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**EVOLUTION OR REVOLUTION?**

**THE IMPACT OF THE 1991 GULF WAR ON  
UNITED STATES AIR FORCE DOCTRINE**

**A Thesis presented in partial fulfilment of the requirements for  
the degree of Master of Arts in History at Massey University**

**Warren Wairau**

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Warren Jade Wairau  
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## Abbreviations

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<b>AA</b>	Anti-Aircraft
<b>AAA</b>	Anti-Aircraft Artillery
<b>AAM</b>	Air-to-Air Missile
<b>AAR</b>	Air-to-Air Refuelling
<b>ABCCC</b>	Airborne Command and Control Center
<b>ACTS</b>	Air Corps Tactical School
<b>AEF</b>	American Expeditionary Force
<b>AEW</b>	Airborne Early Warning
<b>AFDD</b>	Air Force Doctrine Document
<b>AFM</b>	Air Force Manual
<b>ALCM</b>	Air Launched Cruise Missile
<b>AOR</b>	Area of Responsibility
<b>ATO</b>	Air Tasking Order
<b>ARI</b>	Airpower Research Institute
<b>ARM</b>	Anti-Radiation Missile
<b>AU</b>	Air University
<b>AWACS</b>	Airborne Warning and Control System
<b>BAI</b>	Battlefield Air Interdiction
<b>BDA</b>	Battle Damage Assessment
<b>C<sup>2</sup></b>	Command and Control
<b>C<sup>2</sup>W</b>	Command and Control Warfare
<b>C<sup>3</sup></b>	Command, Control and Communications
<b>C<sup>3</sup>I</b>	Command, Control, Communications and Intelligence
<b>CADRE</b>	Center for Aerospace Doctrine, Research, and Education
<b>CAP</b>	Combat Air Patrol
<b>CAS</b>	Close Air Support
<b>CENTAF</b>	Air Force Component, Central Command
<b>CENTCOM</b>	Central Command
<b>COG</b>	Center of Gravity
<b>CRAF</b>	Civil Reserve Air Fleet
<b>DEA</b>	Degrade Enemy Army
<b>DOD</b>	Department of Defense
<b>ECM</b>	Electronic Counter Measure
<b>EW</b>	Electronic Warfare
<b>FM</b>	Field Manual
<b>FSCL</b>	Fire Support Coordination Line
<b>GPS</b>	Global Positioning System
<b>HARM</b>	High-Speed Anti-Radiation Missile
<b>HAS</b>	Hardened Aircraft Shelter
<b>IADS</b>	Integrated Air Defense System
<b>IQAF</b>	Iraqi Air Force
<b>IW</b>	Information Warfare
<b>JFACC</b>	Joint Force Air Component Commander
<b>J-STARS</b>	Joint-Surveillance Target Attack Radar System
<b>KTO</b>	Kuwaiti Theatre of Operations
<b>LOC</b>	Lines of Communication

<b>LGB</b>	Laser Guided Bomb
<b>MAC</b>	Military Airlift Command
<b>MOOTW</b>	Military Operations Other Than War
<b>NATO</b>	National Atlantic Treaty Organisation
<b>NBC</b>	Nuclear, Biological, Chemical
<b>NCA</b>	National Command Authorities
<b>NVAF</b>	North Vietnamese Air Force
<b>OCA</b>	Offensive Counter Air
<b>OCI</b>	Offensive Counter Information
<b>PGM</b>	Precision Guided Munition
<b>RAF</b>	Royal Air Force
<b>RFC</b>	Royal Flying Corps
<b>RNAS</b>	Royal Naval Air Service
<b>SAC</b>	Strategic Air Command
<b>SAM</b>	Surface-to-Air Missile
<b>SEAD</b>	Suppression of Enemy Air Defences
<b>TAC</b>	Tactical Air Command
<b>TLAM</b>	Tomahawk Land Attack Missile
<b>UN</b>	United Nations
<b>USA</b>	United States Army
<b>USAAC</b>	United States Army Air Corps
<b>USAAF</b>	United States Army Air Forces
<b>USAF</b>	United States Air Force
<b>USMC</b>	United States Marine Corps
<b>USN</b>	United States Navy

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## Introduction

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One of mankind's greatest accomplishments this century has been the realisation of powered flight. Aviation has significantly changed the way that humans think, live and, for better or worse, wage war. The advent of airpower has revolutionised the conduct of warfare during the twentieth century as the development of platforms with the ability to project military power while operating above the earth's surface has opened a third dimension to armed conflict. Technological advances has made man's ascent into the air possible and it has progressively become the most important sphere of modern warfare. Airpower entails the use of the air not just as a medium for transit, as in the case of a projectile, but also for manoeuvre, deployment and surprise which includes aircraft, non-ballistic cruise missiles and more increasingly, space assets.

Constrained by geography and the physical environment to a much lesser extent than surface forces, airpower enjoys speed, reach, responsiveness and perspective far exceeding those of land or seapower. Today, aircraft are able to fly unlimited distances and deliver a variety of weapons upon targets with unprecedented destructive capacity. As well as applying direct firepower, aircraft are able to protect and enhance the combat power of all other friendly forces, regardless of their operational spheres. Indeed, the versatility, range, speed, precision and lethality of contemporary airpower have made it such an integral component of modern warfare that no major military operation can be efficiently conducted without it. In many instances, airpower has demonstrated that it can be the dominant form of military power.

This manifest itself most clearly in early 1991 during the Persian Gulf War between the United Nations and Iraq. On 17 January, an American-led United Nations Coalition initiated a campaign designed to eject Iraq's army of occupation from Kuwait, which it had subjugated over five months earlier. For the next 43 days, Operation *Desert Storm* confirmed airpower's status as the dominant force of modern warfare. Airpower was the principal military instrument used to destroy Iraq's warfighting capabilities, paralysing Saddam Hussein's ability to maintain his occupation of Kuwait. Unlike any previous large-scale conflict, an independent air campaign accounted for more than 90 percent of the war's entire duration. Only during the final moments of the war did allied ground forces undertake a major surface campaign that easily overwhelmed the Iraqis. The air campaign had already significantly degraded the combat effectiveness of Saddam's army, allowing the coalition ground forces to successfully conclude the conflict in a

matter of hours, bringing about one of the most complete military victories in the history of warfare. Airpower had proven the decisive factor in Iraq's defeat.

The purpose of this thesis is not to provide a narrative description of this remarkable conflict, but, rather, to assess the impact of the Gulf War on American airpower doctrine, specifically that of the United States Air Force, the Coalition's most powerful air component. Rather than merely presenting a chronicle of the events that occurred in the Gulf—which have been well documented, after all—this study will determine and evaluate whether or not *Desert Storm* changed or modified the prevailing basic doctrinal precepts of American airpower. It will investigate the application of airpower in the Gulf in order to establish whether the particular practices employed represented a continuation, or departure from, the major evolving trends in airpower theory and practice. The study will then reveal and explain the modifications to basic airpower doctrine, if indeed there were any. This analysis, then, is not a history of recent military aviation. Instead, it is an investigation of ideas and concepts as they have evolved and been applied to aerial warfighting.

In order to undertake this study, it is necessary first to trace the evolution of airpower theory and practice so that the doctrinal principles of the United States Air Force at the time of the Gulf War can be adequately explained. The following pages will first examine the major relevant theories and practical experiences that have driven the development of airpower doctrine from World War I, through to the early years of the nuclear-paramount Cold War. Within this period emerged the first vital lessons of airpower application and doctrinal origins that eventually formed the foundations for its future employment. The study will then examine the crucial role of the Vietnam War on the progression of American military aviation, as well as the reemphasis of conventional air warfare and growing awareness of appropriate airpower doctrine. It will then explain the actual application of airpower in the Gulf War and establish whether its employment validated current doctrinal concepts, or proved them unsound. Finally, this analysis will explain any lessons that airpower theorists and doctrine developers may have drawn from their observations of the war while determining the extent to which the conflict influenced air doctrine. It will also establish the doctrinal changes that *Desert Storm* air operations may have caused and, thus, disclose the impact of the Gulf War on American air doctrine. This thesis will provide an incisive account of why airpower played such a significant role in the Gulf while also demonstrating how that war, the culmination of eighty years of airpower evolution, highlights its crucial importance at present and for the future.

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## Chapter I

### The Evolution of American Airpower, 1903-63

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*"The advent of air power, which can go straight to the vital centers and either neutralize or destroy them, has put a completely new complexion on the old system of making war."*  
— Brigadier-General William "Billy" Mitchell, 1930

Since earliest times flight has fascinated people. Past centuries are fraught with speculation, research and experiments by those seeking to conquer the sky. It was not until December 1903, however, that the aviation age was pioneered when the Wright brothers accomplished the first successful powered, controlled heavier-than-air flight at Kitty Hawk, North Carolina. This new device soon found favour amongst armies throughout the world and, within fifteen years, mass formations of aircraft were clashing over Western European skies. The era of airpower had begun and would change the conduct of warfare for ever.

This chapter traces the evolution of airpower during its first sixty years, particularly that of the United States. The purpose of this study is not to provide a narration of the early history of aerial warfare, but rather to determine how the interaction of theory, practical experience and technological change influenced the formulation, and subsequent progression, of airpower doctrine. It will examine the early development of American airpower in order to explain how the doctrinal concepts of the US air arms have subsequently evolved. This examination is necessary as the doctrinal underpinnings that guided the employment of airpower in the Gulf War took their first form during these pioneering years.

Doctrine grows from a combination of three potential sources: airpower theory, practical lessons gained from warfighting, and present or projected technological developments.<sup>1</sup> Basic air and space power doctrine, according to the modern day United States Air Force, "states the most fundamental and enduring beliefs that describe and guide the proper use of air and space forces in military action."<sup>2</sup> General Curtis LeMay formulated a much more descriptive and helpful definition of doctrine thirty years ago. The former Air Force Chief of Staff declared in 1968 that:

At the very heart of warfare lies doctrine. It represents the central beliefs for waging war in order to achieve victory. Doctrine is of the

mind, a network of faith and knowledge reinforced by experience which lays the pattern for the utilization of men, equipment, and tactics. It is the building material for strategy. It is fundamental to sound judgment.<sup>3</sup>

Doctrine, then, encompasses more than what is written in official manuals. It is dynamic and evolves continuously in order to remain applicable for present operations, as well as for future contingencies. Airpower doctrine is alive amongst its practitioners and serves as the airman's guide to the correct employment of airpower; essentially, it is an air arm's theory of victory.<sup>4</sup> Thus, sound doctrine should identify the capabilities and limitations of airpower. By tracing the ideas and military lessons of airpower history, the evolution of doctrine can be best explained.

Although military and political authorities were at first rather skeptical of the Wrights' new contraption, the War Department established an Aviation Division within the Army's Signal Corps four years after Kitty Hawk.<sup>5</sup> The fledgling aeroplane immediately proved its effectiveness in reconnaissance and began replacing traditional cavalry patrols in army field exercises.<sup>6</sup> The technological limitations of these embryonic aircraft, however, restricted their employment primarily to this function, despite the first ever bombing raids conducted by Italian pilots against Turkish forces in 1911.<sup>7</sup> The First World War, though, soon provided aircraft an opportunity to demonstrate their greater potential as weapons of war.

Major continental warfare ignited between the European powers only eleven years after the Wright brothers had pioneered powered flight. Although airpower was still in its infancy and did not prove decisive in any theatre, the war had a profound impact upon its development. The demands of war transformed and accelerated the pace of construction, equipment, ideas and organisation as belligerents attempted to gain advantages. Practical employment soon defined new and more significant roles for the aeroplane in battle. Within the test of combat, several important airpower concepts evolved that became enduring doctrinal principles of the US air arms up to and beyond the Gulf War.

At the war's beginning, Army and Navy officers, long indoctrinated with the precepts of two-dimensional surface warfare, regarded aviation as an auxiliary component of their own land and sea forces. Thus, only a vaguely defined American air doctrine had emerged which was primarily concerned with reconnaissance and artillery observation in support of ground operations.<sup>8</sup> This also mirrored the emerging doctrines among the new air arms across the Atlantic. Indeed, timely Allied aerial reconnaissance proved invaluable in the early warning and interception of several major 1914 German offensives.<sup>9</sup> These information gathering missions, ironically, contributed to the



subsequent entrenchment of armies along the Western Front, leaving the aeroplane as their primary source of intelligence. Air reconnaissance and observation of artillery targets continued to feature prominently throughout the war and systems of communication between air and ground forces became much more elaborate as both sides adapted to positional warfare.<sup>10</sup>

Airmen soon began shooting at opposing aircrews in order to deter them from completing increasingly important reconnaissance assignments, thus, leading to the most important airpower concept: the need to control the air.<sup>11</sup> Air-to-air combat emerged as pilots realised that they had to gain air superiority before they could adequately perform any other task. This soon led to the development of specialised pursuit aircraft in 1915 that were designed to destroy enemy airplanes; the first air superiority fighters had appeared. The importance of air superiority was further emphasised by the rapidly expanding roles accrued by aircraft later during the war. As airplanes began to bear their firepower against each other, they also began attacking enemy ground positions and lines of communication (LOCs). Surface forces increasingly had to contend with trench and ground strafing by enemy attack aircraft, although these raids only proved valuable if air superiority had been attained.<sup>12</sup> Thus, specialised pursuit, attack and reconnaissance aircraft soon constituted the force structures of the belligerents air arms.

