



## The Mitchell Forum

# The Air Base: The Air Force's Achilles Heel? Understanding the Key Role Air Bases Play in the Employment of Airpower

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### About the Forum

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### Abstract

Air Force doctrine and most treatments of Air Force airpower make a serious mistake by giving surprisingly little attention to the key role air bases play in the employment of airpower at the operational level of war. Examination of past conflicts from World War I to Desert Shield/Desert Storm shows that the air base, to include the aircraft carrier, is one of the primary means by which an air commander maneuvers airpower. Air commanders use this maneuver to achieve the advantages of concentration, survivability, and surprise that have allowed them to make their airpower more effective. However, not having fought a near-peer opponent since World War II, the Air Force has devoted most of its attention to improving airborne performance, which has had a negative impact on an air commander's ability to conduct this maneuver. Increased airborne performance has made it more expensive in terms of time, money, and engineering resources for air commanders to provide the bases that are needed to maneuver airpower. To remedy this problem the Air Force needs to begin by making the air base a key concern when establishing aircraft requirements. Moreover, given the evolving threats from advances in surveillance and precision attacks, Air Force commanders, like the Army's, must reorganize their forces so as to exploit the use of mobility, dispersal, concealment, and deception that is essential for increasing the survivability of their airpower.

## Introduction

Air Force doctrine and most treatments of Air Force airpower make a serious mistake by giving surprisingly little attention to the key role air bases play in the employment of airpower at the operational level of war. This lack of attention can be traced to the fact that since World War II, the United States has not fought a near-peer opponent. Operating in this relatively benign environment, the Air Force focused almost all of its attention to improving aircraft performance in terms of airspeed, altitude, range, maneuverability, and payload. At the same time, it gave little attention to the ways improved performance impacted air bases in regard to cost, availability, operability, and survivability.<sup>1</sup>

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The air base plays a critical role in the employment of airpower at the operational level of war because it is one of the primary means by which an air commander maneuvers airpower. On land air commanders conduct this maneuver by providing airpower with air bases either through the construction of new air bases or by refurbishing existing bases. At sea air commanders use aircraft carriers to provide this same maneuver capability. In both cases commanders use maneuver to achieve the advantages of concentration in the form of enabling more aircraft to reach opposing forces, fly deeper into opposing airspace, fly more sorties, and deliver larger payloads. Commanders can also use this maneuver to provide airpower with increased survivability through the dispersal of vulnerable concentrations, by removing airpower from positions where it is at risk from opposing forces' surface maneuver or air attack, and to make an opposing commander's targeting

information less reliable through the use of mobility, concealment, and deception. Finally, commanders can use maneuver to achieve surprise by enabling airpower to fly from areas where opposing forces did not expect an attack.

This paper will examine past conflicts to show the critical role that air bases have played in an air commander's maneuver of airpower in theater warfare. This examination will show how air commanders have used this maneuver to achieve the advantages of concentration, survivability, and surprise to make airpower more effective. It will also show that increases in aircraft performance have tended to handicap an air commander's ability to maneuver airpower. Increased performance has done this by making it more expensive in terms of time, money, and engineering resources for air commanders to provide the bases (to include the aircraft carriers) what they need to maneuver airpower. Although air refueling has reduced, to a certain extent, the role air bases play in a commander's ability to maneuver airpower, air refueling has also introduced new vulnerabilities and complexities. Finally, given ongoing developments in cruise and ballistic missiles, precision weapons delivery, unmanned air vehicles, vertical lift, and electrical power, this paper will conclude by discussing the need for the Air Force to reassess its future aircraft requirements so that these aircraft can better support an air commander's ability to maneuver airpower by enhancing the ability to provide quickly suitable, more survivable basing. This reassessment will consider how Air Force units should be organized, trained, and equipped to meet future threats.

## World War I

The flimsy, primitive aircraft available in the First World War needed little more

than a small field to take-off and land. Similarly, since needs for maintenance, fuel, and munitions were small, it was relatively easy for air commanders to provide basing to maneuver airpower. Given the short range of their aircraft, especially those used for reconnaissance, it was essential for air commanders to maneuver their forces by providing bases close to the front.<sup>2</sup>

In Western Europe as long as the front remained somewhat static, relatively little maneuver took place. But in 1918, as the fighting became more fluid, and the Allied armies went on the offensive, the maneuver of airpower became essential. Colonel William Mitchell, commander of the

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recently established United States First Army Air Service, provides an early example of how an air commander used basing to achieve the advantages of concentration and surprise. In August 1918, in preparation for the coming offensive, Mitchell moved his pursuit and observation squadrons into fields around the flanks of the Saint-Mihiel Salient, often doing so secretly.<sup>3</sup> Mitchell's decision to concentrate airpower and use air strips closer to the battlefield led to the first US-led Allied victory in the war.

## **World War II**

In World War II developments like the tank made possible the resumption of large-scale army maneuver. Meanwhile, advances in aircraft performance since the First World War were having a growing impact on basing requirements that were key to an air commander's ability to maneuver airpower. Whereas in World War I airmen had needed only a relatively flat surface with few obstructions for take-offs and landings, now aircraft were faster and heavier, needing larger fields with longer runways and stronger materials capable for

all weather operations. However, although airmen focused on the need for increased aircraft performance, the need to rapidly build air bases in austere locations received much less attention.<sup>4</sup>

The importance of rapidly building air bases in austere locations became quickly apparent in the Mediterranean theater during Operation Torch, when Allied armies moving across North Africa required air support. The Allies faced a major setback at Kasserine Pass in part because the German Air Force possessed local air superiority. German airpower operated from developed, all weather bases close to the battlefield, while Allied aircraft operated farther away and from poorly supported, undeveloped and muddy bases. Later improvements in Allied basing along with use of C-47s to bring forward fuel and munitions helped change the situation leading to Allied victory.<sup>5</sup> By the end of the campaign in North Africa, the growing importance of engineers to the maneuver of airpower was apparent in the fact that engineers had built or improved 129 air bases, causing General Carl A. Spaatz to write to General Henry H. "Hap" Arnold that aviation engineers were "as nearly indispensable to the AAF as is possible to ascribe to any single branch."<sup>6</sup> The ability to use basing to maneuver Allied airpower continued to play a key role in determining objectives as the Allies advanced across the Mediterranean Sea to Sicily and then Italy.<sup>7</sup>

