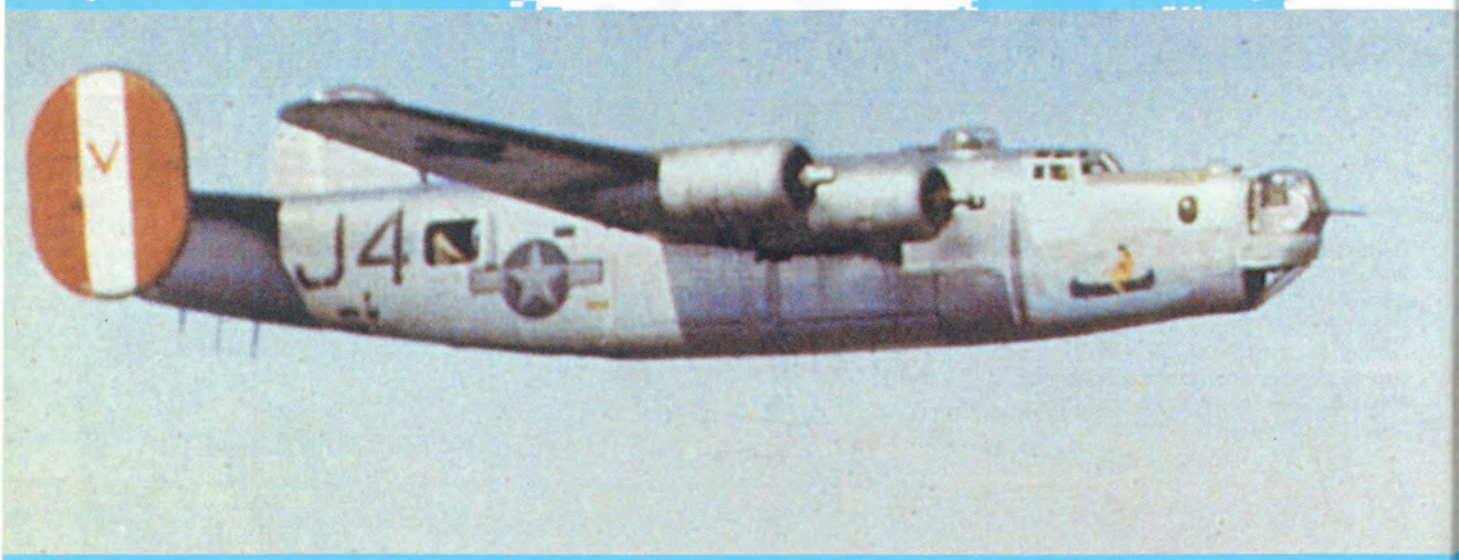

To Kill a

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Stalking Bird:

Fodder for your Professional Reading on Air and Space Superiority.*

Part One

Since the earliest days of aviation, the most important and probably least controversial of the Air Force missions has been Air Superiority – and now Air and Space Superiority.[1] In fact, most of the initial impetus for the development of the capability to control the air came from the ground generals in World War I. Air reconnaissance and artillery spotting had become so important to ground battle that they wanted to prevent enemy interference with their own and deny those functions to the adversary. By the middle of the Great War, that led to the genesis of air units specialized to command the air.[2] It is clear enough that though airpower had not been decisive in that war, soldiers and airmen alike predicted that in future campaigns it would be necessary to control the third dimension before other goals could be achieved there, on the ground or at sea.

Hopefully, the reader and Harper Lee[3] will indulge my play on words in the title. My excuse is that most of the time American air combat has taken place not in defensive roles, but rather on the offensive – to protect our attacking air-to-ground birds that themselves were being stalked by Fokkers, Messerschmitts, Mitsubishis and MiGs. The purpose of this essay, then, is to give the reader a survey of the way that our theory, doctrine and technology for Air and Space Superiority has evolved. Hopefully that will be a stimulant for additional professional reading on the subject. Finally, the essay will review an important new work on the subject, Colonel Marshall L. Michel's *Clashes: Air Combat over North Vietnam: 1965-1972.*[4]

* I wish to acknowledge the expert assistance of Major Scott Walker of the Air Force Doctrine Center and Majors Matthew Donovan and Lee T. Wight of the School of Advanced Airpower Studies as well as Major Pete Osika of CADRE in the preparation of this essay – the shortcomings are all my own.

A Shoestring Primer on the Evolution of Air and Space Superiority Theory and Doctrine.

First World War, 1914-1918: There had been stray thoughts about the need to command the air even before the outbreak, but as of 1914 air units had not been specialized according to function. Air combat did begin even in 1914, but it was not very effective then. However, technological gains in engines and armament made it more important to specialize squadrons intended to command the air – both engine power and the development of synchronizers were important here. Air superiority swung from one side to the other because of advances in air combat, and there was even an early example of what we would call Offensive Counter Air (OCA)* today when the British had to withdraw several fighter outfits from the front to respond to the German air attacks on London – which yielded an advantage to the Germans over the front.

Interwar Period: 1919-1939: In general, most airmen emerged from the War with the notion that the key to air superiority was air combat between fighters. In the U.S., for example, the First Pursuit Group was thought of as the elite unit of the Air Service and early Air Corps until the late 1920s. However, the march of technology and the arguments of Giulio Douhet made the notion of air superiority through attacks on enemy airpower on the ground ever more attractive. Mitchell thought that air superiority might be achieved through some mixture of air combat and ground attack, but Douhet thought that the latter would be by far the most important element. As the 1930s wore on, though, Air Corps thinkers were increasingly won over to an Offensive Counterair approach.

World War II: 1939-1942: Radar had been little anticipated before the Second World War, yet it did much to weaken the potential for OCA and strengthen the air defense. The Luftwaffe achieved some marvels by opening its attack on Poland and France with assaults on enemy airpower on the ground – and then again against the Red Air Force in 1941. But in the interim in 1940, in large part because of Radar, the attack on the RAF and its infrastructure on the ground failed. The US 8th Air Force made a major effort to wreck the German air force and its supporting aircraft industry on the ground, but the results were disappointing to say the least. Though the shortage of oil (in part due to US air attacks on synthetic plants) weakened the Luftwaffe, General Carl Spaatz and many others emerged with the conclusion that the air battle between the escorts and the stalking Focke-Wulfs and Messerschmitts had been essential to the winning of air superiority. Up to that point, practically all of the air-to-air kills had been done by guns (and unguided rockets.) Most other countries were moving to cannons toward the end of the war, but the U.S. stuck with the .50 caliber.

The Dawn of the Cold War: 1945-1965: A combination of things made the USAF increasingly specialized in long-range nuclear attack during the late 1940s while the rest of its functions were sadly underfunded. Nuclear weapons, jets, and long range missiles were coming on strong and the thought was that any war would be short and total. However, we got into Korea and because the unanticipated political limits prevented a true OCA attack across the Yalu, most of the job was done with air-to-air combat in the extreme northern reaches of the peninsula. It was the first great campaign among jets, but the weapons were still guns--.50 caliber Brownings on the US part, and cannons on the Communist side. The technical virtues of the MiG-15 were a nasty surprise to us, but we decided that crew experience and training had been decisive. After the Korean War, the U.S. returned to its emphasis on strategic nuclear attack though it was still introducing new jet fighters at short intervals. By then, she was going over to cannons, the 20 mm appearing first in the late models of the F-86 and the now-standard M-61 of the same caliber first appearing in 1958 in the F-104 and F-105. By the end of the 1950s, the U.S. led the way into the air-to-air missile (AAM) the first kill being made by a Sidewinder from a Chinese Nationalist F-86 in 1958. Toward the end of the period, a portent of things to come was the downing of a US U-2 over the USSR in 1960 by a surface-to-air missile (SAM). The greater part of 8th Air force losses in the last year of World War II had been to AAA, but the surface element of the air superiority battle nevertheless received little thought before Vietnam.

* OCA are offensive operations intended to destroy enemy airpower on its bases or in its factories, or through air battles over its own territory. Defensive Counterair is to win air superiority through air defense over one's homeland as with the RAF in the Battle of Britain.

High Noon of the Cold War: 1965-1982: There had been substantial enthusiasm for AAMs before Vietnam, but their kill ratios turned out to be disappointing, and it was deemed necessary to go back to a gun installation in fighters where it had been omitted. The ground defenses in North Vietnam turned out to be more formidable than had been foreseen, and that stimulated the building of a Suppression of Enemy Air Defenses (SEAD) capability that had not been much anticipated. There was a synergy between the North Vietnamese fighters, SAMs and AAA that had been underestimated. Most of the US fighters had not been optimized for the air battle, and that was costly. All the same, the greater part of the kills were done by infrared and radar missiles, and in the Arab-Israeli wars the trend was duplicated. The Israelis achieved a classic victory with an OCA attack in 1967, but the air battle was much more important in 1973 and there, too, the missile kills were becoming a greater part of the whole. By 1982, all of the British kills in the Falklands War were done with missiles and almost all of them in the Israeli operation in the Bekaa Valley that same year were by the same method.

