's initial five BMD interceptor tests were successful, with one test, on March 14, 2010, having been aborted due to technical problems.[74] India plans to conduct a total of 10 interceptor tests—five endo-atmospheric (below 30 km) and five exo-atmospheric (up to 80 km)—with the AAD interceptor missile system beginning initial deployment by 2013.[75] A next-generation version of the system is under development for the interception of intercontinental ballistic missiles (ICBMs). India is also developing a laser-based BMD system for the interception of ballistic missiles, as well as lower-level air-breathing targets, and is planning on deploying

space-based radars to support the nation's BMD architecture.[76]

India has a modest but growing military space program, and some influential Indian thinkers have advocated the development of an Indian ASAT weapons program in the wake of China's 2007 ASAT test. The director of India's Defense Research and Development Organization (DRDO), General V. K. Saraswat, has stated: "India is putting together building blocks of technology that could be used to neutralize enemy satellites."[77] Air Chief Marshal P. V. Naik, speaking in a clear reference to China, stated, "Our satellites are vulnerable to ASAT weapon systems because our neighborhood possesses one."[78] However, India is not expected to test a direct-ascent ASAT system in the near future, and instead plans to further develop its BMD interceptor system, based on Agni-III technology, so that it could leapfrog technology in order to field an ASAT weapon rapidly if needed.[79] India has tested exo-atmospheric ballistic missile interceptors, which could be evolved into kinetic-kill ASAT weapons, and India is also investing in laser weapons that could be applied to an ASAT mission as well.[80]

India operates one dedicated military EO imaging satellite, the CARTOSAT 2A, and three other dual-purpose EO satellites.[81] India also launched its first SAR imaging platform, RISAT-2, on April 20, 2009, to monitor its borders with China, Bangladesh, and Pakistan.[82] The IAF has long been trying to establish an Aerospace Command at Thiruvananthapuram, without success to date.[83]

## PRC AEROSPACE MODERNIZATION AND REGIONAL STABILITY

The Asia-Pacific region is in the midst of fundamental change, with significant implications for long-term strategic stability. The gradual expansion of China's long-range precision strike capabilities, especially its increasingly sophisticated conventional ballistic and cruise missile infrastructure, is altering the regional strategic landscape. Due to their speed, precision, and difficulties in fielding viable defenses, these systems—if deployed in sufficient numbers—have the potential to provide the PRC with a decisive military edge in the event of conflict over territorial or sovereignty claims. Reliance on ballistic missiles and extended-range cruise missiles also incentivizes other militaries to develop similar capabilities. Beyond force modernization programs in Taiwan, Japan, and Taiwan, the PRC's expansion of its aerospace capabilities is at least a partial driver for a shift in U.S. defense policies.[84]

The PLA's expanding capacity to deny the United States access to bases and the ability to project power into the region figured prominently in the 2010 QDR.[85] Augmenting the QDR are a number of analyses outlining ways to manage the dynamic shifts underway in the region. With concerns mounting over the anti-access challenge to utilizing bases in the Western Pacific and area denial capabilities that could restrict U.S. naval operations, pressure to reduce the U.S. footprint in Japan and elsewhere could mount. Noting the emergence of an arms race, Robert Kaplan of the Center for a New American Security foresees a shift in U.S. basin— moving away from allied territories to Guam and the South Pacific Islands—and a greater U.S. naval presence in the Indian Ocean.[86]

To counter the PLA's growing capacity to carry out an extended-range aerospace campaign, one detailed study suggests investing in the ability to withstand initial strikes and limit damage to U.S. and allied forces and bases; neutralize PLA command and control networks; suppress the PLA's theater sensor architecture and theater strike systems; and sustain initiative in the air, on the sea, in space, and within the cyber domain.[87]

In short, the PRC's expanding aerospace capabilities are influencing the development of similar capabilities in other defense establishments, including the United States. However, they may also have another effect. PLA successes in fielding advanced long-range precision strike systems dilute international efforts to stem proliferation of the means of delivery for weapons of mass destruction. This may encourage other countries to follow suit, especially as China's global leadership and standing increases. In particular, long-range cruise missiles have emerged as another proliferation concern. In light of Russia's threats for withdrawal, partially due to the global proliferation of short-and medium-range ballistic and ground-launched cruise missiles, the PLA's selection of these systems to defend its territorial claims could also undermine one of the most successful and enduring arms control agreements to date—the Intermediate Nuclear Force (INF) Treaty.[88]

## CONCLUSION

The Asia-Pacific region is witnessing increasing competition over the air and space domains, as evidenced by regional missile defense and space capability acquisitions. China's development, testing, and

deployment of advanced missile and emerging capabilities, such as ASAT, cyber, and advanced electronic warfare weapons, are the primary driver behind the competition. This competition could intensify over time, should the regional actors' sense of vulnerability continue to increase. The countries around China's periphery have a growing appreciation for key strategic importance of the air and space domains. This could lead to a proliferation of long-range precision strike and ASAT capabilities, and could have a highly detrimental effect on regional stability.

China's successes in designing, developing, and producing the world's largest and most sophisticated arsenal of medium- and intermediate-range ballistic missiles create a demand for similar capabilities around the world. Thus, the PLA's conventional missile-centric strategy potentially weakens international efforts to curb the proliferation of the means of delivery for weapons of mass destruction.

Looking ahead, it will be of critical importance to seek various means by which to mitigate the potential arms race brewing in the Asia-Pacific. A Chinese willingness to increase engagement and transparency with regional stakeholders in the Asia-Pacific as it continues to modernize its military air and space capabilities will be needed for putting the region on a course toward a future defined by greater strategic stability and prosperity.

## ENDNOTES - CHAPTER 5

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