The operations of Ninth Air Force in the European Theater revealed the importance of air bases to the maneuver of airpower. According to Ninth Air Force, "To a tactical air force mobility on the ground is what flexibility is in the air... [which explains why] Ninth Air Force was organized, trained and equipped so that its headquarters and tactical units could move individually or collectively at a moment's

notice.”<sup>8</sup> Key to this maneuver was the establishment of IX Engineer Command that was responsible for developing, constructing, and rehabilitating air bases. Army Air Force leaders recognized that “the greatest single limiting factor on the ability of Ninth Air Force to carry out its mission would be the speed with which air bases could be brought into operation behind the advancing ground forces.”<sup>9</sup> Thanks to this emphasis, Ninth Air Force’s IX Engineer Command possessed the organization, training, and equipment that enabled it to complete an emergency landing strip on Omaha Beach on D plus 1. By D plus 5, four aviation engineer battalions were ashore and building three fighter bomber airfields on Omaha and one on Utah.

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By D plus 16, five fighter bomber groups were based in Normandy and by D plus 24, nine all weather fields had been finished and seven more were under construction.<sup>10</sup> Because of the absence of German airpower, fighters like the P-47 Thunderbolt carried the heavier loads of munitions needed to help defeat the German Army’s resistance, rather than the lighter munitions needed for control of the air. This need for aircraft to carry heavier loads of munitions also made it necessary to increase several of the 3,600-foot runways to 5,000 feet. In turn, this created more challenges due to the need for grading, filling, compacting, and the laying of square-mesh track or prefabricated hessian surfacing.<sup>11</sup>

As Allied armies advanced across France, they captured large numbers of partially demolished German airfields that IX Engineers were able to refurbish, which enabled aircraft to maneuver closer to the enemy. However, during this period of rapid

advance when the need for airfields became more urgent, the engineers were hindered considerably by difficulties moving large amounts of construction supplies to these forward airfields. Ninth Air Force’s analysis notes that because assistance from outside sources was negligible, “the engineers, and all other air force commands, would have profited by the establishment of a joint air-ground traffic priority board which determined priorities of movement of personnel and supply.”<sup>12</sup>

In the Pacific, Japanese air attacks in Hawaii and the Philippines revealed the vulnerability of American airpower when an air commander’s aircraft were concentrated on a limited number of bases and the aircraft were not dispersed. Fortunately, the Navy’s aircraft carriers were maneuvering at sea, allowing them to escape attack on 7 December.

From the very beginning of the war in the Pacific, as was the case in the Mediterranean and Western European Theaters, Allied strategy depended on the maneuver of airpower through the rapid building of air bases. In the Pacific, this maneuvering of airpower was of even greater importance because airpower possessed far greater ability to detect and defeat the movement of ships compared to its ability to detect and defeat an enemy’s movement on the land’s surface.<sup>13</sup> This capability meant that by seizing islands in order to refurbish or build air bases from which airpower could control the naval movement of Japanese forces, the Allies were able to bypass many Japanese islands. This tactic neutralized large numbers of Japanese Army forces without ever engaging them in close combat.

However, the war in the Pacific was unique in the almost complete absence of existing infrastructure to support the maneuver of both air and land

forces, explaining why General Douglas MacArthur saw the war in the Pacific as an “engineers’ war.”<sup>14</sup> The failure of some of the Army’s leaders to understand airpower and appreciate fully the difficulties involved in building air bases was evident in the Allied invasion of the Philippines and their decision to seize Leyte rather than Mindanao, a poor decision for which the Army assumed full responsibility.<sup>15</sup> The lack of proper seasonal weather information on existing Japanese fields, soil conditions, and rainfall all combined to greatly delay the building of suitable bases on Leyte. These delays significantly increased the exposure of Allied ships to Japanese kamikaze attacks while also causing “appalling overcrowding” of the Tacloban air base. The importance of rapidly building bases explains why by 1945 thirty-six aviation engineer battalions were concentrated in the Philippines, more

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than any other theater. By the end of the war in 1945, engineers had completed two hundred runways between Australia and Okinawa.<sup>16</sup>

The lack of infrastructure and difficulties building bases in the Pacific caused both Japanese and Allied commanders to concentrate airpower at relatively few bases. This explains why General George Kenney, MacArthur’s air commander, also put great emphasis on attacking Japanese air bases. When General Arnold visited Kenney during the Buna campaign, Kenney referred to a message Arnold had sent asking why Kenney was attacking air bases when experience had shown they were not profitable targets. Kenney explained that this strategy had given him control of the air over New Guinea.<sup>17</sup>

To successfully attack the four Japanese bases at Wewak in New Guinea, Kenney needed to move a base closer to the Japanese. He did this by secretly

building an airfield in the Markham Valley, while using deception to draw Japanese attention to two locations away from the construction at Marilinan. Key to his ability to quickly build a base was the use of heavy construction equipment like bulldozers, graders, and trucks.<sup>18</sup>

As was the case on land, the aircraft carrier operations of the United States Navy showed the importance of maneuver. Naval leaders used the maneuver of their carriers to exploit signals intelligence and achieve surprise and victory over Japanese carriers in the Battle of Midway.<sup>19</sup> Similarly, awareness of their vulnerability when carriers remained in one area - and could not use maneuver to increase their survivability by making Japanese information less reliable - helps explain why the carriers failed to remain close to Guadalcanal in support of the Marines seizing the island.<sup>20</sup>