Twilight and Sunset of the Cold War: 1982-Present: The USAF reacted to the frustrations of Vietnam in part by designing three new fighters: one optimized for air combat (F-15), one for Close Air Support (CAS) (the A-10), and one swing-role bird (F-16) for both ground attack and air combat. Later, it moved to create a follow-on to the F-15C with the F-22, originally optimized for air-to-air combat. Unlike the F-4C, all these aircraft except the A-10 came equipped with the M-61 20mm cannon plus missiles, though most of the F-16s had only infrared Sidewinders. The F-15 came with both Sidewinder and Semi-active Radar Missiles (AIM-7, Sparrows), and later when the AIM-120 active radar missile proved successful both aircraft were retrofitted with it. Again in the Gulf War, almost all of the kills were by missiles, and the U.S. seems to have suffered only one loss to the stalking birds, a Navy airplane that may have fallen to a MiG missile – all the rest of the losses were to SAMs and AAA. By then, though, stealth had entered the equation to weaken the SAM threat and the SEAD also helped greatly. At the end of the day, many airmen hoped that the U.S. dominance of the Gulf War air battle might be continued by the coming of the F-22 with all the advantages discussed above plus stealth, supercruise, (sustained supersonic speed without afterburner) and an ever increasing information edge.

THE CURRENT CONCEPTUAL FRAMEWORK: AIR & SPACE SUPERIORITY

The current official vision of the way in which superiority in the third dimension, the air and space regime, should be achieved and maintained is contained in Air Force Doctrine Document 1 of September, 1997. It is signed by the current USAF Chief of Staff, General Michael E. Ryan.[5] Doctrine is said to emerge from history and from speculative thought, and there is much in the current concept that has come down to us from the earlier manuals and experience in war.

The new document asserts that the offensive is often the more effective way to foster air superiority. That has been a strongly held notion among airmen from the very beginning.[6] Thus, the function is divided up into "Offensive Counterair" (OCA) and "Defensive Counterair" (DCA) with the airman's preference usually being the former. For a time, the USAF was proposing that the conceptualization of the function include yet another mission area, the "Suppression of Enemy Air Defenses," (SEAD), but it was unable to persuade our allies to go along with that to make it a part of NATO doctrine.[7] So in that context, SEAD has remained a part of OCA and that practice is now also carried into the new USAF basic doctrine manual.

One of the ideas inherited from the past has to do with Air Superiority as an objective. Giulio Douhet thought that the mere achievement of command of the air would make the enemy case so hopeless that it might even be enough to impose one's will on him without the need to punish his civilian population and wreck his economy.[8] But it did not turn out that way in World War II, and by the time the USAAF set to writing its scheme to defeat Germany in the summer of 1941(AWPD-1), it was clear to the authors that air superiority was instead a means to an end. It was not a final objective, but an intermediate one that would take priority in point of time to enable the achievement of later goals.[9] It is the later concept that is in the current USAF doctrine manual, asserting that the struggle for air supremacy, or at least air superiority, usually has to be the first call on the air commander. It does recognize, however, that sometimes in desperate ground emergencies, it may be necessary to divert air forces to the support of the ground units. It also allows that sometimes the battle for air superiority may be conducted simultaneously with other operations – parallel attack to use the modern vernacular.[10] As noted, it does distinguish between Air Supremacy and Air Superiority and laments that sometimes the achievement of the former may simply be too expensive. It also warns against premature relaxation of the pressure because of the possibly huge penalties of even a temporary revival of enemy ability to contest the command of the air. Finally, in its discussion of the "Core Competencies" the new manual unifies the effort to achieve space superiority with the battle for air superiority. In a later chapter when discussing the functions of air and space power, it creates separate categories for counterair and counterspace.[11]

In its discussion on functions and elsewhere, the 1997 version of basic doctrine continues the traditional Air Force emphasis on the centralization of command – especially for the sake of the battle for control of the air – both OCA and DCA must be under the command of a single airman in order to implement the idea of centralized control and decentralized execution for the most efficient accomplishment of those functions.[12]

THE GENESIS OF AIR SUPERIORITY THEORY & DOCTRINE:

Central to the very definition of professionalism is the requirement that the members have a specialized expertise and a system of schools to develop it. In America, at first, it was a technical expertise: civil engineering for the Army and mechanical or steam engineering for the Navy. But after the Civil War, the technical dimensions were reduced and the education systems focused more on the professional officer as a military rather than technical expert. As with other professions, the history of the development of this expertise was a vital part of the professional's understanding.[13] So, it can be argued that he who would understand the current conceptual framework for the primary USAF core competency must know something of its evolution.

It is not at all surprising that the idea that one must control the medium in which he operates should come to the fore in the very earliest days of aviation. At the outbreak of World War I, we were emerging from the heyday of Alfred Thayer Mahan during which his argument was that if a state gained command of the sea, then all else would follow. Even Douhet was explicit in the notion that the concept should be expanded from the sea to the air.[14]

...by World War One, artillery projectiles could be made to reliably burst above the surface and to shower thousands of high-velocity fragments on those in the open below

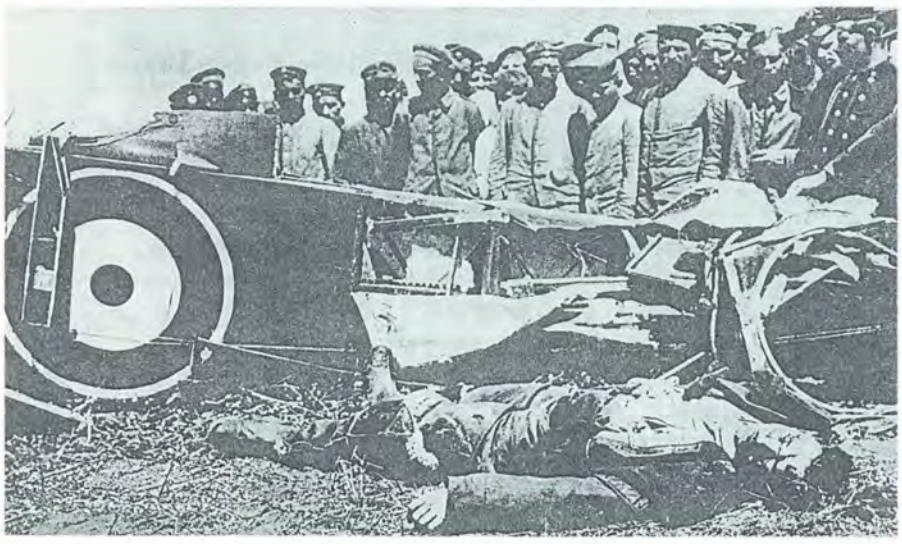
The machine gun is often given the major credit for the World War I defensive stalemate when it should really be more widely shared with many other factors. Artillery was one. The Civil War round used to fragment into two or three pieces. However, by World War One, artillery projectiles could be made to reliably burst above the surface and to shower thousands of high-velocity fragments on those in the open below. On the defensive, the infantry man was in a trench; on the offensive, he was in the open. Another factor was the presence of prying eyes above, some in balloons but many more in aircraft. It was then the rule that the offensive had to have a numerical advantage of three or four to one to have any chance of overcoming a prepared defensive line. But how was a general to accumulate that kind of mass when the aircraft were warning his adversary in plenty of time to undertake countermeasures? So it happened that a cry came up first from the ground commanders that air superiority must be had over the battlefield. The ground general must have a free ride for his own observation aircraft; the enemy general must be denied a free ride for his.[15]

But how could an air force achieve this? Immediately after the Guns of August spoke their piece, aviators began casting about for methods of gaining air superiority. Some of the things tried seem pretty bizarre now. The Russians actually achieved an air-to-air kill with a towed grappling hook. The British flew above attacking Zeppelins to drop flaming darts onto their hydrogen-filled envelopes. Booby traps were set up in the baskets of captive observation balloons by filling them with explosives. When an attacking fighter rolled in on them, the observer would parachute out of the basket and the operator on the ground would detonate the charge when the enemy was near the balloon.[16]

But the problem was gradually overcome by a combination of more conservative measures. First, engine power was increased rather rapidly as propulsion was still on the steep part of its development curve. Also, the Lewis gun was adapted to aerial combat and it was only about half as heavy as the Maxims and Vickers of older design – and it did not need a water jacket. But if one added a second crew member to man the gun, then the weight increase would certainly prevent overtaking enemy aircraft and therefore defeat the purpose. Putting the guns outboard of the propeller arc was tried, but neither they nor their ammunition was yet reliable enough to place them out of the reach of the pilot. Finally, means were found to fix the gun to the aircraft and fire it through the propeller arc without shooting one's self down. Thus, the pilot was then able to aim his whole aircraft at the target without trying to fly and manipulate a gun at the same time.[17]

But technology alone was not enough. By the middle of the war, the general purpose aviation units were supplemented by specialized squadrons. On both sides of the line, organizations optimized for air combat were built. On the German side, a defensive policy was generally followed – usually the aviators were instructed to give combat only over their own territories. In the British case, Hugh Trenchard at the head of the Royal Flying Corps for much of the War, consistently ordered an offensive approach – which led to many combats over the German lines and considerable losses. The role of the dogfight in all this has been romanticized in the popular literature. The vast majority of kills were done on crews who did not know they were under attack until they were hit – one pass and away was already a good tactic.[18] By mid-war formation flying for the sake of both mass and situational awareness was common practice on both sides.

