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World Security Institute's
Center for Defense Information
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CHAPTER 7

REVERSING THE DECAY OF AMERICAN AIR POWER

Col. Robert Dilger (U.S. Air Force, ret.) and Pierre M. Sprey

U.S. Air Force resource allocations and tactical/strategic decisions from the 1930s to today have been heavily dominated by the theories expressed in Giulio Douhet's 1921 book, "The Command of the Air." Douhet's premise was that strategic bombardment of an enemy's heartland can win wars independently of ground forces. The unchanging dominance of that strategic bombardment paradigm has caused the Air Force to discount effective, sometimes war-winning, forms of air power and to spend vast sums on air power technologies that are ineffective and often counterproductive. Further, this focus on bombardment technologies has created the huge cost, maintenance and logistics burdens of the present steadily aging and shrinking fleet of U.S. Air Force aircraft.

The aircraft in Table 1 (on page 130) comprise the Air Force's major combat and support aircraft inventory. All but two of the 15 aircraft listed began their development 30 or more years ago and will remain in the active inventory for a long time to come. (Two – the B-2 and the F-22 – are "younger" at 20 plus years.) At the extreme, the B-52, a 1944 requirement concept which began development in 1952, is scheduled to remain in inventory until 2030 – almost a full century. The age and enormous burden of this inventory will only deteriorate further under present Air Force plans.[1]

In the late 1960s and early 1970s, the U.S. Air Force received an unasked for bonanza of three warfighting aircraft. It despised all three: a 40,000-pound F-15 (the Air Force wanted a very different 80,000-pound aircraft); the smaller, lighter F-16 (considered a Mattel toy by most in the Air Force leadership); and the greatest heresy of all, the A-10 dedicated to the mission of close support for troops in combat, a mission the Air Force wanted to forget. A group of individuals of various backgrounds, known as the "Fighter Mafia,"[3] fought a long and harsh battle to place all three aircraft into the Air Force inventory – and won. Of the Air Force's 2,581 warfighting aircraft listed in Table 1, 2,390 (or 93 percent) are the very same designs the Air Force originally did all in its power to scuttle.

Air Combat and Funding Lessons of History (1918-2008)

The most reliable gauge of any air force's underlying beliefs is its funding decisions for key combatants, in this case the relative funding for bombers versus fighters, that is for strategic bombardment versus air-to-air, battlefield interdiction and close support.

Table 1. Major U.S. Air Force Active and Reserve Component Aircraft in 2008[3]

U.S. Air Force Active/Reserve Aircraft	First Year of Development	Quantity	Direct Combat Aircraft	Support Aircraft
A-10	1967	249	249	-
OA-10	1967	108	-	108
AC-130	1966	21	21	-
B-1	1965	64	64	-
B-2	1980	20	20	-
B-52	1952	94	94	-
C-5	1964	111	-	111
C-17	1981	165	-	165
C-130	1951	514	-	514
F-15	1968	714	714	-
F-16	1969	1,319	1,319	-
F-22	1986	100	100	-
E-3	1971	32	-	31
KC-135	1955	532	-	532
KC-10	1977	59	-	59
Total		**4,102**	**2,581**	**1,521**

Shortly after World War I, the U.S. Army Air Corps,[4] as well as the British Royal Air Force (RAF) and the German Luftwaffe, became captivated by General Douhet's theory of air power: strategic bombardment could win a war by itself by attacking the enemy's heartland.

At the close of World War I, our Army Air Corps possessed approximately 12,000 pursuit fighters. By 1930, it let this fleet became a worn out and dated force of 400 obsolescent biplane pursuit aircraft – a mere 3 percent of its former greatness. No other U.S. military arm was cut so severely. On the other hand, by 1941 the Army Air Force had developed an inconceivable 71 separate bombers.[5] Throughout this period, bomber funding dominated the air power budgets. Typically, while four to six fighters would equal the cost of one bomber, the force ratios actually procured were heavily biased in favor of bombers.[6] Because of the almost exclusive budgetary emphasis on bombers by the U.S. Army Air Force, the Royal Air Force and the Luftwaffe, the three great air superiority fighters of the World War II western combatants (the U.S. Army Air Force P-51 Mustang, the RAF Spitfire, and the Luftwaffe ME-109) were all

developed by private ventures quite independently of their respective nations' air force leadership.

The German Luftwaffe: Stuka Versus Bomber Analysis

Beginnings of the Stuka

Although it is rarely discussed by historians, from the '30s on the Luftwaffe was dominated by bomber generals and bomber spending. In the early stages of World War II, they undertook major strategic bombardment campaigns against Britain and Russia. As late as the Battle of the Bulge in the winter of 1944, they were still focused on major bombardment efforts against the rear areas of the Allies. From the German perspective, this focus had disastrous results.

At the most senior Luftwaffe levels, the only prominent advocate of a fighter-based approach to air power was Col. Gen. Ernst Udet, a close personal friend of Field Marshall Hermann Goering, the Supreme Commander of the Luftwaffe. Almost alone in the early 1930s, Udet supported the development and production of the Ju-87 "Stuka" dive bomber. The Luftwaffe Air Staff tolerated the Stuka but limited its procurement to 2 percent of aircraft procurement funding. The Luftwaffe decided to cancel Stuka production in 1943, shortly after Udet's death and well before the war's end.

Implications of German air power in the Spanish Civil War (1936-1938)

Field Marshall Wolfram von Richthofen, the head of the German Condor Legion fighting in Spain, realized that multi-engine, horizontal (i.e. level bombing) bombers were a poor fit for the conflict. Against considerable opposition and without official sanction, he went on to develop the techniques and tactics of close support based on the Stuka and other fighters.[7]

Despite impressive combat results achieved by von Richthofen, not much changed at the Luftwaffe air staff. Luftwaffe crew authorizations in 1938 tell the story: only 300 Stuka air crews were authorized, compared to 1,409 crews for multi-engine bombers.[8] The Luftwaffe bomber paradigm was clearly apparent in the 5-to-1 bomber advantage. This imbalance also resulted in an even larger training burden imbalance of 600 Stuka crew members (at two per aircraft) versus over 7,000 bomber crew members (five per aircraft). Ratios of similar magnitudes held all the way to the end of 1943; at that point, the production of most bombers and all Stukas was canceled.

However, far more importantly, the bombers' funding was 25 times greater than the Stukas' – given that one bomber equaled the cost of five Stukas. This advantage provided the bomber a funding advantage of 96 percent bombers to 4 percent Stukas.[9] It is also notable that the Germans produced 114,000 aircraft of all types. Despite the failure of the German strategic campaigns (discussed below), this total included 25,000 bombers but only 4,900 Stukas.[10] Had the investment made in multi-engine bombers been transferred to Stukas, 125,000 Ju-87s would have resulted.

Holland, Belgium and France, 1940

Despite the swift and overwhelming defeat of Dutch and Belgian resistance by the Germans, the Luftwaffe took relatively heavy bomber losses in the two day campaign: 67 bombers and 16 Stukas were lost.[11]

In France, the Germans easily crossed the Meuse River, innovatively using the Stukas in continuous close support over the German army spearhead. In a panic, the RAF sent their conventional bombers (they had no Stuka equivalent, nor would they develop one) to destroy the German pontoon bridges. On a single day, May 15, 1940, the RAF lost 56 percent of the horizontal bombers sent to destroy these bridges.[12] And, they failed to eliminate the bridges. (Later in the war, on the eastern front, Stukas easily destroyed many pontoon bridges constructed by the Soviets.) Nonetheless, neither side's air leaders acknowledged the effectiveness of the Stuka and the failure of the conventional bomber for such missions.

During the British-French evacuation from the port city of Dunkirk, the Luftwaffe's strategic bombers were tasked to destroy the Allied forces. They also failed.[13] The British extracted 338,000 soldiers. RAF fighter aircraft attacked the German bombers attacking the Dunkirk area. Apparent losses were great on both sides. The loss data was presented in a simple sentence by one historian: "...from May 26 through June 3, the RAF lost 177 aircraft destroyed or damaged; the Germans lost 240."[14] This quote demonstrates how combat data can be warped to support a favored position. Seemingly, the Luftwaffe lost 36 percent more aircraft than the RAF. With a moment's thought the bias can be plainly seen: the statement equates destroyed or damaged RAF aircraft with destroyed German aircraft. An "apples to apples" comparison of just destroyed aircraft would mean approximately 60 RAF fighter losses – plus 117 damaged to equal the 177 "destroyed or damaged" in the quote. (The RAF on average suffered two damaged fighters for each loss.) The comparison of aircraft destroyed should be more like 60 RAF losses compared to 240 Luftwaffe losses, or a four to one defeat for the Luftwaffe.

However, a second, larger bias is still present. The RAF lost exclusively inexpensive fighters, while the Luftwaffe lost mostly expensive bombers. This fact is unreported even though it is crucial to understanding the combat realities. The investment cost for each Luftwaffe bomber was about 4 to 5 times greater than for each RAF fighter. A better comparison can be made based on estimated costs; Table 2 shows the results.

Table 2. Dunkirk Aircraft Losses – Investment Cost Comparisons

Air Force	Losses	Cost Ratio
RAF	60 exclusively fighters	60 fighters
Luftwaffe	240 mostly bombers	960 aircraft cost equivalents (where each bomber = 4 fighters)

Ignoring relative casualties is the final distortion. RAF single-seat fighter casualties occurred at a rate of about 0.5 crew members per aircraft lost. The Luftwaffe bomber casualty rate is unknown. However, later in the war, the U.S. Army Air Force/RAF bomber casualties were generally about 80 to 85 percent of the crew in each bomber loss. Thus, the British lost approximately 30 pilots with their loss of 60 fighters, while the Germans may have lost about 960 crew members in the loss of up to 240 bombers. The Luftwaffe was potentially losing crew members at a rate 32 times greater than the RAF in the Dunkirk scenario, and the Luftwaffe was loosing expensive bombers at a 400 percent greater rate than the RAF was losing fighters. In cost terms, the Luftwaffe losses were 1,600 percent greater, and their crew casualties were 3,200 percent greater. All of this was almost certainly distorted, obscured or missing in the combat data presented by the air staffs to their senior leadership. As we shall see, this practice did not end with Dunkirk or even World War II.

In addition, historians of the Dunkirk battle seldom mention that British shipping took a fearful beating. Britain lost 6 destroyers, and 23 other warships were damaged.[16] In addition, 230 lesser ships and boats were lost. This Luftwaffe success was accomplished mostly by Stukas. Author Peter C. Smith states categorically, "Dive bombers ... were proved to be the quintessential weapon for destroying ships. ...By contrast ... no major warship was ever sunk. ...[by multi-engine, high altitude bombers]."[17] The Luftwaffe leadership was completely silent on this great disparity. As so often happens, the Air Staff allowed the bombers to amass most of the combat credit earned by Stukas. It must be understood that Field Marshall Goering surely approved of this deception. If Goering had actually gathered, analyzed, and presented bomb damage assessment data by aircraft type, his bomber program advocacy to Hitler would have floundered.

The Battle of Britain

The Battle of Britain began with a huge imbalance of forces: 2,600 Luftwaffe aircraft versus 741 RAF fighters. Less than 300 of the RAF fighters were Spitfires. Only these were a good match against 800 German ME-109s. See Table 3.