As airpower's contribution to war rapidly expanded, a second major concept emerged: the belief in offensive action.<sup>13</sup> The speed, flexibility and lethality of aircraft, although very primitive compared to modern standards, demonstrated to many observers that they were, indeed, essentially offensive weapons. General Sir Hugh Trenchard, commander of the British Royal Flying Corps (RFC), was one of the more important believers in this philosophy. Trenchard felt determined to gain control of the air in order that his air arm could provide direct support to Allied ground forces through close offensive action.<sup>14</sup> Under his direction, the RFC pursued a relentless strategy designed to drive the Imperial German air fleet from the skies. Although this claimed many Allied airmen, it demonstrated that the concepts of air superiority and offensive strike were already forming the underpinnings of a new airpower doctrine. This gained confirmation from the growing numbers of flying fighter formations over the Western Front, by both Allied and German aircraft.<sup>15</sup>

The concept of offensive action, however, found its clearest expression through strategic air warfare. Although much smaller than that of later conflicts, the first strategic bombing raids occurred during World War I. While German airships had raided England within a year of the war's outbreak, powered machines did not begin systematically bombing towns and cities until 1917.<sup>16</sup> The physical damage caused by these raids was relatively minor, but the psychological impact on civilians and politicians was

tremendous.<sup>17</sup> To improve its aerial defence, the British War Cabinet soon formed the Royal Air Force (RAF) following the amalgamation of the RFC and Royal Naval Air Service (RNAS) in April 1918.<sup>18</sup> An "Independent Force" had already begun conducting retaliatory strategic strikes against Germany.

Although the Armistice prevented strategic bombardment from having a decisive impact on the war, it did demonstrate that the aeroplane offered the potential to strike at an opponent's heartland by flying over its defending surface forces. For the first time in warfare, a whole nation and its population were exposed to attack, regardless of the condition of their army and navy. There was a growing widespread acceptance that strategic bombing could effect a quick and conclusive victory over relatively defenceless populations and, therefore, become the sole decisive factor in war.<sup>19</sup> This belief was to be of fundamental significance in the shaping of airpower during the inter-war period.

By the war's end, then, airpower had emerged as a valuable component in the conduct of war. Although the aeroplane had not done much at the strategic level of war, it had an immediate impact at the tactical level. It had proved useful to continental strategies, and it had also played a key role in maritime operations which forecast the missions that would soon become integral features of sea warfare. The war had defined new roles in the application of airpower which brought with it changes in tactics, organisation and force structures. Technological advances replaced the very rudimentary and awkward contraptions that were prevalent at the outset of the war as faster, powerful and more larger aircraft took to the skies.<sup>20</sup> These were much more manoeuvrable, had a longer radius of action and better armed with weapons that significantly changed the nature of the employment of airpower. World War I had indeed provided airmen and theorists with fundamental lessons that would prove vital for airpower doctrine and strategy in future conflicts.

Although the United States sent observers to Europe prior to its entry into the war, it proved unable to keep up with air developments as a result of its non-belligerence status.<sup>21</sup> The Air Service of the American Expeditionary Force (AEF), under the command of Colonel William "Billy" Mitchell, could only exert a limited impact on the aerial campaign before the war was over. Mitchell, however, would gain valuable experience in the employment of airpower while stationed in France. His small Air Service, subordinated to the AEF's ground units, meant that all air elements were invariably controlled by ground commanders.<sup>22</sup> Although he realised that offensive strike through the concentration of force was fundamental to the application of airpower, Mitchell opposed the use of aircraft as independent, decisive units, preferring instead that they remain as adjuncts to the army.<sup>23</sup> Upon his return to the United States following the Armistice, he had a major influence on the development of American air doctrine.



During the immediate post-war years, however, his ideas on the employment of airpower began to fluctuate.<sup>24</sup> Although he first believed that the primary purpose of airpower was to gain air superiority over the battlefield and then provide close support to ground forces—reflecting the War Department's official doctrinal position<sup>25</sup>—Mitchell increasingly looked to the future and envisaged the airplane as a decisive instrument of warfare. Rather than focusing on the lessons of World War I, the combat pilot was now convinced that airpower would prove crucial in future conflicts through the use of strategic bombardment. His arguments that airpower was a decisive force became more profound and he started demanding a separate aviation department, independent of army and naval authority.<sup>26</sup>

Mitchell's outspokenness, however, soon led to his court-martial in 1925 for insubordination which effectively ended his military career. Yet his influence had a strong impact on leading airmen and theorists throughout the country. Mitchell's views on airpower were closely followed by the formation of the Air Corps Tactical School (ACTS), the Army's leading aviation faculty.<sup>27</sup> The lessons and doctrines of World War I faded as airmen increasingly regarded strategic bombardment as the most effective employment of airpower, believing that swift victory in war could be gained by decisive air attacks.<sup>28</sup> They based their theories on the purported ever-increasing technological dominance of the aeroplane over other weapons of war and the weak morale of civilian populations. Many airmen believed that aircraft had the means to deliver a decisive blow in war through strategic attacks behind the battlefield. Although the experiences of World War I did not offer any substantial evidence to support these theories, the fears generated by the war's bombing campaigns gave them a powerful psychological underpinning. Despite the moral questions of bombing behind the frontlines, Mitchell and others felt that strategic bombing would end a conflict much more quickly, alleviating the carnage of trench warfare that cost the warring nations of the Great War so much.<sup>29</sup> Thus, strategic bombardment, they reasoned, would ultimately moderate the expenditures and attrition of modern war.<sup>30</sup>

The emphasis upon strategic bombing received further impetus from the works of Giulio Douhet. Although he lacked the employment practice of Mitchell and Trenchard, the Italian general definitely proved the most influential through his compelling book, *The Command of the Air*.<sup>31</sup> He firmly believed that airpower would prove the decisive form of military power, relegating surface forces to essentially defensive roles in future conflicts.<sup>32</sup> Douhet felt that the bomber could deliver a conclusive blow by directly attacking an enemy's vital industrial, commercial and civilian centers.<sup>33</sup> Although his influence upon American air doctrine is uncertain,<sup>34</sup> Douhet's views, either directly or indirectly, paralleled many then being expressed in the United States. Indeed, the ideas

of Douhet and Mitchell closely resembled each other after the latter's court-martial.<sup>35</sup>

By 1930, then, strategic bombing had become the dominant idea of the newly-formed US Army Air Corps (USAAC). The doctrine being developed at the ACTS, however, began to deviate from Mitchell and Douhet's theories.<sup>36</sup> Although the school's officers continued to promote attacks against strategic vital centers, they now advocated precise strikes against crucial economic systems—rather than indiscriminate attacks against population centers—as the most efficient means of destroying an enemy's ability and will to wage war. Developments in technology by the mid-1930s, such as the relatively accurate Norden bombsight, the turbosupercharger which enabled aircraft to fly higher than any anti-aircraft (AA) fire, combined with the long-range B-17 bomber, made the school's doctrine feasible. Precision strikes would be made possible through daylight raids while the heavy armour and armament of the B-17s precluded any need for defensive escort.

Thus, by the time of Pearl Harbour, the ACTS had developed America's first comprehensive airpower doctrine. Although the War Department maintained its insistence that the official doctrinal priority of the Air Corps was the support of ground forces,<sup>37</sup> airmen themselves had developed their own doctrine. The emphasis upon strategic bombing, though, resulted in an unfortunate neglect in other areas of aviation. Whereas pursuit and attack aviation were the Air Service's doctrinal priorities at the end of World War I, these had progressively declined during the inter-war period due to the emphasis on long-range bombing.<sup>38</sup> The focus upon strategic air warfare retarded and distorted the development of other facets of airpower. Pursuit aviation was now largely directed towards the interception of enemy bombers. Yet it was not until the late 1930s that Air Corps officers realised that potential adversaries would do the same.<sup>39</sup> By this time, it proved too late to prevent the unnecessary loss of many American airmen.

As the world once again became engulfed in another global war, the urgent need to gain an advantage over the enemy forced the belligerents to revolutionise and enhance the capabilities offered by airpower. Although the Second World War did not validate the theories of Mitchell and the ACTS, it demonstrated that the air weapon was truly indeed a powerful force. Technological innovation gave the aircraft marvellous new capabilities. The speed, flexibility and offensive firepower of the aeroplane now made it an essential weapon in modern warfare. The air lessons to emerge from the war, however, were remarkably similar to those that had emerged during 1914-8.

The most important of these was the need to establish and maintain air superiority. This proved most evident in the RAF's victory in the Battle of Britain. As a prerequisite for the threatened amphibious invasion of England, the German High Command acknowledged the need first to gain air superiority. The *Luftwaffe* correctly directed its

offensive against RAF Fighter Command and very soon the loss rates of Allied fighters and pilots reached critical levels; a German victory seemed imminent.<sup>40</sup> Yet in response to raids on Berlin, Hitler ordered his air fleet to launch retaliatory strikes against British towns and cities.<sup>41</sup> Although many urban centers were then pounded from the air, the change in strategy allowed Fighter Command to revive its strength and eventually defeat the *Luftwaffe*. The shift in objective from air superiority to strategic bombardment provided Germany its first major setback of the war.

Air superiority was equally important to the conduct of ground operations. It was immediately apparent that no surface forces could expect to function effectively if confronting overwhelming aerial opposition. Field Marshal Erwin Rommel, a famous proponent of armoured warfare, observed that in the face of enemy air superiority, "That is a sentence of death for any land army, however large, that has to fight without adequate air cover."<sup>42</sup> American ground forces soon realised the tragic consequences of being without air superiority (Kasserine Pass, February 1943) as opposed to the benefits of operating under it (Normandy, June 1944). Indeed, airpower was to prove invaluable as the Western Allies opened up their second front in Northern France. A devastating interdiction and close air support (CAS) campaign would remove any chance that the *Wehrmacht* had of launching a successful counter-offensive.<sup>43</sup> Once again, however, these operations only proved effective because of the attainment of air superiority.

The tactical support of ground forces proved to be one of airpower's best functions during the war. Indeed, the effectiveness of combining armour, aircraft and mobile infantry forces was one of the major lessons of World War II. Tactical airpower played a crucial role in restoring mobility to the battlefield as first proven by the *Wehrmacht* during its early *Blitzkrieg* victories. Combat experience soon taught the US Army Air Forces (USAAF) valuable lessons on how to effectively conduct air-ground operations.<sup>44</sup> The Army Air Forces' tactical air methods were eventually modelled upon those developed by Marshal of the RAF Sir Arthur Coningham.<sup>45</sup>

Airpower also became indispensable in the war at sea. Although the US Navy (USN) had developed the basic idea behind the aircraft carrier as early as 1911,<sup>46</sup> these only served as a fleet's advanced reconnaissance and striking arm; the world's navies still revolved around the massive battleship. Following Pearl Harbour, though, the battles in the Pacific were immediately dominated by carrier aviation. As early as May 1942, the first ever major naval engagement took place in the Coral Sea between surface ships which did not even come in sight of each other.<sup>47</sup> Air support became crucial to most forms of maritime operations, as best exemplified in the Battle of the Atlantic, where convoy escort and anti-submarine warfare proved crucial in keeping the Allied sea lanes open throughout the war.<sup>48</sup>

Although World War II demonstrated the importance of all aspects of military aviation, the focus of airpower remained upon strategic bombardment. Despite the warnings of RAF Bomber Command, the USAAF entered the European theatre convinced that its doctrine of daylight precision strike would prove decisive.<sup>49</sup> As the combined bomber offensive gathered momentum in 1943, however, *Luftwaffe* fighters began inflicting grim losses upon the AAF's unescorted bomber fleet. Yet the American strategic air commanders remained steadfast, continuing to send large numbers of men and machines to their doom. Their approach had become dogmatic, culminating in the disastrous loss rates of several missions.<sup>50</sup> Indeed, as one official history concluded: "By mid-October 1943 the daylight bombing campaign had reached a crisis."<sup>51</sup> The advent of mass numbers of long-range P-51 fighter escorts in early 1944, though, cleared the skies for the Allied bombers who were then able to successfully conduct systematic, deep raids against the Reich.<sup>52</sup> It is interesting to note that of the 2.7 million tons of bombs dropped on Germany during the war, 83 percent of that total was dropped after 1 January 1944.<sup>53</sup>

Despite the massive bombing raids, though, strategic bombardment did not bring the war against Hitler to a swift and conclusive end, let alone bring about victory by itself, even though German Armaments Minister Albert Speer certainly believed that it could have.<sup>54</sup> Although strategic air warfare, then, may have proved disappointing, it still played a crucial role in the defeat of Germany. Its economy was brought to virtual collapse and armament production would have already been brought to a halt by May 1945 even if allied surface forces had not crossed its borders.<sup>55</sup> Speer acknowledged after the war that the AAF daylight precision strikes were particularly damaging to his war industry.<sup>56</sup> Thus, although the bombing offensive did not meet prewar expectations, it certainly proved invaluable. Mitchell and Douhet had overestimated the technical dominance of the air weapon and the test of combat had demonstrated the exaggerations of their theories. Strategic bombing, nevertheless, still played a vital role in the allied war effort.

The bombing of Japan also played a crucial, if not key, factor in its decision to surrender. After destroying most of its military and economic base, the AAF increasingly moved towards a series of devastating fire raids directed against Japan's population centers.<sup>57</sup> Although the two atom bombs dropped on Hiroshima and Nagasaki are usually credited for ending the war, AAF leaders believed that they had little influence on Japan's decision to surrender.<sup>58</sup> Indeed, one official report concluded that Japan would still have surrendered by the end of 1945, even without the atom bombs or a surface invasion.<sup>59</sup> Regardless of what may have occurred, the aerial offensives against Japan and Germany proved that strategic bombardment could make an invaluable contribution to war. It did not, however, provide the quick and conclusive blow that air theorists had



promised. Attrition warfare, not any sudden, decisive strike, caused the two Axis powers finally to capitulate. Airpower theory, then, was still well ahead of what the aircraft could actually deliver.

The Second World War, though, had demonstrated that airpower was now an integral component of modern warfare. The air weapon had revolutionised the conduct of war and influenced the planning and execution of all maritime and continental operations. Indeed, General Dwight Eisenhower, the Supreme Allied Commander, felt that one of the fundamental lessons of that great conflict was the growing importance of airpower.<sup>60</sup> Advanced technological developments achieved during the war such as electronic combat, the jet engine and ballistic missiles foreshadowed the future of air warfare. Operational realities also significantly influenced the shaping of post-war airpower.