Carrier vulnerability due to remaining in place to support land operations during the Philippine Campaign validated Navy concerns. The escort carriers supporting operations ashore faced destruction when the Japanese used the maneuver of their carriers for deception, which caused Admiral Halsey to take up chase and leave the escort carriers dangerously unprotected from Japanese surface naval attack.<sup>21</sup> When continuing delays establishing bases ashore on Leyte forced the Navy to keep its carriers in the vicinity, they came under increasingly intense Japanese air attacks, including the first use of kamikazes - which could be seen as manned cruise missiles.<sup>22</sup> But it was during the Okinawa campaign that the vulnerability of carriers was most apparent because of the need for them to remain in the area to support operations ashore until land bases could be made available. Prevented from using maneuverability to enhance survivability, the fleet lost 31 ships and 13 aircraft carriers were damaged, often

severely, with heavy loss of lives. One of these, the CVE Sangamon was not deemed worthy of repair.<sup>23</sup> Learning from combat about carrier vulnerabilities, the Navy took action by ensuring that its newest three carriers, the Midway class, were built with armored-decks and were much more heavily armed.<sup>24</sup>

## Korea

North Korea's surprise invasion of South Korea in June 1950 saw the U.S. Air Force Far East Air Force's (FEAF) ability to respond effectively handicapped by the limited number of air bases in South Korea.

Besides six primitive short sod strips, South Korea had only a few improved bases suitable for the FEAF's F-80 jet fighter and these were quickly captured, making it necessary for the F-80 Shooting Stars to fly missions from bases in Japan.<sup>25</sup> It was soon apparent that the F-80's increased airborne performance in terms of speed, although not range, when compared to the World War II propeller-driven F-51 Mustang had greatly increased the challenges facing the ability of Fifth Air

Force commander Major General Earle Partridge to provide the bases he needed for the forward maneuver of airpower.

Compared to the F-51, jets like the F-80 had a higher take-off and landing speed and weighed more. These factors increased their requirement for longer and smoother runways. And the runways also needed to be stronger because the jet's smaller tires had pressures of 200 pounds per square inch as opposed to the F-51's 80 pounds per square inch. The air commander's maneuver problem was made worse because although

aircraft designs had changed, runway design curves were only slightly changed. It soon became apparent that much more time and new materials were needed to build a base suitable for jets. Instead of the World War II average of one and one-half battalion months to construct a 4,000-foot F-51 runway, it took four and one-half months to build the longer, stronger runway needed for jets. Add taxiways and parking areas, and now the total time to build a base under the best conditions was eight to ten battalion months.<sup>26</sup>

The problem of enhancing bases was made even worse because Air Force commanders often were not knowledgeable about air base engineering problems.<sup>27</sup> To a degree, this problem could be traced to the fact that when the Air Force became a separate service, the Army remained responsible for providing the aviation engineer units. However, the Army's ability to provide the required engineering capability had suffered after World War II because constrained budgets meant that engineer units were undermanned and poorly trained and much of their equipment was obsolete, worn out, or unserviceable.<sup>28</sup>

Early in the conflict the lack of suitable bases in South Korea forced Fifth Air Force F-80s to fly from Itazuke Air Base in Japan and this distance not only left little time to search for and attack North Korean ground forces, it also greatly limited the munitions the aircraft could carry.<sup>29</sup> Fortunately, F-51 fighter bombers were still available in the Air National Guard and this allowed Fifth Air Force to convert six F-80 squadrons to F-51s that were taken from the Guard and transported to Korea on the Boxer aircraft carrier, allowing the F-51s to base at the primitive fields still available in South Korea.<sup>30</sup> Flying from these bases, F-51s could carry far more munitions, including napalm that was essential for

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destroying North Korean tanks, than the F-80 while spending much more time searching for and attacking North Korean forces, which greatly increased airpower's effectiveness.<sup>31</sup> These advantages explain why Brigadier General Edward Timberlake, deputy commander for Fifth Air Force said on 8 July 1950 that "one F-51 adequately supported and fought from Taegu Airfield is equivalent to four F-80s based on Kyushu."<sup>32</sup>

During the defense of the Pusan Perimeter, the need for the air commander to maneuver airpower for survivability became evident because of the threat posed by the maneuver of North Korean ground forces. Despite having warned the Army of the danger of the Air Force being caught off-balance by unexpected United Nations Command (UNC) ground force actions, the growing threat by the North Koreans to the bases at Taegu and Pohangdong within the perimeter forced Fifth Air Force to cancel the planned maneuver of four squadrons of F-51s forward from Japan and withdraw to Japan two F-51 squadrons already in Korea.<sup>33</sup>

When UNC ground forces took the offensive and in early October advanced into North Korea, the ability to maneuver Fifth Air Force airpower forward from bases in Japan and around Pusan to Kimpo and Suwon and even further forward was severely handicapped by General MacArthur's decision to make an airborne assault as well as a second amphibious landing at Wonsan. His decision created a massive logistical problem by reducing available airlift and the use of the Port of Inchon, requiring the movement of heavy equipment forward from Pusan over the severely damaged transportation

infrastructure.<sup>34</sup> The logistical problems slowed the forward maneuver of airpower which, in turn, handicapped its ability to detect and attack Chinese forces that had moved into locations deep in North Korea and along the Yalu. By the end of October when Chinese forces made their first attacks against UNC ground forces that had advanced deep into North Korea, Fifth Air Force's forward maneuver had managed to provide basing for one RF-80 squadron and three F-80 squadrons at Taegu, two F-51 squadrons at Pusan, two F-51 squadrons at Pohang, one more at at Kimpo and the Mosquito squadron at Seoul's airport.<sup>35</sup> On November 24, 1950 when MacArthur resumed his ground offensive, Fifth Air Force had finally succeeded in maneuvering some of its squadrons forward to fields in North Korea. Between 17 and 19 November, three F-51 squadrons arrived in Hamhung, on 22 November three F-51 squadrons arrived at Pyongyang east, and on 25 November two more F-51 squadrons reached Pyongyang.<sup>36</sup>

On November 25 powerful Chinese forces ambushed the UNC ground advance. The ambush led to the sudden withdrawal of UNC ground forces, forcing Fifth Air Force units to maneuver to the rear for survivability, quickly abandon several bases from which they had just begun to operate and leave behind much of their equipment. Fortunately, airpower based further south was able to use air interdiction to slow the Chinese advance, allowing UNC ground forces to break free and establish defenses further south that brought the Chinese advance to a halt and ended the fluid maneuver phase of the conflict.<sup>37</sup>