Table 3. Aircraft Committed to the Battle of Britain[15]

	RAF	Luftwaffe
Bombers	Not applicable	1.134
Fighters	741 (279 Spitfires)	1,109 (809 ME-109s)
Stukas	Not Available	316
Total	**741**	**2,559**

Phase I of the battle began on July 1, 1940. The Luftwaffe was tasked to close the English Channel to shipping and to clear British destroyer flotillas from their anti-invasion bases. Rather rapidly, the Stukas sank one out of every three British ships using the Channel. Within a few weeks, on July 27, the British gave up using the Channel. Ship losses were too great.[18] It was the Stuka's victory, but once again, the Luftwaffe bombers acquired the lion's share of this success through tailored air staff reporting.[19]

In Phase II of the battle, the Luftwaffe planners predicted their strategic bombers would achieve air superiority in four days of bombing the RAF fighter bases. The bombers failed. They did not achieve air superiority in four days, nor in four months.[20] During the three months of July through September 1940, the Luftwaffe lost 621 bombers (45 percent of initial strength) and 88 Stukas (21 percent of initial strength).[21] The Stukas were pulled from the air battle three weeks before the end of September but shortly returned again in October. Correcting for the three week hiatus would result in an estimated 29 percent Stuka loss compared to a 45-percent bomber loss rate. As a percent of initial strength, the bombers' losses were 150 percent greater than the Stukas'. However, the Stukas generally flew sorties each day at about three times the bomber rate. Thus, on a per sortie basis, the bomber loss rates were five times the rate of the Stukas.

Fortunately for the Allies, the Luftwaffe ignored its own data. Bomber production numbers remained five times that of the Stuka and about 25 times that of the Stuka in funding. The Luftwaffe had a winner in their inexpensive Stukas but put almost all their air-to-ground funding into the expensive but ineffective multi-engine bomber.

As a direct result of the Luftwaffe's crushing bomber daytime losses, the Germans switched to night attack in October 1940. As is well known, this effort failed in its objectives to reduce British production and to lower civilian morale. In fact, "direct attacks on British industrial targets and population centers only spurred British desires to repay in kind."[22] Worker morale and British war production increased rapidly. The strategic objective of Goering's Battle of Britain bombing campaign was defeated. Operation Sea Lion, the German cross-Channel invasion, had to be put on indefinite hold. Despite huge bomber losses and lack of military gain, neither the Luftwaffe – nor the RAF – altered their unbalanced, massive commitment to bomber production.

Gen. Adolf Galland, commander of German day fighters succinctly summarized how the resources wasted on bombers harmed the German war effort:

> "In the beginning of 1940 the monthly production figure for the ME-109 was approximately 125 ... the peak was reached with a monthly production of 2,500...in autumn 1944. [During and after a year and a half of massive bombardment of German manufacturing plants.] At the end of 1944, we had a fighter production about 20 times larger than it had been when the Luftwaffe

> entered the Battle of Britain. Had the fighter production reached in 1944 been reached in 1940, or even 1941, the Luftwaffe would never have lost air supremacy and the tide of the war would have taken an entirely different course. Neither technical reasons nor shortages of raw material prevented it. ...It was the fundamental ideology of the German leadership with regard to aerial warfare according to Douhet [that] this was to be done by annihilating the enemy on the ground by surprise attack [with bombers]. ...Fighters were only to be tolerated as a necessary evil, a concession to the unpopular act of defense."[23]

Bomber and Stuka use in Russia

Operation Barbarossa, the German invasion of Russia, began on June 22, 1941. A part of the early Soviet retaliation was the use of large multi-engine bombers on June 30, following the paradigm of the Western air forces. German Me-109s shot down 179 of these, among the 3,808 Soviet aircraft destroyed in this very early phase of the war.[24] Unlike the Allies, the Soviets rapidly altered their paradigm of bomber employment (see below).

As early as July 1941, a fuel shortage was limiting Luftwaffe missions. Despite this, the Luftwaffe used great quantities of fuel to launch a strategic bombardment campaign against Moscow. On July 22, 1941, 238 bombers conducted their first Moscow night attack. Thereafter, the Luftwaffe sent 76 ever-smaller bomber raids against Moscow. The raids accomplished nothing except to consume huge quantities of scarce fuel.[25] The Moscow campaign was the fourth Luftwaffe bomber campaign that ended in failure following on the heels of Spain, Dunkirk and the Battle of Britain. Nonetheless, the high Luftwaffe bomber procurement priority remained unchanged.

The German armies made lightning advances across the wide 2,200 mile Russian front. On average only 300 Stukas were available to cover the entire front. Obviously, they could not properly service the enormous "turkey-shoot" opportunities the Soviets presented in their wild retreat. Despite great carnage, a substantial portion of the huge Soviet armies escaped. By the middle of December, the German armies reached the tram lines of Moscow before Arctic weather and a Soviet counterattack stopped them. A reduction as small as 10 percent in Luftwaffe bomber funding would have allowed the procurement of 15,000 Stukas, while only reducing bombers to 22,500 from 25,000. Given the effectiveness of Stukas against tactical battlefield targets (discussed below), the high priority provided to their ineffective bombers and the near-complete rejection of the Stuka cost the Germans the possibility of success on the eastern front.

Luftwaffe bomber losses in 1941 came to 1,798 aircraft, from a beginning number of 1,339 (a 134 percent loss, which includes replacement aircraft). Stuka losses were 366 from a beginning base number of 456 (an 80 percent loss).[26] Bomber losses five times those of the Stuka amounted to 25 times larger losses in cost. On a per sortie basis (assuming three Stuka sorties per day, compared to one for bombers), bomber loss

rates were about 500 percent greater. By every measure, the Stuka had a significantly smaller loss rate than the bomber. Nonetheless, the Luftwaffe air staff continued the myth of Stuka vulnerability and left the aircraft production priorities unchanged.

On September 21-24, 1941, several Stuka missions were sent against the Soviet Baltic fleet operating in the Finnish Sea near Leningrad. Lt. Hans Rudel, of *Stuka Pilot* fame, damaged the Soviet battleship *Marat* on his first sortie. In an ensuing mission Rudel sank a cruiser. A few days later, he dropped a delayed fuse 2,000 pound bomb that detonated an ammunition magazine in the *Marat*. It broke in half and sank while in port.[27] The cost of all 4,900 Stukas produced over a 10-year period was about $25 million – approximately the same cost as the battleship. The entire 10-year Stuka production run was justified on a single sortie. Other Stukas hit the *Marat's* sister battleship, the *Oktobrescaig Revolutia* 10 times, inflicting great damage; they also sank seven other ships and damaged eight.[28]

Contrast that performance to the RAF bomber performance over a one-year period on nearly identical missions. Two German battlecruisers, the *Gneisenau* and *Scharnhorst*, plus a cruiser, *Prinz Eugen*, had been forced into Brest harbor just a short distance across the Channel from England. Over the next year, the British sent 299 heavy bomber attack missions against the German ships – approximately 8,000 sorties. They lost 43 aircraft, all bombers and 247 airmen.[29] On Feb. 11, 1942, a year after the ships had entered the port, they made a successful dash through the English Channel to Norway. The British sent continuous waves of multi-engine bombers to stop their escape. They lost another 60 aircraft, again mostly bombers, and an estimated 345 airmen. The Luftwaffe employed 150 ME-109s to provide cover over the escaping ships. They lost 17 fighters and only 11 airmen.[30]

Both the Luftwaffe and the RAF had complete reports on the Stuka and RAF bombers' results against battleships. Neither altered their advocacy of multi-engine bombers over single engine dive-bombing.

Despite its successes in other missions, the primary utility of the Stuka was its timely and effective close support of the German army. It was a key component of the blitzkrieg operations that were brilliantly successful in the German conquest of Poland, Denmark, Holland, Belgium and France. In the first year of the Russian campaign, Stuka close support was devastating even though only about 300 Stukas were operating across a 2,200-mile front. No total of Russian tanks destroyed by those 300 Stukas is available but they must have accounted for many thousands. Rudel alone had confirmed kills of 518 tanks; the next highest Stuka pilot had approximately 300 tank kills.[31]

In 1943, the Luftwaffe bomber generals canceled Stuka production. The last Stuka was produced in July 1944.[32] To replace it, the Germans had already developed the Hs-129B, a well conceived follow-on. It had two widely spaced engines, an armored cockpit and, most importantly, a 30-mm internal cannon that carried enough rounds

for 18-tank killing attacks compared to only six for the Stuka. Due to low priority, it was equipped with an unreliable French surplus engine and then canceled before mass production. Once again, the bomber advocates prevailed.

Neither the British nor the United States saw value in a Stuka equivalent. Unlike the western forces, the Soviets paid attention to their initial bombing failures and abandoned their huge ineffective bomber force. Instead, they developed the highly robust Shturmovik IL-2 close-support fighter and produced an astonishing 36,000 of them. With this huge close-support fleet the Shturmovik became a major player in Russian successes.

Luftwaffe air defense and revenge weapons

The British had won "The Battle of Britain" using 700 to 800 fighters, but they immediately rejected their population's experience with strategic bombing ineffectiveness. Instead, they embraced the same losing strategic bombardment policy as the Luftwaffe by launching a new, huge night bombing offensive against German cities. The Luftwaffe, in mirror-image fashion, rejected the idea of boosting fighter production to defeat the city-busting bombers, despite having just experienced the defeat of their own bombers at the hands of the RAF fighters.

Hitler and Goering were so focused on bombing and revenge that they would not entertain diverting funds to defensive fighters. Instead, Germany's primary air defense weapon was heavy flak artillery. These were relatively ineffective. Given the large round size, the rate of fire was only 1 round per 30 seconds. The timed-fused rounds were none too accurate and expensive. By 1944, 1.25 million men manned about 12,000 heavy guns. They were a great burden on German military resources and they provided, at best, a rather leaky defense.[33] There were also a limited number of German night fighters; these extracted a huge toll from the British attackers.

The V-1 was a relatively low cost, air-breathing missile. It delivered a 2,000-pound warhead with miss distances of several miles, a 75-percent failure rate and a nearly 90-percent shoot-down rate by RAF fighters. The V-1 accomplished little. The V-2 rocket had an equally poor accuracy and failure rate. It was a notably complex and very expensive liquid-fueled rocket; 6,000 were produced although only 3,000 were successfully launched. It was the most expensive weapon produced by the Germans. (The 6,000 V-2s equaled the cost of 48,000 tanks.) Given its high failure rate and poor accuracy, its military utility was negligible, and yet it was one of the most fabled "weapons" of World War II, touted by defense analysts for decades.

The U.S. Strategic Bomber Survey, discussed below, estimated that the V-2 cost Germany's aircraft production capacity the equivalent of 24,000 fighters. Assume that instead of the V-2, the Germans procured 24,000 additional Stukas. Like the V-2, the Stuka could also carry a 2,000-pound bomb and could deliver up to 50 sorties for each Stuka. Thus, the 24,000 Stukas could deliver up to 1.2 million 2,000-pound bombs with accuracy vastly superior to the V-2. It was amazing that the Germans had

the technological expertise to develop the complex V-2 but were unable to appreciate the V-2's minuscule effectiveness.

Luftwaffe conclusions

In the Battle of Britain, German bombers attacked British airfields but achieved little with heavy losses. Even less effective were the following fall's night incendiary offensives against London, Essex, Canterbury and other cities. Not only were German losses high, but the British population became so outraged that war volunteers and war production soared. In contrast, the tiny force of 300 or so operational close-support Stukas achieved real successes in support of the Blitzkrieg armies slashing their way into France and Russia.