Although airpower's role was complementary rather than autonomous, World War II demonstrated that this newest form of military power was indeed its own unique form of warfare. As the effective conduct of ground and sea forces demanded specialised training, skills and organisation, so too did that of airpower. Air arms had now developed to a standard of sophistication which many airmen felt warranted independent status from that of armies and navies. War in the air was a distinctive, although not separate, entity to that which was waged on the surface below. The practical realities of combat demonstrated this only too well. Thus, in 1947, on the basis of organisational efficiency and specialisation, the United States Air Force (USAF) commenced as an independent service.<sup>61</sup>

Closely linked to the concept of independence was that of unity of command. The importance of this operational concept was already demonstrated during the Great War where air units could be concentrated in mass numbers at critical times and places.<sup>62</sup> The need for centralised command exploited the inherent flexibility of the air weapon, rather than having aviation divided amongst different authorities. This would reduce the effects of dissipation where air elements were distributed rather than concentrated in force. As Sir Arthur Tedder, Eisenhower's deputy, commented, "Air warfare cannot be separated into little packets; it knows no boundaries on land or sea other than those imposed by the radius of action of the aircraft; it is a unity and demands unity of command."<sup>63</sup>

American airpower, though, was neither independent nor centralised during the war.<sup>64</sup> As the North African campaign unfolded, tactical air doctrine attached aviation to army formations so air units were, in effect, subordinated to ground commanders who did not understand the complexities of air warfare.<sup>65</sup> These "little packets" were easy prey for the *Luftwaffe* and could not provide effective support to their assigned ground units. A former AAF officer later recalled that it was Coningham who changed everything.<sup>66</sup> His methods

of placing all air assets under the control of a single air commander who would prioritise the demands of the theatre commander were soon adopted by the Army Air Forces.<sup>67</sup> This subsequently became official doctrine in July 1943 when the War Department released Field Manual (FM)100-20, *Command and Employment of Air Power*.<sup>68</sup> Viewed by some as the Air Force's "Declaration of Independence", FM 100-20 states that "Land power and air power are co-equal and interdependent forces; neither is an auxiliary of the other."<sup>69</sup> The document also pointed out the three phases of an air campaign in their proper order of priority; the attainment of air superiority; interdiction; then CAS.<sup>70</sup> This pattern remains an enduring doctrinal belief of air forces to this very day.

The experiences of war, therefore, taught new lessons in the application of airpower. Regrettably, some of these lessons would have to be relearnt by US airmen as they attempted to apply the doctrinal concepts of World War II within the new context of the Cold War era. However, the advent of atomic, and later thermonuclear, power, seemed to change the nature of warfare. Strategic deterrence became the central focus of Washington's national strategy. The emphasis in the Pentagon shifted towards war against the Soviet Union and the Air Force's atom bomb became the basis of defence planning.<sup>71</sup> As the White House reduced its defence expenditure, most defence dollars went to strategic forces that would deter or win a general nuclear war against its former Soviet ally.<sup>72</sup> This emphasis upon nuclear deterrence and warfare would have serious implications upon the development of US airpower which became painfully evident during America's next two major conflicts after World War II.

The first war fought by the newly formed USAF did not take place over Russia, but over the small Korean peninsula. Unfortunately, the new service was totally unprepared for this type of limited war.<sup>73</sup> As the Air Force's Strategic Air Command (SAC) received most of the service's budget, the development of tactical airpower had been neglected since 1945.<sup>74</sup> The Air Force had cut back on tactical forces during the years prior to the Korean conflict and only those that possessed a nuclear capability were allocated sufficient funding.<sup>75</sup> The long-range bomber had retained preeminent status and strategists felt that their doctrine of strategic warfare would effect a swift and decisive victory over North Korea. They became very disappointed when the USAF found itself locked in a prolonged, exhausting battle.

The doctrine of strategic bombardment proved woefully inadequate.<sup>76</sup> There were very few strategic targets available while there was no crucial industrial base similar to that of Germany or Japan.<sup>77</sup> More important, however, was the fact that political considerations limited the air war to that over Korea. The main sources of North Korean military production lay in China and the Soviet Union. Washington, fearful of escalating the conflict into a major international war, imposed political constraints upon its aircraft from

violating Soviet and Chinese airspace. Airpower, at least in this case, could not be employed as a decisive instrument of war, despite the protests of SAC officers, including LeMay.<sup>78</sup>

Thus, although American air forces managed to establish air superiority over much of the country, political considerations restricted them from fully exploiting it. The most important LOCs outside of North Korea remained immune from attack for the duration of the war. Such was the change in the moral perception of war within five years that raids against certain North Korean targets were cautiously undertaken because of fears of collateral damage and alienation of world opinion.<sup>79</sup> Although China's entry into the conflict led to the escalation of air assaults against North Korean targets, Manchuria remained safe from air attack.

The limitations upon strategic bombardment actually meant that tactical air warfare played a crucial role in the war. Indeed, tactical air support had already saved the entire war effort by repelling the initial North Korean invasion. While tactical airpower may have previously been neglected, the experiences of World War II were fresh in the minds of many airmen.<sup>80</sup> The United Nations (UN) air forces soon established air superiority over the peninsula and conducted interdiction and CAS campaigns which never allowed the numerically stronger communist forces to be decisive. The first air battles between jet-engined fighters would take place over Korea which the allied air fleet, despite the sanctuaries of China and Russia, eventually won. By the war's end, the USAF had achieved an extraordinary 10-to-1 victory-loss ratio.<sup>81</sup> In spite of earlier inefficiencies, air-ground operations also began to improve as allied forces became accustomed to combat.<sup>82</sup> As the ground war degenerated into stalemate, airpower was seen as the only means of breaking the deadlock.

Air Force commanders, however, experienced difficulties by not appreciating the nature of their adversary. While they believed that tactical airpower could be used to best effect in the interdiction of supply lines, the communist LOCs were based primarily on peasant labour which were far less likely to be affected by air attack than were modern mechanised transport.<sup>83</sup> The Air Force's interdiction campaigns also proved ineffective because of the lack of heavy fighting after the first half of 1951.<sup>84</sup> The communists were able to alleviate the losses of interdiction by adjusting their level of fighting at the front. For interdiction to be successful, then, integrated air and surface manoeuvre was required. More problems for the Air Force resulted from interservice disagreements over command and control (C<sup>2</sup>) arrangements. Each service had its own views on how tactical air forces should be employed.<sup>85</sup> Air assets were distributed under separate service commands which further undermined the full potential of airpower.<sup>86</sup> It was not until over a year and a half into the war that the full strength of the major air arms

of the Air Force and Navy were operating in unison.<sup>87</sup>

Thus, from Korea it was immediately apparent that some of the doctrinal concepts that applied to World War II were divorced from military reality in this new age. Strategic air warfare by conventional means, let alone use of the atomic deterrent, seemed impracticable within this type of limited war. The gradual escalation of strategic airpower—or “air pressure” as it was called—undermined the shock effect of the air weapon and, thus, the whole air effort. Although tactical airpower proved vital in bringing the war to an acceptable conclusion, the Air Force realised that it was unable to bring the decisive force to bear that its doctrine had promoted. It had gained aerial superiority over the peninsula, yet it proved incapable of bringing the conflict to a decisive end. American airmen, then, left Korea with a troubled paradox.<sup>88</sup>

Air Force planners avoided confronting this paradox by deeming the Korean conflict as atypical of the wars they would have to wage in the future.<sup>89</sup> The war was seen as an aberration and the USAF refocused its efforts on preparing for an all-out nuclear confrontation against the Soviet empire. Although Korea had confirmed the importance of tactical aviation, the Air Force was unwilling to commit its scarce resources and valuable time to planning contingencies for small and limited wars.<sup>90</sup> This mentality dominated the thinking of Air Force planners which was reflected in the service's doctrine and force structure during the immediate post-Korean years.

Between 1953 and 1959, the USAF released its first four official doctrine manuals, Air Force Manual (AFM) 1-2: *United States Air Force Basic Doctrine*.<sup>91</sup> The basic texts of these editions were virtually the same and undoubtedly reflected the experiences of World War II; those of Korea were largely ignored.<sup>92</sup> The manuals emphasised the employment of airpower against the heartland of an enemy nation and strategic bombardment soon became synonymous with atomic and thermonuclear warfare.<sup>93</sup> Indeed, strategic operations were directly linked to the delivery of weapons of mass destruction while little emphasis was given to the application of precise, conventional weapons in limited or general war.<sup>94</sup> “It is probably much more than coincidence”, according to one doctrinal expert, “that during the 1950s and much of the 1960s, general officers whose careers were inseparably intertwined with strategic bombardment dominated Air Force leadership and that Air Force doctrine emphasized strategic bombardment.”<sup>95</sup>

The priority given to strategic air warfare was also reflected through the Air Force's acquisition of its first supersonic jet fighters in the 1950s. The Century series aircraft were designed primarily to either intercept slow, atomic bombers, or to serve as atomic-bomb-armed strike fighters.<sup>96</sup> Theorists and pundits believed that fighters only needed to stop enemy bombers; the Air Force was unwisely repeating the Air Corps mistakes of the



early 1930s. Little emphasis was consequently placed on tactical aviation as the art and techniques of aerial combat were seen as irrelevant in the atomic age. Tactical air forces were now based upon fighter-bombers which could deliver small nuclear weapons. The USAF, therefore, entered the 1960s with no specialised conventional air-to-air combat fighter. By the end of the 1950s, the Air Force's Tactical Air Command (TAC) did not have the resources to wage a prolonged, conventional air war.<sup>97</sup>

Thus, within sixty years of Kitty Hawk, the aeroplane had become an integral component of a nation's military arsenal. After its introduction in the Great War, airpower in World War II proved that modern warfare would never be the same again. Although it may not have proven the conclusive, decisive force that inter-war prophets claimed that it would be, the marriage of air and atomic power made the daunting prospects of Mitchell and Douhet's theories much more conceivable. Doctrine in 1914 had shifted from one emphasising the support of ground forces to one which promised decisive, destructive firepower by the end of 1945. Although this was not proved in Korea, Air Force planners regarded this conflict as an anomaly and hastily swept it aside. This clearly demonstrated the tendency of airmen to ignore lessons which did not conform to their thinking and doctrine. Outside of the SAC, the air force was indeed in a most critical state. "The deplorable condition of aerospace power today," one officer claimed in 1963, "is to a large extent the result of allowing Air Force doctrine to stagnate and become inapplicable to modern conditions."<sup>98</sup> As the next several years revealed, this proved only too true.

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## Chapter II

### Vietnam and its Aftermath: *From Rolling Thunder to Instant Thunder*

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*"People who fail to study their history are destined to repeat it, and we, the United States, were bound and determined not to make the same mistakes that had so frustrated our military efforts in Vietnam."*

— Lieutenant-General Charles A. Horner, 1991

America's war in Southeast Asia proved calamitous. The so-called bulwark of democracy had failed to halt the communist onslaught while the nation grieved the loss of nearly sixty thousand lives.<sup>1</sup> A small, peasant country undermined the strength of a superpower and disrupted all aspects of American society, highlighted by President Johnson's decision not to seek reelection. For the US military, it was a shattering experience. National Command Authorities (NCA) and the armed services, however, soon began analysing the war in order to avoid repeating this political and military catastrophe.

This chapter will examine that conflict and the repercussions it had on the American military, with particular reference to the application of airpower. It will investigate how the war in Southeast Asia influenced and shaped the evolution of US military aviation through to the period immediately prior to the Iraqi invasion of Kuwait. This analysis will establish the doctrinal concepts of the US air arms on the eve of the Gulf War while also demonstrating how Vietnam marked a crucial turning point in the evolution of American airpower.

Air combat operations against North Vietnam ended in January 1973, marking the end of an experience which one former Air Force Chief of Staff noted as a "great frustration" and a war in which airmen found that "missions, tactics, and targets frequently seemed inconsistent with their experience, training, and doctrine."<sup>2</sup> This "great frustration" reflected itself in aircraft losses during the period between 1966 and 1973 when enemy action claimed 1,324 fixed- and 2,112 rotary-wing craft.<sup>3</sup> The conflict in Vietnam had exacted a heavy toll upon US machines and crews and, for the most part, airmen had been demoralised at the way their civilian superiors had planned and directed the air war.

As Washington's military commitments to South Vietnam intensified after 1964, Johnson and his Secretary of Defense, Robert McNamara, believed that the growing crisis was a counterinsurgency war where ground forces would play the predominant role.<sup>4</sup> Army commanders agreed, believing that the main function of airpower should be the interdiction of the communist LOCs while also providing CAS.<sup>5</sup> Most senior civilian officials felt that an intense strategic air campaign against North Vietnam would not prove decisive and, in any case, that it would provoke war with China.<sup>6</sup> So in 1965 a limited and measured air campaign commenced against relatively inconsequential targets in the north. The operation, code-named *Rolling Thunder*, was based upon McNamara's strategy of graduated response to provocation. It aimed to disrupt the communist supply routes while also signalling to Hanoi that further aggression would be met with incremental air assaults.

Political restrictions, then, meant that the Air Force could not conform to its main doctrinal tenet of strategic warfare. Washington designated that airpower be employed as a supporting element of ground forces rather than as a decisive instrument of warfare. If government officials already had doubts over the effectiveness of airpower, their policy of gradual escalation was only going to further undermine the air weapon's impact. As *Rolling Thunder* unfolded, it soon became apparent that neither the communist LOCs were being effectively disrupted, nor was Hanoi willing to cease hostilities. Senior airmen believed that the operation was too restrictive and requested that they be allowed to conduct a much more concentrated offensive against North Vietnam's vital military and industrial centers. Indeed, LeMay wanted to propel that nation "back into the Stone Age".<sup>7</sup> Washington, however, continually rejected a 94-target list prepared by the Joint Chiefs of Staff (JCS) in 1964 which contained the most crucial components of Hanoi's war effort.<sup>8</sup> Of further irritation to airmen was the White House's direct involvement in the planning of air strikes. Civilian officials played a key role not only in target selection, but also in the size and frequency of the strikes that hit those targets; this was *not* how to conduct an air campaign.<sup>9</sup>

Although Washington's overbearing role in the air war proved detrimental, the Air Force also contributed significantly towards its poor performance, particularly during the war's earlier years. While Kennedy initiated his policy of Flexible Response in 1961, replacing that of Massive Retaliation which had prevailed in the 1950s, basic airpower doctrine continued to be mired in the concepts of general nuclear war. This was confirmed by the Air Force's 1964 AFM 1-1: *United States Air Force Basic Doctrine*, the doctrine with which the service would enter Vietnam.<sup>10</sup> The new manual focused primarily on the employment of thermonuclear weapons which would destroy an opponent's major industrial areas and, thus, its ability to wage war. Little emphasis was

given to any other military action outside that of the nuclear realm. Indeed, one senior Air Force representative believed that weapons of mass destruction, for the purposes of deterrence and war, applied to the whole spectrum of military action.<sup>11</sup> The service's difficulties in accommodating Flexible Response led to many observers concluding that "the Air Force had been caught in a doctrinal and conceptual lag."<sup>12</sup> The assumptions guiding the formulation of basic air force doctrine were founded upon the belief that the service would only wage a war of annihilation against an industrialised enemy. Vietnam proved both these assumptions wrong.