Like the Air Force, the Navy's Seventh Fleet Commander Vice Admiral Arthur D. Struble used maneuver to achieve greater airpower effectiveness. In response to the North Korean invasion, the Navy

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maneuvered the aircraft carrier Valley Forge from Subic Bay to a position off the coast of Korea where its aircraft attacked North Korean air bases and the transportation infrastructure that the North Koreans were using to move south. During these operations the challenges posed by using higher performance jets like the F9F Panthers on carriers designed for slower propeller-driven aircraft became apparent in an increased number of carrier landing accidents.<sup>38</sup> As the situation on the Pusan Perimeter became more critical, the Navy used maneuver to concentrate still more carriers off the Korean coast, including two smaller escort carriers employing propeller-driven F4U Corsairs that possessed good endurance and large munitions payloads. Thanks to the combination of Navy, Marine Corps, and Air Force airpower, the North Korean offensive was defeated, allowing UNC to take the offensive, make an amphibious landing at Inchon and break out of the Pusan Perimeter.

Operating in the confined waters of the Yellow Sea no more than 200 miles from the Soviet military base at Port Arthur posed a special problem because the Navy was well aware from World War II of the vulnerability of its carriers to air attack.<sup>39</sup> Whereas early in the war 15 percent of the total carrier air effort was defensive, as the Navy maneuvered its carriers further north, the possibility of Chinese or Soviet intervention caused their defensive air effort to increase to 25 percent. In October operating off the west coast of Korea, 37 percent of the total effort of four carriers was defensive. Even the two escort carriers operating off Wonsan spent the first ten days flying 276 air defense sorties.<sup>40</sup>

## **Vietnam**

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As the United States increased its involvement in Vietnam, air commanders paid close attention to lessons learned in Korea. Commanders maneuvered land-based airpower to existing air bases in the region, while naval air commanders maneuvered carriers into positions in the Gulf of Tonkin. For attacks against targets in South Vietnam, the Navy maneuvered carriers into an area called Dixie Station. For attacks against North Vietnam and Laos they maneuvered carriers farther north to Yankee Station. As was the case for the Air Force, increases in Navy aircraft performance since Korea had a major impact on the type of aircraft carrier that was required to support an aircraft's operation.<sup>41</sup>

Unlike in Korea, all carriers now had an angled deck that made landings far safer. But along with greater airborne performance, aircraft weights and landing speeds had increased significantly, making it necessary for the Navy to build bigger and much more expensive aircraft carriers. While the "Essex" Fleet carrier of World War II and Korea had had a displacement of 33,000 tons full load, the Vietnam era "Forrestal" class displacement was 76,600 tons full load. The Forrestal was the Navy's first "super carrier" and besides having a much bigger deck, it had four steam catapults, four elevators, and a hanger deck with a higher overhead. These changes were needed to safely handle higher performance aircraft like the 70,000-pound gross weight A3D Sky Warrior as well as launch and recover aircraft faster.<sup>42</sup>

Although carriers possessed the great advantage of the flexibility to maneuver quickly into desired positions as the situation on land demanded, their operations were also degraded by issues unique to carriers. Weather at sea caused pitching decks that could make air operations impossible, restrictions on the weight catapults could

handle lowered munition and fuel loads, and the ship's arresting gear limited the weight in fuel and munitions an aircraft could carry and still safely recover. Perhaps the most important restriction was the time between launch and recovery cycles that limited the numbers of sorties that could be flown and the types of missions.<sup>43</sup>

Aircraft carriers also had a unique survivability problem. Although during this conflict they were never under air or surface attack, the complex nature of aircraft carrier operations with aircraft taking-off, landing, parking, refueling, and loading

munitions - all in a confined space - created much greater dangers from accidents than was the case with air bases on land. On 26 October 1966 a flare set off a fire on the Oriskany that killed 44 including many pilots, destroyed two helicopters, and damaged four A-4s. On 29 July 1967, a Zuni rocket ignited a fire on the Forrestal that cost 134 lives and destroyed 21 aircraft

and damaged another 41. On 14 January 1969, another Zuni rocket caused a fire that killed 28 and destroyed 15 aircraft. Each of these accidents forced the carrier to cease operations and leave the theater for repairs.<sup>44</sup>

For land-based air operations over South Vietnam, initially there were just six bases dating from the French regime available in South Vietnam: Tan Son Nhut, Bien Hoa, Da Nang, Nha Trang, Pleiku, and Binh Thuy and only the first three were suitable for jet fighters like the F-100 Super Sabre. These bases posed a problem for survivability as all three were seriously overcrowded with aircraft.<sup>45</sup> Compounding the problem of survivability was the fact that the bases were all located

in or near population centers.<sup>46</sup> Given the concentration of aircraft at these bases, aircraft dispersal was impossible and storage for fuel and munitions was also vulnerable because they were located near base perimeters. The survivability problem was made worse by the large numbers of key personnel, to include aircrews, who were forced to live off base among the local population.

To achieve the desired concentration of force for execution of their plans air commanders also maneuvered airpower to bases outside of South Vietnam in Thailand, primarily to support air operations against North Vietnam and Laos. At first, only three bases in Thailand could support the take-offs and landings of heavily loaded jet fighters like the F-105 Thunderchief: Don Muang near Bangkok, Takhli 100 miles to the north, and Korat 100 miles to the northeast. To achieve the even greater concentration of airpower that they felt was necessary, air commanders had the runways at Ubon and Udorn lengthened to support the F-4 Phantom. Propeller-driven World War II-Korean era aircraft like the A-1 Skyraider, along with rescue helicopters, were able to use the shorter runway at Nakhon Phanom whose location on the Mekong River allowed these aircraft to reach areas in Laos and North Vietnam without air refueling.<sup>47</sup>

In a first for airpower, fighters based throughout Southeast Asia had come to depend on air refueling to reach targets that were beyond their normal range. By the end of 1966 air refueling was made possible by the basing of KC-135 Stratotankers at Takhli and at U-Tapao, a new base 70 miles south of Bangkok. B-52 Stratofortresses flying from Guam depended on tankers based in Okinawa.<sup>48</sup> The need for air refueling to reach their targets and then safely recover at their bases tied fighters to the availability of

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the tankers. The limited number of tankers meant that after supporting an attack by a large formation of fighters in the morning the tankers had to land and refuel before they could support a second attack. This turnaround time for the tankers caused a gap of several hours between attacks and made their timing predictable.<sup>49</sup> Later aircraft with longer range, the F-111 Aardvark and A-7D Corsair II, reduced the number of tankers required, but the need for escort by F-4s requiring air refueling continued to limit when commanders could plan attacks.

