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SUBMITTED IN PARTIAL FULFILLMENT  
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## *Executive Summary*

**Title:** The MAGTF's Air Power and its Necessary Assets for Antiair Warfare

**Author:** Major Michael J. Pruden, United States Marine Corps

**Thesis:** If the Marine Corps does not continue to increase its Antiair Warfare capability, it may not be able to conduct all MAGTF requirements and missions without solely relying on joint or coalition antiair capabilities.

**Discussion:** The U.S. Marine Corps Antiair Warfare platforms and capabilities have evolved throughout the Cold War but there are skeptics who believe this mission solely resides with the U.S. Air Force. Procurement of high dollar items, such as the F-35 Joint Strike Fighter (JSF), has raised concerns in the Marine Corps that allocation of funds could be better suited in other areas and not on increasing capabilities in platforms for a type of warfare rarely conducted. Antiair Warfare has been at the front of every war since World War II and its capabilities it brings to the MAGTF commander enables freedom of movement for his forces without interference from adversary air forces. As potential adversaries, such as the Chinese People's Liberation Army (PLA), increase their air power technologies and Anti-Access Area-Denial (A2D2) capabilities, the Marine Corps will need to increase its stealth capabilities within its air power and be able to detect adversary threats by using a well-integrated air defense system (IADS).

**Conclusion:** The Marine Corps, who has prided itself on being frugal, made the difficult decision to allocate funding for program such as the JSF. It is easy for the naysayers to disagree with the required funding when the capabilities the JSF provides to the MAGTF commander may not be clearly defined or even understood especially to those who do not understand or have not witnessed what it takes to maintain air superiority in conflict involving antiair warfare. It is the antiair warfare and 5<sup>th</sup> generation capabilities of the JSF coupled with the MACCS support that will deter a viable force and think twice about engaging in an air campaign with the U.S. Marine Corps. The MAGTF must be able to employ all functions of Marine Aviation to include the control of aircraft and missiles even at the MEU level. If not, the Marine Corps will be limited in its ability to access A2/AD areas and will be more reliant on joint forces that may or may not be able to provide the support needed in a timely manner that is associated with Marine Corps contingency response

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## *Preface*

My passion for writing this paper resides in support of the Marines within the Marine Air Control Group who tirelessly provide a capability that is rarely understood or seen by the ground forces. It is my honor and privilege to serve you in any capacity I am capable of doing. My inspiration as a Marine solely resides in my family's day-to-day support of my career and the United States Marine Corps. Without them, I could have not made it through the last 20 years of service and it is because of them, I will continue to push forward!

## **The MAGTF's Air Power and its Necessary Assets for Antiair Warfare**

### **Introduction**

It is difficult for a government like the United States to continue funding and acquisition projects for high cost equipment after a major conflict especially when a capability is more of a deterrence than an immediate requirement. Since the end of the Cold War, the United States Marine Corps has reduced its antiair capabilities. Even today, Marines of different backgrounds have mixed signals among the Marines of whether or not the Marine Corps needs to acquire and fund a 5<sup>th</sup> generation aircraft multi-functional aircraft such as the Joint Strike Fighter (JSF) with capability outside Deep and Close Air Support (DAS/CAS). However, without an air platform capable of air interception of any adversary aircraft, the Marine Corps is challenged with maintaining antiair warfare capabilities against threats such as the People's Republic of China (PRC). The question then is whether or not the Marine Corps should continue funding present and future antiair warfare programs to include the F-35 as an air interdiction capable platform, or whether the Marine Corps need to reallocate funding even though our adversaries are increasing their antiair capability? With a threat such as the PRC and its' increasing Anti-Access and Area Denial (A2/AD) platforms, the Marine Air Ground Task Force (MAGTF) ship-to-shore capabilities and its ability to deter or diffuse conflicts may be losing its effectiveness. If the Marine Corps does not continue to increase its antiair warfare capability, it may not be able conduct all MAGTF requirements and missions without solely relying on joint or coalition antiair capabilities. In order for the U.S. Marine Corps to continue its air power projection capabilities, it must continue to improve its anti-air capability to be effective against a growing enemy such as the Peoples Liberation Army (PLA) of China.

## **The Department of Defense's view on Air Power**

Air power has been the capstone to every major conflict since Pearl Harbor December 7, 1941, a day when Japan showed the United States the abilities of Japanese Air Power from the Sea. Aircraft and its growing capabilities have provided exponential advantages to every military that has deployed them in a way to take advantage of every situation and combat theater. “At the strategic level, airpower, and more broadly aerospace power, have the potential to influence the cost-benefit calculus of an opposing political leadership. At the operational level, air superiority determines success in a campaign for sea control, an amphibious invasion, or physical occupation of territory.”<sup>1</sup> However, what is air superiority? Is it the mere fact of having more aircraft, the weapon systems employed by aircraft, or is it the ability and training of the pilots who master the skies? As defined in *Joint Publications 3-01*, air superiority is “that degree of dominance in the air battle of one force over another that permits the conduct of operations by the former and its related land, maritime, and air forces at a given time and place without prohibitive interference by the opposing force’s air and missile threats.”<sup>2</sup> The key to this definition is that dominance that permits the conduct of operations, not how many aircraft one side has or the type of aircraft an air power may have.<sup>3</sup> Freedom of operations or movement is an integral part of the Marine Corps’ ability to combine air and ground capabilities organically.