Once fighter operations commenced, Air Force pilots quickly realised that their doctrine was totally inappropriate. Air-to-air combat had not become obsolete and airmen soon found that their supersonic jet fighter-bombers were being outmanoeuvred by older generation Soviet-designed MiGs. The Air Force's doctrinal emphasis upon nuclear-armed multi-purpose aircraft proved disappointing as Korean-vintage fighters such as the MiG-17 inflicted greater-than-expected losses upon the new US aircraft. The extraordinary successes of Korea seemed distant as airmen struggled to gain a less than impressive 2.2-to-1 victory-loss ratio over North Vietnamese Air Force (NVAF) fighters by the time *Rolling Thunder* ended in March 1968.<sup>13</sup> This was not very successful considering they were facing, as one later Air Force Chief of Staff said, "a fifth-rate" opponent.<sup>14</sup> Although poor aerodynamic performance may have restricted fighter operational effectiveness, the inadequate training of pilots also proved critical. The Air Force soon realised that its doctrinal devaluation of aerial combat had also been a fatal mistake. Navy pilots proved much more proficient at air-to-air fighting due to their training for fleet defence whereas their Air Force counterparts struggled.<sup>15</sup> The importance of air superiority had to be learnt by the Air Force all over again.

The service's doctrinal emphasis on the employment of nuclear weapons also hindered the effectiveness of its attack operations. The tactics required for strike formations to penetrate enemy airspace and deliver measured, conventional ordnance upon selected targets had to be relearnt and refined. After Korea, little emphasis was placed on the delivery of non-nuclear weapons.<sup>16</sup> The Air Force had focused almost exclusively on single atomic-bombers devastating wide areas with their destructive payload. Airmen once again had to redevelop the art and techniques of attack aviation. Unfortunately, these also had to be modified in the face of new and more dangerous threats.

Vietnam signalled the first major use of surface-to-air missiles (SAMs) which would change the conduct of aerial warfare. The North Vietnamese quickly built an integrated aerial defence network in and around Hanoi which consisted of SAMs, MiG interceptors and heavy anti-aircraft artillery (AAA). Although North Vietnam had a meagre aerial

defence in 1965, Hanoi quickly established a concentrated system which was by far the most strongest that US forces had ever encountered up to that time. Veteran Second World War fighter pilots felt that the AA fire over Hanoi was more dense than anything they had experienced over Berlin.<sup>17</sup>

The threat of SAMs and radar-guided AAA forced airmen to revitalise the employment of electronic countermeasures (ECM) such as chaff and jammers during *Rolling Thunder*. Although fighters during World War II and Korea did not carry ECM pods, these proved crucial in neutralising much of North Vietnam's ground-based defences.<sup>18</sup> The Air Force soon developed specialised electronic warfare (EW) aircraft fitted with sophisticated radar detection and jammer devices. The aircraft located active enemy radar sites and fired anti-radiation missiles (ARMs) that traced the beams emitted by the radar.<sup>19</sup> These new weapons and systems proved much more effective in finding, suppressing and destroying SAM and radar-guided AAA batteries. Prime evidence was the falling casualty rates of US aircraft to SAMs.<sup>20</sup> The vital importance of support elements to reducing losses reflected itself in the compositions of strike packages. The ratio of EW and escort fighters to attack aircraft rose to 4-to-1 when combat operations resumed against North Vietnam in 1972 during the *Linebacker* offensives.<sup>21</sup>

The focus upon nuclear warfare meant that the USAF had also lost valuable practice in the operational art of how to wage a protracted air war. The effectiveness of the US air effort suffered further from a lack of centralised command and control of air operations. The air effort comprised several "theatre" campaigns which separated air assets.<sup>22</sup> The division of North Vietnam into operational boundaries under a "Route Package" system between the Air Force and Navy created so-called "service targets".<sup>23</sup> Thus, one of the crucial tenets of airpower doctrine all but disappeared. As FM 100-20 had stated twenty years earlier, "Control of available air power must be centralized and command must be exercised through the air force commander".<sup>24</sup> Although Air Force officers argued that a single air component commander be established for the C<sup>2</sup> of all air operations, this was never achieved for *Rolling Thunder*.<sup>25</sup>

Hanoi enjoyed the four year respite between bombing, but the US air arms were already implementing new measures to improve operational effectiveness. These profoundly changed the evolution of American airpower over the next two decades. The poor performance of US airmen during *Rolling Thunder* led to a greater emphasis being placed on air combat training and tactics. The Navy took the initiative and developed new training programmes on fighter operations in 1968 which soon led to the much-touted "Top Gun" school. The Air Force, however, lagged behind and only developed new fighter programmes too late before they could have any effect over Vietnam. This was reflected by its relatively poor 2-to-1 kill ratios in 1972 compared to the Navy's



impressive 13-to-1 record.<sup>26</sup>

Although the Navy had taken the first steps to improve aircrew fighter training, the Air Force clearly surpassed it once the war was over, establishing the "Red Flag" programme in 1975. "Red Flag" aimed to provide airmen with simulated missions like they would encounter during their first ten sorties (historically these claim the most lives of fighter pilots).<sup>27</sup> As well as providing improved and extensive training for aircrews, "Red Flag" exercises developed tactical and operational concepts that would be employed against any future adversaries. They also provided air officers and planners vital practice in the art of waging fighter operations. Following the introduction of "Red Flag", the Air Force also instituted "Blue Flag" programmes which focused on air-ground operations and "Green Flag" which emphasised realistic EW operational exercises.

As the reemphasis on fighter operations progressed, there was also more focus to improve and develop weapons systems designed for conventional air warfare. One of the more worrying aspects to airmen was the indifferent performance of their air-to-air missiles (AAMs).<sup>28</sup> These malfunctioned frequently and, coupled with the Air Force's belief that air-to-air cannon was unnecessary in the age of the supersonic jet fighter, proved fatal to US aircrews. Washington's insistence that no AAMs be fired beyond visual range (BVR) meant that airmen had already conceded a crucial tactical advantage.<sup>29</sup> The disappointment of the missiles and the realisation that aerial cannon were essential to fighters, led to the development of better and advanced AAMs along with enhanced internal armament capabilities.

The effectiveness of fighter operations was further improved by the development of Precision Guided Munitions (PGMs). These allowed aircraft to destroy targets with an accuracy unprecedented in aerial warfare.<sup>30</sup> Rather than merely dropping from an airborne platform like conventional ordnance, PGMs, or popularly known as "smart" bombs, could be directed onto targets through laser- or electro-optically guided systems. Their efficiency was purportedly demonstrated when a single 3,000-lb laser-guided bomb (LGB) destroyed a bridge in 1972 after it had been the target of over 700 sorties during *Rolling Thunder*.<sup>31</sup> Thus, PGMs appeared to reduce the number of aircraft, sorties and amount of ordnance needed to hit a selected target. A new dimension had been added to the employment of airpower as aircraft were now able to release their munitions at higher altitudes, avoiding much of the AA fire and, thus, increasing survivability.<sup>32</sup>

Improving the training and tactics of airmen, and the technology of their weapons systems, however, was not enough. Although the multi-role F-4 had performed admirably in air-to-air combat, the Air Force, as one officer pointed out in 1968, did not have a specialised air superiority fighter.<sup>33</sup> The poor performance of the Century series

over North Vietnam clearly demonstrated the need for improved fighter aircraft within its arsenal. Thus, programmes were soon established to develop new aerial fighters. These subsequently led to the introduction of America's "super-fighters" during the 1970s: the F-14, F-15, F-16 and F/A-18. The new series of fighter aircraft clearly reflected the shift in the Air Force's doctrinal emphasis away from the atomic fighter-bomber and to that of air superiority. These aircraft would prove to be the most advanced in their field and spearheaded the revitalisation of fighter operations during the latter years of the Cold War. Together, they would later fly over half of American fixed-wing air combat operations in the Gulf War.<sup>34</sup>

Meanwhile, the Vietnam nightmare continued. Following the initiation of President Nixon's "Vietnamization" policy in 1969, airpower became the Pentagon's main striking arm. *Rolling Thunder* had failed miserably, and, as a result, so had Johnson's and McNamara's strategies. Although the air campaign intensified as the war progressed, it ultimately proved ineffectual. Many critical targets were not attacked while intermittent bombing halts further relieved the pressure on the communists. Johnson later admitted to his successor that the campaign's pauses were a serious mistake.<sup>35</sup> The lessons learnt by airmen, though, proved crucial in later operations. Following Hanoi's 1972 Easter invasion, Nixon instructed that most of the 94 targets selected eight years earlier could finally be struck in Operation *Linebacker*.<sup>36</sup> After further delays in negotiations, however, a complete all-out offensive was launched against North Vietnam's vital centers. The Air Force was finally able to yield the power that it had desired all along as it unleashed its firepower against the most critical points of the communist war effort. The eleven-day *Linebacker II* campaign totally destroyed North Vietnam's air defence network, further exposing the country to the full might of American airpower. Hanoi immediately negotiated a favourable cease-fire.

Despite the success of the *Linebacker* offensives, though, Vietnam demonstrated the failures of the Air Force's basic doctrine. Southeast Asia, like Korea, proved that the US would not always wage general war against an industrialised enemy. In any case, the major sources of North Vietnam's industrial strength lay in China, which was once again safeguarded by political constraints. Thus, Air Force doctrine was neither relevant to Vietnam, nor would civilian leaders let airmen execute it even if it was, until the very end, of course. Protracted, limited war had not become obsolete and nuclear weapons once again demonstrated that they were not applicable to the whole spectrum of warfare. Yet it was a healthy sign that the Air Force, as a result of its poor results in Vietnam, had already begun to reemphasise its conventional warfighting capabilities.

Nevertheless, in spite of this resurgence, the Air Force's official basic doctrine manuals released during the 1970s maintained their emphasis upon preparing for general

nuclear war.<sup>37</sup> Although the 1971 version of AFM 1-1 stated that doctrine “is based on an accumulation of knowledge gained through study, military experience, and test”, the lessons of Vietnam, like Korea, had largely been ignored by its writers.<sup>38</sup> The Air Force’s 1975 edition, its first post-Vietnam manual, continued to stress the importance of nuclear warfare capabilities and operations even though the conflict in Southeast Asia had demonstrated the irrelevancy of weapons of mass destruction.<sup>39</sup> The doctrine manuals were of little practical value to airmen and seemed to be written to justify the service’s budgets for promising technologies.<sup>40</sup> Indeed, airmen had become so mesmerised by technology since World War II that it had now taken over from theory as the driver of doctrine.

The nuclear trend persisted in the manual published four years later. The 1979 AFM 1-1: *Functions and Basic Doctrine of the United States Air Force*<sup>41</sup> epitomised the thought that had dominated US airpower doctrine during the previous three decades. Despite the experiences of Korea, Vietnam and the innovative programmes already underway within the aviation community, official doctrine retained its heavy emphasis on nuclear deterrence and warfare.<sup>42</sup> While the manual stated that “doctrine has evolved through the study, experience, and employment of aerospace power from World War I to the present”,<sup>43</sup> it focused little on the art of war and the employment of airpower. Its inconsistency with military reality and several other deficiencies received much criticism from airpower scholars and officers.<sup>44</sup> Indeed, one pundit stated that the manual represented “the nadir of Air Force doctrine.”<sup>45</sup> However, although the Air Force may have reached a low point in its doctrinal development, it soon implemented a number of programmes and organisations that rejuvenated the interest and study of airpower during the next decade.<sup>46</sup> As the service later recalled, “The 1980s were a period of intense reflection within the Air Force on its role in future conflict.”<sup>47</sup>

This growing awareness accompanied the extensive revision of the lamentable 1979 AFM 1-1 in 1983, and in March the following year, the Air Force released its ninth doctrine manual, 1984 AFM 1-1: *Basic Aerospace Doctrine of the United States Air Force*.<sup>48</sup> This manual was a marked improvement over its predecessor. Although it stressed the importance of strategic offense, the emphasis on nuclear deterrence and warfare had been decidedly reduced. The manual was clearly written with more focus upon the preparation and employment of an air force for combat operations. For the first time, the Air Force pointed out that its early doctrinal publications in the 1950s had been based on the experiences of the Second World War while ignoring those of Korea.<sup>49</sup> Heeding the lessons from Vietnam, the manual stated that the American armed forces “must be capable of achieving victory across a wide spectrum of conflicts or crises.”<sup>50</sup> Such was the significance of Vietnam that the 1984 edition specifically addressed the



importance of the support of the American people to the success of the military. To undertake any operations without their support, the manual claimed, was "to invite defeat."<sup>51</sup>

While the manual asserted that "aerospace power can be the decisive force in warfare", it also emphasised its role as a key component of the nation's armed forces.<sup>52</sup> Despite having to fight another limited war in Asia, the US military continued to view a confrontation with the Soviet Union in central Europe as its primary mission. Unlike throughout the previous thirty years, however, the US felt determined to counter the growing Soviet-Warsaw Pact threat with a conventional capability, rather than merely resorting to weapons of mass destruction. The large numerical superiority of Pact forces over the US-NATO alliance, though, demanded greater unity amongst the US armed services and those of their allies. This soon led to a growing number of "joint" agreements and programmes which fostered a new spirit of cooperation amongst the services. AFM 1-1 reflected this when stating that the armed services fought "as an interdependent team" and "in a unified effort to accomplish common objectives."<sup>53</sup>

Although the Air Force was keen to demonstrate its willingness to participate as part of a "team", the manual continued the service's long held doctrinal tradition of emphasising the importance of independent strategic air operations. Echoing the beliefs of "Billy" Mitchell from over fifty years ago, the manual asserted that "the aerospace medium exposes an enemy's entire power structure to assault by the aerospace vehicle, including his sustaining warfighting components vital to the prosecution of war."<sup>54</sup> Airpower was able to exploit speed, range and flexibility more efficiently than surface forces and could strike directly at the enemy's sources of strength. Reflecting lessons more from the Second World War than Korea or Vietnam, the manual claimed that "Modern warfare has demonstrated the potential importance of strategic attacks against targets in an enemy's heartland."<sup>55</sup> The concepts of strategic warfare were stressed throughout the entire publication and the premise that "Aerospace forces have the power to penetrate to the heart of an enemy's strength without first defeating defending forces in detail" would have a considerable influence over Air Force planners six years later.<sup>56</sup> Essential to the success of a strategic campaign, though, was air superiority. Indeed, the Air Force pointed to airpower's pivotal role in modern warfare, stating that: "Sustained aerospace and surface operations are predicated on control of the aerospace environment."<sup>57</sup>

The 1984 version of AFM 1-1 was the Air Force's most professional and competent doctrinal publication up to that date. Almost immediately after its release, however, the Air Staff began a revision of the manual that would lead to its successor eight years later, the two-volume 1992 AFM 1-1, *Basic Aerospace Doctrine of the United States Air*

*Force*.<sup>58</sup> As the now-rejuvenated intellectual climate within the Air Force community debated the direction and purpose of the service's doctrinal development, the official Air Force historian, Richard Hallion, later claimed that a book written by one officer, "assumed the de facto role of doctrinal guide and, indeed, air power "bible".<sup>59</sup> This book was *The Air Campaign: Planning For Combat*,<sup>60</sup> produced by Colonel John A. Warden III.