Although the tanker refueling anchors over Laos, Thailand, and the Gulf of Tonkin were never attacked, they did create a vulnerability beyond the complexities normal to tanker operations like weather.<sup>50</sup> For example, if the North Vietnamese had attempted air attacks (one way because of the limited range of their MiGs), they not only might have shot down some tankers, they would have caused all the tankers to leave their anchors and withdraw further south for survival. Providing that the attack occurred while the fighters were in the process of making attacks deep in North Vietnam, many of the

fighters depending on air refueling to reach their bases could have been lost because of fuel exhaustion. Even without any tanker or fighter losses, an attack against the anchors would have caused future operations - by both tankers and fighters - to be more cautious. Fighters would have needed to set higher bingo fuel limits and tankers would have been reluctant to fly beyond their anchors as they often did to refuel fighters low on fuel after an attack.<sup>51</sup>

Achieving an even greater concentration of airpower closer to the areas in South Vietnam where enemy forces were located depended on how quickly the Seventh Air Force commander General William W. Momyer could both expand current bases and build new bases. To this end, Air Force air commanders decided they needed to construct four more bases suitable for jet fighters: Tuy Hoa, Cam Ranh Bay, Phan Rang, and Phu Cat. However, since air bases had been built without serious enemy attacks since World War II and there was no Air Force criteria for constructing air bases in wartime, the construction of these bases in South Vietnam was based on peacetime standards and this led to vulnerability problems that soon became evident.<sup>52</sup> Of the new bases Phan Rang was seen as the most vulnerable because it relied on water and fuel pipelines through areas exposed to enemy forces.<sup>53</sup>

For the ability to construct or expand air bases the Air Force depended on the Army, but the Army had delayed sending enough engineers to build these bases because the areas where they were to be built were not yet secure.<sup>54</sup> At Phan Rang Army engineers also faced delays caused by the weather, the need to move an increased amount of earth, and a shortage of aluminum matting. Concerned at the slow pace of air base construction, Air Force Chief of Staff General John P. McConnell requested permission for the Air Force to build its own base at Tuy Hoa using a civilian company, Walter Kidde Constructors, Inc., under a new single-package philosophy called the Turn Key concept. The contractor was responsible for the entire project, design, engineering work, materials, equipment, shipping, offloading, and labor. Six months after the advanced construction party arrived, an expeditionary base was ready with a 10,000-foot temporary aluminum

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plank runway to be followed by a 10,000-foot concrete runway.<sup>55</sup>

To accelerate construction of the bases, the civilian contractor's responsibility was reduced to runways, roads, utilities, munition storage, and the control tower. In addition, the Air Force deployed Prime Beef emergency construction teams to augment the Air Force's Red Horse engineering squadrons of which five were in theater by 1966. These Air Force units also built other required facilities as well as the runway at Cam Ranh Bay when funding for civilian construction ran out.<sup>56</sup> The rush to establish bases in South Vietnam meant that at bases like Phan Rang facilities initially were primitive with maintenance shops operating from tents and lacking a power check pad, test cell pad, fuel cell repair area, wash rack, loading crew and radar calibration areas. Aircraft parking was also limited.<sup>57</sup>

As was noted, the location of bases in South Vietnam and their concentrated nature created vulnerabilities, but because Air Force basic doctrine had ignored air base

ground defense Air Force units were not prepared to provide the necessary local ground defenses.<sup>58</sup> In fact, soon after he arrived in theater General Momyer began working to improve housing conditions and even base appearance, but in doing so made the bases more vulnerable. Soon flower gardens bordered

by whitewashed stones appeared around base buildings.<sup>59</sup> Although there were no air attacks against any bases in Vietnam or Thailand, all the air bases in Vietnam experienced attacks by the Viet Cong and North Vietnamese ground forces. Besides sapper attacks against many of the bases, the Tet offensive saw serious ground assaults against Tan Son Nhut and Bien Hoa that

temporarily caused the suspension of air operations at these bases. These assaults marked the beginning of six months of stand-off attacks by mortars and rockets that destroyed 14 aircraft and damaged 114 more.<sup>60</sup> The mortar and rocket attacks caused the Air Force to begin a crash aircraft shelter construction program, switching from revetments to shelters that provided overhead protection. When the last shelter was completed at Tuy Hoa in January 1969, Seventh Air Force had 373 shelters as opposed to about 1,000 revetments.<sup>61</sup> These attacks made it essential to extend the base defense perimeter, but this was an almost insolvable problem because of the surrounding dense population and the terrain.<sup>62</sup>

## **Desert Shield/Desert Storm**

Saddam Hussein's surprise invasion of Kuwait caused U.S. leaders to fear Iraqi's next objective would be Saudi Arabia. After convincing Saudi King Fahd to allow the United States to deploy forces to Saudi Arabia, the United States began the rapid deployment of air, land, and naval forces to the region. By 8 August two Navy carriers had maneuvered into position where they could, if necessary, with air refueling, deliver air attacks. Eventually the Navy contributed 450 aircraft of the almost 2,000 U.S. aircraft employed in the war.<sup>63</sup> Naval air commanders recognized that operating carriers in the confined waters of the Persian Gulf close to Iraq posed too great a risk, so carriers conducted air operations from the Red Sea and east end of the Persian Gulf. The distances from these locations to Kuwait and Iraq forced the Navy's carrier aircraft to depend heavily on air refueling provided by the Air Force's land-based tankers.<sup>64</sup>