German historian Cajus Bekker summarized the Allies' successes and failures against the Luftwaffe as follows:

> "From 1944 on, the possession of long range fighters [P-51 Mustangs] ...enabled the Americans to win air control over Germany. ...British Bomber Command's endeavor to decide the issue of the war by carpet bombing of the German cities was unsuccessful. ...[German] war production ... reach[ed] its highest ever output at the peak of the bombardment. ...Victory for the Allies was much more [due] to the overwhelming superiority of their tactical forces during and after the invasion. ...In other words it was attacks on military targets, not those on the civilian population. ...that decided the issue. That lesson should never be forgotten."[34]

RAF Bomber Command

Sir Arthur "Bomber" Harris was the commander of the RAF Bomber Command. He was a true believer in the Douhet bombardment theory. Professor Williamson Murray described his philosophy: "Harris possessed an unshakable belief that, with the necessary resources, his command could win the war by itself. ...[He] became a convert to an "area" [city busting] bombing strategy."[35]

Bomber Command's forces consisted of only between 400 to 500 bombers in 1942. The RAF's attempted bomber buildup barely progressed because of continuing heavy losses, which totaled 1,404 four-engine heavy bombers for 1942.[36] To lose almost three times the initial bomber force in a single year was horrendous. The bombers caused great civilian damage to Ruhr cities but had little effect on German military production, which accelerated throughout the year.

To fight the "Battle of Berlin" between August 1943 and March 1944, Harris was convinced that his bombers alone could kill enough civilians to cause the German state to capitulate. The RAF Bomber Command lost its entire bomber fleet every three months. Losses for January 1943 to March 1944 came to 5,881 bombers.[37] To have lost almost 6,000 bombers with 30,000 associated aircrew casualties in 15 months

was a bloody massacre. The RAF Bomber Command had decisively lost their war against the German night fighters.

Fortunately, for the RAF bomber crews, Operation Overlord, the D-Day invasion, took priority after March 30, 1944, despite Sir Harris' strong objections to any diversion of force from city-busting. Bomber losses dropped instantly. Professor Murray wrapped it up well, noting that "...the Battle of Berlin was a mistake – one in which Harris came close to wrecking his command ... and as [Air Vice Marshal] Bennett noted, the battle, 'had been the worst thing that could have happened to the RAF Bomber Command'."[38]

The British "strategic" city-bombing campaigns of 1942-1945 were just as ineffective as the Luftwaffe's bombardment of English cities. In four years of bombing German cities, RAF bomber command suffered over 70,000 aircrew casualties while German military production soared. British strategic bombardment achieved none of its objectives, and it came at a crippling cost.

The U.S. Army Air Force: World War II

Preliminary operations

Unfortunately for the Allies, Gen. Erwin Rommel, the infamous "Desert Fox," had been creating havoc in North Africa since 1941. In response, American troops were sent there in large numbers. Their first significant battle against the Germans was at Kasserine Pass, in February 1943. It was one of the worst U.S. Army defeats in its history. While the U.S. Army Air Force outnumbered the Luftwaffe in North Africa by a 3-1 ratio, it was unable to provide the Army any useful help. General of the Air Force Henry H. "Hap" Arnold, a Douhet advocate, summarized his faction's view of the issue; "Torch [the code name for Allied invasion of Northwest Africa] offered about as poor an air deal as could have been dreamed up. Practically every one of our principles for the use of air power ... had to be violated." He further explained to Gen. Carl Andrew "Tooey" Spaatz the basic problem as he saw it, "The development of the war is just about the worst case scenario as far as our air plans are concerned."[39]

In actual fact, North Africa armored warfare was an ideal setting for air power. American air power was presented with an enticing tactical target turkey shoot. German armor was out in the open and on the move, perfectly delineated against a barren desert background. Only the fanatical belief in strategic bombardment blinded the Army Air Force generals to this obvious close-support opportunity.

Despite the terrible performance of U.S. air power, Rommel's army surrendered on May 10, 1943. His army was not so much defeated as it ran out of armor, fuel and ammo. The origins of this achievement can be traced back to 21 RAF Swordfish torpedo biplanes that successfully destroyed four Italian battleships protecting the Axis' Mediterranean sea lanes. It was the beginning of an intensive Allied naval interdiction campaign that strangled Rommel's army.

In 1943, the Americans needed to conquer the small Italian island of Pantelleria and the nearby Pelagian atoll to provide air fields near Sicily to support an invasion there. They were held by dispirited Italian units. Gen. Hap Arnold ordered the Army Air Force to "Bomb the Hell out of them."[40] Over 1,100 aircraft flew 7,000 sorties dropping 12,400,000 pounds of ordnance on these two tiny outcroppings of land. Twice the Italians refused Gen. Dwight Eisenhower's surrender offer despite the bombing. He had hoped to avoid an invasion. Finally, he sent a 600-ship force into their harbor. The Italians surrendered to the invasion force.

Despite this, the strategic bombardment leaders were ecstatic, claiming the lion's share of the victory. Tooey Spaatz declared the old debate about bombardment dead, "The application of air available to us can reduce to the point of surrender any first class nation now in existence."[41] Nonetheless, less than 5 percent of the bombs came within 300 feet of their target. Almost all of the Italian big guns survived. Their hangars dug into the side of the hills were unscathed. Very few Italian casualties resulted. In other words, bombing accomplished little of military value.[42] The air staff – in this case the American one – studiously avoided the data and its implications.[43]

U.S. European fighter operations

On June 27, 1943, an Allied landing force of 1,200 ships was en route to an invasion of Sicily. There were 1,500 German aircraft within striking distance. American and British fighters were tasked to provide air cover. Despite repeated Luftwaffe mass attacks, not a single ship was lost. On that day the Anglo-American fighters had won the air battle for the Mediterranean. This was the last Luftwaffe mass attack in the theater.

The European war was fought by the United States primarily with three fighters, the P-38, P47 and the P-51. All three were developed after the World War II build-up started in late 1937. The P-38 and the P-47 failed as high-altitude dogfighters. Eventually the P-38 was withdrawn from Europe as a fighter, while it did continue in other roles. The P-47 was pulled from the bomber-escort role and then employed on close support and interdiction ground-attack missions. It failed as a high altitude, long-range dogfighter but became pre-eminent in the close support and interdiction ground-attack missions.

The P-51 was initially developed as a private venture independent of the Army Air Force's development bureaucracy. They favored the larger, less maneuverable and more expensive P-47 and P-38. After the P-51 was mated with the Rolls-Royce Merlin engine, license-built in the United States (a modification strongly opposed by the Army Air Force leadership), it became perhaps the best fighter aircraft in any World War II theater. Over 15,000 P-51s were ultimately procured, most of them with the Merlin engine. Interestingly, it was also the smallest and least expensive U.S. fighter – yet it had the longest range: 600 miles, compared to only 375 miles for the larger P-47.[44]

The U.S. bomber generals' assumptions proved particularly wrong about their oft-repeated claim that heavily armored bombers would always get through. Once

unescorted daylight raids entered the German heartland in 1943, the U.S. Army Air Force bomber losses grew exponentially. The loss rate average for 1943 was an untenable 6 percent per sortie.[45] After crippling losses of 30 percent at Schweinfurt and at Regensburg, the Army Air Force was forced to cease almost all strategic bombardment operations in August 1943. They only resumed in force in early 1944 when the long-range P-51 escort fighters belatedly became available.

The P-51 changed the equation. The bombers acted as a sacrificial goat that attracted the Luftwaffe day fighters. The escort P-51s engaged the Luftwaffe fighters and with their numerical advantage, a superb performing aircraft, and pilots with far more training hours, they prevailed. It was P-51s that won air superiority over Germany just shortly before D-Day, which was the critical precursor necessary for a successful D-Day invasion.

In fact, the U.S. fighters had so decimated the Luftwaffe that it could only launch a pathetic 200 sorties against the exposed D-Day landing force at Normandy on June 6, 1944. Utterly dominant, Allied aircraft flew 15,000 sorties that day.[46] Of course, not all Allied sorties were effective. Over a thousand heavy bombers with thousands of tons of bombs blasted the Omaha landing site, but most missed their target area by as much as 3 miles. Maj. Gen. Charles Gerhardt, the division commander, in disgust stated, "Very few of the bombs fell on the beach or the fortifications commanding it ... the failure cost heavily in men and material."[47]

Maj. Gen. Elwood Richard "Pete" Quesada, the Army Air Force's pioneer in air-ground cooperation, performed magnificently with his 1,500 tactical fighters, primarily P-47s, against the tenacious German defenses in the Normandy area. His P-47s roamed the French road and rail network feeding into the area from dawn to dusk, wreaking tremendous damage and delays on the 23 German divisions trying to reach the Normandy beach head to overwhelm the invaders. The German divisions' planned three-day travel time took as long as six weeks – and those that finally made it arrived badly mauled by the P-47s.

Without the P-47s under Quesada's leadership, the Normandy invasion could have been a rout of monumental proportions. It was Quesada and his 1,500 fighters that pulled our chestnuts out of a potentially very hot fire. It was the effectiveness of the U.S. fighter bombers performing close-in tactical interdiction missions against the German reinforcing divisions that prevented a potential defeat of our forces on the Normandy beaches. The American ground commander Lt. Gen. Omar Bradley stated, "The fighter-bomber operations against road traffic played a major part in the success of the invasion," – perhaps the biggest understatement of the entire war.[48]

Multi-engine strategic and tactical bombing

Half of America's total World War II budget went to U.S. air power and, of that half, 65 percent went to multi-engine bombers. A major study to quantify the effectiveness

of this huge investment was initiated in October 1944 at the direction of President Roosevelt. The United States Strategic Bombing Survey (USSBS) was to consist of a small group of civilian experts. The Army quickly dominated the Survey team with 850 military participants versus 300 civilians.

The Survey's summary report contains a wealth of information. Embedded deep in it were a few sentences that succinctly summarized the results of the U.S. Army Air Force/RAF strategic bombardment campaigns:

> "...City attacks by the RAF prior to August 1944 did not substantially affect the course of German war production. German war production as a whole continued to increase. ...while production received a moderate setback after a raid, it recovered substantially within a relatively few weeks. [Though unstated, the U.S. daylight raids had the same outcome.] In late 1944, there were so many forces making for the collapse of production ... that it is not possible separately to assess the effects of these later area raids on war production. There is no doubt, however, that they were significant."[49]

What is missing in the above summary is the fact that only 35 percent of bomber missions after March 1944 were strategic, that is, against cities, war production and other strategic targets, as opposed to against ground forces. Secondly, the Survey's experts did, in fact, document the effects of bombing on specific target systems such as railroads, bridges, oil production and munitions production.

The following data are extracted from the USSBS summary report:

- 5.4 billion lbs. of ordnance were dropped.
- 1,440,000 bomber sorties were flown.
- 60,000 U.S. and 40,000 RAF bombers were manufactured.
- On average, each bomber manufactured produced 15 sorties.
- 60,000 U.S. fighters were manufactured.
- 2,680,000 Allied fighter sorties were flown.
- On average, per aircraft manufactured, fighters produced three times as many sorties as bombers.
- 1,300,000 men were in the U.S. air combat commands.
- 79,200 American airmen were casualties: 73,000 in bombers and 5,600 in fighters.
- Total Allied casualties for airmen were 158,500.
- 18,000 U.S. planes were lost: 12,400 U.S. bombers and 5,600 U.S. fighters.
- 22,000 British planes were lost for a total of 40,000 Allied planes lost.