First published in 1988, *The Air Campaign* addressed the operational art of an aerial campaign. Warden focused his study primarily on how theatre and air commanders were to translate strategic objectives into tactical plans at the operational level, a task that had proved difficult in Southeast Asia. The former Vietnam fighter pilot argued how an air officer should plan and structure a "proper" air campaign, as proven by the critical analysis of history. Essential to the success of this campaign was, undoubtedly, the objective of air superiority. Reflecting the Air Force's doctrinal declaration, Warden pointed out its significance, claiming that "For the last half century, air superiority inevitably has spelled the difference between victory and defeat."<sup>61</sup>

Once this had been attained, the air commander then had to apportion the rest of the air effort by determining how interdiction and close air support operations could be integrated into his campaign plan. Although the mission of maintaining air superiority remained foremost, as well as depending on the eventuality of any critical emergency situations, Warden argued that the campaign should focus primarily on interdiction. Believing that airpower history had long demonstrated the effectiveness of interdiction over that of CAS, Warden felt that the air commander should direct the main effort of his forces towards these operations.<sup>62</sup> The colonel categorised interdiction as either distant, intermediate or close.<sup>63</sup> Distant interdiction was basically strategic attack against the enemy's source of material and men while intermediate operations focused on striking these while they were moved to the front. Close interdiction occurred in the area along the front where lateral movement took place. If circumstances and proper resources were sufficient, then airpower should be directed against all three areas simultaneously. Warden believed that the air effort should only focus on providing CAS for land and naval forces if the enemy possessed no suitable interdiction targets, such as what occurred during the Korean War. In such a conflict, surface forces would serve as the primary arm while airpower provided a supporting role.

Central to Warden's thesis was the concept of "center of gravity". First developed by the great Prussian military strategist Carl von Clausewitz in the early nineteenth-century, centers of gravity formed the critical elements of a nation's warfighting capability. A successful attack against these represented the best opportunity of achieving decisive results. As Clausewitz stated, a center of gravity (COG) "presents the most effective target for a blow" and "is the place where the decision should be reached".<sup>64</sup> Warden

adopted this notion of center of gravity and based the structure of his air campaign on their identification and neutralisation or destruction. He also embraced Clausewitz's concept that war essentially served a political purpose and, therefore, the imposing of one's political will over that of the enemy national leadership was the fundamental essence of modern warfare.

Warden, however, disagreed with Clausewitz's thinking on the means of achieving this. Whereas the Prussian theorist believed that the destruction of the enemy's armed forces was the principal method, Warden argued that airpower had displaced this as the prerequisite for victory as it could "go directly to the political center of gravity".<sup>66</sup> As the nature of its medium of employment offered air forces the opportunity of destroying any identified target, Warden felt that airpower could prove decisive if employed properly against strategic centers of gravity. "Air may be the key force", he claimed, "when enemy ground forces can be isolated or delayed while air works directly against political or economic centers."<sup>66</sup> Warden believed that these constituted a modern nation state's true centers of gravity while armed forces—the COG identified by Clausewitz—only served to protect those. Political and economic centers, however, were now immediately exposed to aerial attack, even though its protective armed forces might still be largely intact. Thus, airpower could wage "inside out warfare", or as close to the middle of the enemy's center(s) of gravity as possible, rather than against the fielded forces themselves.

For this type of warfare to succeed, the enemy's centers of gravity must be correctly identified and destroyed. Warden then developed his "Five Strategic Rings" model, which he presented to the Air Command and Staff College—and later published in several post-Gulf writings<sup>67</sup>—that addressed these critical vulnerabilities. His model consisted of five concentric rings comprising the vital components of a modern state: national leadership (the innermost target), key production, infrastructure, a population's support for its government, and fielded military forces (the outermost target). Warden believed that as much effort as possible should be applied against the innermost strategic ring—the nation's command structure. Warden felt that the enemy's command and control (C<sup>2</sup>) system was the critical instrument in the functioning of a state. If it were incapacitated, then the state would be unable to effectively undertake any of its regular activities, let alone sustain a war effort. Thus, ideally, the emphasis must be placed on destroying the enemy's command structure.

The second strategic ring consisted of key production facilities. These are the essential systems that are vital to the working effectiveness of a state and its armed forces which included arms and energy production industries. The third most critical ring was that of infrastructure which comprised the enemy state's entire transportation network made up of rail lines, bridges, airfields, ports and other similar systems. Following this ring was

the support of the population for its government. This was not to be undermined by direct aerial attacks, but by nonlethal means such as propaganda. Warden felt that the will and support of the people exercised a powerful influence over the direction and outcome of war. The final strategic ring was the fielded forces themselves. These were considered the least important of the centers of gravity because of their total dependence on the other strategic rings. If isolated from the inner centers, they were already effectively neutralised as a warfighting force.

Thus, Warden was a firm believer in Air Force doctrine that airpower could achieve decisive results "without first defeating defending forces in detail". Air forces could conduct "inside out warfare" by directly attacking the enemy's centres of gravity as close as possible to the leadership circle of the five strategic rings, rather than having to focus on engaging opposing fielded forces first. By concentrating on its centers of gravity, the enemy state would either concede to the political objectives of the opposing leadership due to the levels of destruction inflicted upon it, or it was made physically impossible of offering anymore resistance. This, Warden later stated, constituted "strategic paralysis".<sup>68</sup>

Warden had made an invaluable contribution to airpower thought. The insightful officer had expanded and advanced his service's doctrinal beliefs, applying and modifying the old-age principles of land warfare to that of modern aerial combat. As stated above, his *Air Campaign* would reportedly assume "de facto role of doctrinal guide" and he was soon appointed as Deputy Director for Warfighting Concepts and Doctrine Division in the Pentagon. Warden's division, allocated within the building's "Checkmate" basement, would have a major influence on the early campaign planning for the Gulf War. Inside of his department, Warden's book was definitely considered a "bible". However, within other Air Force commands and in the air arms of the other services, this proved not to be the case. Hallion's claims were exaggerated, as demonstrated rather clearly during the crisis of August 1990.

Although the Navy had fallen behind the Air Force during the late 1970s and early 1980s in terms of its fighter operations programmes, it established the "Strike University" in 1984 which essentially became the service's own "Red Flag" programme.<sup>69</sup> The success of the "punitive" air strikes against Libya in Operation *Eldorado Canyon* by carrier and land-based aircraft two years later demonstrated that military aviation had improved significantly since Southeast Asia. Colonel Qaddafi's air defences were much more complex and dense than any encountered over North Vietnam and, thus, by far the strongest that any US air forces had encountered up to that time.<sup>70</sup>

Naval aviation, though, was obviously tied to naval strategy and planning. Its primary mission was to assist in gaining control of the sea while striking at littoral areas that challenged the attainment or possession of that control. The Navy had also neglected



the operational art of a sustained strategic air campaign.<sup>71</sup> During the 1980s, it focused its planning on an all-out confrontation with the Soviet Union and, at the other extreme, of limited, short-duration air strikes such as *Eldorado Canyon*. It failed to develop regional contingency plans in which it would be involved with the other services in an integrated theatre conflict. Marine Corps (USMC) aviation held similar views over the nature of its employment. Marine air units were binded to the support of its ground forces and doctrine did not emphasise the importance of independent air operations. As with the Navy, then, there was no doctrinal priority placed on a strategic air campaign.

Although Vietnam had hurt the US Army, the war had provided it with several valuable lessons. The most obvious of these, in relation to airpower, was the vital role of the helicopter on the modern battlefield. The rotary-wing craft demonstrated its importance through combat and support missions during the war and 37 million helicopter sorties were flown between 1966 and 1973.<sup>72</sup> The Army gradually came to view the helicopter as its "modern cavalry" and has since become an integral component of planning and operations. More importantly, during this post-war period of self-analysis, the Army soon realised the shortcomings of its warfighting doctrine. Its emphasis on firepower-based war of attrition and tactical defence would prove futile in a war against overwhelming numbers of Soviet and Warsaw Pact forces. The Army recognised the need for greater service cooperation in order to improve the overall effectiveness of its combat operations. It believed that the synergistic effects of integrated ground manoeuvre and aerial offense were required to halt and defeat the mammoth forces that could be unleashed from behind the Iron curtain. This led to the development of its "AirLand Battle" doctrine during the 1980s.<sup>73</sup>

AirLand Battle was officially first endorsed by the Army in 1982. Despite its name, the doctrine was developed purely by the army and is separate to that of basic Air Force doctrine. The Army's second AirLand manual, the 1986 version of FM 100-5: *Operations*, would be the doctrinal publication that it fought to in the Gulf War.<sup>74</sup> Although the Army had integrated the role of airpower within its concept of operations, airpower remained an ancillary, not complementary, element of the new doctrine. While the manual claimed that independent air operations against strategic targets did have an effect on the enemy's warfighting capabilities, the Army viewed these as only supporting the decisive operations on the ground.<sup>75</sup> Airpower was subordinated to a corps-level war of fighting. No doctrinal emphasis on strategic warfare existed. Although commanders must coordinate "air and naval support of ground maneuver", surface operations were never designed to support those in the air.<sup>76</sup>

Thus, although the Army realised that it could not wage a successful war without airpower, air elements were still considered a supporting arm for ground forces. Air

operations were only seen as enhancing the combat effectiveness of the ground offensive and only surface forces were capable of truly decisive action. Air forces were to gain air superiority and provide offensive support for land units by attacking "not only those enemy forces in contact, but enemy forces held in reserve or rear echelons as well."<sup>77</sup> While many debate how much influence AirLand doctrine had on the Air Force, it was soon shown that its tenets, either directly or indirectly, were widely embraced amongst airmen within the tactical air community.

While the military recovered from Vietnam, the US Government also assessed its role during the war. It was obvious that the White House had exercised too large a role in the daily running of the tactical and operational levels of war while also failing to provide its field commanders with well defined strategic objectives and realistic rules of engagement (ROE). *Rolling Thunder* had demonstrated the folly of airpower being restricted to the concepts of gradual escalation by politicians who did not understand the essence of the air weapon. It was doubtful that the Air Force would ever want to wage another similar air campaign. Evidence is its declaration in its 1984 version of AFM 1-1 to "Attack the Enemy Relentlessly".<sup>78</sup>

To improve the military's command structure, Congress passed the 1986 Goldwater-Nicholas Department of Defense Reorganisation Act. This gave a theatre commander unified control over all forces in his area of responsibility (AOR), as well as the responsibility for the conduct of all operations. At the highest levels, the Chairman of the Joint Chiefs of Staff (CJCS) became the "principal advisor" to the president while the service chiefs had all but lost their power to exercise any direct control over theatre commanders.<sup>79</sup> The effectiveness of this improved chain-of-command became evident when US forces gained an easy but confidence-boosting victory against Panamanian rebels in late 1989 in one of their largest operations since Vietnam. A rejuvenated American military felt that it was now much more capable of challenging any threat than ever before during the previous two decades.

Airpower was at the fore of this renewed strength. The Air Force did not repeat the mistake of the 1950s by ignoring Korea and devaluing air warfare within a conventional context. Although doctrine writers were slow to learn the lessons of Vietnam, amongst the actual combat community, where the need to heed those lessons was far more pressing, a resurgence in fighter operations had commenced that evolved into the formidable aerospace force of the 1990s. American airmen would benefit from the large defence budgets of the Reagan administration and the finest technology in the world. Advanced employment programmes would provide airmen with invaluable experience on how to utilise these modernised systems. Air theorists soon awoke to these events and their own doctrinal shortcomings. They revived and modified their concepts of air

warfare, which was most clearly seen in Warden's *Air Campaign*. Although the main assumptions of his thesis can be traced back to the time of "Billy" Mitchell, it clearly reflected the Air Force's reemphasis on conventional theatre warfare.

Such was the confidence within the Air Force that in June 1990 its leadership released its first ever senior level enunciation of how the service contributed to national security.<sup>80</sup> The Air Force's *Global Reach—Global Power* White Paper argued that airpower had significant advantages over that of land forces and seapower as it could project decisive military force at any point on the globe within hours.<sup>81</sup> Exploiting speed, range, flexibility, precision and lethality to a degree far greater than that of surface forces, the paper claimed that Air Force units were probably the only assets capable of projecting military power in the first crucial moments of a crisis, even in distant theatres such as the Persian Gulf.<sup>82</sup> Indeed, the Gulf was directly specified as a vital strategic interest where the US was committed to supporting any friendly states from hostile powers.<sup>83</sup> Less than two months later, the USAF was casting a long shadow over Saudi Arabia.