In general, it is probably fair to say that most aviators carried away the idea that air superiority was the most important mission, and that it is best achieved in an air battle. Airdrome attack had been tried, but was not all that successful. No one had given much thought to anti-aircraft artillery before the war, and it was held in disdain by most of the aviators coming home.[19]



Hugh Trenchard at the head of the Royal Flying Corps for much of the War, consistently ordered an offensive approach – which led to many combats over the German lines and considerable losses

Most airmen and soldiers realized that airpower had not been a decisive factor in the outcome, but most of those were predicting that command of the air would soon become necessary to the success of all other operations on land, at sea and in the third dimension. In the words of Billy Mitchell himself:[20]

> *The principal mission of Aeronautics is to destroy the aeronautical force of the enemy, and, after this, to attack his formations, both tactical and strategical, on the ground or on the water.*
>
> *The secondary employment of Aeronautics pertains to their use as an auxiliary to troops on the ground for enhancing their effect against hostile troops. It is this feature of the employment of Aeronautics that I shall deal with principally in this talk...*

THE INTERWAR AIR SUPERIORITY THOUGHT:

Mitchell was undoubtedly speaking for the majority of airmen in the early twenties in insisting that air superiority was the first mission and a prerequisite of everything else. Those were austere times, and only three groups were allowed the Air Service, organized along functional lines. The fighters (then called pursuits) were brought into the First Pursuit Group and clearly that was *the* elite organization. There was one bomb group, the Second, and one attack unit, the 3d Attack Group. It was clear enough that Douhet then thought that command of the air in the future would be achieved by massive attacks on enemy air forces and their supporting structures on the ground. But in America the thought was that a part of the contest would take place in the air. Douhet contended that bomb units might well be all that was required, but Mitchell in the early twenties argued that a balanced force of fighters, bombers, ground attack and observation aircraft would be necessary.[21]

Mitchell was undoubtedly speaking for the majority of airmen in the early twenties in insisting that air superiority was the first mission and a prerequisite of everything else

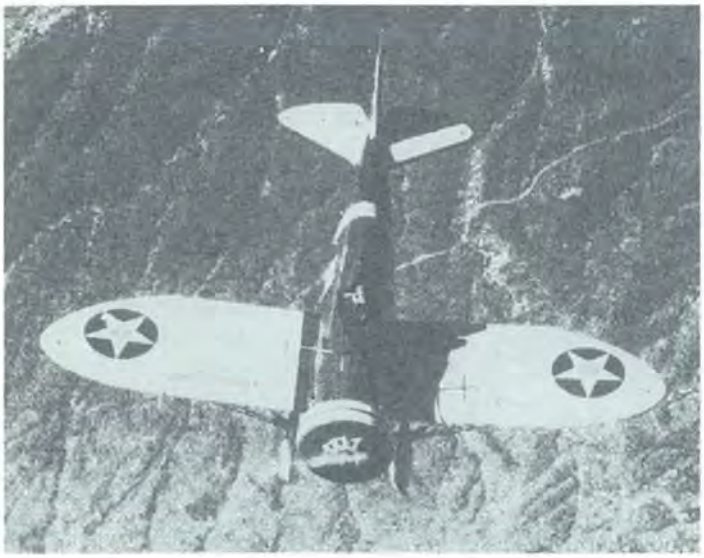
Mitchell was court martialed and convicted in late 1925 and he resigned from the Army in early 1926. From about that time forward he moved away from his original balanced-force approach and toward Douhet's concentration on strategic attack.[22]

There can be no doubt that the strategic bombing mission was further elaborated and emphasized at the Air Corps Tactical School in the years that followed. However, it is also to be noted that it has often been exaggerated into an obsession in the literature. Neither the attack nor the air superiority mission was ignored and both were in the curriculum throughout the interwar period.[23]

At the school a heated debate went on in the early and mid-1930s between Chennault and a few other pursuit advocates versus the prevailing majority of bomber enthusiasts.[24] He questioned the "Big Sky" concept and the notion that the bomber would always get through. He asserted that an air defense system was practical given a competent early warning network. However the bomber advocates, arguing in the absence of any knowledge or anticipation of radar, rejected the Chennault

argument. Not only did Chennault agree with the bomber people that the escort fighter was probably an impractical concept, he also asserted that such use of fighters yields their most precious asset: the initiative.

Too many historians have indulged in the wisdom of hindsight to paint Chennault as a pariah who was right and who was drummed out of the service because of his outspokenness in a correct cause. But arguably Chennault was wrong and the establishment was right – in the context of the facts then known and assumptions that could *then* be reasonably made. First, much of the literature was highly colored by the knowledge that five years later the defense worked in the Battle of Britain. The bomber did not get through. However, radar and an integrated command and control system was in place for the Battle of Britain. The disastrous experience of the 33d Pursuit Group at Thelpte in Tunisia two years later in the absence of radar and a competent reporting system showed what was likely to occur.[25] In the mid-1930s it would have taken a superhuman act of foresight to anticipate the coming of radar in just five short years.[26] Even in Chennault's own theater, China, his argument is weakened by the fact that the Japanese had more important fish to fry than to wreck his forces. In 1944, when the Japanese had been set back on their heels everywhere else, they marched against Chennault's bases in China and were not to be stopped. Finally, the drumming out part of the story has also been dramatized. As Martha Byrd has shown, Chennault had a lucrative contract in hand in the summer of 1936 from the Chinese Nationalists *before* he put in his retirement papers.[27]



The first metal monoplane fighter to reach line service in any of the major air forces was the Boeing, P-26 "Peashooter"

Further, a plausible case can be made that the Air Corps certainly did not ignore the need for progress in either ground support or pursuit, notwithstanding the emphasis, perhaps even overemphasis, on strategic attack. The doctrinal equivalent of "putting one's money where his mouth is" may be the kinds of equipment that actually got on to the ramps of attack and pursuit units.

The first monoplane metal bomber got on to the line of the Air Corps in 1932 – the Martin B-10.[28] The first metal monoplane fighter to reach line service in any of the major air forces was the Boeing, P-26 "Peashooter." It arrived the next year, 1933.[29] The first monoplane in the British service, where the threat of bombing attack was much greater than with the U.S. was the Hurricane which got to squadrons in 1937 – and did so with fixed-pitch wooden propellers and a partially fabric covered fuselage. The first unit in the German air force to receive monoplanes traded its biplane He-51s for Messerschmitt 109s in the summer of 1937.[30] The first monoplane fighter in the carrier deck loads of the Navy was the Brewster Buffalo which was delivered in 1939. The first Air Corps monoplane

fighter with closed cockpit and retracting landing gear was the Seversky P-35 which first flew in 1935 and was ordered in quantity in 1937. The Curtiss P-36 was similar and it, too, first flew in 1935. Delivery of the production models began early in 1938 and some P-36s were in combat against the Japanese at Pearl Harbor.[31]

The first monoplane fighter in the carrier deck loads of the Navy was the Brewster Buffalo which was delivered in 1939

The first Soviet monoplane fighter with retracting gear and closed cockpit, the Polikarpov I-16, went into squadrons starting in 1934 and outclassed the German and Italian fighters in the first part of the Spanish Civil War – albeit that the Russians were still dependent upon Western technology transfer for their engine designs.[32]

The point is that notwithstanding that there was practically no bomber threat against the American homeland, pursuit design was not ignored. It was only in the last months before the war that European fighters began to open a lead over those of the U.S. – and with good reason because they were much more threatened by possible bombing attacks.