U.S. Air Force Col John A. Warden III, a leader and major figure regarding airpower doctrine, stated, “No country has won a war in the face of enemy air superiority, no major offensive has succeeded against an opponent who controlled the air, and no defense has sustained itself against an enemy who had air superiority.”<sup>4</sup> This is vital as air superiority and air power are the combination of the training, the technology and the integration of forces that provide air superiority that allows the ground campaign to conduct its operations unimpeded by

threats from above. Air superiority also requires suppressing or neutralizing the entire integrated air defense (IADs) to include fighters, radars, missiles, and support equipment in order to conduct missions in every facet.<sup>5</sup> Each government is fully aware of this and they are balancing their defense funding and posturing their forces to maintain air superiority.<sup>6</sup>

The United States military has dominated the air in almost every conflict in the last 40 years. No nation has matched the United States' ability to conduct air strikes, reconnaissance, and air mobilization but even the U.S. government understands that it must continue their research and development of new air platforms and systems in order to support its national interests such as those that lie in the Asia Pacific region. This region has multiple sea-lanes of communication (SLOCs) to the world's trading market and vast resources that will provide the United States with increased economy for years to come. This region also has its challenges and as stated the Secretary of Defense (SECDEF) in the Defense Strategy Guidance (DSG) in 2012, "Accordingly, while the U.S. military will continue to contribute to security globally, we will of necessity rebalance toward the Asia-Pacific region."<sup>7</sup> This "rebalancing" will require the U.S. military to continue its dominance against rival states such as the People's Republic of China (PRC).<sup>8</sup>

As stated in the 2012 U.S. Defense Strategic Guidance, "states such as China and Iran will continue to pursue asymmetric means to counter our power projection capabilities, while the proliferation of sophisticated weapons and technology will extend to non-state actors as well."<sup>9</sup> The U.S. military, to include the Marine Corps, will invest in multi-million dollar projects to ensure its ability to operate effectively with minimum resistance in anti-access and area denial (A2/AD) environments.<sup>10</sup> In order to counter a regional giant as the PRC, the United States will be required to continue investing in order to maintain dominance and area access in Asia Pacific

and other areas.<sup>11</sup> However, to maintain investments to counter the future capabilities of military forces like the PRC People's Liberation Army (PLA), the Marine Corps will need to support the funding of technological acquisition programs, which is easier said than done during fiscal restraints normally associated after a major conflict. In 2012, the Department of Defense announced a ten-year cut in defense spending close to the amount of \$487 billion in accordance with the Budget Control Act (BCA) of 2011.<sup>12</sup> These cutbacks will significantly affect research and development and will create hard decisions on which program the Marine Corps will continue to fund and those programs that will be either cut back or completely omitted. So why is it that the U.S. government continues funding large programs such as the Joint Strike Fighter (JSF) and how will this support the overall mission of the Marine Corps? Is the JSF the key to air power projection to the Marine Corps or is it a high priced deterrent?<sup>13</sup>

### **U.S. Marine Corps and the Push for the JSF**

As stated in the 2014 Quadrennial Defense Report, “We (the United States Department of Defense) will continue to invest in combat aircraft, including fighters and long-range strike, survivable persistent surveillance, resilient architectures, and undersea warfare to increase the Joint Force’s ability to counter A2/AD

challenges.”<sup>14</sup> Even with budget cuts, the U.S. Department of Defense (DOD) is continuing its JSF investments and all the capabilities it brings. The F-35 JSF (*Figure 1*)<sup>15</sup> is the largest acquisition

program currently in the DOD with a program cost



**Figure 1: (F-35 Joint Strike Fighter, VMFA-121 Website, March 2013)**

of approximately \$300 billion.<sup>16</sup> This program will produce 2,443 jets between the Air Force and Marine Corps and another 730 aircraft produced to U.S. international partners: United Kingdom, Australia, Italy, Netherlands, Canada, Denmark, Norway, and Japan.<sup>17</sup> Other nations such as Israel, Singapore and Turkey have invested funding into the JSF program and may potentially procure the JSF in next 10 years.<sup>18</sup> The JSF will be the embodiment of U.S. airpower and will provide combat air superiority for the next 50 years.<sup>19</sup> However, this program has a huge price tag and there are a number of skeptical personnel in the U.S. government, the DOD, and even some Marines do not understand why this aircraft is so expensive. So why purchase the JSF when the Marine Corps already has aircraft that has been supporting the Marine Corps mission for the last 30 years? Unfortunately, most aircraft has an expiration date.<sup>20</sup>

The Department of the Navy is currently facing a large shortfall of aircraft that will total close to 250 aircraft in the next five years.<sup>21</sup> “A shortfall that is large enough that if it were

realized could cause us to tie up aircraft carriers at the pier for lack of aircraft to send with them.”<sup>22</sup> The Marine Corps assault and fighter aircraft are reaching their service life expiration date and the Marine Corps needs to invest in a new platform. The AV-8B Harrier’s