Thus, during the years after Vietnam the American military underwent significant changes. The Air Force, determined never to repeat the bitter experiences of Southeast Asia, was at the vanguard of this change. It realised that its doctrine, weapons and tactics were incompatible with those of a conventional war and after *Rolling Thunder*, began to implement measures that would increase its conventional combat capabilities. By the end of the 1980s, the USAF would be by far the most superior air force in the world, capable of dealing with conflicts or crises ranging across the whole spectrum of warfare. Its doctrine was modified to be more consistent with the military realities of the contemporary world. The atomic, and, later thermonuclear, strategies and deterrence policies that had dominated airpower thought since Hiroshima and Nagasaki, had diminished during the post-Vietnam years. Airpower doctrine had moved away from the apocalyptic legacy of nuclear power and returned to a more conventional context. Rapid technological developments were providing airpower vast new capabilities. Equally important, however, was the fact that these were being reconciled with operational and tactical concepts. According to the predictions of one RAF officer in 1987, the 1990s would be airpower's "Decade of Opportunity".<sup>84</sup> Indeed they would be.

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### Chapter III

## Airpower in the Gulf: Darkened Skies

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*"Bombers went in first; when they lifted from their targets and left the area, Tomahawks would arrive. As that onslaught abated, yet another wave of aircraft would be on its way".*

— General H. Norman Schwarzkopf

Airpower in the Gulf War proved to be the dominant form of military power. As General Colin Powell, Chairman of the Joint Chiefs of Staff, pointed out during the conflict: "Airpower is the decisive arm so far, and I expect it to be the decisive arm into the end of the campaign".<sup>1</sup> The coalition air offensive played the pivotal role in Iraq's defeat, effecting a strategic paralysis upon Saddam Hussein's regime and incapacitating his military. This enabled the coalition army to eject his occupying forces from Kuwait in only 100 hours of major ground action.

This chapter will examine American airpower's overall contribution to the Gulf War. It will appraise the whole spectrum of airpower, particularly the *Desert Storm* air campaign, from its conception through to its successful application in early 1991. The study will reveal the capabilities and limitations that airpower demonstrated in the Gulf, while also establishing the unique factors that facilitated its employment. This analysis will thus demonstrate whether the application of airpower observed or rejected established doctrinal concepts.

Iraq's invasion of Kuwait on 2 August 1990 caused immediate anxiety within the Bush administration. Saddam's elite Republican Guard forces easily overran the small oil-rich emirate and Washington feared that they would strike into Saudi Arabia. A full-scale Iraqi offensive would have overwhelmed any Saudi resistance and placed nearly half of the world's estimated oil reserves in Saddam's hands.<sup>2</sup> From the outset, Bush felt determined to stop this happening and began evaluating possible military options that would deter the Iraqis from any further aggression.

The US military already had plans in place for a possible deployment of forces to the Arabian peninsula. Any military action authorised by Washington would fall under the jurisdiction of the US Central Command (CENTCOM) which began developing an outline for a defence of Saudi Arabia a year earlier.<sup>3</sup> Its Commander-in-Chief, General H. Norman Schwarzkopf, had identified Iraq as the major threat in the region in 1989



and ordered his staff to design plans covering possible contingencies. CENTCOM's operations plan, however, was not yet finished and contained no detailed offensive component when the Republican Guard surged into Kuwait.<sup>4</sup> Schwarzkopf immediately had to devise a counteroffensive strategy to offset any Iraqi incursion beyond the Kuwaiti border. His only real option at this crucial stage was the Air Force's long-range bombers, even though Navy carriers were already moving into the region.

Schwarzkopf promptly ordered his Air component (CENTAF) Commander-in-Chief, Lieutenant-General Charles Horner, to develop appropriate plans. Horner, very concerned at the possibility of an Iraqi ground invasion, drafted a defensive plan that would disrupt the momentum of any attack by concentrating airpower against Iraqi LOCs and second echelon forces.<sup>5</sup> Friendly ground forces would engage the initial Iraqi spearheads. This classic AirLand strategy was accepted by the President and subsequently became the basis of CENTCOM's defence planning.<sup>6</sup> Horner believed that it was not necessary to strike at strategic targets deep in Iraq unless Saddam resorted to using chemical weapons.<sup>7</sup> The CENTAF commander's plan demonstrated how even senior Air Force officers had become captivated by Army doctrine.<sup>8</sup>

Following *Desert Shield's* commencement on 7 August after Saudi Arabia's acceptance of US military assistance, Schwarzkopf began investigating the possibility of further options. Wanting more than CENTAF's defensive AirLand battle plan, the general contacted the Air Staff and requested that it develop for him a strategic air campaign.<sup>9</sup> Fortunately, the Pentagon had already begun arranging plans, albeit only as an exercise. Colonel Warden had instructed his Checkmate staff to practice preparing a strategic operation against Iraq based on his five concentric rings model. Following Schwarzkopf's request, Warden then informed his staff that the exercise was now an official project which he subsequently code-named *Instant Thunder*. The name was deliberately selected to contrast it with Vietnam's failed *Rolling Thunder* operation where airpower had been applied gradually; or in Warden's view, poorly. The colonel felt determined to prevent this mistake from happening again.<sup>10</sup>

*Instant Thunder* was planned as a sudden, massive and intense aerial campaign that would immediately strike at the most critical points of Saddam's military infrastructure. The Checkmate planners developed a round-the-clock operation covering a six-day period directed against Iraq's strategic centers of gravity which Warden believed would eject the Iraqi forces from Kuwait. The plan was nothing like that hitherto produced by the American military. Its key target was the isolation and incapacitation of the Iraqi command, control and communications (C<sup>3</sup>) systems. There was to be no traditional sequential attack upon targets; all of Saddam's vital centers were to be destroyed instantaneously.<sup>11</sup> The bulk of Iraqi fielded forces were conspicuously missing from the

plan and the only military elements targeted by Checkmate were Iraq's Integrated Air Defence System (IADS) and Air Force's (IQAF) offensive component.<sup>12</sup>

Despite the omission of tactical targets, Schwarzkopf gave the plan his "100 percent" approval.<sup>13</sup> Although the general was initially cautious of Warden and his ideas on airpower, he was delighted with the plan presented to him on 10 August. The following day, though, Powell expressly ordered Warden to target Iraqi forces in the Kuwaiti Theatre of Operations (KTO).<sup>14</sup> The Joint Chiefs Chairman was resolute in demanding that Saddam's occupying army must be destroyed. While Warden was resigned to include tactical targets, he felt that the effects of an air campaign would be negated if a combined air and ground offensive was waged simultaneously as precious assets would be diverted to providing CAS.<sup>15</sup> The air campaign would have to be executed independently of any ground offensive.

Warden then began developing an operational phase of his campaign plan. Strike operations against the fielded Iraqi forces, however, could only begin after the coalition had gained air superiority and suppressed enemy air defences in the KTO. This, then, would become the second and third phases of Warden's campaign plan following *Instant Thunder* (which Schwarzkopf later claimed as his own). By mid-August, Checkmate planners had identified 84 strategic targets to be destroyed which Warden felt would effectively paralyse the Iraqi state.<sup>16</sup> The pleased Schwarzkopf then instructed Warden to present his plans to Horner who was already stationed in Saudi Arabia.

The CENTAF chief had previously been told of Warden's planning in Washington and was furious that his superior had asked for help from the Air Staff. Earlier during the month, TAC officers had warned the fighter veteran of Warden's recent activities. Many within the command disagreed with *Instant Thunder*, believing that it was too violent and lacking a tactical perspective.<sup>17</sup> Remembering the mistakes of Vietnam, they were concerned at the lack of input by theatre staff and the predominant role played by Pentagon officers. However, in a similar vein to that of *Rolling Thunder*, TAC advocated an air campaign based upon gradual escalation.<sup>18</sup> The plan would target Saddam's fielded forces while also striking a key facility in Iraq every few hours which would make Baghdad realise the futility of further resistance, as Hanoi supposedly was to do 25 years earlier. Despite TAC's proposals, Schwarzkopf had already adopted *Instant Thunder* and ordered Warden to maintain direct control over its development.

Disgruntled that its plans were never considered, TAC warned the CENTAF chief of Warden's project; Horner was waiting. During his briefing on 20 August, the three-star general persistently criticised *Instant Thunder* and Warden.<sup>19</sup> Horner and his staff were very skeptical of the plan, questioning its origins in the Pentagon and, more importantly, its content. Horner felt that the omission of targets in Kuwait and Iraqi ground forces was

a serious oversight. Warden, though, felt that the general had placed too much emphasis on defensive planning and was underestimating the effects of a strategic air campaign.<sup>20</sup> He was, in effect, questioning the doctrinal beliefs of his superior. The irritated general eventually rejected the plan, although requesting that Warden's planners remain in theatre. There was, however, no invitation to Warden who headed back to the Pentagon. It is one of the great ironies of the Gulf War that some of the fiercest opposition to a strategic air campaign would come from American, rather than Iraqi, airmen.

As planning for an air offensive unfolded, the deployment of forces to Saudi Arabia gathered momentum. With the threat of an Iraqi ground invasion seemingly imminent, Schwarzkopf wanted combat aircraft in theatre before support and service support systems arrived.<sup>21</sup> The general believed that it was crucial that CENTCOM first built up its combat strength in order to deter, or defeat, an Iraqi invasion. Within two days of the Pentagon receiving deployment orders, F-15 fighters had arrived in Saudi Arabia after flying nonstop from their US bases, immediately beginning combat air patrol (CAP) sorties.<sup>22</sup> After one month, 14 tactical fighter squadrons and three carrier air wings were already positioned in the region.<sup>23</sup> US Defense Secretary Dick Cheney believed that by 21 August, Saudi Arabia was strong enough to prevent an Iraqi invasion.<sup>24</sup>

As the flow of American forces to the Gulf continued, airpower demonstrated its unique capability of rapid power projection. As the Air Force recently declared, "When an operation needs to be carried out quickly, airlift will be the key player."<sup>25</sup> Airlift was the only means to provide significant combat strength over long ranges within hours and the transport and tanker aircraft of Military Airlift Command (MAC) and SAC played a crucial role. The MAC's colossal C-5 and C-141 transports soon formed a vital supply line between the US and principal Saudi airfields. Such was the intensity of operations that airlift transporters were sometimes landing in the desert nearly every ten minutes.<sup>26</sup> To meet CENTCOM's enormous airlift requirements, Washington activated the Civil Reserve Air Fleet (CRAF) for the first time in its 38-year history. This allowed MAC to commandeer commercial cargo and passenger aircraft to assist its operations. During *Desert Shield* and *Desert Storm*, the airlift would deliver half a million tons of cargo and a similar number of personnel to the Gulf region.<sup>27</sup>

This impressive record, however, would not have been possible without SAC's in-flight refuelling tankers. The Air Force had developed Air-to-Air refuelling (AAR) after World War II and extended it to transporters during the 1970s, thus improving the speed and efficiency of airlift operations.<sup>28</sup> Airlift's unprecedented build up of forces in the Gulf was the result of the synergy between the Air Force's tankers and transports. During the war, AAR would prove to be an indispensable force multiplier to both support and combat

operations. Indeed, the number of strike sorties during *Desert Storm* would be constrained not by the number of combat aircraft, but by the number of aerial tankers.<sup>29</sup> Virtually every type of combat and combat support aircraft required AAR and sorties were sometimes cancelled because aircraft could not reach a tanker.<sup>30</sup> The Air Force's belief that "Aerial refuelling has a vital role across the spectrum of employment strategies" was totally vindicated in the Gulf War.<sup>31</sup>

Despite airlift's outstanding contribution, the limitations of aerial transportation were clearly demonstrated during the conflict. The most obvious and crucial of these was that it could not efficiently move the heavy armoured forces that CENTCOM desperately needed. The dimensional volume of heavy tanks and large fighting vehicles restricted airlift's input as the same heavy equipment taken on eight fast sealift ships would require over 2,500 sorties by C-141 aircraft.<sup>32</sup> Although airlift delivered 95 percent of all US personnel to the Gulf, it only accounted for five percent of all cargo, with sealift delivering the rest.<sup>33</sup> It was not until late September that the first heavy elements of American ground forces began arriving in the port of Dhahran, much to Schwarzkopf's relief. Thus, although airlift may be critical for rapid power projection, for major sustained operations involving large heavy forces, sealift is an equally, if not more important, transportation method.

Schwarzkopf, who had arrived in Riyadh at the end of August, was further relieved by the fact that Iraqi forces were establishing defensive positions throughout Kuwait. Regular infantry had dug in all along the Saudi-Kuwaiti border while the Republican Guard's heavy armoured divisions had withdrawn to southeast Iraq as a tactical reserve. Although the threat of an Iraqi attack was diminishing by the day, coalition defences continually grew stronger. The CENTCOM chief recalled that by mid-September, Horner's air fleet "had built a steel curtain against [possible] Iraqi attacks" and was flying hundreds of CAP and training missions per day.<sup>34</sup> The time that the coalition air armada had to prepare for combat operations during *Desert Shield* proved invaluable. CENTAF benefited from five and a half uninterrupted months of extensive training and exercises. Never before has an air force assembled in a foreign theatre and commenced operations at such a high level of combat readiness.<sup>35</sup>

As the level of forces deployed to the Gulf grew substantially, planning for the air offensive also became more elaborate and detailed. Despite his earlier criticisms of *Instant Thunder*, Horner soon adopted the essence of Warden's plan as his own. For all its detractors, *Instant Thunder* actually became the basis of air campaign planning right to the end of the war.<sup>36</sup> Following Warden's departure, Horner appointed Brigadier-General Buster Glosson to coordinate planning of the air campaign. Glosson, who would head a Special Planning Group which directed the air effort (located in a cell that would



later become known as the "Black Hole") was sympathetic to *Instant Thunder*.<sup>37</sup> He and his deputy, Lieutenant-Colonel Dave Deptula, one of Warden's own staff, would transform the plan into a well orchestrated campaign that would soon vindicate Warden's thinking on airpower.