We also know from other sources that the U.S. bombers suffered average losses of 4.5 percent per sortie throughout the war, more than four times the rate of fighters.[50] The human cost of bomber losses was far greater: total casualties were 13 times greater in bombers than fighters. A fighter loss resulted in a single aircrew member casualty; the much larger number of bomber losses resulted in 6 to 10 crew members lost per aircraft lost.

These costs must be measured against the bombers' achievements. The USSBS examined nine separate campaigns against specific target systems. The eight campaigns against ball bearing, aircraft, steel, armored vehicle, electrical power, truck production and submarine pens were all judged failures that had little effect in advancing victory. The ninth, fuel production, was assessed a success, though some experts attributed the dire German fuel shortages of late 1944 to the Russian capture of the Ploesti oil fields in August 1944. All the bombers that flew the eight failed strategic bombardment campaigns could have remained home without effect on the war's outcome – except to reduce U.S. casualties by at least 50,000 airmen.

The multi-engine bombers had somewhat better success against tactical targets. As noted earlier, in March 1944, both RAF and U.S. bombers were pulled off most of their strategic raids and tasked to battlefield interdiction missions to prepare for the D-Day invasion. This occurred over the strongest objections of both the RAF and U.S. Army Air Force senior leadership. From this period forward until the war's end, 65 percent of the bomber missions were not strategic but tactical interdiction. Bomber losses dropped from an average of 6 percent during 1943 to about 1.5 percent by D-Day and thereafter.[51] Not only did the bomber loss rate drop by 75 percent but, more importantly, their mission success rate took a turn for the better.

From this perspective, one can find some success on the part of the heavy bombers. First, by luring the Luftwaffe into the skies to be shot down by Allied escort fighters, the bombers enabled the defeat of the German fighter force; second, bomber attacks on road and rail networks contributed to hampering German reinforcement of a number of battles, though tactical attacks by fighter types very probably had a much more direct effect.

In conclusion, the RAF and U.S. Army Air Force bomber commands fared rather poorly in their strategic bombardment campaigns. Eight of nine of the strategic bombardment campaigns were failures, contributing little to Allied victory. With the switch to interdiction missions, the bomber loss rate rapidly dropped, and they started achieving some observable military effects.[52]

Post-World War II fighter draw down, bomber largess

When the war ended, almost all the fighters were sent to "boneyards," with a small contingent sent to the reserves. The fighter production rate had been 2,000 fighters per month at the war's end. A short three years later the Air Force was producing 11 F-86 fighters per month.

In 1945, the Army Air Force planned and approved a force that would consist of 112 heavy bomber groups (about 10,000 bombers) and 95 light bomber/fighter groups.[53] The bomber planners believed that a bomber carrying atomic bombs was the equivalent of 1,000 World War II B-17s; the absurdity of an approved force structure the equivalent of 10 million B-17s is astonishing.

In 1947, the U.S. Air Force reduced these numbers to 75 heavy bomber groups and 25 light bomber/fighter groups, a bomber force the equivalent of "just" eight million B-17s. Note also that they grouped the light bombers (i.e. two-engine bombers) with the fighters, thereby burying the tremendous cut in fighters. Assuming an even split of light bombers and fighters in those units, the approved force had 88 percent bombers and only 12 percent fighters.[54] In terms of dollars, this amounted to 96 percent for bombers versus 4 percent for fighters.

The worst was yet to come. In 1948, the Tactical Air Command (i.e. fighters) under the war's most successful air power leader and close support innovator, General Quesada, was downgraded to a planning-only command, stripped of its fighters. It was the last ignominy for Quesada. Convinced that continuing as TAC Commander would make him a "conspirator in an ugly mistake," he resigned his command and retired – a huge loss for the country, as the U.S. Air Force's failures in Korea would soon prove.[55]

Korean War

North Korea invaded South Korea in June 1950. Elements of the U.S. 24th Infantry Division showed up in early July, and the Air Force sent a few obsolete fighters and 90 B-29 bombers. There was no close support capability of any kind to help those few beleaguered Army battalions as they were being mauled and pushed to the southern tip of Korea. Instead, the Air Force strategic planners came up with a preposterous plan to fire bomb five North Korean cities. Still mesmerized by Douhet's dream, they were convinced that the North Koreans would quickly capitulate.[56] The commander of the United Nations' forces, Gen. Douglas MacArthur vetoed the plan, but only temporarily.

The B-29 strategic bomber crews were, unsurprisingly, a horrible fit in a limited conventional war. They had the wrong equipment, the wrong training and the wrong motivation. Out of an eventual force of 150 B-29s they lost 107 while accomplishing virtually nothing. The entire fleet of B-29s flew less than 1,000 sorties in *three* years, averaging about one ineffective sortie per day. Their loss rate was more than 10 percent per sortie.[57]

If the Air Force had not expunged most of their fighter aircraft and fighter experts, they could have rounded up at least 700 P-47s that would have been a real combat close support capability and the cost equivalent of the 90 B-29s that were originally sent, and a lot of American lives would have been saved.

The Far East Command Operations Research Office reviewed the actual close support delivered. It reported that all the U.S. Air Force assets available flew just 13 of what were termed "close support" sorties per day. The ordnance was delivered not in direct support of the troops but an average three miles forward, a distance that made the strikes all but useless to the supported troops.[58]

Providing 13 useless close air support (CAS) sorties per day constituted virtually criminal neglect that our army grunts paid for in blood. It should have been a national scandal, but wasn't. Over the previous four years, the Air Force had dismantled the in-being capability to deliver 3,000 highly accurate and effective CAS/interdiction sorties per day, fundamental to winning the war in Western Europe. By the summer of 1950, that superb combat potential had been wantonly scattered to the wind, and the American infantryman in Korea was on his own.

On Aug. 4, 1950, the B-29s were released by the U.N. Command from their ineffective interdiction/CAS missions. The Air Force immediately implemented their original Douhet strategy: the bombers eventually bombed and then firebombed five major North Korean cities and some lesser cities. As in World War II, the enemy's military production was unaffected as was his military action in the field. There was great privation among the North Korean civilian populace, but not a sign of capitulation.

If the 900,000 Chinese that intervened the following winter had run up against United Nations forces supported by 700 P-47s, it would have been a far more difficult war for the Chinese. The rout of the U.N. forces in the north could have been prevented, and American infantry casualties would have been far lower.[59]

Once released from CAS duty, the Air Force's bombers also conducted deep interdiction missions, particularly on the Yalu River bridges and rail lines. The effects were minimal, as exemplified by the following account: "For 44 days, beginning January, 26th, 77 B-29s plus 125 B-26s dropped a total of nearly 4,000 500lb bombs on the objective [railroad transportation lines]. They achieved only 33 hits and succeeded in blocking the railway and road for just one week."[60]

A new Air Force campaign, presented in May 1952, was more of the same strategic bombardment of North Korean cities, with electric power plants added in. Both Bomber Command and Air Force Fighter Command were queried as to the estimated length of time for a campaign to shut down 50 percent of the electricity production capacity. Bomber Command said it needed nine to 29 days for the effort; the 5th Fighter Command said it needed just two to three days. In four days, not 50 percent, but 90 percent of the electric power was shut down by the fighters.[61]

Subsequent to the city-bombing, both fighters and bombers were tasked with the newly named "air pressure" campaign, another rerun of the discredited idea that strategic bombardment can win by itself. Gen. Charles Banfill, chief of intelligence, pointed out that the principal source of military supplies and most important strategic targets were outside Korea and the North Koreans had already moved their smaller

industries to the far northeast outside the range of the fighter-bombers and of SHORAN, the radio navigation system for bombers. He concluded, "We are somewhat in the position of trying to starve a beggar by raiding his pantry when we know that he gets his meals from his rich relatives up the street."[62]

In January through July 1951, the North Koreans set out to gain air superiority. The Soviet Union supplied 500 of its latest MiG-15 fighters. These MiGs could outperform all U.N. aircraft but the American F-86, with which it had performance parity. At that point, there were just 90 F-86s in the theater. The North Koreans' plan was simple: (1) from their Manchurian sanctuary they would establish air superiority over a small area extending south; (2) they would build dispersal airfields in this area and extend air superiority further south; (3) the MiGs would use these fields in further extending their reach south. In successive steps, they would leapfrog to the southern tip of Korea, having attained air superiority.

The North Korean plan failed. Even 500 MiGs could not defeat 90 F-86s. Over time, they built up to 1,300 MiGs, which could not defeat the 200 F-86s they then faced.[63] The communists finally supplied the latest MiG-15Fs with Soviet pilots. Nothing changed. In total, the U.S. Air Force lost 78 F-86s versus 960 MiG losses.[64] The exchange ratio was about 12-1, even though the MiGs had a numerical superiority of 6-to-1.

The B-29/B-26 bombers had been an extremely poor fit for the Korean War. As in Europe, they had little effect on war production; they certainly did not cause capitulation. In Korea, the bomber close air support efforts had no discernable results. In the three years of war the B-29s only flew 994 sorties, losing 107 aircraft for an intolerable 10-percent loss rate. In contrast, the Air Force had overall losses of 1,466 aircraft on 721,000 sorties – a per sortie loss rate of 0.2 percent.[65]

Waging the Post-Korea Peace

Despite the bombers' poor showing throughout the Korean War, the funding floodgates were once again opened for lots of new bombers, as shown in Table 4 on the next page.

Bombers dominated 65 percent of the Air Force funding obtained under the huge budget windfall that occurred with the onset of the Korean War. The same budget windfall also launched fourteen jet "fighters" into development in the 1950s. However, most of these were, in reality, single-seat nuclear strike bombers or all weather/night interceptors, with seriously compromised performance as air-to-air fighters, but they fit nicely under the strategic bombardment paradigm. No close support aircraft were developed.

The Korean War "fighter" resurgence was short-lived. A few years after the end of the war, the fighters suited for the traditional tactical roles were once again sent to the bone yard or the reserves. Only the Air Defense Command's all-weather interceptors and the Tactical Air Command's F-100s or F-105s, equipped for nuclear strike, remained active.

Table 4. Bomber Development: Korea to Start of Vietnam War

Aircraft	Start	Quantity Produced	Comments
B-47*	1948	1,700	First all-jet strategic bomber
B-52*	1950	744	Carried 12 times the load of the B-17
B-57*	1950	403	Twin-engine tactical subsonic bomber; built under license from Britain
B-58*	1951	115	Mach 2 medium-range nuclear bomber
B-66*	1953	294	Twin-engine subsonic bomber; based on a U.S. Navy design
B-70	1955	2	1 million pound Mach 3 bomber; most expensive development ever attempted by the United States up to that point
F-111	1961	500	Tactical nuclear and conventional bomber; 1,000-plus planned
FB-111	1965	76	Medium-range strategic bomber; 210 planned

*All started, developed or built under Korean War budgets.

In 1961, Robert McNamara, President Kennedy's secretary of defense, took over the U.S. Air Force's tactical nuclear bomber development, the F-111. He promoted it as a tri-service, multirole fighter supposedly capable of air-to-air, close support and conventional interdiction bombing for the Air Force, Navy and Marine Corps. However, in design it remained a nuclear bomber and grew to 80,000 pounds. It proved to have no capability in the tactical role except night bombardment. It was deployed to Vietnam in this role, quickly failed, and was withdrawn.