**Figure 2: (AV-8B Harrier, NAVAIR Website, January 2015)**

(Figure 2)<sup>23</sup> life as the Marine Corps primary fixed wing

(F/W) Combat Air Strike (CAS) asset has been extended and revamped numerous times in order to support the Marine Corps mission on land and with Amphibious Readiness Groups (ARG) supporting the two Marine



**Figure 3: (F/A-18C Hornet, NAVAIR Website, July 2012)**

Expeditionary Units (MEU). The Marine Corps F/A-18 C/D Hornet (*Figure 3*)<sup>24</sup> has been the Marine Corps primary air interdiction and long-range air asset but this platform is aging faster than the Harrier. The current Marine aviation plan (AVPLAN) is to sunset (decommission) the AV-8B Harriers in 2025 and the F/A-18C/D Hornet in 2030.<sup>25</sup> This may seem like a long time between now and 2025 but it takes years to research and develop a new aircraft. The main reason why the Marine Corps is pushing for the quick development of the F-35 JSF is to mitigate any gaps in Marine aviation supportability for future missions and operations. The Marine Corps is purchasing two versions of the F-35: (1) The F-35B capable of Short Take Off and Vertical Landing (STOVL) capabilities like the AV-8B Harrier; and (2) The F-35C for Deep Air Strike missions and Air Interdiction.<sup>26</sup> “The Marine Corps will procure a total of (353) F-35B’s and F-35C’s.” The F-35B will be Initial Operation Capable (IOC) by the end of calendar year 2015.<sup>27</sup> IOC in this case is at least one squadron with (10) aircraft.<sup>28</sup> It is clear that the Marine Corps needs a replacement for its fighter attack and assault F/W platforms. However, does the JSF price tag match the capabilities needed by the Marine Corps and does the Marine Corps require the next generation aircraft?

The F/A-18 is a 4<sup>th</sup> generation fighter attack aircraft and the F-35 is a multi-role fighter

with 5<sup>th</sup> generation technology capable of

deploying and integrating into almost every modern system interface.<sup>29</sup> Like the United States Air Force (USAF) F-22 Raptor (*Figure 4*)<sup>30</sup>, the F-35 is the next step in 5<sup>th</sup> generation aircraft to provide a multi-role function to the



**Figure 4: (F-22 Raptor, USAF Website, March 2015)**

Marine Corps with enhanced technology that enables the computer to make quick decisions based on sensors and innovative software in order to provide the pilot with instantaneous data to make accurate decisions. The JSF computer integrations system will improve lethality, survivability, and supportability.<sup>31</sup> As stated before *the U.S. Senate Committee on Armed Services* in 2011:

The F-35's design incorporates leading edge stealth, propulsion, mission systems sensors, interoperability and supportability technology. It is these technologies and capabilities that will provide the warfighters with a long-range, day-one, strike fighter that is capable of executing the essential mission of Strategic and Tactical Suppression/Destruction of Enemy Air Defenses, Strategic Attack, Interdiction, Offensive and Defensive Counter Air, Tactical Intelligence, Surveillance and Reconnaissance and Close Air Support.<sup>32</sup>

The capabilities stated above will provide flexibility to the operational commander. This means a massive increase of support for troops on the ground in more ways most do not understand especially in the Anti-air Warfare arena.<sup>33</sup>

### **JSF and its Role in Anti-air Warfare**

Most Marines do not realize the requirements needed to maintain air superiority and the overall concept of Anti-air Warfare (AAW). (AAW) is "that action required to destroy or reduce to an acceptable level the enemy air and missile threat."<sup>34</sup> It integrates "all offensive and defensive actions against enemy aircraft, surface-to-air weapons, and theater missiles into a singular, indivisible set of operations."<sup>35</sup> Normally ground troops are not concerned with surface-to-air threats unless they are being air transported, but even then, it normally will never cross their minds. Even in on a commercial flight, the majority of passengers on air flights do not concern themselves with what is happening in the airspace. A small percentage of passengers who are terrified with flying but the probability of an accident is extremely low. Military personnel flying on non-commercial flights are more concerned with the upcoming

mission and potentially the imminent threat that may confront them. Passengers, whether on civilian or military flights, are unaware of how aircraft are controlled or what it takes to get them from point A to point B or how it will affect them while they are not flying. It is the unknown threats that can influence air support, mobility, and troops on the ground via enemy air threats to include enemy aircraft and surface-to-surface missiles. In this case, AAW serves two purposes: force protection of friendly assets by providing air superiority and air defense of missiles.<sup>36</sup> “Force protection is those actions taken to guard friendly forces from attack or disruption by enemy forces.”<sup>37</sup> The JSF is an integral part in force protection and air defense of missiles, especially in an anti-access/area denial scenario.