The three-phase campaign first developed by Warden became the guideline for operations by CENTAF's staff. A fourth phase had already been added that focused upon a ground offensive. Although the air campaign plan envisioned separate sequential phases, there was no real clear distinction between them. By the time that fighter operations commenced, the notion of separate phases had all but disappeared.<sup>38</sup> During actual combat, the planned phases overlapped considerably. Strategic targets which were included in the first phase were still being hit after the ground campaign commenced.<sup>39</sup> The strategic air offensive and the attainment of air superiority over Iraq and Kuwait were, in reality, prosecuted in conjunction with each other.

During *Desert Shield*, air planners would continue to modify and expand the campaign plan as intelligence identified more crucial targets. High-altitude surveillance aircraft and space satellites provided valuable information on Iraqi assets. On the eve of the air war, the 84 targets of *Instant Thunder* would have grown to nearly five hundred.<sup>40</sup> The air campaign plan was significantly affected by the further deployment of a considerable number of land- and sea-based aircraft from the beginning of November as the Black Hole found that it could strike at more targets simultaneously with the availability of more assets.

Probably of more importance than the number of aircraft, however, was the command and control arrangement that would guide their employment. Unlike Korea, and especially Vietnam, American airpower would wage only one air campaign in the Gulf. Horner was appointed as the Joint Force Air Component Commander (JFACC) who coordinated all Air Force, Navy and Marine Corps aerial operations. All fixed-wing US aircraft in the theatre would operate within a single, integrated campaign plan as designated in a daily Air Tasking Order (ATO). The success of the JFACC concept in the Gulf War would validate the Air Force's enduring belief in the efficacy of centralised control.<sup>41</sup>

By mid-January 1991, the US had assembled nearly 2,000 aircraft throughout Southwest Asia.<sup>42</sup> Washington's allies provided a further 600 aircraft to assist the American-led effort of ejecting Saddam's forces from Kuwait. The UN Security Council Resolution that demanded Iraq's withdrawal by 15 January soon expired, authorising the coalition to "use all necessary means" to liberate the country.<sup>43</sup> The powerful air armada that had been built up during the previous five and a half months was poised to strike and less than two days later, Schwarzkopf transformed *Desert Shield* into *Desert*



*Storm.*

The opening stages of the air offensive were unprecedented in terms of scale and intensity in the history of warfare. During the first 24 hours of combat, the coalition flew over one thousand sorties directed against targets throughout the whole theatre of operations.<sup>44</sup> Black Hole planners believed that by striking against all target sets simultaneously, the air campaign would induce a much greater disruptive effect upon Iraq's COGs, rather than attacking one single target set at a time. As an official Department of Defense (DOD) report stated: "Nothing approaching the depth, breadth, magnitude, and simultaneity of this coordinated air attack had been previously achieved."<sup>45</sup> The coalition air fleet achieved total surprise as it set about dismantling Saddam's air defence and C<sup>2</sup> systems. After attack helicopters had opened a corridor in Iraq's radar network by destroying two early warning stations, massive strike packages immediately began penetrating enemy airspace, eventually delivering their lethal payloads upon carefully selected targets deep in Iraq.

As these packages ingressed towards their targets, low-observable, or "stealth", aircraft were already striking at vital points of Saddam's military infrastructure in Baghdad. The stealth qualities of the F-117A significantly reduced the possibility of its detection by enemy radar. The fighters delivered precision munitions against several air defence centers which opened further holes in Iraq's radar coverage network for non-stealth aircraft to fly through. The F-117As were able to penetrate Baghdad, one of the best defended cities in the world, and strike at valuable leadership, military and industrial targets without incurring any damage or losses. According to the Air Force, the stealth fighters attacked 40 percent of all strategic targets, even though they only flew two percent of all combat sorties.<sup>46</sup>

The Navy also used its Tomahawk Land Attack Missiles (TLAMs) for the first time in combat against targets that air planners thought too dangerous to be attacked by manned aircraft. The advances of technology in air warfare were demonstrated by the employment of TLAMs which made pinpoint strikes on targets after being fired from ships hundreds of miles away in the Gulf and Red Sea. Stealth fighters and over 180 Tomahawks simultaneously struck at Iraq's key vital centers during the first two days of the campaign.<sup>47</sup> Air Force B-52 bombers also used conventional Air-Launched Cruise Missiles (ALCMs) for the first time in combat to destroy key installations. These standoff precision munitions played a crucial role in the campaign's opening stages while Iraq's air defence system was at its most strongest.<sup>48</sup> Demonstrating the Air Force's *Global Reach—Global Power* doctrine, B-52s flew the longest combat missions in aviation history after flying nonstop from American bases and attacking Iraqi targets, before returning across the Atlantic again.<sup>49</sup>

The strikes against the regime's command structure made communications between Baghdad and its fielded army much more difficult. Saddam's key C<sup>3</sup> facilities and communication nodes were soon either neutralised or destroyed, isolating elements of his war machine both physically and psychologically. Indeed, within three weeks, Saddam was unable to communicate effectively with his army while his commanders in the field also lost contact with their own forces.<sup>50</sup> This proved critical to a military structure where C<sup>3</sup> was highly centralised. Saddam was unable to launch any coordinated IQAF combat missions to offset the coalition offensive which was now devastating vital components of his military apparatus. His military machine soon lost the ability to function effectively as a warfighting force through the destruction of its C<sup>3</sup> system. As the Defense Department concluded: "The strategic bombing campaign had the effect of virtually isolating and immobilizing the Iraqi army in the field."<sup>51</sup>

As the strategic air campaign unfolded, air defence targets were also simultaneously destroyed. The destruction of Iraq's IADS was essential to achieving establishing air superiority. Based on the Soviet model which had served Hanoi well, Saddam had developed a sophisticated, redundant and layered air defence system that was controlled centrally by Baghdad.<sup>52</sup> A combination of fighters, SAMs and AAA, linked together through an extensive system of radars and a rigid C<sup>2</sup> organisation, posed a real threat to the air campaign. Iraq's IADS, however, could not withstand the overwhelming coalition air strikes. The system was built primarily to counter limited air strikes and proved no match for a sustained, intense and sophisticated aerial campaign.<sup>53</sup>

Central to the defeat of Saddam's air defence network was the control of the electromagnetic spectrum. EW played an invaluable role in the reduction of the IADS. Lethal and nonlethal electronic combat aircraft blinded, paralysed and destroyed the system's key components. The suppression of enemy air defences (SEAD) was made much more effective through electronic strikes performed by a host of coalition aircraft.<sup>54</sup> The lessons of Vietnam proved invaluable as the most modern radar and missile warning systems, ECMs, chaff and self-protection jammers thoroughly disrupted Saddam's IADS. The use of improved high-speed anitradiation missiles (HARMs) against active radar sites forced many ground controllers to switch off their systems in order to stop radar emissions which then decreased SAM and radar-guided AAA effectiveness.<sup>55</sup> Drones and decoys further confused the Iraqi radar network causing many sites to expend unnecessary munition while also exposing themselves to SEAD aircraft.<sup>56</sup> Following the coalition's initial air strikes, Iraq's IADS immediately began disintegrating and SAM and AAA batteries were soon operating autonomously. Within two days of unrelenting aerial attack, Horner claimed air superiority.<sup>57</sup> The Air Force's belief that, "the use of the electromagnetic spectrum can have a major impact on the

success or failure of military operations" was proven unequivocally in the Gulf War.<sup>58</sup>

As the Iraqi leadership command and air defence structures collapsed, the coalition continued to launch overwhelming sorties against those elements critical to Iraq's ability to wage war. The Iraqi military and its supporting infrastructure were devastated by an air campaign that persisted round-the-clock. "Mission after mission", Horner triumphantly recalled, "struck at the heart of Iraq, systematically eliminating the enemy's warfighting capabilities."<sup>59</sup> Vital industrial facilities were destroyed while many key C<sup>2</sup> and telecommunications systems had already been neutralised. Saddam's known Nuclear, Biological and Chemical (NBC) production sites were targeted in order to reduce the possibility of the dictator resorting to unconventional warfare. Key railroads and bridges were attacked repeatedly to disrupt the Iraqi LOCs while surface forces were also pounded from the air. For Saddam, there was no respite. As Schwarzkopf recalled, "our objective was to give the Iraqis no rest: we wanted to maximise the shock that relentless bombardment can produce."<sup>60</sup> Air Force officers claimed after the conflict that *Desert Storm* was the first real "Hyperwar" as operations occurred 24-hours per day and in all weather.<sup>61</sup>

An additional vital component of Saddam's military machine, obviously, was his Air Force, the sixth largest in the world. Although the IQAF had some 500 front-line combat aircraft, the majority were obsolete and technically inferior to those of the coalition.<sup>62</sup> While its arsenal did comprise some very modern aircraft, most notably the MiG-29 and Su-24, the IQAF had only very recently acquired these and it was most unlikely that they had yet been mastered by pilots.<sup>63</sup> Furthermore, the IQAF lacked an effective EW capability, making it highly vulnerable to the coalition's electronic combat operations.<sup>64</sup> As well as its technological and numerical disadvantage, the IQAF air and ground crews were poorly trained and lacked initiative. Under Saddam's totalitarian rule, the Air Force was systematically purged of its best officers, resulting in a lack of competence and motivation.<sup>65</sup> The dictator also imposed a rigid system of centralised C<sup>2</sup> that further reduced combat effectiveness. The Air Force's leadership lacked aggression and tactical imagination, as demonstrated by its inadequate performance during the eight-year war with Iran.<sup>66</sup> It was totally unprepared to challenge the massive coalition air armada.

The Iraqi airfields were immediately struck in order to make it difficult for the IQAF to conduct counter air operations. Rather than challenge the allied air fleet, though, the IQAF concealed the majority of its planes in Hardened Aircraft Shelters (HASs) designed to withstand a nuclear blast. During the first week of *Desert Storm*, Saddam's air force averaged a mere thirty fighter sorties a day, leading to Horner's claim that the IQAF threat had virtually disappeared.<sup>67</sup> However, as the Iraqis were unwilling to fight in

the air, the JFACC began directing attacks against their protective HASs. Penetrating PGMs were used to make pinpoint hits on the supposedly indestructible shelters and, by the war's end, over half of them were either damaged or destroyed.<sup>68</sup> Iraqi airmen, facing imminent destruction both in the air and on the ground, soon began seeking sanctuary in Iran. As it had done at the beginning of its war against its former enemy, Iraqi aircraft started fleeing the country.<sup>69</sup> This time, though, their destination would be their eastern neighbour as more than 100 front-line combat aircraft flew over the border and were subsequently interned by Teheran.<sup>70</sup> Soviet officials later confirmed that Saddam had ordered the execution of his Air Force Chief.<sup>71</sup>

After just ten days of the air war, then, the coalition claimed aerial supremacy as the Iraqis found themselves incapable of offering *any* effective resistance to allied air operations.<sup>72</sup> Horner's complete control of the skies manifested itself clearly on the battlefield when Saddam launched a limited ground attack in late January. Iraqi armoured forces penetrated into Saudi Arabia, seizing the evacuated coastal town of Al-Khafji in what was probably an attempt to draw the coalition into a costly ground engagement. Horner, though, directed his fleet against the Iraqi units and fixed-wing aircraft and helicopter gunships devastated the invading columns with blistering air strikes.<sup>73</sup> Without any air support at all, Horner's aircraft pulverised the Iraqis and a small number of coalition ground units regained the town after a combined-arms operation which met little resistance. Saddam's only ground offensive of the war had been easily crushed and the battle demonstrated that his forces could not conduct any mobile operations while the coalition possessed air supremacy.

Although Saddam could not effectively counter the coalition's military operations, he could threaten its political viability through the use of his ballistic surface-to-surface *Scud* missiles. It is a less recognised fact of the Gulf War that despite its vast assembly of surface forces, airpower, via the *Scud*, also served as Iraq's primary weapon and most effective means of attaining any significant results. While military planners recognised the limited operational impact of a conventional *Scud*, most, including Horner, failed to fully appreciate their political significance.<sup>74</sup> During *Desert Storm*, Iraq fired over eighty *Scuds* at Saudi Arabia and Israel, hoping that this would draw the Jewish state into the war and split the Arab-Western alliance.

Although *Scud* missiles and launchers were a key target set of the air campaign, the coalition underestimated the frequency of attacks that Iraq could effect during the war. During the first few weeks of the campaign, nearly one third of all combat and air missions were diverted to locating and destroying mobile-launchers in western Iraq.<sup>75</sup> Although the number of launches gradually decreased, the *Scud* search demonstrated airpower's limitations in detecting mobile targets that could be easily dispersed and



concealed, even under conditions of aerial supremacy and little or no ECM to airborne sensors. As one congressional analysis concluded: "the United States did not have the combination of real-time detection and prosecution required to hit portable launches before they moved from their launch points."<sup>76</sup> However, the Gulf War witnessed the employment of an anti-missile missile defence system for the first time in the history of warfare. The Army's PAC-2 *Patriot* SAMs proved crucial in keeping Israel out of the war by supposedly intercepting Saddam's *Scuds*. Although the origins of this system can be traced back to 1946, it was not until *Desert Storm* that a surface-to-air missile destroyed an incoming ballistic missile in actual combat.<sup>77</sup>

Despite the difficulties of *Scud* launches and unseasonably bad weather, the relentless air campaign persisted, although Schwarzkopf now ordered that the focus move to tactical targets in the KTO. While many air officers wished to continue pressing with the strategic air campaign, the CENTCOM chief wanted the air effort shifted to reducing the combat effectiveness of the Iraqi fielded forces in preparation for a ground offensive. Any hopes of maintaining the emphasis upon the strategic campaign took a final blow following a strike on a Baghdad bunker on 13 February that killed several hundred civilians. No attacks were permitted upon central Baghdad for several days following the tragedy while targeting selection came under closer scrutiny from Powell.<sup>78</sup> The general felt that airpower had now reached a point of diminishing returns against a target that was already isolated and militarily impotent.<sup>79</sup>

Horner, then, began concentrating his air fleet upon battlefield air interdiction (BAI) missions. Massive B-52 bombers were already pounding the Iraqi positions every three hours while most key rail and road bridges in the KTO were made impassable.<sup>80</sup> Supplies to front-line units fell to ten percent of their prewar levels as ammunition and food could not be efficiently distributed within the theatre.<sup>81</sup> With the Iraqi forces immobilised, the coalition focused upon reducing their armoured, mechanised and artillery formations. These were soon devastated by air attack, especially precision munition strikes during twilight and night hours when they were exposed to infrared sensors.<sup>82</sup> In the face of enemy air supremacy, the Iraqi units could do nothing except shelter in their defences; the air campaign had inflicted operational paralysis upon Saddam's army. Every twenty-four hours, the Iraqi positions were bombed and strafed by hundreds of allied air sorties. Front-line troops soon began deserting, surrendering to coalition forces even before a ground offensive had begun.