After making a 15-hour non-stop flight from Langley Air Force Base involving up to 12 air refuelings, 24 Air Force F-15

**distances from these locations to Kuwait and Iraq forced the Navy's carrier aircraft to depend heavily on air refueling provided by the Air Force's land-based tankers.**

**in the future an air commander's ability to maneuver airpower with aircraft carriers or land air bases will face major survivability challenges if the United States fights a near-peer opponent.**

Eagles landed at Dhahran Air Base 200 miles south of Kuwait on 8 August.<sup>65</sup> The basing infrastructure required for the forward maneuver of Allied air forces was already available because over the previous decades the U.S. Army Corps of Engineers had helped build far more air bases than were necessary for the Saudi air force.<sup>66</sup> Despite this construction program, the U.S. air commander, Lieutenant General Chuck Horner still needed to enlarge existing bases with taxiways, ramps, storage for fuel and munitions, and housing. And to support the forward maneuver of airpower, General Horner created a quick-turn base at KKMC less than fifty miles from the border with Iraq.<sup>67</sup> Eventually, U.S. and allied aircraft were based at more than twenty air bases on the Arabian Peninsula.<sup>68</sup> However, because the deployment of fighters was so rapid, their logistical support to include bare base support equipment and communications gear often lagged far behind so that initially they could not function properly. Plans also failed to estimate how heavily air operations would depend on air refueling and initially called for 68 tankers while in the end over 230 were required.<sup>69</sup>

Eventually the coalition had available 2,614 aircraft.<sup>70</sup> The concentration of so many aircraft on bases without shelters and limited parking space created a major vulnerability, but fortunately the Iraqi air force was unable to take advantage of this concentration. Although it was equipped with modern aircraft, most of the Iraqi pilots were not well trained.<sup>71</sup> The Iraqis also possessed the Scud-B surface-to-surface missile with some 225 mobile launchers that posed a threat to these bases. Fortunately, although it proved extremely difficult for the coalition to find these mobile

launchers, the missiles they fired were very inaccurate. Out of the 51 missiles fired at targets in the Arabian Peninsula, only one caused casualties when it hit a barracks at Dhahran.<sup>72</sup>

## **Conclusion**

History clearly shows that air bases have played a vitally important role in a U.S. air commander's ability to achieve increased effectiveness through the maneuver of airpower at the operational level of war. However, in the future an air commander's ability to maneuver airpower with aircraft carriers or land air bases will face major survivability challenges if the United States fights a near-peer opponent. As operations in World War II off the Philippines and Okinawa revealed, when carriers attempt to conduct sustained air operations close to land, they sacrifice the protection mobility can provide, causing them to risk unacceptable losses. An additional problem for carriers is the reality that many areas of near-peer opponents like China and Russia are too distant from the sea to be in the range of unrefueled carrier-based aircraft. Of even greater concern, ongoing developments in modern surveillance and precision missiles are creating an increasingly dangerous threat to carriers despite their mobility. Finally, as accidents during the Vietnam War demonstrated, the concentration of large numbers of aircraft, fuel, munitions, and personnel in a small areas like carrier decks makes it very likely any successful attack will cause sufficient damage, forcing the carrier to cease operations and leave the area to make lengthy repairs.

However, in contrast to carriers, an air commander can still conduct survivable airpower maneuver using land bases, provided the Air Force starts taking certain actions. Clearly, the way forward must begin with the Air Force

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recognizing the critical importance of making the air base a key concern when establishing aircraft requirements. While aircraft are now seen as weapons systems that require integration of the airframe, engine, avionics, and munitions, the Air Force has neglected appropriate planning for air base requirements to ensure aircraft can operate effectively at the operational level of war against a near-peer opponent. The Department of Defense often makes the unexamined assumption during tactically oriented exercises that airpower will always be available and operable (despite the growing threat from precision attacks by near-peer precision attacks). If the Air Force continues to neglect air bases, they are behaving like armies in the past that continued to build castles in the age of gunpowder. To meet evolving threats first from gun powder, and later from aircraft, and with the development of motorized vehicles, armies were forced to radically change how they organized, trained, and equipped. Now the same need for change is apparent for an Air Force that plans to deploy forward to wage theater warfare against a near-peer opponent. Just as armies have been forced to use mobility, dispersal, concealment, and deception in their maneuver to increase survivability, the

same will be true for the Air Force and its future bases.

Survivable maneuver will require exploiting the existence of the numerous runways located throughout the world by being prepared to quickly refurbish these fields and make them capable of supporting dispersed air operations.<sup>73</sup> Dispersed operations will require significantly reducing aircraft dependence on long, smooth runways and elaborate support measures that need a significant amount of readily available spare parts and large numbers of personnel. It will require personnel who are prepared to live in austere conditions while being able to defend themselves and their base against an increasing variety of threats that include unmanned aerial vehicles and special operations forces.<sup>74</sup> As Pacific Air Forces Commander General Charles Q. Brown recently pointed out, making these personnel responsible for base defense will also require rethinking service roles and missions so as to give the Air Force responsibility for air base defense.<sup>75</sup> And while dispersed operations alone are not sufficient to provide the essential degree of survivability, the same capabilities that make dispersed operations possible would also allow Air Force units, as the Army does with its units, to use mobility in order to exploit concealment and deception measures that can make an enemy's targeting information unreliable.<sup>76</sup> ★