Potential adversaries, such as the PRC later discussed in this essay, are increasing their weapons range associated with A2/AD in order to create defense-in-depth with present and future adversaries.<sup>38</sup> The Marine Air Ground Task Force (MAGTF) will need to develop assets to counter enemy A2/AD strategy in order to allow access of its’ organic assets.<sup>39</sup> JSF is one of those assets due to its Low Observation/Low Radar Cross Section (LO/LRCS) capabilities. The stealth capabilities of the JSF will decrease, if not eliminate, radar early warning detection enabling the F-35 to penetrate enemy air defenses in order to allow access for the rest of the forces. This, coupled with Intelligence Surveillance Reconnaissance (ISR) capabilities, will provide an integrated air and ground picture of enemy assets in order to provide additional means of targeting to include cruise missiles, Naval Gun Surface Fires (NGSF), electronic warfare and other weapons. The JSF will also be able to engage targets at an increased Beyond Visual Range (BVR) that will create depth and survivability of the JSF. “The ability to operate inside of an A2/AD environment from multiple austere locations enables the joint force to have operational depth while simultaneously providing a strong deterrence to adversary aggression.”<sup>40</sup> Even

though the United States has not been in an air-to-air scenario since the Gulf War, the JSF's capabilities is a deterrent that makes the enemy think twice about using air assets as a projection of force, which in turn may increase enemy submission or expedite diplomatic agreements vice using force as a means to the end of a conflict. However, as stated before, the JSF is an integral part of AAW and it still requires an air command and control system to provide an integrated air picture and information flow/management. This is where the Marine Air Command and Control System (MACCS) provides the necessary assets that are vital to the MAGTF AAW capabilities.<sup>41</sup>

#### **MACCS: AAW of the MAGTF**

The MACCS provides several air command and control (AC2) capabilities from Air Traffic Control (ATC), immediate air support provided by the Direct Air Support Center (DASC), a Tactical Air Command Center (TACC) providing the Marine Air Wing Commanders an efficient command operation center and a means of integrated joint resources and agencies, a Tactical Air Operations Center (TAOC) to provide AC2 for AAW assets and an integrated air picture, as well as a Low Altitude Air Defense (LAAD) battalion for air base defense and air defense. The JSF is an expensive asset and must be managed and prioritized effectively. Providing 24-hour support is only sustainable for a limited time so direction and cuing is vital in organizing assets. This is where the TAOC's employs its capabilities.

The TAOC "distributes the air picture to the MAGTF and join commands while controlling Deep Air Support, Aerial Refueling, AAW operations and routing itinerant aircraft"<sup>42</sup> by using tactical data links to integrate the air picture from multiple radar and sensor assets to include USAF AWACS, USN E-3 Hawkeye, other ground AC2 radars such as the U.S. Army

Patriot medium-long range batteries.<sup>43</sup> There are three organic radars to the TAOC: the TPS-59 long-range radar, the new TPS-80 Ground/Air Task Oriented Radar (G/ATOR), and the TPS-63 radar, which is coming up to its sundown date in FY17. The TPS-59 Long Range Radar is currently the largest ground radar in the US military. This 47-foot radar is capable of detecting targets at a distance of up to 200 NMI. This radar is also capable of detecting ballistic missiles for early warning and cueing to anti-ballistic missile batteries such as Patriot.<sup>44</sup> The TPS-59 does have some shortfalls to include detection of LRCS vehicles such as UAVs and cruise missiles. The TPS-80 (G/ATOR) is a medium-ranged radar that provides increased detection capabilities to the MAGTF commander while also providing fire control quality data supporting the Integrated Fire Control (IFC) concept.<sup>45</sup> It is the newest asset to the MAGTF commander and a replacement radar for the aged TPS-63 radar and can detect LO/LRCS targets which previous and other current radars cannot.<sup>46</sup> This will aid in detecting UAV's as well as cruise missiles, a capability that the TPS-59 and TPS-63 cannot provide.<sup>47</sup> However, deployment of the TAOC and its radar assets can be difficult due to its massive footprint and this leads into limited AAW capabilities elements of the MAGTF.<sup>48</sup>

Currently the TAOC will normally only deploy in support of a Marine Expeditionary Brigade (MEB) size element or higher due to the large equipment footprint of the TAOC. The TAOC's large footprint is one of the reasons why the TAOC will not deploy with a MEU size element due to the limited cargo space in an Amphibious Readiness Group (ARG). This reduces the MAGTF commander's ability to detect enemy air assets and provide tactical positive control of friendly aircraft against enemy air assets. The Marine Corps is currently looking at reconfiguring assets on ships in order to incorporate a smaller detachment of the TAOC called the Early Warning and Control Center (EW/C) which will at least provide the AAW capabilities

of the TAOC without the routing transit aircraft capability due to limited gear and personnel. Again, it comes down to priority of equipment and space availability. Ultimately, the MEU will be required to use joint assets such as USAF AWACS, USN AEGIS cruiser or USN E-3 Hawkeye platforms to provide AAW cuing and AAW airspace management. However, these joint AC2 assets have little if not to no experience with cuing the MAGTF commanders another AAW asset: LAAD.