About the time that the B-17 first flew and the P-35 and P-36 were coming in to service, a major reorganization of the Army Air Corps took place. In 1935, the GHQ Air Force was established with headquarters at Langley Field, Virginia. It was made up of three wings and resembled the current composite wings much more than the organizations the USAF has had for most of the time since Pearl Harbor. That is to say that each had a variety of types: including bombers, fighters and sometimes attack aircraft. Theoretically each of the wings was similar and qualified for all the Air Corps' missions. However, the 2d Wing at Langley Field had all of the B-17s and the 3d Wing at Barksdale Field was more oriented toward the attack mission. Neither the First Wing at March Field nor the other two could be described as having pursuit as a primary function – though all three possessed fighter squadrons.[33]

On the eve of Hitler's attack on Poland, then, there was a heavy emphasis on long range bombers in the Air Corps though the equipment to implement that was still scarce. That implied that a substantial portion of the battle for air superiority would be through the OCA attack on those bases in striking range of the US homeland – the grand strategy was still purely defensive in outlook and the primary mission was defense. There were indeed some doubts among the airmen that the bomber could go it alone. The development of an escort fighter was a low priority – and the hope was that the bombers could be made self-defending. Perhaps that was only making a virtue out of necessity (or perceived necessity) since the feeling was widespread that any escort with enough tankage to go the route with the bombers would necessarily not be agile enough to contend with the short range interceptors at the far end of the trip.[34] Though General Arnold was aware that the Navy was doing research in the area, in the rest of the Air Corps there was not even a glimmering that radar was just around the corner.[35] He was also getting feedback by the summer of 1940 that the Me-110 which *had* been designed as a long range escort fighter was a failure in the Battle of Britain and it had itself to be escorted.[36]

THE IMPACT OF WORLD WAR II:

Poland: The German attack on Poland in 1939 seemed to be a splendid demonstration that Douhet had been right. The best place to get the stalking birds was in their nests where they were helpless. That part of the Polish air force that escaped did so by dispersing to outlying bases – where the maintenance and supply support was so poor that the sortie rate was driven so low that it was ineffective.[37] Offensive Counterair seemed to be the way, and nothing in the experience seemed to contradict the general notion that air superiority came first, then interdiction and where necessary direct support of ground forces through Close Air Support (CAS).

Battle of Britain: Dunkirk before and Barbarossa after the Battle of Britain seemed to mask some of the doubts that should have arisen from the fight over the British Isles. The Germans started with their standard OCA against the RAF on the ground, but it did not go as well as it had in Poland. Here it was faced with an integrated air defense system (IADS) – the first in the world. It included radar, a first class pair of fighters which were agile and heavily armed, a competent command and control system, and an elaborate anti-aircraft structure under the operational control of the air commander. Further, it also included a good organization of ground observers to supplement the radar and first class communications. The Luftwaffe persisted in its OCA attack for a while, but when frustrated turned to other objectives (like London) shy of having achieved the command of the air. By mid-September, 1940, it had been defeated. It had made a start against the British radar, but for several reasons still underestimated its importance.

There were many "lessons" coming out of the Battle of Britain. Among them was the notion that maybe the bomber would not always get through after all. Defensive Counterair (DCA) can sometimes work. In the words of General Carl Spaatz at the time:[38]

> *A well dispersed air force is a most difficult target to destroy on the ground. Bombing attacks against airdromes have resulted in surprisingly little damage against aircraft and combat crews although considerable damage has been done to buildings and major permanent installations. However this damage does not prevent the units from operating effectively. On the other hand the action of fighters against hostile daylight raids has been very effective and in such cases where airplanes are brought down the combat crews are casualties, this in contradistinction to the destruction of planes on the ground. Since the combat crew eventually becomes the neck of the bottle this makes destruction in combat doubly effective. The RAF officers I have spoken to on this subject state that their pre-war conception that the place to destroy an Air Force is at their nests was wrong...*

Combined Bomber Offensive: The initial British attempts at bombing the Germans seemed to affirm that DCA had much more potential than had been anticipated, and the RAF went over to night operations to preserve the security of the bomber force. This was done at a considerable cost in target acquisition and bombing accuracy, but it seemed necessary.

When the Americans got into the bombing of Germany they, too, learned that the bomber might not be able to get through with acceptable losses. Too, the USAAF made more of an effort to establish air superiority through offensive counterair than did the RAF. The airfields and aircraft factories did prove hard to get, and later the impact of bombing the Luftwaffe's fuel sources was felt only gradually, though from the late spring of 1944 the effect proved increasingly significant.

...in the first half of 1944 most of the mayhem worked on the Luftwaffe was done in the air – by US long-range fighter escorts and the gunners of the bombers

But, in the first half of 1944 most of the mayhem worked on the Luftwaffe was done in the air – by US long-range fighter escorts and the gunners of the bombers. Air superiority was achieved by the deadline, the invasion of Normandy. However, the factors leading to that result were complex indeed. Suffice to say at this point that the USAAF leaders came away with the idea that the bombers could only get through with acceptable losses through a campaign that resembled Mitchell's approach more than Douhet's. There would have to be both an air battle and an attack on the ground echelons of the enemy air force plus its supporting infrastructure. Even in Russia, the effects of the German OCA assault at the outset were only temporary and at the end of the day the USSR owned the air, very largely through air battle there and over Germany itself. In the words of two of the principals:[39]

> General Carl A. Spaatz: *When did you know that the Luftwaffe was losing control of the Air?*
>
> Reichsmarschall Herman Goering: *When the American long range fighters were able to escort the bombers as far as Hanover, and it was not long until they got to Berlin. We then knew we must develop the jet planes. Our plan for the early development of the jet was unsuccessful only because of your bombing attacks.*

The US Strategic Bombing Survey seemed to agree. It attributed the German loss of command of the air to a combination of attrition of fighters in the air and on the ground, and damage to aircraft production that delayed that program and assured air superiority over Normandy. Command of the air was then sustained by the additional measures of destruction of aircraft fuel sources, and finally the disruption of the transportation system which wrecked supply and aircraft repair.[40]

Pacific: In the end, the War against Japan did not do much to change the perceptions of the nature of the battle for air superiority. In the Pacific, too, the factors leading to command of the air for the Allies were complex.

Severe attrition was put upon the irreplaceable Japanese pilot force at the Battle of Midway and during the Solomons Islands Campaign. The Japanese committed their best surviving naval air units to the latter struggle and lost them. But they proved unable to replace them in part for the want of fuel, technological limitations and bad doctrines. Literally hundreds of half-trained pilots went down in the 1944 Battle of the Philippine Sea to cite but one of many examples.

Yet, there were also some classical OCA operations against Japanese bases in New Guinea before then, and the Southwest Pacific Campaign might even be seen as one designed to capture air bases with the ground forces acting in support of the main striking arm, the air forces. Again, the need for escort was demonstrated there, and the length of the leaps that MacArthur's forces made was usually determined by the range of the fighters available.

By the time that the B-29 attacks on the Japanese homeland started, the two Japanese air forces (Army and Navy) were too weak to do much about them...

By the time that the B-29 attacks on the Japanese homeland started, the two Japanese air forces (Army and Navy) were too weak to do much about them, even if they somehow could have been persuaded or coerced into cooperating with one another. The bomber losses over Japan were but one third of what they had been over Europe. Too, the Japanese training system had degenerated to the point where nearly half of their losses were non-combat – getting lost or crashing on landing and the like. The Allies by mid-war enjoyed a substantial qualitative and quantitative advantage in aircraft and their weapons and though the Western organizations were hardly more unified in command than the Japanese, there did seem to be more unity of effort through cooperation.[41]

JUDGMENTS:

It has seldom happened that victory is so complete that the winner has complete access to his victim's country, and even to his archives. That did happen with both Germany and Japan in World War II. Even that, though, does not reveal a picture that is absolutely complete and absolutely true. Often, the defeated will tell the victors what the latter want to hear. Often the investigators will somehow reveal to the defeated that which they want to hear. Often, much of the desired data is lost in the final fires. But the US Strategic Bombing Survey (USSBS) is about as valid feedback as one ever gets from wars. Its final judgment on air superiority in World War II was expressed thusly:[42]

> *The German experience suggests that even a first class military power – rugged and resilient as Germany was – cannot live long under full-scale and free exploitation of air weapons over the heart of its territory...*
>
> *The significance of full domination of the air over the enemy – both over its armed forces and over its sustaining economy – must be emphasized. That domination of the air was essential...*

THE BATTLE FOR COMMAND OF THE AIR IN KOREA:

At the time of the Strategic Bombing Survey report, few people thought that any war in the future would be anything but a total war. Fewer still thought that our wartime ally, the USSR, would soon be our enemy – and that before the decade were gone she would have exploded a nuclear device. And fewer yet suspected that we would again be involved in an overseas war before the aircraft with which we had fought World War II had been worn out.[43]