## Endnotes

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- 1 As addressed in this paper the air base, which also includes the aircraft carrier, consists of the operating surface (runway or deck) an aircraft requires to get airborne and to land. It also consists of the parking areas for aircraft, as well as facilities for providing maintenance, fuel, munitions, personnel housing, messing, and medical support.
- 2 Denis Winter, *The First of the Few: Fighter pilots of the First World War* (Athens, Georgia: The University of Georgia Press, 1983), British Aerodromes on the Western Front in 1916 were almost all located within 30 to 40 miles of the front, 58. Scout aircraft needed a minimum of 200 yards to land and about thirty aircraft would be dispersed around a field of about 300 yards square because of the threat from German night bombing. Canvas hangers were used for maintenance and personnel often slept in barns or nearby villages. 62.
- 3 Mitchell instructed Major Hartney, commander of the 1st Pursuit Group, "...to go over to that map and look at that tiny field, then go back and prepare to slip in there overnight...The enemy mustn't know we are coming." James J. Hudson, *Hostile Skies: A Combat History of the American Air Service in World War I* (Syracuse, New York: Syracuse University Press, 1968), 140-6.
- 4 Wesley Frank Craven and James Lea Cate, editors, *The Army Air Forces in World War II: Volume Seven, Services Around the World* (Washington, D.D.: New Imprint Office of Air Force History, 1983), 239.
- 5 Allied air bases were far from the land battle (Bone, 120 miles back, Youks and Souk-el-Arba, 150 and 70 miles back, both frequently muddied) while German bases were close and all weather. Wesley Frank Craven and James Lea Cate, editors, *The Army Air Forces in World War II: Volume Two, Europe: Torch to Pointblank August 1942 to December 1943* (Washington, D.D.: New Imprint Office of Air Force History, 1983), 83-91.
- 6 The Army Air Forces in World War II: Volume Seven, Services Around the World, 253.
- 7 Ibid, The operational capacity of bases in Malta and Pantelleria and their distances from Sicily were key considerations in the design of Operation Husky. Similarly, the maneuver of airpower to air bases in Sicily and the range of aircraft flying from these bases were key factors in determining the amphibious maneuver forward of Allied armies forward into Italy. 488-94.
- 8 Condensed Analysis of the Ninth Air Force in the European Theater of Operations (Washington, D.C.: New Imprint Office of Air Force History, 1984), 3.
- 9 Ibid, 11.
- 10 Ibid, 21.
- 11 The Army Air Forces in World War II: Volume Seven, Services Around the World, 268.
- 12 *Condensed Analysis of the Ninth Air Force in the European Theater of Operations*, 32-3. As will become clear, in Korea the same failure to have a board to establish traffic priorities handicapped the forward maneuver of Air Force airpower after United Nations land forces advanced into North Korea.
- 13 To understand why in World War II airpower possessed much greater ability to detect and defeat movement at sea than movement on land see Price T. Bingham, "The Urgent Necessity to reverse Service AirLand Roles" *Joint Force Quarterly*, Issue 84, 1st Quarter 2017, 72-80.
- 14 Thomas E. Griffith Jr., *MacArthur's Airman: General George C. Kenney and the War in the Southwest Pacific* (Lawrence, Kansas: University Press of Kansas, 1998), 90.
- 15 Army Air Forces in World War II: Volume Seven, Services Around the World, 289, end note 27, citing a letter by General Krueger.
- 16 Ibid., 277-88.
- 17 George C. Kenney, *General Kenney Reports: A Personal History of the Pacific War* (Washington, D.C.: Reprint by Office of Air Force History, 1987), 113-4.
- 18 An American construction battalion with 700 men and heavy equipment could accomplish as much work in 24 hours as 50,000 men with hand tools. Griffith, 125-9.
- 19 Alan Schom, *The Eagle and the Rising Sun: The Japanese-American War 1941-1943* (New York: W.W. Norton & Company, 2004), 279-96.
- 20 Ibid., 329-39.
- 21 Clark G. Reynolds, *The Fast Carriers: The Forging of an Air Navy* (New York: McGraw-Hill Book Company, 1968), 253-88.
- 22 Ibid., 288.
- 23 Norman Polmar, *Aircraft Carriers: A History of Carrier Aviation and its Influence on World Events, Volume I, 1090-1945* (Washington, D.C.: Potomac Books, 2006), 483.
- 24 Norman Polmar, *Aircraft Carriers: A History of Carrier Aviation and its Influence on World Events, Volume II, 1946-2006* (Washington, D.C.: Potomac Books, 2006), 8.
- 25 Conrad C. Crane, *American Airpower Strategy in Korea, 1950-1953* (Lawrence, Kansas: University Press of Kansas, 2000), 24-5.
- 26 Lieutenant Colonel Joseph L. Albert and Captain Billy C. Wylie, "Problems of Airfield Construction in Korea," in *Airpower the Decisive Force in Korea* ed. James T. Stewart (New York: D. Van Nostrand Company, Inc., 1957) 232-5.
- 27 Ibid., 236-7. Also see *FEAF report on the Korean War* Tab19, "SCARWAF Engineer Aviation Units—Our Chosen Construction Forces," Historical Research Agency, Air University, Maxwell Air Force base, AL, (hereafter cited as HRA) File K720.04D, book 3.
- 28 *History of the Far East Air Force*, 25 June-31 December 1950, HRA File K720.01, 19. Also see Robert F. Futrell, *The United States Air Force in Korea 1950-1953* (Revised edition Washington, D.C.: Office of Air Force History, 1983), 61-2.