The only organic ground-to-air capability the Marine Corps has is Low Air Altitude Defense (LAAD) battalions (2 active duty battalions). LAAD currently uses Stinger missiles to defend High Value Assets (HVAs), but this normally requires cuing from the Tactical Air Operations Center (TAOC) unless LAAD teams visually identify (VID) enemy aircraft or given advanced notice by other elements identifying targets as hostile.<sup>49</sup> One of the shortfalls of LAAD is the defense against cruise missiles and LO/LRCS aircraft such as UAV's and stealth capable aircraft. To eliminate or significantly reduce this shortfall, the Marine Corps has funded a new weapon: Directed Energy. "Directed Energy (DE) provides game changing capabilities versus the low observable/low radar cross section (LO/LRCS) threat when integrated with TPS-80 G/ATOR"<sup>50</sup> which again is normally never deployed with a MEU sized element. "DE provides speed of light engagement (point of aim is point of impact), deep magazines, near-instantaneous effect on target, low shot cost, and precise lethal accuracy to negate the enemy's strategy to destroy our high value assets (HVAs) using rockets, artillery and mortars (RAM) and Unmanned Aircraft Systems (UASs)."<sup>51</sup> The Directed Energy (DE) weapon is currently in development and projected to be IOC in the next 3 years.<sup>52</sup> Until then, the MAGTF is susceptible to LO/LRCS threats since target acquisition by the stinger missile is difficult, especially without cuing.<sup>53</sup>

The MAGTF does have some AAW assets but it still requires joint capabilities such as Patriot to provide medium-high altitude engagement of Air Breathing Targets (ABTs) and ballistic missiles such as SCUDs. These limitations can inherently affect how the MAGTF employs in an A2/AD environment. The JSF's capabilities can fill some of these gaps but it cannot fulfill all requirements or employ all of its abilities unless the MAGTF commander increases the requirement for all AAW assets deployed with all elements of the MAGTF to include the MEU. The concept and support of these AAW assets seem to have justification of their existence in certain scenarios. The JSF will provide more than just AAW capabilities but is there really a threat in the world that justifies the funding and development of all these AAW assets? As the United States postures towards the Asia-Pacific region, is there a concern that the Peoples Republic of China (PRC) is really a threat to U.S. interests and does the PRC have the capabilities that would surpass or eliminate 4<sup>th</sup> generation aircraft?

### **The People's Republic of China vs. the United States**

As China increases its military capabilities and continues to claim maritime territory as part of the PRC, there are numerous strategic analysts that are implying that this is a start of a new Cold War and as the United States continues its pivot to the Pacific China is becoming defensive and seeks to dominate the Asia-Pacific area and push out Western influence.<sup>54</sup> The potential for a conflict between the United States and China increases each day as the Asia-Pacific territorial disputes have become more and more of an issue within the last 10 years. This may or may not be the case diplomatically or even on a large military scale, but it does not negate the responsibilities of the United States to increase its air superiority capabilities and abilities to be able to infiltrate A2/AD areas if need be.<sup>55</sup> The PRC has been building and

modernizing military forces substantially for the last 20 years with the support of double-digit percentage increases in their defense budget.<sup>56</sup> It is evident that the PRC is concerned with its territorial security and Western influence in Asia Pacific. This insecurity is the basis of Chinese paranoia on whether or not the PRC can maintain regional stability while simultaneously pursuing its own national interests.<sup>57</sup>

The United States is not the only stakeholder in Chinese diplomatic relations as Asian neighbors like Japan, Philippines, and South Korea, who have strong diplomatic relations with the United States, have concerns about how an increase of Chinese military may influence trade and agreements in the Asia-Pacific region.<sup>58</sup> In a 2010 Chinese white paper on national defense, the PRC stated concerns about regional stability in Asia-Pacific and that strategic competition will only intensify and a conflict between two states is likely.<sup>59</sup> The United States and some Asian countries interpreted this white paper as sign of a potential threat to their own security interests especially within the South China Sea.<sup>60</sup> Maritime territory disputes in the South China Sea not only affect freedom of movement of both military and civilian ships, but also has the potential to affect the sea lines of communication (SLOCs).<sup>61</sup>

### **China's Intent to Reclaim Maritime Territories**

The United States air and sea power projection goals is to use its increased and uncontested technology and firepower “with coordinated mobility, speed and precision at an operational-tactical level of warfare, or the level of battle, to achieve such decisive effects that the enemy is virtually disarmed before he can even mount effective operations.”<sup>62</sup> This assumes that this theory would deliver strategic-level military victory.<sup>63</sup> However, the ease of movement of U.S. naval military power is becoming more limited in Asia-Pacific region especially in the

South China Sea. In the last 10 years, China has claimed more than 80 percent of the South China Sea, creating tensions that may increase instability with the U.S as well as Western partners.<sup>64</sup> China has claimed this maritime area as traditional territory of China known as the nine-dash line (also known as the cow's tongue).<sup>65</sup> More than 33,000 commercial ships, 40 percent of the world's trade, transit this area and the South China Sea also has a massive oil reserve that has barely been tapped.<sup>66</sup> The PRC will continue to expand its influence in the South China Sea and eventually the PRC will enforce its non-internationally recognized nine-dash line.