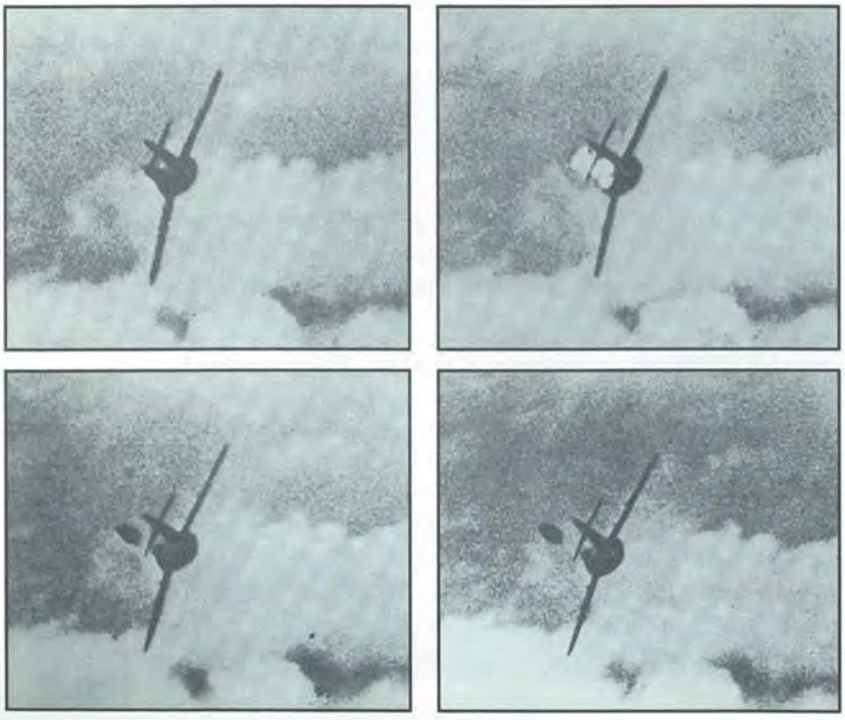
Yet we were back in combat in Korea before the fifth anniversary of V-J Day. The tiny North Korean Air Force was wiped out in short order, but soon the Peoples Republic of China, now the second great communist state, had intervened in the war. Airpower was a disappointment in Korea to most airmen. But it was not because of the want of air superiority. Most of them felt that we enjoyed more or less complete superiority not only over the battle lines but all the way up to the Yalu River. It is true that there were some pretty fierce air battles, by then all jet, over the northernmost reaches of North Korea. However, the United Nations forces seemed to have a free ride all over South Korea and almost up to the northern borders of North Korea.[44]

Many interpretations of the frustrations with airpower rest upon the notion that the new form of limited war denied the UN forces the possibility of conducting an OCA campaign against the communist air forces on the ground. Rather they had to depend wholly on the air battle and to do so at a long range from friendly air bases and in the enemy radar environment. That yielded three great advantages to the enemy: numbers, the ability to refuse battle, and ground control intercept direction by radar.[45] Too, the Chinese Air Force had MiG-15s that were surprisingly competent in some ways even in comparison to the U.S. F-86 Sabre which was the jet that did most of the air combat on the UN side. Until very late in the war, the American airplanes were armed only with .50 caliber machine guns whereas the MiGs had cannons – with much heavier projectiles albeit with a lower rate of fire. Missiles were not on the scene yet for either the air or the ground defenses – though ground fire did impose many casualties on UN aircraft.

The war did have an OCA dimension to it notwithstanding that the Rules of Engagement (ROE) prohibited the B-29s from crossing the border and the MiGs made it too dangerous for them to do so in any event (in daylight.) The Chinese did, however, try to extend their base structure southward to increase their pressure on the interdiction airplanes in the north and perhaps to provide some air support to their troops in the line. However, the B-29s and fighter-bombers were successful denying that extension by their continual attacks on bases under construction.[46]

The organization of airpower in the Korean War was anything but centralized. The USAF did create a Joint Operations Center and won the cooperation of the other services in it, but that had little effect on the air battle. The air combat in MiG Alley up at the Yalu was largely an Air Force affair as the Navy and Marine Corps did not yet have fighters that were at all competitive with the communist jets. So, the lack of centralized organization did not matter much for the air superiority battle.[47]

In the end, the judgment was that the superior combat experience among the American flyers was the decisive thing in generating the overwhelming kill ratios against the MiGs. The Sabre was not superior to the MiG-15 in some important respects. Its armament had a much higher rate of fire,



...the judgment was that the superior combat experience among the American flyers was the decisive thing in generating the overwhelming kill ratios against the MiGs

F-86 Gun Camera footage. MIG-15 pilot ejects from doomed aircraft

Before Eisenhower left office, the first Surface-to-Air Missile (SAM) kill was achieved when a US U-2 was brought down over Russia by a SA-2

but the communist cannons had a much larger projectile weight. The MiG also had a weak gunsight, a small ammunition load, and guns that often jammed.[48] The official organization certainly had little to do with the ratio. The communists had the advantage in command and control in their own GCI environment. They also had the ability to refuse battle, and a large numerical advantage. So, there is little left but combat experience to explain it. And that was largely fortuitous. Only five years had passed since World War II, and many of the seasoned veterans of that conflict were still in good shape and on active duty or in the reserves.[49] Perhaps all that led to complacency in America – especially in light of the fact that few came away with any thought of ever again engaging in a limited war on the Asian mainland.

AIR SUPERIORITY IN VIETNAM

In the years immediately following Korea, the Commander-in-Chief and the Secretary of State were telling the country there would be no more Koreas. Though fighter and ground attack aviation were never ignored altogether, the emphasis was very much on Massive Retaliation. It was the heyday of the Strategic Air Command, and for all others it seemed that the only way to get funding was to acquire a slice of the nuclear pie. Still, it was during the Eisenhower Administration that some important things were done that affected US conventional war capabilities. The Forrestal class of aircraft carriers came on the line – the Navy got its supercarriers after all. The C-130 rolled out in 1956 to become one of the most successful tactical aircraft programs ever. One of the best nonnuclear weapons in history, the M-61 Gatling Gun, got its Initial Operational Capability (IOC) in 1958 aboard the F-104 and F-105. Too, air-to-air missiles (AAMs) appeared for the first time and one of them, the AIM-9 Sidewinder, got its initial kills aboard Chinese Nationalist F-86s that same year.[50] Before Eisenhower left office, the first Surface-to-Air Missile (SAM) kill was achieved when a US U-2 was brought down over Russia by a SA-2. That these things would work a substantial change on the world of air combat was only dimly perceived.

History may record that in one respect, the Eisenhower Administration's foresight was crystal clear: the space part of Air and Space superiority. The German combat employment of ballistic missiles in World War II even while General Eisenhower was campaigning across France set the world thinking about the future of space and space weapons. Soon after, both RAND and the Scientific Advisory Board were declaring that satellites and ICBMs might soon become practical.[51]

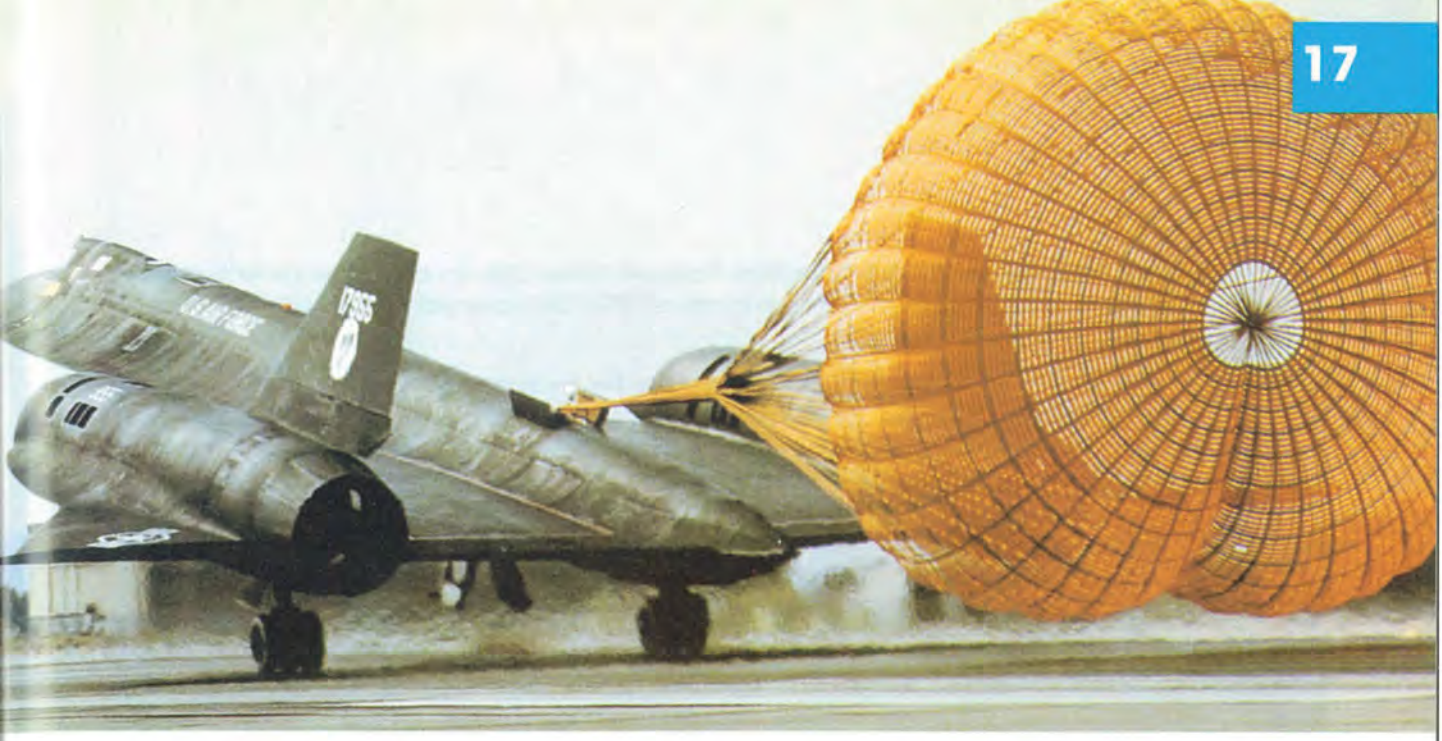
The remarkable thing about the initial space policy was that Eisenhower, himself a military man, chose the "Freedom of the Seas" rather than the "Command of the Air" model to be sought as humanity first extended its military activity into space. Well before anybody had orbited anything in space, and before he could have had an inkling that the Russians would do so first, President Eisenhower established the policy of freedom of space – similar to freedom of the seas. A part of that was his "Open Skies" proposal at the summit of 1955 and his whole effort to keep military space and civilian space activities strictly separated – and to give the latter a commanding role. His whole effort was greatly facilitated by the fact that the Soviets under Khrushchev launched Sputnik without any attempt to get permission for overflight and the satellite clearly flew over US territory repeatedly and with impunity.[52]