Vietnam War

The Vietnam War was the third consecutive conflict that began with a terrible shortage of fighter aircraft. Much to its chagrin, the Air Force was forced by Defense Secretary McNamara to procure from Navy production lines large numbers of F-4s as fighter-bombers and A-7s as light bombers. As unlikely as it may seem, the U.S. Air Force had no active fighter production lines in the 1960s – though it was actively procuring F-111s and FB-111s and developing the absurdly expensive million-pound Mach 3 B-70 bomber. The Air Force fought the entire air war in North Vietnam with aging F-105 nuclear bombers plus Navy F-4s and A-7s.

The war in the north was mainly fought around the cities of Hanoi and Haiphong. Targeting was pure strategic bombardment by heavy bomb-laden fighters married to air-refueling tankers. Due to the inadequate range of F-105s and F-4s, the new employ-

ment equation became 1 fighter plus 1 tanker equals 1 strategic bomber. Interestingly, the payloads were similar to those of the World War II B-17s.

Our strategic bombardment campaign in North Vietnam was unsuccessful. Once again, the Douhet objectives were not achieved. Moreover, a total of 1,737 combat aircraft losses were recorded, including about 900 F-100s, F-105s and F-4s from the Air Force, not counting the substantial Navy losses. Combat experience had again shown that the strategic-bombing mission is short on effectiveness and costly in both treasure and blood.

A very different air war was fought in South Vietnam. There the regular Air Force flew interdiction against enemy logistics and base camps, plus some close support of friendlies, using mostly jet aircraft. The jets were often ineffective due to the difficulty of finding and hitting small tactical targets at high speed. On the other hand, the Special Air Warfare forces, flying many sorties per day with small numbers of 1944-designed A-1 propeller attack aircraft, were highly effective in night and day close support of Special Forces camps. The A-1 was slow, maneuverable, highly survivable and had extraordinary loiter endurance which was essential for continuous support of forces in contact with the enemy.

The B-52s flew missions only in the south for almost the entire war, bombing suspected Viet Cong base camps in the jungle. However, in 1972 they were sent north for a short while. They immediately lost 15 aircraft while flying 724 sorties, a loss rate seven times higher than the F-105s and F-4s.[66] Their combat return was indiscernible.

Waging the post-Vietnam peace

Unlike the post-World War II and post-Korean eras, there was little apparent fighter drawdown after Vietnam. The reason is simple. Most of the U.S. Air Force's Vietnam-era "fighters" were already strategic bombers, or pseudo-strategic bombers supported by 600 air-refueling tanker aircraft.

The small fleet of F-100s and F-105s that started in Vietnam had already been replaced by a large fleet of big, heavy F-4s configured for bombing. Soon after the war, these started being replaced by F-15A/C fighters, as well as by the bombing-only F-15E. The Air Force also procured, albeit reluctantly, a larger number of the smaller but longer-range F-16s. The F-16 was designed originally as a superbly maneuverable dogfighter, but it was immediately reconfigured by the Air Force into a heavier "multirole" (in other words, mostly bombing) aircraft.

The "stealthy" F-117 light bomber started entering the fleet in 1983.[67] While the Air Force strongly supported it, it proved disappointing. It was sluggish and only had a two-bomb payload. In its 13-year development and production run, only 54 operational aircraft were procured, the sure mark of an inefficient, ultra-expensive program.

The most unexpected post-Vietnam development was the A-10, the only single purpose, close-support aircraft ever built by the Air Force. This precedent-shattering

program was largely initiated and shaped by the so-called "Fighter Mafia." Though opposed by almost every Air Force general, the A-10 reached production in 1976 after a unique, live-firing, "fly-off" prototype competition. The Air Force leadership eagerly cut off production in 1984 after a very short eight-year run of 715 aircraft. The A-10 program cost was minor: all 715 A-10s cost less than three B-2 bombers.

At the same time, in the decade after Vietnam the incredibly expensive B-1B, and then the even more hugely expensive B-2 bomber aircraft, entered development and production. Eventually, 100 of the 200 planned B-1Bs and 21 of the planned 132 B-2s were built. Despite the tiny numbers produced, huge bomber budgets were being spent in the late 1970s through the 1980s leading up to the first Gulf war.

Gulf War I, 1991

On Aug. 2, 1990, the Iraqi army invaded its oil-rich neighbor, putting 43 divisions inside Kuwait. After a six-month buildup of U.S and coalition forces, on Jan. 17, 1991, the U.S. Air Force launched the strategic-bombing campaign it had advocated, the "softening-up" prelude supposedly indispensable for the ground attack. Against weak and ill-trained air opposition,[68] the 39 days of bombing knocked out electric power and civilian communications, but had little real effect on Iraqi military activities, Iraqi radar surface-to-air missile (SAM) sites or military communications.

The campaign opened with massive attacks against SAMs, command centers and major communications in and around the capital city, Baghdad. In the first hour, seven B-52s also fired 35 Air-Launched Cruise Missiles (ALCMs) against targets in and around Baghdad.[69]

The mainstays of the Air Force campaign were the F-111, F-15E, F-16, A-10 and the B-52 – all aircraft developed 20 to 40 years earlier. The one new participant was the F-117. However, with just 42 F-117s available in the entire theater, at 0.7 sorties per day, they generated less than 1,300 sorties (3 percent) of the 44,000 flown by all aircraft types. The F-117s made only about 2,000 laser bomb attacks during the entire war.[70] In terms of bombs delivered, they were a minor player in the war. Nevertheless, the F-117 was broadly touted by the Air Force for its ability to "knock-the-door-down," i.e., to enter Baghdad unseen, to destroy the SAM network and to allow non-stealth aircraft to operate safely. All three elements of these assertions failed.

On the first night, 167 non-stealth "Wild Weasel" jamming and other aircraft also engaged the SAMs without a loss. The "stealth" F-117s were only able to launch 15 precision strikes against air defenses on the first two nights.[71] This was a few drops in the torrent of thousands of bombs and missiles launched those first two nights. The meager F-117 attack could hardly scratch the 59 SAM batteries present, a network of many hundreds of point targets. The CIA assessed that of the 15 SAM batteries reported as attacked by the F-117s, 13 continued to operate, as did most of the radar control centers that the F-117s were sent to knock out. As for ensuring the safety of

other aircraft, Baghdad radar SAMs shot down two F-16s on day three; apparently the door was not knocked down after all. Radar SAMs continued to make kills throughout the war with 20 percent of their kills made in the last week of the war.

B-52s and F-16s conducted a maximum campaign against elite Republican Guard Divisions located along the Iraqi-Kuwaiti border. From the first day of the air war onward, a flight of three B-52s bombed the deployed, dug-in Republican Guard positions about every three hours. Also, roughly 300 high-altitude F-16s sorties were flown daily against the Republican Guard.[72] Historically, high-altitude bombing against a dug-in, static army is seldom productive – and so it was in this case. Ground forces can only be successfully attacked from the air when: a) they are moving and thus necessarily exposed; and b) the attacking aircraft can fly (and survive) low and slow enough to discern targets.

The official, almost certainly optimistic, U.S. Air Force estimate of the actual combat attrition suffered by the Republican Guard at the end of the 39-day bombing campaign showed that four divisions had an attrition rate between 15 and 45 percent, and two suffered little to no attrition at all.[73] Similarly, an unclassified CIA report found a notable lack of significant effect on the Guard divisions.

The survival of the Republican Guard was very probably the greatest shortcoming of the war. The predictably ineffective high-altitude, high-speed air attacks on the Guard permitted important elements to escape intact to Basra at the end of the war – and to subsequently suppress a major Shi'ite rebellion against Saddam Hussein's Sunni regime. Other Guard units remained unaffected in the Baghdad area. The intact, and still loyal, Republican Guard ensured Saddam's survival after the war, just when his regime was critically vulnerable to collapse.

In the war's second week, Saddam sent significant elements of his army across the Kuwaiti-Saudi border toward the Saudi city of Khafji. These Iraqi army units had to come out of hiding in order to move, thus setting up a U.S. turkey shoot opportunity. Fortunately, two A-10s plus an AC-130 gunship were immediately available. In short order, they destroyed 58 targets in a 71-vehicle convoy. This would have required about 20 effective attack passes per each A-10. Unlike all Air Force "F" designated aircraft, they actually had the 20 attack passes worth of cannon ammunition (and other weapons) on board. The two A-10s put it all to good use. This was typical of the many A-10 missions flown over the Khafji incursion in the next two days. According to Saddam, this was to be the "Mother of all Battles." Instead, the Iraqi force was decimated en route and the remnants were destroyed in Khafji. The Iraqi army never again maneuvered any of its divisions, save during their final retreat.[74]

The strategic bombardment campaign in the Baghdad area ended abruptly after three weeks. An attack by two F-117s against the Al Firdus command bunker went awry. Unknown to our intelligence, the Iraqis were using it as a civilian bomb shelter. CNN and other international television displayed the appalling results of our mistake

to the world: almost 300 women and children were killed. This ended the bombardment of Baghdad. But there was another, less publicized lesson. Iraqi military activities were unaffected when the strategic bombing of Baghdad ended. Militarily, the cessation appeared to be a nonevent – just as in North Vietnam.

After the Khafji incursion, the war saw many further examples of the need for multipass lethality in close support and tactical interdiction. For example, two A-10 pilots, Capt. Mark Salmonson and Lt. John Marks, were credited by ground observation with killing 23 tanks in a single encounter using the 30-mm cannon.[75] On Feb. 27, 1991, the Iraqi rocket force assembled 20 Scud mobile missile launchers with the plan to swamp the Israeli Patriot SAM missile defense against Scuds. An Air Force forward air controller with a Special Operations Force (SOF) observer team deep inside Iraq spotted the SCUD launchers en route to their launch site. Two A-10s were called in. Using their cannon, they destroyed all 20 Scuds and their mobile launchers, as verified by the ground observer team.[76]

Right after the war, the Air Force and other analysts praised the F-117 for its zero-loss performance while at the same time damning the A-10 for its losses. Some pertinent facts were omitted. Night was a much safer combat environment than day, and the F-117 flew only at night. Two squadrons of A-10s flew at least as many night sorties as the F-117. Their losses were the same as the F-117's: zero. F-111Fs also flew at night and also had no losses.

The A-10s and the F-117s flew in both the first Gulf war and the next war in Kosovo in 1999. The day-flying A-10s suffered a total of four losses in both wars.[77] The night-flying F-117s suffered two casualties, both to radar missiles in Kosovo.[78] The important point is the number of sorties flown and the overall survival rate. (See Table 5.)

Table 5. Combined Losses First Gulf War and Kosovo

Aircraft	Approximate Total Sorties Flown Both Wars	Losses	Loss Rate/ Sortie
F-117	2,600	2	1/1,300 sorties
A-10	12,400	4	1/3,100 sorties

The A-10 had a per sortie loss rate less than half that of the F-117 in the combined campaigns. It will never be heard from official U.S. Air Force channels that the A-10s were twice as survivable as the F-117s by this more meaningful measure, but in fact, they were.

In many thousands of daytime missions, the A-10 suffered three losses to infrared (IR, heat seeking), man-portable missiles. The aircraft brought the pilot home after

three other IR missile strikes – two of them were repaired and quickly put back in the battle. The third was not economical to repair. The A-10s also survived multiple anti-aircraft artillery (AAA) hits, were repaired, and promptly sent back to the air battle.

Because the "Fighter Mafia" imposed survivability requirements of unprecedented stringency on the initial A-10 design, analysts projected that it would survive most combat hits at least long enough to bring the pilot back to friendly territory. In Gulf war combat, 83 percent of A-10s that were hit made it to a safe landing, even better than the early projections. Moreover, of all combat aircraft in the war, the A-10 had the highest sortie rate as well as the highest in-commission rate, 95.7 percent.