The PRC is confident in its claim that it has already implemented the nine-dash line on all of its maps even though it has no international standing.<sup>67</sup> This type of arrogance alone would support the reasons of why the U.S. military would need to increase its military effectiveness especially in an A2/AD environment like the South China Sea. The PRC has every intention in defending this area. For example, in November 2013, Beijing had created an air-defense identification zone (ADIZ) over the waters that lie between China and Japan.<sup>68</sup> Some countries have an ADIZ surrounding their borders as a 'buffer zone' between two states to ensure military aircraft do not come too close to its neighboring military air assets. The purpose of the ADIZ is to reduce friction or the potential of an incident between opposing aircraft. The United States do not recognize China's East China Sea ADIZ and continued to send military aircraft in what the United States calls international airspace, causing friction in the region.<sup>69</sup> This was not the only major change or incident in the last two years.<sup>70</sup>

Another incident occurred in December 2013. The Chinese aircraft carrier *Liaoning* was deployed in the South China Sea and had abruptly maneuvered in the path of the United States Aegis cruiser *Cowpens*, which had been patrolling in international waters. The Chinese claimed

that the *Cowpens* was navigating in the *Liaoning*'s inner defense layer, a Chinese defense zone that spans more than 2,800 square miles but not recognized by international law.<sup>71</sup> Even though a collision was not imminent, it was clear that *Liaoning* battle group was holding its inner defense layer and was not allowing the *Cowpens* to enter it. Admiral Samuel J. Locklear, Pacific Command (PACOM) Commander, stated, "The U.S military, my forces in the Pacific AOR (Area of Responsibility) will operate freely in international waters."<sup>72</sup> This supports the Secretary of Defense (SECDEF) Robert Gates January 2011 statement to Beijing reporters "publicly affirmed U.S. determination to deal effectively with Chinese advancing military capabilities."<sup>73</sup> The SECDEF and PACOM's intent not to wane its military presence in the South China Sea coupled with the PRC's intent to increase the patrolling range of its carrier group is evident that there will most likely be more incidents in the future between United States and PLA forces. Some may fear that this is China's initial push to regulate the nine-dash line and lay claim to waters that are rich in oil preserves and serve as a major shipping lane for trade.<sup>74</sup> These incidents may increase as China holds firms to the nine-dash line and it is imperative the U.S. military continues training and developing AAW and A2/AD penetrating assets. The PLA intent is clear: to increase its military effectiveness and programs.<sup>75</sup>

### **PLA's Increased Budget and Air Power Capabilities**

With the Western pivot to the Pacific, Chinese leaders made it clear the United States is its main security concern within the Asia Pacific area of influence.<sup>76</sup> With this statement as the forefront for PRC military development, "the PRC has increased its defense budget at least fivefold over the past 15 years, and it is now the second largest defense spender in the world."<sup>77</sup> In 2011, the PRC stated that they allocated nearly \$92 billion in its defense budget and U.S.

analyst speculate Chinese research and development (R&D) spending is approaching \$6 billion a year making it the world's second highest defense R&D budget.<sup>78</sup> Some of the major programs the PLA is supporting its Air Force in order to provide extended capabilities and defense of its territories especially now that they have a functional aircraft carrier *Liaoning* as well as increased defensive and offensive abilities of its cruisers.<sup>79</sup>

The People's Liberation Army Air Force (PLAAF) is seeking ways to increase its capacity using indigenous technology and not relying on importing technology from states such as Russia.<sup>80</sup> China currently makes up about 25-30 percent<sup>81</sup> of Russian's aerospace arms deliveries with average sales of \$1-\$2 billion annually.<sup>82</sup> Some of the deliveries include (76) Su-30MKK multirole fighters, (24) Su-30MK2 fighters, (95) Su-27SK fighters, and (4) A-50E airborne early warning aircraft.<sup>83</sup> Su-27 (J-11) compares to U.S. F-15 and the Su-30 to the F-15E. Even though the PLAAF have assets to counter some of our 4<sup>th</sup> generation aircraft, they still lack are force multipliers.<sup>84</sup> Force multipliers are noncombat aircraft such as the E-3 AWACS, E-8 JSTARS, KC-135, and RC-135; which increase the effectiveness and capabilities of our US fighters and bombers.<sup>85</sup> The PLAAF has A-50E airborne early warning aircraft



**Figure 5: (A-50E Airborne Early Warning Aircraft (Chinese), Beriev Website, March 2015)**

(Figure 5)<sup>86</sup> but it does not match the capabilities and technology of the USAF E-3 AWACS (Figure 6).<sup>87</sup> Another issue is that the PLAAF has limited air-to-air refueling capabilities



**Figure 6: (E-3C AWACS, USAF Website, September 2012)**

substantially limiting the combat range of its fighters.<sup>88</sup> Even though the PLAAF has fourth generation aircraft that are comparable to U.S. fourth generation aircraft but other variables must be taken under consideration such as training, avionics, and weaponry. The U.S. fourth generation aircraft avionics surpasses the Chinese fourth generation aircraft. U.S. pilots have extensive instruction and support facilities that provide better training that surpasses Chinese pilots. The weapons systems are close to being equivalent but the avionics associated with these weapons systems are dated and not as advanced as U.S. systems.<sup>89</sup> Even though the United States continues to outpace the PLA's fighter aircraft, the United States must stay vigilant as the PLA is quickly increasing its manufacturing capabilities and has the revenue to acquire the technology that may match the U.S. air power in the future. The Chinese is also trying to close the gap by no longer purchasing an entire aircraft platform but acquiring specific technology in support of the aircraft itself.<sup>90</sup>