- 29 During the summer of 1950 it was not unusual for an F-80 carrying only two rockets and full drop tanks to hit the PSP (perforated steel platform) overrun before getting airborne. Comment by First Lieutenant George Thomas, 36th Fighter Squadron, in an interview for the *USAF Evaluation Group*, Book II, 25 June-December 1950, HRA File K168.041, 11'2.
- 30 Futrell, 69.
- 31 *Commander's Control Digest*, 25 June-31 December 1950, Volume 15, HRA File K168.041-1.
- 32 Futrell, 68-70, 94.
- 33 Letter, Major General Earl E. Partridge, Commander Fifth Air Force, to Lieutenant General Walton H. Walker, Commander of Eighth US Army in Korea, 4 August 1950, HRA File K720.13A.
- 34 Ibid, 178-82.
- 35 Headquarters Fifth Air Force Memo for Record on 22 October, 1950 meeting on airlift, HRA File K168.041-1, Volume 6 (Part 4).
- 36 Futrell, 232. Also see "Study on Fifth Air Force Command Use of Forces Available," HRA File K730.3102-25.
- 37 For more in-depth treatment of the end of the fluid phase of the conflict see Price T. Bingham, "*The U.S. Air Force and Army in Korea: How Army Decisions Limited Airpower Effectiveness*," *Joint Force Quarterly* Issue 91, 4th Quarter 2018, 53-9.
- 38 In the war's first month one Navy jet squadron had 15 crashes in three weeks and 20 crashes in the second month, but only one bullet hole from enemy fire. Richard P. Hallion, *The Naval Air War in Korea* (Baltimore, Maryland: The Nautical & Aviation Publishing Company of America, 1986), 30-7, 52.
- 39 Ibid., 60-1.
- 40 Major General O.P. Weyland, Some Lessons of the Korean War and Conclusions and Recommendations Concerning USAF Tactical Air Responsibilities, 10 October 1950, HRA File K720.609B.
- 41 The Korean War F9F max weight was 19,4947 pounds, the Vietnam War A-6A combat weight was 53,700 pounds, and the F-4B max weight was 55,950 pounds. Bill Gunston, *Fighters of the Fifties* (Osceola WI: Specialty Press, 1981), 95 and Rene j. Francillon, *Tonkin Gulf Yacht Club: U.S. Carrier Operations Off Vietnam* (Annapolis, MD: Naval Institute Press, 1988), 205-8.
- 42 Polmar, Vol. II, , 135-6, 470-5.
- 43 John Schlicht, *The War in South Vietnam: The Years of the Offensive, 1965-1968* (Washington, D.C.: Office of Air Force History, 1988), 189-90.
- 44 Polmar, Vol. II, 253-5.
- 45 Schlicht, 26.
- 46 Roger P. Fox, *Air Base Defense in the Republic of Vietnam 1961-1973* (Washington, D.C.: Office of Air Force History, 1979), 60.
- 47 Wayne Thompson, *To Hanoi and Back: The U.S. Air Force and North Vietnam, 1966-1973* (Washington, D.C.: Smithsonian Institution Press, 2000), 6-10.
- 48 Ibid., 9.
- 49 Ibid., 40.
- 50 General William W. Momyer, US Air Force (Retired), *Airpower in Three Wars (WW II, Korea, Vietnam)*, (Washington, D.C.: Office of Air Force History, 1978), 228.
- 51 This speculation is based on the author's experience in the current operations section of Blue Chip, MACV's Tactical Air Control Center, where in 1972 I was responsible for managing in real time KC-135 assets in order to respond to the impact of weather, tactical ground emergencies, and rescue efforts.
- 52 Schlicht, 302.
- 53 Ibid., 63.
- 54 Schlicht, 78.
- 55 Ibid., 120-2, 155. In 1970 the author experienced the challenge of landing my F-100D on the aluminum plank runway in a strong crosswind after the concrete runway was closed by an accident. The erosion of the sand underneath the aluminum matting made for a wild landing roll that for a moment seemed like it would lead to my aircraft departing the runway.
- 56 Ibid, 158. 168.
- 57 Ibid., 172-3.
- 58 The doctrinal void lasted until 1968. Fox, 139.
- 59 Schlicht, 174. The author arrived at Tan Son Nhut Air Base just weeks before the 1968 Tet offensive. All the squadron's aircrew were living in a several story building in Saigon and were unarmed since all weapons were turned in after each flight. The building was guarded by two Chinese mercenary Nung guards armed with shotguns when the Tet offensive began with an attack against the unoccupied building next door. The next morning the guards deserted so for the next few days until the squadron was moved on base into an uncompleted barracks the squadron provided its own protection with weapons obtained from the base. Most of the squadron's aircraft that had been parked in the open wing tip to wing tip could not be flown until they had been inspected and bullet holes and mortar damage repaired. During this time squadron aircrew who were not flying or on crew rest were tasked with filling sand bag walls around base buildings using dirt because there was no sand and then covering the walls with plastic sheets to protect the walls from the rain.
- 60 Momyer, 314; Fox, 132.
- 61 Ibid., 70-1.
- 62 Ibid, 128-9.
- 63 Richard P. Hallion, *Storm over Iraq: Air Power and the Gulf War*, (Washington, D.C.: Smithsonian Institution Press, 1992), 157.

- 64 Michael R. Gordon and Bernard E. Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston: Little, Brown and Company, 1995), 55, 98.
- 65 Hallion, 136.
- 66 Williamson Murray, *Air War in the Persian Gulf* (Baltimore, MD: The Nautical & Aviation Publishing Company of America, Inc., 1995), 12-3.
- 67 Tom Clancy with General Chuck Horner (ret.), *Every Man A Tiger* (New York: G.P. Putnam's Sons, 1999), 506-9.
- 68 Williamson Murray, *Air War in the Persian Gulf* (Baltimore, MD: The Nautical & Aviation Publishing Company of America, Inc., 1995), 12.
- 69 Ibid., 14-5.
- 70 Hallion, 157.
- 71 Murray, 27.
- 72 Hallion, 178-85.
- 73 A 2017 airport report on European aviation shows 2,250 airports in the European Union. Helen Massy-Beresford, "Electrical Aircraft May Eventually Shake Up the Airline Business," *Aviation Week & Space Technology*, August 19-September 1, 2019, 47.
- 74 During Saudi Arabia's war against the Yemen Houthi rebels the rebel's Iranian ally has successfully attacked Saudi oil facilities with drones that may cost less than \$15,000 or less to build. Palko Karasz, "Saudi Facilities Are Set Ablaze In Drone Strike," *The New York Times*, September 15, 2019, 1.
- 75 John A. Tirpak, "PACAF Boss Calls for a Roles and Missions Discussion About Air Base Defense," *Air Force Association News*, 9/20/2019.
- 76 General Brown has explained that to respond to Chinese and Russian long-range missiles the USAF needs the ability to disperse. He states that "The more airfields I prove I can operate from, the more airfields our adversaries have to account for. We need to shift and move." John A. Tripak, "Questions & Answers: Toward a Seamless Pacific," *Air Force Magazine*, October 2019, 9.

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