Lt. Gen. Charles Horner, the air commander in the first Gulf war, said, "I take back all the bad things I've said about the A-10s. I love them. They're saving our asses."[79]

Waging the post-Gulf War peace: changing the tune, punishing the victors

With the war over, the U.S. Air Force strategic bombardment paradigm and the need to defend bomber budgets returned to the fore. The Air Force revived the 20-year-old canard used by the generals opposing the A-10 citing that the A-10 is vulnerable to hits because its speed is limited. That despite the extraordinary daytime survivability the A-10 had just demonstrated in combat, not to mention its actual tactical target kills, far higher than any other fighter or bomber in the war. The post-war official Air Force view was that the F-16s, F-15s, F-117s, B-1s, B-2s and B-52s "will posses the capability to conduct close air support and will be able to do so in the most demanding threat environment which the A-10 cannot survive."[80] "One reason we're keeping the A-10 is for the niche environments – very, very low-threat environments where you're doing counter-insurgency operations."[81] That is Lt. Gen. David Deptula speaking. At the time, he was in charge of planning for the Air Force's highest combat aircraft headquarters, the Air Combat Command. Every phrase contradicts the empirical combat data.

By the end of the first Gulf war, the Air Force had almost achieved its strategic bombardment dream. Its entire warfighting force was already strategic bombers or pseudo-strategic bombers. The exceptions were the A-10 and the F-15A/C. Accordingly, a major unfilled need for more complete fighter drawdown was to purify the force by sending all the A-10s to the bone yard. Outside pressures and saner heads prevailed, partially: "only" half the A-10s were sent to the bone yard. In the meantime, the Air Force leadership was preoccupied with finding procurement funding to cover still-continuing cost overruns for the B-1B and B-2 bomber programs while cranking up the hyperinflating F-22 program, the world's first fighter to top one third of a billion dollars.

Kosovo Air war

Led by the United States, eight NATO nations' air forces planned a quick, two-day strike against Yugoslavia in order to bomb the Milosevic government into submission,

the classic Douhet strategy. Seventy-eight days and 36,000 sorties later, Milosevic settled for terms that were the equivalent of those he had offered before the bombing and that the U.S. government had already rejected.

During the war, U.S. Air Force Lt. Gen. Michael Short, who commanded the NATO air effort, restricted his pilots to altitudes above 15,000 feet to hopefully eliminate any possibility of losses. Unfortunately, this exacerbated an already difficult problem. It proved to be all but impossible to find camouflaged military targets in hiding at an altitude of three miles with or without sensors. So, despite 24 million pounds of ordnance dropped, the Serbs' military losses were extremely minor.[82]

The NATO air forces made a major effort. They launched 36,000 sorties, fired 743 HARM anti-radar missiles, and dropped 24 million pounds of munitions of which 6,728 were precision-guided. Their claimed bomb damage seemed sizable. However, after the war, the Serbian government reported shockingly lower damage levels than NATO had claimed. Only three of 80 radar missile batteries were actually destroyed. NATO had claimed 5,000 to 10,000 military casualties; Belgrade reported 387. Belgrade also reported 1,400 civilian casualties, an astonishingly low number for 36,000 sorties of bombing effort, much of it against urban targets.[83]

During the course of the war, Yugoslavians fired 845 radar SAMs. As in other wars, they were all but ineffective. They accounted for only three kills – an F-16 and two stealth F-117s. The SAM ineffectiveness rate was 99.7 percent.

Given a 78-day bombing campaign, the results were minimal. This illustrates, yet again, how tactical air effectiveness depends crucially on integration with a simultaneous ground campaign, that is, combined arms. A friendly ground force is essential to move the enemy army out of hiding into the open. Air attacks against an enemy army that is never forced to maneuver are certain to show negligible military results. This is especially true when attacks are conducted from 10,000 or 15,000 feet, even with "precision" munitions. Who is available to penetrate the camouflage to find a target? Who is available to sort decoys from real targets? Who is available to distinguish wedding parties from terrorists?

Afghanistan

In the Afghanistan war in 2001, American forces were primarily small units of Special Operations Forces (as small as four U.S. soldiers) that teamed up with fighters of the indigenous Afghan "Northern Alliance." These forces were supported by American close-air support in a multitude of minor engagements, most of them highly successful with few U.S. casualties.

The following typical encounter illustrates the great effectiveness of a small four-man Special Operations unit supported by A-10s. The thread is abbreviated and excerpted from a published account by the Army News Service:[84]

A four man American special ops team leading a force of 26 Afghan National Army (ANA) troops was ambushed several times by 800 enemy Taliban fighters. The 7 vehicle convoy led by Staff Sgt. Jamie Osmon was ambushed for the first time at a valley edge. Fortunately, the convoy was able to extricate itself from this ambush. Sgt. Osmon "... knew they were going to hit us again, it was just a matter of where." Just 3 kilometers later it happened. They were in deep trouble. At that point they noticed the ANA troops were missing. "We headed back south to the other ambush point." The first close support aircraft, a B-1B bomber, flew overhead. "It didn't seem to have much effect," Osmon said. [No matter how badly the B-1B pilot wished to help, a single B-1B bomber at high altitude flying close support is still an oxymoron.]

The special ops team got back to the original ambush site and discovered that the other team was still pinned down. Osmon asked about A-10 close air support.

On the Baghram flight line, Tonto and Lobo [call signs of the two A-10s] had just taken off and refueled en route. Once the A-10s were close to the ambush site, Tonto explained, "We were told they didn't have radio capability ... We flew over the canyon to put eyes on the situation." Private Schloss, "We could hear the A-10s come in... It was like it was Christmas – the happiest moment of my life."

Captain Tonto pointed out that, "It took us a little time to determine exactly where the friendly forces were, as well as where they were taking fire from. ... Once we identified the enemies, we marked their positions and opened up with 720 rounds of 30-mm high-explosive incendiary ammunition."

Sgt. Osmon, "When the Vulcans [the A-10's 30-mm cannons] opened up, the enemy fire ceased. It was great." [Note that up to this point the A-10s did not have radio contact. The entire encounter was accomplished by eyeball.] The Army team finally made radio contact with the pilots.

"The A-10s came around for a second gun pass," Tonto said, prompting Sergeant Osmon to quip: "Grip-21, this is Maverick. This may be a bit quick, but I think I love you."

The convoy discovered the whereabouts of the missing ANA members. "One of the ANA members came up to the group in a lull in the fighting – he told us they had been captured by the enemy forces...The enemy said they would release the rest of the ANA team and let us go if we called off the aerial close air support." The enemy dispersed and the reconstituted convoy limped home on two bad tires.

The normal three hour trip took six hours, covered by the A-10s the entire trip.

There are a few lessons to be learned from this incident:

- Though few, if any, Air Force documents praised the A-10s, the Army grunts love the Warthogs, and Army periodicals had much praise for the A-10s.
- The close-support effort provided by the B-1B bomber was useless.
- The 30-man force would have been "goners" without the A-10s.
- When the small force recognized their peril, the first question they asked was, "Where are the A-10s?"
- The air battle began without radio contact. Nevertheless, the A-10 pilots had the low- speed maneuverability and survivability necessary to sort out the ground battle disposition.
- Even in terrain that offers cover, the 30-mm cannon is devastatingly effective against enemy combatants.
- Note the enemy's offer to release captives as a bribe to shut off the A-10's attack.
- Thirty men backed-up by two A-10s can prevail against an enemy force of 800 men. No high-speed, high-altitude jet could have achieved this.

Second Gulf War

The U.S. Air Force planners complained that the plans for the air portion of the second Gulf war were too timid. They advised that a 40-day air campaign (shades of the first Gulf war) would topple the regime without a ground invasion: the old Douhet dream again. They later offered to settle for 10 days. Their campaign was advertised as "shock and awe," a newly minted synonym for strategic bombardment. Well over 10,000 precision weapons were to be delivered on the first two days of the war. The Air Force actually dropped only 1,500 precision bombs on the first two days, just 15 percent of their advertised plan.

U.S. intelligence felt sure they knew the bunker where Saddam Hussein was located. It was decided to assassinate Saddam from the air by bombing the bunker, thus starting the war one day early. The Navy fired 34 high-cost Tomahawk missiles at the underground bunker. Two F-117s dropped four 2,000-pound, precision-guided bombs. The Air Force and Navy both failed.

Gen. Tommy Franks, in charge of the war, ignored the Air Force "shock and awe"

advice, perhaps based on the results of the first Gulf war's 39-day bombing campaign. He simultaneously launched the air and the ground battle without a precursor air campaign. Saddam's regime toppled in just 21 days. American casualties were almost insignificant. Nonetheless, strategic bombardment missions had been performed from day one with few noticeable effects.

Helicopters

For the first Gulf war, the Army had sent 1,644 helicopters of 11 different types to the theater, including 274 AH-64 attack helicopters. Except for some highly publicized attacks early in the air campaign, these remained mostly on the sidelines for the first 39 days of the war. This was presumably an acknowledgement of their low survivability against AAA and IR SAMS. The AH-64s launched 2,764 Hellfire anti-armor missiles. The 132 A-10s, at half the fleet size and at much lower procurement and operating costs, fired 5,000 Maverick missiles, dropped 40,000 bombs of various types, and made thousands of gun-strafing passes.

In the second Gulf war from March 19, 2003 to July 4, 2007, 103 helicopters were combat and operational losses, including 32 AH-64/AH-1 attack helicopters. During this same four year period of the war, there were 18 fixed-wing aircraft combat and operational losses, including two CAS aircraft (one A-10 and one Marine Corps AV-8B). 214 people were killed in the helicopter losses; 18 were lost in the fixed-wing losses.

Attack helicopters simply do not compare successfully to an effective CAS aircraft, such as the A-10, in terms of either effectiveness or survivability.

Historical wrap up

In sum, the combat record of strategic bombing shows very small military returns, very high aircrew casualties, and enormous cost burdens in terms of money and lost opportunities for building more effective forces.

In contrast, the combat record of dedicated close-air support and of air-to-air dogfighters shows them to be real contributors to winning wars with unexpectedly low casualties and costs. The question now is: "What to do?"

Reversing the U.S. Air Force's Shrinking Forces and Growing Ineffectiveness

Since World War II, the U.S. Air Force has, in each succeeding war, provided less aircraft and has had less effect on the outcome of the war while steadily increasing the costs of doing so. The causes of these unfortunate trends are many. Principal among them are:

- A dogged Air Force adherence to the strategic bombardment paradigm, impervious to any correction from combat experience, and

- Development incentives and an acquisition process that guarantees ever-

escalating unit cost and technical complexity without regard to the effect on either combat effectiveness or force size.

Below, we outline our approach to reversing the seemingly inexorable trend of shrinking U.S. Air Force numbers and effectiveness.

Air Force procurement planning has traditionally been based on a wish list for favored aircraft types with unrealistically high production quantities and notoriously low procurement cost estimates. As discussed in Chapters 10 and 11 at greater length, these wish list plans become hopelessly expensive and unachievable within any conceivable overall defense budget. This wish-list behavior and the inevitable shortfalls in meeting it serve as a way of putting pressure on the secretary of defense, the president and Congress in the annual negotiations that lead to the real-world budget that is finally approved. Table 6 below shows the Air Force's current – unattainable – wish list with the procurement quantities that are most likely to be actually attained if we simply continue down the business-as-usual path.