The PLA has been constrained by a relatively underdeveloped aviation technology, especially in its turbine engine development, but within the last 5 years, the PLA is investing in the aerospace industry by creating new aviation manufacturing plants and acquiring innovation in airspace technology.<sup>91</sup> From 1992-2005, the PRC has tried to increase its ability to produce third- and fourth-generation weaponry but it is until recent years that the PRC has created new



**Figure 7: J-20 Chengdu (Chinese), IHS Janes Defense Weekly, January 2015)**

technology in aviation assets to that of fifth generation capabilities.<sup>92</sup> The J-20 Chengdu (*Figure 7*)<sup>93</sup> is a Chinese manufactured 5<sup>th</sup> generation aircraft with stealth-like capabilities. The J-20 is roughly about the size of the U.S. F-111 stealth fighter and

has some resemblance of the U.S. F-22 Raptor with matched super-cruising flight capabilities.<sup>94</sup> The in-service date of this aircraft is projected to be in 2020 pending any developmental issues that are normal with any new platform production.<sup>95</sup> This aircraft can change the entire United States outlook on the PLAAF's capabilities. It is unknown what the true capabilities of the J-20 but it is clear the PLA's R&D is making technological leaps and bounds to include its other resources such as surface-to-air (SAM) and ballistic missiles.<sup>96</sup>

### **The United States Next Hurdle: PRC Missiles**

The force multipliers in a Sino-US conflict will have issues as SAM platforms such as the S-400 would have major influence on the US fighter support capabilities.<sup>97</sup> Just by sheer numbers, the PLA would initially have a major advantage against US forces in the defense of China's territory due to its SAM capabilities.<sup>98</sup> The new S-400 surface-to-air missile system developed by Russia had support funding from China, which means that China will most likely be Russia's first customer of this new weapon if it has not already happened.<sup>99</sup> The detection and combat range of this weapon system is 400 kilometers or roughly 250 miles supporting China's intent to increase its A2/AD capabilities making it increasingly harder for the United States to penetrate the PLA's defenses.<sup>100</sup> Another major threat to MAGTF forces is ballistic missiles.<sup>101</sup>

The PLA is also equipped with conventional ballistic and land attack cruise missiles with the capability of ranging targets between 300 to 3,400 miles.<sup>102</sup> As noted earlier in this essay, the MAGTF have major shortfalls against the defense of ballistic missiles. The Directed Energy weapon is still in development and the organic ability to detect these missiles, TPS-80 G/ATOR and TPS-59 radar, are within the TAOC deployed only at the MEB level. Once the TAOC

deploys, it will most likely require U.S. Army Patriot support to counter these threats but even then, it would be challenging to conduct air defense against the ballistic missile inventory of the PLA. Another issue is the Harpy Unmanned Aircraft System (UAS) anti-radiation weapon.<sup>103</sup> This vehicle, with LO/LRCS capabilities by most radar systems, can target radars when they start radiating by acquiring the radar signal and dive-bombing into the radar.<sup>104</sup> As the United States develops one capability, the enemy will acquire a new way to counter it.<sup>105</sup>

The PLA has increased its ballistic missile artillery budget and has created a command to implement this capability to its fullest. “As the 2008 Defense White Paper notes, the “Second Artillery Force is a strategic force under the direct command and control of the Central Military Commission (CMC), and the core force of China for strategic deterrence.<sup>106</sup> “China is also focusing on development and deployment of its sea-launched ballistic missiles (SLBMs), such as the JL-2, testing the DF21-D as an anti-ship ballistic missile (ASBM) for maritime strikes, and further developing its anti-satellite weapon capabilities (ASAT).”<sup>107</sup> This also will increase the defensive ring around the PLA forces and push U.S. assets to its maximum effective range. This is another reason why the JSF is extremely important to have all the capabilities the Marine Corps has invested in this platform. Its 5<sup>th</sup> generation stealth capability and LO/LRCS will enable the JSF to penetrate the PLA’s defenses. However, how is China, a country that had only 3<sup>rd</sup> generation weaponry 15 years ago, able to start producing 4<sup>th</sup> and 5<sup>th</sup> generation weaponry without acquisitions from other states? The answer is their ability to reverse engineer.<sup>108</sup>