So, well before Gary Powers was shot down in the U-2 for violating Soviet airspace (May, 1960), the Eisenhower Administration had established the freedom of space idea to facilitate space reconnaissance that was to underwrite the viability of both deterrence and arms control. At first and for a long time, the space program clearly had a strategic orientation though it sometimes had tactical effects. Among its early achievements were the revelations that neither the "bomber gap" nor the "missile gap" had any basis in fact. That was an important factor in the leveling off of the US strategic nuclear order of battle which in turn led to the stabilization of the nuclear arms race.

Space-based weather forecasting began to have a significant effect on the Vietnam War. Communications technology was so facilitated by satellites that it actually became an impediment in some cases. During the 1975 evacuation of Saigon, for example, the presence of a satellite communications terminal in the Defense Attache Office (formerly the MACV Hq Building) was a godsend. Ultimately all other links with the outside world were broken. But the satellite communications made it so easy for many leaders everywhere to reach the few officers responsible for marshalling the evacuation that they hardly had time to attend to their urgent duties – they were so busy answering queries from every headquarters between Nakom Phenom and Washington.[53]

Two years earlier, during the Yom Kippur War, the superpowers had been better informed as to what was going on at the battle front than were the combatants themselves. In part, this was due to high-altitude reconnaissance from the SR-71 and the Foxbat. In part, too, both sides were getting photographic intelligence from satellites that was instrumental in bringing a truce to the fighting – and to the stabilization of Middle East politics ever since.[54]

Up to that point then, I suppose that one could argue that the US did not have space superiority. She could operate freely there herself, but could not deny the adversary the free use of the medium. Still, the fact that the Soviets could also work there with impunity was not altogether negative in its impact on US national interests. We now turn to a review of an important new book as a vehicle for discussing the Vietnam War phase of the history of air and space superiority theory and doctrine.



...during the Yom Kippur War, the superpowers had been better informed as to what was going on at the battle front than were the combatants themselves. In part, this was due to high-altitude reconnaissance from the SR-71...

CLASHES: A New View of the Struggle for Air Superiority Over Vietnam:

So the U.S. entered the War in Vietnam in stages without much thought as to what her real objectives were, nor how she would get out. Her Air Force and Navy had emerged from Korea without much change in their doctrines on air superiority and probably had not fully articulated the implications of the subsequent new technology of AAMs and SAMs. It is probably also true that the services had not much considered that relationship between guerrilla war and airpower, nor were they as advanced in electronic warfare (EW) as they might have been. At the outset of Vietnam, precision guided munitions technology had hardly advanced at all (in principle) over the AZONs that had been used in Korea. Colonel Marshall Michel* has now come forth with a new book explaining how all that came to pass and how the performance might be improved in the future.

***Clashes'* Thesis:** Marshall Michel makes a persuasive argument that is not altogether new. The US air forces, Navy and USAF, held their own for the early part of the War, once they found technical answers to the new SAM threat to their command of the air. But things turned sour during 1967, in part because the Vietnamese themselves were learning and the technological responses were having a diminishing effect against them. ROLLING THUNDER was shut down in the spring of 1968, and in the months that followed, the Navy went to work and repaired its training program with its Top Gun operation; the Air Force made some technological improvements, but did not then do much with the air-to-air training effort. The result was that when the LINEBACKERs came in

Clashes: Air Combat over North Vietnam, 1965-1972
by Marshall L. Michel III. Naval Institute Press,118 Maryland Avenue, Annapolis, MD, 21402-5035.

1972,[55] the Navy fared much better than did the Air Force. Only since then has the Air Force repaired the training system with such things as RED FLAG, changes at the Fighter Weapons School and other programs.[56]

Is the Author an Authority? Colonel Michel has fine credentials for doing such a book. A native of New Orleans, he came into the Air Force in 1966, and flew combat sorties, more than 300, out of Udorn, Thailand – some in the RF-4, and others in the F-4E. He later spent time as assistant air attache in Israel and on the Israeli desk for the JCS. He then flew a tour in F-15s at Langley AFB. Michel later was on the NATO Staff and retired in 1992. His writing style is excellent, and though he seems knowledgeable on naval aviation, the vast preponderance of his documentation is of Air Force origins. He has a nice combination of practical experience and professional study, but it is probably fair to say that his search of the literature on air and space superiority was competent but not exhaustive.

One of Colonel Michel's degrees is in English from Georgetown University and that shows in his writing. Another is from Catholic University in International Relations. He was also a fellow both at the Harvard Center for International Affairs and at Tel Aviv University. He is now working on another book, this one focused on LINEBACKER. It does seem to me that he makes one assumption that there is in the USAF an inverse relationship between rank and the ability to profit from constructive criticism. A second might be that there is a direct relationship between high rank and the fragility of egos. Perhaps a third is that commanders and other high ranking officers are omnipotent. I have no evidence that Michel was ever a flying unit commander, and those apparent assumptions make me suspect that he was not.

The Argument: *Clashes* explains the disappointments of the battle for the command of the skies over North Vietnam as arising from a variety of factors, the most important of which is unrealistic air combat training before and during the war. Among the others, though, were equipment shortcomings. The main air-to-air fighter on the US side was the F-4, much larger than the MiGs it fought. That, plus the fact that it had a smokey engine made it less likely that the American crewmen would see their enemy before they themselves were spotted. Too, the design of the F-4 (originally intended to be a fleet defense fighter against nonmaneuvering, large targets) yielded poor all-around visibility which was especially bad toward the rear – the most likely avenue of enemy attack. Further, in the F-4C, the Air Force version, the cockpit layout was not "user friendly." The switches were placed hither and yon which made it difficult for the crews to manipulate them at the same time they were keeping a watch for enemies outside the cockpit. Finally, the aircraft did not have an internal gun in either the Navy (F-4B) or the Air Force versions (F-4C and D). Here, Michel seems to imply that the shortcomings were somehow the fault of the senior leadership in the USAF.

The air-to-air weapons were also highly ineffective. The radar missiles were particularly difficult to set up in the heat of combat, and one had to keep the F-4's radar pointing at the target for the entire time of flight of the missile.[57] The AIM-7 Sparrow (radar guided – semi-active)[58] was large, about a quarter ton, and it had a smokey engine – both factors making it easier to spot and evade with violent maneuvers. Too, when the Navy first developed the missile in the 1950s, solid-state electronics had not yet appeared and miniaturization of electronic parts had just begun. Thus, the early versions of the Sparrow were far less reliable than desired. Also, the Rules of Engagement required a visual identification of the target before firing which greatly inhibited the use of the AIM-7s. So, in the end, the kill rate with them in Vietnam was down around 10 percent, and two thirds of them malfunctioned when Air Force crews tried to fire them.

...the design of the F-4 (originally intended to be a fleet defense fighter against nonmaneuvering, large targets) yielded poor all-around visibility which was especially bad toward the rear...

The AIM-9 Sidewinder was a heat seeker (Infrared – IR) also developed by the Navy in the 1950s. The infrared system was much simpler than radar missiles and thus more reliable. But it also was dependent on earlier generation electronics and consequently very subject to failure. Too, its rocket motor was exceedingly smokey[59] and its ability to make a High-G (very sharp) turn was limited – so it could also be avoided if spotted in time. Still, the Sidewinder kill ratio was only about 18 percent. Colonel Michel does explain, though, that one of the reasons the Navy achieved a better record was its greater reliance on the more reliable and simpler-to-use infrared missile than on the radar weapons. (The Navy's best trained air-to-air units flew the F-8 which was not equipped to fire the radar missiles.)

None of the Navy's F-4s ever used a gun in combat – they never acquired a model with an internal weapon and could not use the external gun pod because it would have eliminated the use of the centerline external fuel tank, which would have been unacceptable for carrier operations. Even before the war, the USAF had undertaken the development of an external gun pod with a 20 mm weapon in it. It turned out to be a good piece of equipment, but it did limit the performance of the airplane because of its drag and it never was as accurate as an internal gun. The F-105 had such an internal gun from the beginning and some of its kills were done with that weapon – it did not have a radar missile capability, but it also got some kills with the Sidewinder.