Table 6. Air Force Wish-List Acquisition versus Business as Usual

Apparent Current Air Force Wish List	Approximate Estimated Costs
Total force of 383 F-22 (Adds 200 aircraft at $200 million each[85]	$105 billion
1,750 F-35 As at $180 million each[86] (650 Marine/Navy aircraft not included)	$315 billion
100 Global Strike Bombers at up to $5 billion each	$500 billion
400 Air Refueling Tankers at $280 million each	$112 billion
400 New Airlift Aircraft at $250 million each	$100 billion
Total Aircraft on wish list: 3,033	
Cost Total	**$1,132 billion**

What Business as Usual Will Produce	Approximate Estimated Cost
183 F-22 at $355 million each (sunk or already under contract)	$65 billion
500 Air Force F-35 As at $200+ million each	$100 billion
0 Globe Strike Bombers	$0
200 Air Refueling Tankers	$56 billion
100 New Airlift Aircraft	$25 billion
Total U.S. Air Force Aircraft: 983	
Cost Total	**$246 billion**

The present Air Force aircraft wish-list program, costing over $1 trillion, is shown in the upper part of Table 6 on the preceding page. It costs about four times the actual budgets likely to be available for the next 20 years, exemplified by the lower part of Table 6.[87] While the table's contents will appear very controversial to some; it is simply an extrapolation of past history and current behavior. Skeptical readers will find an explanation and documentation of that history and behavior in Chapters 10 and 11 of this anthology. In spite of the massive budgets and purchases envisioned, a result of only about 1,000 aircraft is far more likely. This is an insignificant production rate of 50 aircraft per year, but it mostly exceeds what the Air Force has bought each year for the past decade. In other words, it will take the Air Force another 40 to 80 years to replace its current legacy fleet. When this finally occurs, the Air Force will just have a different legacy fleet of even older aircraft. Nothing will have changed except that cost escalation will probably squeeze the final total force down from 4,000 aging aircraft toward 2,000.

Clearly, the nation needs a new and fundamentally different approach to aircraft procurement.

Ground rules for increasing combat capability

The business-as-usual policy dooms us to an Air Force of decreasing effectiveness, uselessly small force size, and such inflexibility that it can only be employed for strategic bombardment, against only mostly incompetent enemies. Here we propose a very different approach to an Air Force that can flexibly serve the real, and highly diverse, defense needs of the nation. This approach is based on the following common ground rules, each a complete departure from present U.S. Air Force planning assumptions:

- Based on realistic, auditable cost estimates validated by objective and independent analyses, stay within the roughly $250 billion the Air Force is likely to be allowed to spend on aircraft procurement over the next 20 years or so.

- Ensure that the following missions can be performed effectively in real-world combat as a matter of the highest urgency:

    1. close air support of American troops anywhere, whether in counterinsurgency missions or in sophisticated armored warfare;

    2. battlefield airlift to American troops in remote areas, and

    3. air-to-air superiority (dogfighting) against any air force, modern or aging, large or small;

4. battlefield interdiction, particularly in adverse terrain and against primitive, highly camouflaged supply lines.

- Develop and procure only aircraft and weapons of the utmost austerity, stripped down to only the capabilities directly required by actual combat experience. "Nice-to-have" features and capabilities for hypothesized future combat lead directly to shrinking force size and degraded effectiveness in real combat.

Table 7 is an example of applying these effectiveness-based procurement ground rules.

Note that this effectiveness-based procurement outline provides nearly 10,000 aircraft over 20 years without exceeding current annual aircraft procurement budgets. The plan does include 183 F-22s for the simple reason that they have already been acquired at no further acquisition cost after 2010; it includes 200 F-35s, redesignated as A-35s, simply to fill commitments to allies who remain interested in it and to serve as battlefield interdiction aircraft in some limited-stress missions, albeit less effectively and at higher operating cost. The F-22 and the A/F-35 commitments were made years

Table 7. Effectiveness-Based Aircraft Procurement Outline

Mission	Aircraft Design	Number to be Procured	Approximate Total Cost
Close Air Support and Battlefield Interdiction	Close Air Support Fighters at no more than $15 million each	4,000	$60 billion
Close Air Support	Forward Air Control (FAC) Aircraft at ~$1 million each	2,500	$3 billion
Airlift	New Air Refueling Tankers	100	$28 billion
Airlift	Dirt Strip Airlifters at $30 million each	1000	$30 billion
Air-to-air combat	F-22s already purchased at $350 million each	183	already sunk; no actual additional procurement cost.
Air-to-air combat	New Air Superiority Fighter at no more than $40 million each	1,100	$44 billion
Battlefield Interdiction	F-35. Redesignate as A-35; acquired mostly to meet commitments to allies at $250 million each	200	$50 billion
Totals		**9,983**	**$251 billion** (does not include sunk F-22 costs)

ago by Air Force leaders driven by strategic bombardment single mindedness and cost-maximizing incentives. Unfortunately, we will have to live with the expensive fallout of those flawed decisions for additional decades.

Description of aircraft envisioned

Some might believe the cost estimates for the new aircraft listed in the chart above are unrealistically low. In fact, they are conservative. The five new aircraft in the table above are designs tailored by combat experience using the ground rules described above. They will provide the expanded force structure with a remarkable real-world increase in combat potential – and they will begin to chip away at the seemingly intractable problem of our ever-aging and shrinking fleet. Indeed, some of the Air Force's current business-as-usual leaders may be perplexed with the idea of managing such a greatly enlarged, combat-oriented fleet. Such perplexity on their part should be interpreted as a sure sign that they are not the right people to lead such a combat-oriented Air Force.

The close support fighter

This is a significantly smaller, more maneuverable and even more survivable improvement on the A-10. It is based on two, off-the-shelf, 9,000-pound class commercial/military turbofan engines. The aircraft would mount a much more compact, lighter and quicker-accelerating cannon system that fires the same highly lethal, combat-proven 30-mm round at the same muzzle velocity as the A-10. The weight savings of just using the smaller gun should be around 7,500 pounds. With a much smaller aircraft size also permitted by the more compact gun, and with other weight savings, the Close Support Fighter is projected to have an empty weight of less than 14,000 pounds compared to the A-10's 25,000 pounds. With 10,000 pounds internal fuel this aircraft will have range and loiter well beyond the A-10. Combat takeoff weight will be less than 25,000 pounds. At the mid-point of its combat mission, it would have a near 1:1 thrust to weight ratio. The sustained G, acceleration, quick re-attack time, and rate-of-climb will be world class for a close support aircraft. Survivability will be even better than the A-10, due to higher maneuverability, smaller size and new improvements in control-system hardness and fire suppression. The unit cost of $15 million is based on the actual production price of the A-10, inflated to today's dollars plus 30 percent. In other words, we are using as a model the price of an airplane that is 50 percent larger than the Close Support Fighter and have added another 30 percent to the cost just for conservatism.

FAC aircraft

The forward air controller (FAC), both air- and ground-based, is the crucial link in delivering close support, but one that is *always* neglected in peacetime. The FAC coordinates air attacks with the supported ground units, ensuring that no friendlies

get hit. Effective FAC aircraft are traditionally light observation aircraft. They need good visibility, the ability to land on dirt roads and pastures right next to supported units, long loiter time, survivable controls and fuel, and the ability to fly low and slow enough to find pinpoint, camouflaged targets like machine-gun nests, artillery/rocket emplacements, and teams laying mines. There are several light single-engine turbo-prop aircraft in production that meet all these needs. The candidates currently cost about $1 million each.

Dirt strip airlifter

This Army forward-area support transport, a modern analog of the superbly useful C-123 that the Air Force retired during the Vietnam War, is an upgraded version of existing two-engine cargo planes in the 50,000- to 60,000-pound weight class that carry 12,000- to 15,000-pound payloads. Upgrades are focused on unpaved/rough- field landings and takeoff capabilities to better serve Army units far from paved runways. The cost of $30 million is based on current quotes for the C-27J now being acquired.

Air-refueling tanker

The Air Force is contemplating a follow-on air-refueling tanker. This is a continuation of those efforts but, with so much less emphasis on the strategic bombing paradigm, substantially fewer of these aircraft will be needed. Chapter 8 of this anthology discusses other alternatives, both for this and for other airlift aircraft.

Air-to-air fighter

This fighter is 30 percent smaller than the F-16 with vastly better acceleration and turning performance. It will be, by a large margin, the hottest performing and most maneuverable fighter in the world – both subsonically and supersonically. Size is 18,500 pounds gross weight with a current in-production engine of 32,500 pounds thrust, or more. It will be able to accelerate to supersonic speeds going straight up *without using afterburner.* Electronics will be cutting edge, all-passive with 360-degree infrared and radar warning gear. Weapons will be the most advanced and effective (as demonstrated by realistic, live-fire testing) current IR air-to-air missile, a passive radar-homing air-to-air missile for attacking any stealth/non-stealth fighter radar in the world;[88] and a new, more lethal, higher velocity 20-mm cannon based on an in-production round. The small size and the 100 percent passive electronics and weapons approach will maximize surprise relative to the always-larger stealth fighters or any radar-using fighter in the world. (Surprise is the number one factor in achieving aerial victories.) Unit cost is estimated at $40 million, about 20 percent below the cost of the currently overloaded, radar and avionics-laden F-16 now in very low-rate production. We assess the cost estimate as conservative because this new fighter is 30

percent smaller than the current model of the F-16, the avionics suite is three times smaller and half the complexity of the radar-/radar missile-based F-16, and the annual production rate would be a large multiple of the current F-16 rate.

Final Thoughts

The simple aircraft procurement outline presented here can release us from the air power morass that the U.S. Air Force and our country have been experiencing for decades. If we fail to make the kind of changes outlined, we will continue to face a vanishing close-support capability, a rapidly diminishing air-to-air force increasingly unable to control the skies over our ground and naval forces, and a continuing failure to support ground forces and special operations with the emergency remote-area airlift they always need. Every military objective then becomes inordinately more difficult or even impossible. We will have no air power options other than bombing the enemy's heartland, albeit less and less every year.

The Air Force is awash in money (approximately $150 billion each year), more than it had, on average, during the Cold War. Despite this, it is being forced to cut the buy of every major program and to stretch schedules in order to pay for cost overruns and technical failures. So few airplanes are being produced that the average age of the tactical force has increased from 15 to 20 years in just the last seven years. Either age for a fighter inventory is intolerable.

A frightening example is the B-2 bomber program, right at the heart of the strategic bombardment mindset. The Air Force planned for 132 B-2s. It doubled the funding and bought 21. When the B-2s finally went to war in the Kosovo air war, the entire $44 billion fleet was able to support, on average, only one sortie per day. The B-2 proved completely irrelevant.

In contrast, the A-10 program developed and procured 715 aircraft of unprecedented close- support capability at the equivalent cost of three B-2s. Even though the Air Force leadership sent only 132 of the several hundred A-10s available in 1991 to the first Gulf war (and only under duress from the secretary of defense), this handful of aircraft generated over 200 sorties per day and may well have destroyed more tactical targets by themselves than all the remaining combat aircraft combined. As soon as the war ended, the Air Force's reward to the A-10s for their superb results was to get rid of as many as possible by sending increased numbers to the National Guard and to the Air Force's "bone yard" at Davis-Montham Air Force Base.

If we continue to rely on Air Force procurement wish lists and 90-year-old strategic bombardment theories, there will be more and more fiscal and military failures like the B-2 and the F-35. If new leadership in the Congress and the executive branch can find the courage and the open-mindedness to examine the combat history and the combat results of the last 70 years, they will find a simple solution to the air power morass written there loud and clear.