### **PRC Innovation coupled with Reverse Engineering**

As stated earlier, the PRC has increased its defense budget fivefold in the last 15 years in order to catch up with the rest of the Asian countries and to suppress United States influence in

the Asia-Pacific region.<sup>109</sup> The PRC has mirrored Russian purchased military equipment and have developed reverse engineering capabilities that would provide the foundation for its future innovation. This is normal for latecomer countries playing catch-up development.<sup>110</sup> States as China acquires equipment, reverse engineer the item into China's own version, and then equip it with additional technology through other acquisitions.<sup>111</sup> This is probably the main reason why the PRC will now only purchase specific technology instead of the entire platform such as a Russian Su-30. This approach to acquisition of foreign technology is a way to shortcut the research portion of R&D and dismiss years of research by using reverse engineering.<sup>112</sup> This technology imitation is not a new concept developed by the Chinese; it has just be refined and used in a way to propel "their integration into the global economy and technological order."<sup>113</sup> China started this long process at the lowest level of imitation, which is duplicate imitation.<sup>114</sup>

Duplicate imitation is "products obtained from foreign sources and are closely copied with little or no technological improvement."<sup>115</sup> The Chinese developed duplicate imitation during the 1950's and 1960's.<sup>116</sup> The next stage in Chinese innovation and development lies closely with creative imitation, which is "a more sophisticated form of imitation that generates imitative products with new performance features."<sup>117</sup> This phase for the Chinese started in the 1970s and has continued to the present day with some other variances of imitation innovation such as creative adaption in the 1990's.<sup>118</sup> Chinese acquisition of Russian aircraft and other defense equipment is an example of this. Chinese developers, to become a better asset to the PLA for missions needed for future security, are changing the baseline aircraft acquired from Russia. The Chinese are now acquiring software and avionics in order to increase the capabilities of previously purchased Russian aircraft while also incorporating indigenous technology to integrate the two systems.<sup>119</sup> This is the basis for incremental and architectural

innovation: “Innovation that changes the way in which the components of a product are linked together, while leaving the core design concepts untouched.”<sup>120</sup> Russian and other countries that have sold military equipment and capabilities to China have only provided equipment that does not match or outweigh their own military capabilities ensuring that the provider has the upper hand and military superiority. This may leave China with no alternative but to acquire the technology through illegal ways. Some have called this espionage depending on how the technology was acquired.<sup>121</sup>

A recent case that may be evident of Chinese naval technical espionage is between a Japanese petty officer in Japan’s Maritime Self-Defense Force and his wife who is of Chinese descent.<sup>122</sup> The Japanese petty officer was accused of releasing Aegis Cruiser Active Phased Array Radar (APAR) technology that was acquisitioned from the United States. The petty officer had allegedly provided this technological information to his wife who in turn provided the information to the PLA.<sup>123</sup> The PRC has claimed that it received APAR technology legally from a Ukrainian source but there was not any paperwork to support the acquisition from Ukrainian R&D.<sup>124</sup> An incident like this definitely falls under espionage. China will continue to reverse engineer items openly unless it is contracted or patented than an item cannot be reverse engineered legally. Through reverse engineering China’s aviation industry has almost caught up with its Russia distributor in a way that the PRC has reduced its acquisitions with Russia because the PRC manufacturing can fill the gap.<sup>125</sup> So much so, that China has increased its R&D funding to that of 2.5 percent of the gross domestic product and increased science and technology funding.<sup>126</sup> This form of innovation has skyrocketed the Chinese economy by reducing foreign military acquisitions while simultaneously providing jobs for the Chinese Population.<sup>127</sup>

The Chinese have been able to catch up and it will not be long until the Chinese R&D will be able to develop its own aviation engines closing the gap on its inability to mass-produce aviation assets. A couple of points can be made from the capacity and reverse engineering capabilities of the PRC. First, that China and its PLA may become a force to be recon within the next 10 years solely by the PRC's ability to fill technology gaps with reverse engineering and significantly decreasing research time. Second, that China may be able to contest U.S. forces in the Asia-Pacific region as well as provide other U.S adversaries with Chinese military equipment in which the United States could lose its current foothold in Asia-Pacific and potentially other areas of U.S. interest.

## **Conclusion**

As of today, the United States is not at war with China and the probability of a conventional war with the PRC is unlikely. Both countries have numerous trade agreements and both would most likely agree that it would not be in the best interest to pursue an armed conflict to resolve issues in the Asia-Pacific area. A conflict of this magnitude would affect almost all countries in the world. The United States could spend an enormous amount of funds to ensure it has air superiority, which tends to be difficult in post-conflict era but to underestimate a growing military such as the PLA would be a grave mistake by the U.S, a mistake that may tip the balance in the Asia-Pacific region for decades. The Marine Corps, who has prided itself on being frugal, made the difficult decision to allocate funding for program such as the JSF. It is easy for the naysayers to disagree with the required funding when the capabilities the JSF provides to the MAGTF commander may not be clearly defined or even understood especially to those who do not understand or have not witnessed what it takes to maintain air superiority in

conflict involving anti-air warfare. It is the anti-air warfare and 5<sup>th</sup> generation capabilities of the JSF coupled with the MACCS support that will deter a viable force and think twice about engaging in an air campaign with the U.S. Marine Corps. The MAGTF must be able to employ all functions of Marine Aviation to include the control of aircraft and missiles even at the MEU level. If not, the Marine Corps will be limited in its ability to access A2/AD areas and will be more reliant on joint forces that may or may not be able to provide the support needed in a timely manner that is associated with Marine Corps contingency response.

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