Michel demonstrates that another reason for the Navy's superior record was the excellence of its shipborne GCI, called "Red Crown." Even the Air Force crews, when they were close enough to the coast, avowed that radar control and warning was superior to the USAF provisions in the "College Eye" radars aboard C-121s or the "Teaball" warnings coming from a ground facility at Nakhom Phenom.

Finally, Michel explains that the Navy had the easier problem in many ways. Its operating areas were on the coast requiring very little time over enemy territory. But the USAF aircraft had a long drag from Thailand across the whole of North Vietnam to the targets in the eastern part of the country. Thus, Air Force crews were under enemy surveillance and fire for much longer periods. Also, he explains that the Vietnamese deployed the MiG-21s against Air Force formations more than against the Navy and the latter was faced with the obsolescent MiG-17 much more frequently than was the Air Force.

Nevertheless, Michel denies that excused the Air Force for its inferior record. His main complaint was the inadequacy of air combat training before and during the war. This he lays at the door of the senior leadership, though he does allow that there was a substantial conservative streak among the teachers at the Fighter Weapons School. Their approach to training was much too conservative, and the air-to-air portion of the program consistently received too little emphasis. A part of this arose from the heavy concentration on the nuclear strike mission in the years following Korea. Also, many commanders were too hypersensitive to the risk of accidents to permit truly realistic air combat training. Then too, the conservatism of the senior generals made the Air Force stick with an inadequate tactical formation, the "Fluid Four," long after the Navy had demonstrated the superiority of its "Loose Deuce." Finally, the conservatism of the senior USAF leaders also caused them to cling to a technological explanation for the disappointment after Rolling Thunder – that the poor kill ratios were to be expected because we were operating in the enemy GCI environment without radar warning and control of our own. But the Navy was usually able to employ the radar facilities of ships standing hard by the shore. The result was that the Navy turned to briskly and built up a splendid "Top Gun" training program[60] while the USAF sought only technological solutions until after LINEBACKER exposed the unwisdom of that.

The way that Lieutenant General John J. Burns explains it is that the A-7, the F-4C, and the F-111 were forced upon the USAF as a package at least insofar as some of their design features were concerned by Secretary of Defense Robert McNamara

Evaluation: My estimate is that ***Clashes*** is the best book in print on the subject. It is not perfect. The sources used are largely limited to USAF documentation and only a few of the most prominent published works on naval aviation.

The Aardvark F-111 side-by-side cockpit was a feature primarily originating from a carrier operations design requirement

He uses the USAF's Red Baron studies very extensively. There *are* some inferences drawn that may not come from the documentation, but rather from his crew member experience. One example is that the absence of a gun from the design of the F-4C was the fault of the Air Force senior leadership. I suspect that the whole thing is much more complex that Michel imagines. The way that Lieutenant General John J. Burns explains it is that the A-7, the F-4C, and the F-111 were forced upon the USAF as a package at least insofar as some of their design features were concerned by Secretary of Defense Robert McNamara. He came to office determined to improve accountability and to reduce the inefficiencies arising from service parochialism.

One dimension of this was to get the services to employ more "commonality" in their aircraft acquisition programs. The Navy did not require an internal gun for the F-4 because it was designed to be a fleet defense interceptor. McNamara wanted the airplane to equip both services, and the initial difficulties with the F-105 helped him achieve that. When the Air Force was finally persuaded to accept the F-4, the Secretary put strict limits on the modifications that would be made to it to make it suitable for Air Force service. One that was permitted was the addition to a duplicate set of controls to the back cockpit – which were not in the Navy version. The Air Force wanted an internal gun, too, but the Office of the Secretary of Defense would not permit it – until after the combat over Vietnam proved its essentiality. By then it was necessary to come out with an entirely new model, the F-4E, to accommodate it. The side-by-side seating in the F-111 is another example. The visibility from the cockpit of that airplane is poor, and the reason that the Air Force could not have tandem seating was that would have made the airplane too long for aircraft carrier elevators – and the Navy, in the end, never purchased any 111s.[61] The point is that the generals in the Air Force are not as omnipotent as most flyers, including me, have traditionally thought them to be. That is as it should be in a democracy even when it results in some wrong decisions from time to time.

Another standard lament of crew members, especially those in the fighter force, is that the generals of the pre-Vietnam days were too timid to permit realistic air combat training. General Burns shares that opinion with Colonel Michel.[62] Doubtless they have a point, but what is often left out of that lament is that the accident rate certainly did come down greatly during the late 1950s and early 1960s. It seems to me that there was a certain devil-may-care/ boys-will-be-boys attitude among the flyers in the early fifties, but the "buzzing" of girl friends' houses was much diminished after 1955 when the service began to exert more professional discipline on the officer corps. Who knows but what more lives were saved in the ensuing decade than were lost in the skies over North Vietnam – just another dilemma of high command, I suppose?[63] Finally, we came away from the war against Kim Il Sung with a stout "no-more-Koreas" attitude that necessarily led to emphasis among fighters on continental air defense against high-altitude, nonmaneuvering bombers.

In the end, though, those comments are only quibbles. Again, I say that *Clashes* is to my knowledge the best thing in print on the air war over North Vietnam and you should give it a high place on your reading list. It may not be the last word, though, because there is a book in the offing that will appear in the next year or so that should supplement if not supercede Colonel Michel's fine work. That will be by a long-time member of the Air Force History and Museums program, Dr. Wayne Thompson. He has done much creditable work there over the last couple of decades, and he was a prominent member of the Gulf War Airpower Survey. The book will be titled: *Rebound: The Air War over North Vietnam, 1966-73,* and the draft is complete. It should be in print within the next year, and it and *Clashes* are both positive signs that airpower history is maturing beyond the histrionics of the 1960s.

Part Two: to follow Volume 2 Number 4.

NOTES

1 US, Air Force, Air Force Doctrine Document 1, September 1997, [hereinafter "DD-1"] p. 29, describes it as Air *and Space* superiority and places it at the head of the list of USAF Core Competencies; it appears that the recent changing of the guard at Hq AF will result in a change of the nomenclature in the next version of *Basic Doctrine* in that we shall revert to the old term, "Aerospace."

2 The best short treatment of the subject is Lee Kennett, *The First Air War: 1914-19198*, (NY: Free Press, 1991), Chapter 4, pp 63-82.

3 Harper Lee, *To Kill a Mockingbird*, (Philadelphia, PA: Lippincott, 1960).

4 Marshall L. Michel, III, *Clashes: Air Combat over North Vietnam: 1965-1972*, (Annapolis, MD: US Naval Institute, 1997).

5 DD-1, pp 29, and 47-48 are the relevant parts.

6 Major J.C. Carter, "The Cult of the Offensive," unpublished master's thesis, School of Advanced Airpower Studies, Maxwell AFB, AL, 1997. Carter's work won the Air Force Historical Foundation's award for the best SAAS thesis for Academic Year 1996-97.

7 Colonel Maris McCrabb, "The Evolution of NATO Air Doctrine," Chapter 12 in Colonel Phillip S. Meilinger, *The Paths of Heaven: The Evolution of Airpower Theory*, (Maxwell AFB, AL: Air University Press, 1997), [hereinafter *Paths of Heaven*], 455.

8 Giulio Douhet, *The Command of the Air*, (New imprint, Washington, DC: Office of Air Force History, 1993), 23.

9 MGEN Haywood S. Hansell, Jr., *The Air Plan that Defeated Hitler*, (Atlanta, GA: Higgins-McArthur/Longino & Porter, 1972), 40.

10 DD-1, 29.

11 DD-1, 29, 45-7.

12 DD-1, 46,

13 Samuel P. Huntington, *The Soldier and the State: The Theory and Politics of Civil-Military Relations*, (Cambridge, MA: Harvard University, 1957), 234-242,

14 Douhet, *Command of the Air*, 18-19.

15 Memorandum, Major William Mitchell, Aviation Section, Signal Corps, to Chief of Staff, American Expeditionary Force, 12 June 1917, in Maurer Maurer,ed., *The U.S. Air Service in World War I*, Vol II, *Early Concepts of Military Aviation*, (Washington: Office of Air Force History, 1978), 108.

16 Kennett, *First Air War*, 63-70, incidentally, attacking balloons was not the little leagues by any means as they so often were surrounded by heavy concentrations of AAA and small arms making them into traps for unwary aviators; shooting one down was deemed just as prestigious as defeating a Fokker.

17 *Ibid.*; Mike Spick, *The Ace Factor: Air Combat and the Role of Situational Awareness*, (Annapolis, MD: Naval Institute Press, 1988), 32-3.