ENDNOTES

1 For an additional discussion of larger budgets buying a shrinking, aging inventory, see Chapter 11.

2 To learn more about this group, see Robert Coram, *Boyd: The Fighter Pilot Who Changed the Art of War* (Boston, MA: Little, Brown, 2002).

3 Find these data at http://en.wikipedia.org/wiki/List_of_active_United_States_military_aircraft. However, it is notable that various sources differ, sometimes significantly, in their count of Air Force active-duty and reserve- component aircraft. In response to inquiries, we were informed that the Air Force, even its historical offices, does not have a publicly available, apples to apples, consistent count of its aircraft over time.

4 U.S. air forces went by various names up to the creation of the U.S. Air Force in 1947; U.S. Army Air Corps, U.S. Army Air Force, and other titles were used.

5 These data were collected by author Dilger at the National Museum of the U.S. Air Force, Bomber Archive.

6 As an example, the U.S. B-17 bomber cost $278,000 while the P-40 cost $46,000, a 6-1 ratio. (National Museum of the U.S. Air Force archives).

7 Williamson Murray, *Luftwaffe, 1933-1945: Strategu for Defeat*, (Westport, CT: Brassey's, 1996), 40.

8 Murray, *Luftwaffe*, p. 18.

9 For further discussion of these ratios, see Murray, *Luftwaffe*, p. 18.

10 Cajus Bekker, *The Luftwaffe War Diaries: The German Air Force In World War II* (New York, NY: Ballantine Books, 1966), 539.

11 Murray, *Luftwaffe*, p. 40.

12 Murray, *Luftwaffe*, p. 41.

13 It is worth noting that some of the Luftwaffe's multi-engine bombers were equipped to conduct dive bombing. However, such variants of the Do-17 were quite small in number and frequently tasked to horizontal bombing, and such variants of the Ju-88 were found not to have the structural strength to perform high-angle dive bombing. See Wikipedia.com entries on these Luftwaffe bomber aircraft.

14 Murray, *Luftwaffe*, p. 42.

15 Murray, *Luftwaffe*, p. 50.

16 Peter C. Smith, *Ju-87 Stuka, Volume One: Luftwaffe Ju-87 Dive-Bomber Units, 1939-1941 (Luftwaffe Colors)* (Classic Publications, 2007), 41.

17 Smith, *Stuka*, p. 27.

18 Smith, *Stuka*, p. 49.

19 In another success attributable to attack aircraft other than high-altitude, horizontal bombers, against ships, in 1941, Italy had dominated the Mediterranean with four battleships. In a daring mission, the British sent 21 Swordfish torpedo aircraft to attack them at very low level. These were simple, single-engine, old and tired biplanes with a cruise speed of 88 MPH. Nonetheless, they successfully sank all four battleships on a single day in November 1940. (Luftwaffe, Murray, p. 76) This altered the balance of power in the Mediterranean in the Royal Navy's favor.

20 Murray, *Luftwaffe*, p. 49.

21 Murray, *Luftwaffe*, p. 57.

22 Murray, *Luftwaffe*, p. 59.

23 Adolf Galland, *The First and the Last* (Buccaneer Books, 1990), 12.

24 Murray, *Luftwaffe*, p. 85.

25 Bekker, *The Luftwaffe War Diaries*, p. 322.

26 Murray, *Lufewaffe*, p. 95.

27 Hans-Ulrich Rudel, *Stuka Pilot* (New York: Bantam Books, 1979), 34.

28 Peter Smith, *Luftwaffe 9: Stukas Over Steppe (Luftwaffe at War Series, No 9)* (Greenhill Books, 1999), 24.

29 Galland, *The First and the Last*, p. 90.

30 Galland, *The First and the Last*, p. 116.

31 Rudel, *Stuka Pilot*, p. 128.

32 Smith, *Luftwaffe 9: Stukas Over Steppe (Luftwaffe at War Series, No. 9)*, p. 16.

33 Murray, *Luftwaffe*, p. 161.

34 Bekker, *The Luftwaffe War Diaries*, p. 539.

35 Murray, *Luftwaffe*, p.127.

36 Murray, *Luftwaffe*, p. 161. The types lost included 228 Sterling, 249 Halifax and 202 Lancaster bombers. Another 2,724 were damaged in 1942.

37 Murray, *Luftwaffe*, p. 210.

38 Murray, *Luftwaffe*, p. 211.

39 Thomas Alexander Hughes, *Overlord: General Pete Quesada and the Triumph of Tactical Air Power in World War II* (Free Press, 2002), 86.

40 Hughes, *Overlord*, p. 94.

41 Hughes, *Overlord*, p. 97.

42 Hughes, *Overlord*, p. 97.

43 It is also notable that on June 27, 1943, an Allied landing force of 1,200 ships was en route to an invasion of Sicily. There were 1,500 German aircraft within striking distance. American and British fighters were tasked to provide air cover. Despite repeated Luftwaffe mass attacks, not a single ship was lost. On that day the Anglo-American fighters had won the air battle for the Mediterranean. This was the last Luftwaffe mass attack in the theater.

44 Murray, *Luftwaffe*, p. 167.

45 Murray, *Luftwaffe*, Appendix 4, p. 319.

46 Hughes, *Overlord*, p. 4.

47 Hughes, *Overlord*, p. 5.

48 Hughes, *Overlord*, p. 12.

49 United States Strategic Bombing Survey, Summary Report, September 1945.

50 Murray, *Luftwaffe*, p. 319.

51 Murray, *Luftwaffe*, p. 319.

52 Time and space prevents an analysis of the strategic bombing campaign against Japan. However, it should be noted that the driving factor in America's strangling the Japanese war machine on the home islands was the U.S. Navy's brilliantly successful submarine campaign. In addition, while firebomb and nuclear raids on Japanese cities did indeed kill hundreds of thousands of civilians and cause horrible damage, it is also notable that some historians and political analysts of the time question whether the nuclear raids were indeed the single factor that caused the Japanese to surrender when they did. See, for example, Robert A. Pape's *Bombing to Win: Air Power and Coercion in War* (Ithaca, NY: Cornell University Press, 1991).

53 Hughes, *Overlord*, p. 311.

54 Hughes, *Overlord*, p. 311.

55 Hughes, *Overlord*, p. 312.

56 Conrad C. Crane, *American Air Power Strategy in Korea 1950-1953* (University of Kansas Press, 2000), 31-32.

57 Crane, *American Air Power in Korea*, p. 61.

58 Crane, *American Air Power in Korea*, p. 62.

59 Robert Jackson, *Air War over Korea* (New York: Scribner's, 1973), 136.

60 Jackson, *Air War over Korea*, p. 136.

61 Jackson, *Air War over Korea*, p. 118.

62 Crane, *American Air Power in Korea*, p. 128.

63 The 200 F-86s were more than defended the entire U.S. military. When the U.S. Air Force decides to get rid of their fighters, they do a thorough job.

64 Jackson, *Air War over Korea*, p. 172.

65 Richard Hallion, *Storm over Iraq: Air Power and the Gulf War* (Washington, D.C.: Smithsonian, 1997), 354.

66 Hallion, *Storm over Iraq*, p. 65.

67 Their maximum takeoff weights in the bomber mode varied from 42,500 pounds for the F-16, 52,500 for the F-117 and 80,000 pounds for the F15E. For comparison, the average World War II B-17 heavy bomber at maximum takeoff weight came in at about 50,000 pounds.

68 After 33 losses, the Iraqi air force remained grounded until multiple aircraft fled to Iran. The 39-day air war was followed by a four-day ground engagement.

69 The air war required a huge air-refueling effort. A gallon of fuel air-delivered cost 20 times as much as a ground-delivered gallon. The requirement for airborne tankers adds enormously to mission expense and mission complexity.

70 Hallion, *Storm over Iraq*, p. 251.

71 Williamson Murray, *Air War in the Persian Gulf*, p. 141-142.

72 Murray, *Air War*, p. 242.

73 Murray, *Air War*, p. 263.

74 Hallion, *Storm over Iraq*, p. 223.

75 Murray, *Air War*, p. 286.

76 Hallion, *Storm over Iraq*, p. 184.

77 This tally does not include the loss of OA-10 FAC aircraft in the first Gulf war. Because these aircraft fly a significantly different mission profile from the A-10 attack aircraft, they are not counted here. Even if they were included, the points that follow would be the same, just with different details in the numbers.

78 The Air Force asserts that only one F-117 was shot down in the Kosovo air war. In fact, a second was also destroyed; it was severely damaged and managed to return to base, never to fly again.

79 William L. Smallwood," *Warthog: Flying the A-10 in the Gulf War* (New York: Brassey's, 1993), 96.

80 Email from Maj. Gen. David Deptula, HQ ACC/XP, to Robert Odonohue, sent on June 4, 2003 at 5:20 p.m.; forwarded to the authors by sources inside the Pentagon.

81 Elaine Grossman, "Air Leaders: A-10 Upgrades May Be Cut But Retirement Not Accelerated," *Inside the Pentagon*, June 5, 2003.

82 Andrew J. Bacevich and Eliot A. Cohen, *War over Kosovo* (New York: Columbia University Press, 2002), 14.

83 Bacevich and Cohen, *Kosovo*, p. 26.

84 Master Sgt. Andrew Gates, "A-10s Rescue Ambushed OEF Ground Forces," Army News Service, August 18, 2004.

85 Current flyaway cost is just above $180 million per aircraft. The cost cited here is based on internal memoranda circulated by the former secretary of the Air Force in advocating the additional aircraft.

86 The current total program unit cost of the F-35 is $180 million, each; given the early stage of the current program, that cost is likely to climb dramatically. This unit cost, even as a so-called "flyaway" cost is a very likely understatement.

87 The right-hand column cost of $251 billion over 20 years or so is consistent with the current U.S. Air Force yearly aircraft procurement of about $12 billion and is also consistent with internal OSD estimates published by the media. For example, see "Cutback On F-35 In 2008 Rejected," by Tony Capaccio, *Fort Worth Star-Telegram*, January 4, 2007. That article stated, "The Pentagon estimates that it will spend about $231 billion over the next 20 years buying aircraft."

88 Not just the F-22 and F-35 but apparently all U.S. combat aircraft of the future will include both stealth and radar. The radar of the F-22 and the F-35 incorporates spread spectrum techniques. These spread the electronic energy of the radar's pulses over a very wide band of frequencies to confound the enemy's ability to detect or intercept the signal. The energy is intended to appear as low level, undecipherable white noise on a standard passive receiver, or "fuzzbuster." Over 30 years ago, Dr. Thomas Amlie commented on this radar technology. At the time, Dr. Amlie was head of the Navy's China Lake test and development facility and a world-class expert on radar. His point was that such a radar would be of great expense and size and would emit a signal that was 1 million to 10 million times greater than real-world background noise. It would be relatively simple to develop a passive receiver or fuzzbuster device to detect these radar spread spectrum emissions at least four times further away than the radar's own maximum range. Dr. Amlie wrote that trying to hide the radar's immense signal would be similar to trying to camouflage an elephant in the living room by painting its toenails red. The only thing that has changed since his statement is that lots of cell phone and wireless computer devices now use spread spectrum techniques, so it is vastly easier to build a spread spectrum passive receiver today. For further discussion, see James Stevenson, *The Pentagon Paradox* (Annapolis, MD: U.S. Naval Institute Press, 1993), 367.