18 Kennett, *First Air War*, 71-82; Spick, *The Ace Factor*, 6.

19 Lecture, William Mitchell, Army War College, 24 November 1922, Army War College File No. 240-49, Archives, U.S. Army Military Institute, Carlisle Barracks, PA, in which he said "Some improvement has been made in anti-aircraft artillery. However, as I said before, we care little for anti-aircraft artiller..."; Giulio Douhet, in *Command of the Air*, (reprint, Washington: Office of Air Force History, 1982,) said it thusly: "The airplane has complete freedom of action and direction; it can fly to and from any point of the compass in the shortest time – in a straight line – by any route deemed expedient. Nothing man can do on the surface of the earth can interfere with a plane in flight, moving freely in the third dimension. All the influences which have conditioned and characterized warfare from the beginning are powerless to affect aerial action...." P. 9.

20 Lecture, William Mitchell, "Tactical Application of Military Aeronautics," 1921, Army War College Curricular Archives, No. 97-10, Archives, US Military History Institute, Carlisle Barracks, PA, 1.

21 Douhet, *Command of the Air*, 18-9; Alfred F. Hurley, *Billy Mitchell: Crusader for Air Power*, (Bloomington, Indiana: Indiana University, 1964, 1975), 63.

22 This did not include, though, any public advocacy of population attack nor an extreme concentration on battleplane (strategic bombers) *a la Douhet*.

23 Robert T. Finney, *History of the Air Corps Tactical School, 1920-1940*, USAF Historical Study 100 (Maxwell AFB, AL: 1955) is the current authority on the subject.

24 Martha Byrd, *Chennault: Giving Wings to the Tiger* (Tuscaloosa, AL: University of Alabama, 1987), is the least partisan work on Chennault and his "struggles" at Maxwell Field.

25 Daniel R. Mortensen, ed., *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-1943.*, (Maxwell AFB, AL: AU Press, 1998), 62.

26 Hansell, *Air Plan*, 12-14 for a view from one on the bomber side of the debate.

27 Byrd, *Chennault*, 61-4.

28 John W. R. Taylor, ed., *Combat Aircraft of the World, 1909 to the Present*, (NY: Paragon, 1969), 527.

29 *Ibid., 453 – "Peashooters" actually got into combat as a part of the Philippine Air Force the day the Second World War started.*

30 Taylor, *Combat Aircraft*, 182.

31 *Ibid.*, 4c78.

32 *Ibid., 597-99.*

33 Maurer, *Aviation in the U.S. Army, 325-44.*

34 Hansell, *Air Plan*, 40-1, Hansell, incidentally was as qualified to judge as Chennault in that he too was an experienced fighter pilot, a graduate of Georgia Tech and had considerable engineering experience in civilian life.

35 Bernard and Fawn M. Brodie, *From Crossbow to H-Bomb*, (Bloomington, Indiana: Indiana University, 1962, 1973), 207-08 the Navy was working on radar in Washington from 1935 and demonstrated it aboard ship before the war; the Army tested radar for AAA guns and for aircraft warning by 1939 as well, but little thought had so far been given to the implications for air defense and for long-range bombing.

36 Derek Wood with Derek Dempster, *The Narrow Margin: The Battle of Britain and the Rise of Airpower, 1930-1940*, (new edition, Washington: Smithsonian, 1961, 1990), 29.

37 R.J. Overy, *The AirWar, 1939-1945*, (NY: Stein & Day, 1980), 28-9; Williamson Murray, "The Luftwaffe Against Poland and the West," Chapter 2 in Benjamin Cooling, ed., *Case Studies in the Achievement of Air Superiority*, (Washington: Center for Air Force History, 1994), 76-8.

38 Ltr., Colonel Carl A. Spaatz in London to Major General Henry H. Arnold in Washington, 27 August 1940, in Box 7, Spaatz Papers, Manuscripts Division, Library of Congress, Washington, DC.

39 Interview, Reichsmarshall Herman Goering and General Carl A. Spaatz and others, Augsburg, Germany, 10 May 1945, Copy in Spaatz Collection, Air Force Historical Research Agency, Maxwell AFB, Alabama.

40 U.S., Strategic Bombing Survey, Military Analysis Division, *The Defeat of the German Air Force*, 1945, 1947, p. 1, copy in Air University Library, Maxwell AFB.

41 James A. Winnefeld and Dana J. Johnson, *Joint Air Operations: Pursuit of Unity in Command and Control, 1942-1991*, (Annapolis, MD: Naval Institute Press, 1993), 33-5; Alvin D. Coox, "Air War Against Japan," Chapter 8 in Cooling, *Air Superiority*, 383-442; U.S., Strategic Bombing Survey, Military Analysis Division, *Japanese Airpower*, July, 1946, 103, Copy in Air University Library.

42 U.S., Strategic Bombing Survey, Summary Report, European War, 30 Sep 1945, (reprint, Maxwell AFB, AL: Air University Press, 1987), 37-8.

43 John Lewis Gaddis, *We Now Know: Rethinking Cold War History*, (NY: Oxford, 1997), 1-25.

44 Eduard Mark, *Aerial Interdiction in Three Wars*, (Washington: Center for Air Force History, 1994), 287-319 argues that the conventional view that we had air superiority because our kill ratio of enemy fighters was something above 10:1 obscures the fact that we did not command the skies. The Communist MiGs so threatened the B-29s in daylight near the Yalu that they could not operate there for half the day. The great advantage in numbers enabled them to so stalk our interdictors up north even while losing great numbers in the air battle meant that we did not have air superiority. But it is probably fair to say that his is a rare opinion depending heavily on his own definition of what air superiority is.

45 During the latter part of the War the UN was able to emplace a radar on one of the islands off the west coast of North Korea and that diminished the communist advantage somewhat.

46 Thomas C. Hone, "Korea," Chapter 9 in Cooling, ed., *Air Superiority*, 453-98, Hone being much more certain than Mark that air superiority was achieved and maintained by UN forces in Korea.

47 The Joint Operations Center had its main impact in the air-to-ground battle, mostly Close Air Support, Winnefeld & Johnson, *Joint Air Operations*, 49-50.

48 Interview, Major Lee T. Wight, with David R. Mets, Maxwell AFB, AL, 7 April 1998.

49 Robert Frank Futrell, *The United States Air Force in Korea, 1950-1953*, (revised ed., Washington: Office of Air Force History, 1983), 697.

50 Bill Gunston, *The Illustrated Encyclopedia of Aircraft Armament*, (NY: Orion, 1988), 55; Frederick I. Ordway and Ronald C. Wakeford, *International Missile and Spacecraft Guide*, (NY: McGraww-Hill, 1960), 34-5.

51 David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, (Peterson AFB, CO: Air Force Space Command, 1997), 271; Jeffrey T. Richelson, *A Century of Spies: Intelligence in the Twentieth Century*, (NY: Oxford, 1995), 170-172, 295.

52 Spires, *Beyond Horizons*, 50-1.

53 Lt Col Thomas Tobin, et al., *Last Flight From Saigon*, (New Imprint, Washington, DC: Office of Air Force History, 1985), 103.

54 David R. Mets, *Land-Based Air Power in Third World Crises*, (Maxwell AFB, AL: Air University Press, 1986), 109-10; Richelson, *Century of Spies*, 333-34 explains that the Soviets were better informed of the Israeli truce violations than were the Americans because their short-life satellites had to be launched and recovered more frequently than the "better" US satellites and consequently their information was more recent than ours.

55 Actually, the USAF did activate its first aggressor squadron between LINEBACKER I and II.

56 For background on some of the things that *were* done in fighter training before Vietnam see Mr. Blake Morrison, "Gunsmoke: A History, A Tradition, A Competition," *USAF Fighter Weapons Review*, (Fall, 1981): 3-12.

57 Over time the time-of-flight problem was mitigated by tactical development, but the requirement for a visual identification remained a serious handicap, interview, Major Matthew Donovan, Maxwell AFB, AL, 23 March 1998, who was a Fighter Weapons School instructor and also an aggressor squadron pilot.

58 Semi-active radar missiles have a radar receiver and a control system that guides them toward the source of the radar energy. That means that the aircraft radar has to continue bouncing the radar signal off the enemy aircraft until the time of impact. Some of the newer missiles, like the AIM-120, have active radars – that is that they can be launched at a target and they have their own radar transmitters as well as receivers. At some point in their trajectories, their own radar transmitters will start "painting" the target and thus they will home on the energy reflected back from their own radar signals. That means that the launching aircraft can leave as soon as the missile is on its way (in one mode of its operation, at least.)

59 It was smaller than the radar missile, though, the AIM-9L which is the current version weighing less than half as much.

60 Captain Allan Miller, USAF, "Top Gun Program," *USAF Fighter Weapons Review*, (Winter, 1986): 8-12.

61 Interview, Lieutenant General John J. Burns, USAF (Ret.), with Hugh Ahmann, Saint Louis, Missouri, 5-8 June 1984, January 1986, copy at USAF Historical Research Agency, Maxwell AFB, Al, file no. K239.0512-1587.

62 *Ibid.*

63 As it happens, once the realistic training was introduced after the Vietnam War, the accident rate actually went down, not up, interview, Major Scott Walker, USAF, Maxwell AFB, 25 March 1998.