Although the attrition of Iraqi combat units was clearly succeeding, the coalition was unable to agree upon the level of damage that it was inflicting. Accuracy of intelligence reports proved to be a major problem for air planners, especially bomb damage assessment (BDA). All echelons of the US defense establishment disagreed over BDA



estimates and this was further magnified when CENTCOM began evaluating its battlefield preparation phase.<sup>83</sup> Schwarzkopf, who had wanted airpower to reduce Iraqi combat capability by fifty percent, believed that some analyses based on data provided by reconnaissance aircraft and space satellites did not always present reliable assessments.<sup>84</sup> While there is some disparity amongst estimates, according to the Air Force, coalition airpower had effected a sixty percent reduction in both Iraq's tank and artillery inventories, as well as forty percent of its armoured vehicles by the eve of the ground war.<sup>85</sup> Whatever the levels of destruction caused by Horner's fleet, it is certain that they exceeded the ten percent threshold which military practitioners traditionally view as considering a force to be thoroughly defeated, or "decimated".<sup>86</sup> Thus, Saddam's army had been significantly more than decimated by the air campaign.

Although Schwarzkopf may have been cautious of the conservative estimates based on data provided by satellites, these played an invaluable role in the coalition war effort. Indeed, *Desert Storm* was the first "Space War" as satellites directly supported the coalition's planning and direction of combat operations. Satellites provided crucial real-time C<sup>3</sup>I, meteorological data and early detection of enemy missile threats that allowed theatre commanders to see deep into the battlefield. The overall efficiency and speed of operations was significantly improved by the NAVSTAR-Global Positioning System (GPS) by giving allied air and ground forces their exact locations in almost featureless terrain. Although the functions of space assets during the Gulf War were limited to surveillance and information gathering (as airpower had been 77 years earlier), *Desert Storm* demonstrated that space power has now become an important component of modern warfare.

The effectiveness of allied air combat operations was further improved by orbiting C<sup>2</sup> provided by the Air Force's E-3 Airborne Warning and Control System (AWACS) and EC-130 Airborne Command and Control Center (ABCCC). These received support from the Navy's E-2 Airborne Early Warning (AEW) aircraft which assisted carrier operations. These systems provided airborne surveillance and C<sup>2</sup> for all coalition combat aircraft and were a key element of all offensive and defensive fighter operations. The E-3 AWACS supervised the air war by managing the airspace throughout the entire theatre of operations, vectoring combat aircraft to their targets while also monitoring any Iraqi responses. At least two different AWACS aircraft flew continuously during the war providing coalition air commanders with a distinct advantage over their adversaries. One expert analyst felt that if the Air Force could have employed a Gulf War-type AWACS in Vietnam, 75 percent of the service's air-to-air losses might have been avoided.<sup>87</sup>

The EC-130 provided a closer-command and control system for attack operations by collecting and disseminating information from leading strike elements to incoming attack

aircraft.<sup>88</sup> Although the ABCCC concept was first used in Southeast Asia, the modern systems of the E-3 and EC-130 used in the Gulf were much more advanced than anything used over Vietnam.<sup>89</sup> These systems and other advanced technologies provided the coalition air armada with unprecedented situational awareness. Horner's fleet was able to direct its operations on the basis of near-real time information and his commanders were able to adjust missions, tactics and make decisions accordingly. Never before had a military force enjoyed such a theatre-wide view of the battlespace, nor had so thorough a picture of its adversary. Iraq, in direct contrast, could not employ any major intelligence-gathering systems and neither any effective countermeasures to the coalition's air- and space-borne sensors. All echelons of the Iraqi military, then, suffered from a dearth of invaluable battlefield information whereas the coalition was able to almost completely monitor the theatre. At no other time in the history of warfare had C<sup>3</sup>I, or the lack of it, played such a crucial role to the outcome of a campaign.

As Horner's fleet continued preparing the battlefield for Schwarzkopf's ground forces, disagreements between air and surface officers intensified over targeting selection. CENTCOM's Army and Marine Corps commanders felt that the Air Force-dominated Black Hole was paying inadequate attention to the destruction of Iraqi front-line forces.<sup>90</sup> Of a hundred daily nominated targets selected by the Army, only a few dozen would appear in the ATO.<sup>91</sup> Indeed, Schwarzkopf himself had berated Horner at the beginning of the war for not targeting the Republican Guard as frequently as he wanted.<sup>92</sup> Tension over targeting priorities would persist between air and ground commanders for the duration of the conflict, eventually leading to the withdrawal of nearly all Marine F/A-18s from Horner's ATO as Marine aviation only had to supply the JFACC with sorties that were leftover from direct Marine ground support requirements.<sup>93</sup> Despite the Marines' resistance and other minor concerns, the vast strength of coalition air assets precluded any major problems for the Black Hole.

Any interservice quarrels were further mitigated by the fact that the Iraqi forces were rapidly deteriorating in the face of constant aerial bombardment. Saddam's already-battered units in the KTO were being struck daily by hundreds of attack sorties and, after 39 days of incessant pounding, Schwarzkopf finally decided to launch his surface offensive. The lightning success of the coalition ground campaign was testament to the overwhelming destructiveness of modern airpower. Following the opening attack during the early morning of 24 February, coalition ground forces easily penetrated the Iraqi defences and rapidly advanced towards their objectives. Resistance was isolated and largely ineffective as the coalition spearheads made rapid progress. Such was the success of the initial assaults that the coalition's western outflanking manoeuvre was advanced by over fourteen hours.<sup>94</sup> Allied air supremacy had blinded Iraqi intelligence

and allowed two massive army corps to secretly deploy to the right flank of their defences. The coalition's "Left Hook" achieved total tactical surprise as spearhead forces struck into the rear of Saddam's Republican armoured divisions. Allied field commanders believed that the Iraqis were not expecting such a powerful assault force through the western desert's featureless terrain.<sup>95</sup> The successful envelopment could not have taken place without the advent of GPS.

As the coalition ground forces advanced further into the KTO, they received invaluable CAS from Horner's fleet. In many instances when Iraqi resistance did materialise, allied attack aircraft were called in to devastate the enemy units with blistering air raids. Combat aircraft sometimes expended their munitions before consuming their fuel while Navy and Marine strike sorties were reportedly restricted by the rate at which carrier lifts could bring ordnance to flight decks.<sup>96</sup> The withering air strikes clearly reduced the number of allied casualties on the ground. Such was the devastation caused by the 39-day air campaign, however, that not much CAS was actually required during the ground offensive. Engagements were largely between armoured and artillery formations, and coalition ground forces almost always emerged victorious due to their own organic firepower assets.

Airpower's role during the ground offensive, though, extended far beyond CAS. Horner's fleet also provided essential intratheatre airlift, reconnaissance, medical evacuation and airborne early warning and control.<sup>97</sup> Indeed, one of the more crucial non-combat contributions of airpower to the ground campaign was that made by the E-8 Joint-Surveillance and Target Attack Radar System (J-STARS). E-8s gave the coalition an unparalleled intelligence capability by providing commanders with real-time information of all movements on the battlefield. J-STARS could detect Iraqi ground forces and then direct air strikes against them, improving the overall effectiveness of attack operations. This was proven when Iraqi columns began fleeing from the coalition onslaught, eventually leading to the "Highway of Death" after the intervention of E-8s and allied fighter-bombers.<sup>98</sup>

Despite this success, however, the J-STARS could not prevent the escape of substantial numbers of Iraqi units due to the poor cooperation between CENTCOM's Army and Air Force components. In order to prevent the bombing of friendly troops, the Fire Support Coordination Line (FSCL) was implemented in the Gulf. Within this area, the Army would operate its own attack helicopters while Air Force strikes could only take place after coordinating with nearby ground units. As the coalition army moved forward, so too did the FSCL. Horner, however, was infuriated when the army could not attack retreating Iraqi forces that had managed to cross the Euphrates River, even though these were within its area of operations after the FSCL had been extended.<sup>99</sup> The forces,

unfortunately, escaped destruction in one of the major disappointments of the war.

In spite of this setback, though, the Iraqi army had been effectively routed by the coalition's combined air-ground campaign. Allied forces had retaken Kuwait in only a few days rather than weeks which ground commanders had anticipated. After only 100 hours of major ground combat President Bush called a cessation to offensive operations; the Gulf War was over. One of the most successful and decisive wars ever waged by a military force had concluded. Allied casualties were exceptionally low while the relatively short campaign had liberated Kuwait and prompted Iraqi compliance with UN resolutions. Although a surface invasion had been required, airpower was clearly the most significant factor in the coalition's victory. As an official report from Capitol Hill concluded: "The decisive factor in the war with Iraq was the air campaign".<sup>100</sup>

During the 43-day conflict, the coalition flew nearly 110,000 sorties while American airmen released over 84,000 tons of munitions on targets throughout the theatre.<sup>101</sup> According to one independent study, the coalition lost only 39 fixed- and seven rotary-wing craft in combat operations.<sup>102</sup> This loss rate is remarkably small considering the intensity and scale of the air campaign. In light of the results that airpower achieved in the Gulf, these losses seem even more marginal. Airpower systematically destroyed the warfighting capabilities of Saddam's military machine and paved the way for the relatively easy surface campaign. As the Pentagon later stated: "The combination of massive airpower applied precisely and simultaneously against key Iraqi centers of gravity overwhelmed the Iraqis' ability to resist or recover from the damage inflicted upon them."<sup>103</sup> Although it could not hold territory, airpower demonstrated that it could deny it to enemy ground forces. The Gulf War was testament to the Air Force's belief that offensive aerial operations can reduce the ability of an adversary to effectively launch an attack while conferring the initiative and opportunity to dictate the battlefield to friendly forces.<sup>104</sup> Overall, the Gulf conflict confirmed the fatal mistake of waging war against an enemy that held air superiority.

Clearly, then, airpower proved the decisive military power in the coalition's victory. However, this unprecedented accomplishment was only achieved because of a unique set of strategic, operational and tactical circumstances which most likely will never be repeated again. One of the most important was Iraq's political isolation. Almost the whole world condemned Saddam's invasion of Kuwait, including Soviet Premier Mikhail Gorbachev who felt that the Iraqi aggression should not go unchecked.<sup>105</sup> For the first time since the Second World War, US air commanders could plan a campaign without the risk of provoking the intervention of the Soviet Union or any other regional power. The concepts of gradual escalation that had characterised the air campaigns of the Cold War were discarded. Without Moscow's support, Saddam also lost his major source of



military equipment and assistance which were vital to his armed forces.<sup>106</sup> The coalition, in contrast, enjoyed the advantages and benefits of a world-wide alliance that fully supported the American-led effort to liberate Kuwait.

It was further unfortunate timing for Saddam that his invasion occurred at the end of the Cold War when US air forces were at their most powerful. The massive concentration of air assets in the Gulf was only made possible through the augmentation of the American air arms under the Reagan administration during the 1980s. With the Soviet threat clearly diminishing and Washington facing no other immediate acute danger, the US was able to assemble a formidable air armada of unparalleled capability and level of operational readiness. Today, however, the US is no longer able to put together a massive air fleet as it did in 1991 simply because of fiscal constraints and discontinued production of much of its Cold War inventories.<sup>107</sup>

The coalition was also able to concentrate its powerful air force within a restricted geographical area and against relatively weak aerial opposition. Despite its substantial size, the IQAF presented no serious challenge to Horner's fleet. Thus, the senior air commander did not have to wage a time-consuming and costly battle for aerial superiority as well as spending a considerable number of sorties on defensive counter air operations. His fleet was also deployed against targets which were highly vulnerable and accessible, despite Saddam's sophisticated IADS. The system could not withstand the massive sustained coalition offensive while the USAF had long developed countermeasures to most of its SAMs. Horner's fleet also benefited from the uninterrupted build up of *Desert Shield* which provided invaluable training and combat practice, as well as the availability of well-prepared airfields in the immediate vicinity of target areas which allowed it to fly a very high number of missions each day.

The desert topography and climate also proved conducive to air operations. Although the weather during *Desert Storm* was some of the worst that the region had experienced in a number of years, conditions of employment were far more favourable than any other theatre is likely to provide. Saddam's forces and LOCs were highly exposed in the featureless terrain while the logistical needs of a modern mechanised army were further increased by harsh desert conditions that made it more vulnerable to interdiction. The positioning of enemy forces in static defences, far removed from major civilian centers, presented allied airmen with many numerous and unrestricted targets which they willingly obliged.

This remarkably favourable set of circumstances has never existed before and will probably not exist again. At no other time have conditions of employment been so favourable for airpower and it is almost certain that the military ineptitude displayed by Saddam, a factor of importance equal to that of any other, will not be repeated by him,



nor anyone else. Neither are the strategic and political factors that shaped and influenced the conflict so profoundly likely to eventuate again. Despite this, however, the Gulf War stands as evidence of the effectiveness of modern airpower. At no other time since the Second World War had American airpower proved so dominant. *Desert Storm* was a proving ground for the doctrine, systems, weapons and tactics of the USAF. The same prophetic commander who believed that the 1990s would be airpower's "Decade of Opportunity" would comment after the conflict: "The Gulf war marked the apotheosis of twentieth-century airpower."<sup>108</sup>

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## Chapter IV

### Lessons of the Air War

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*"Gulf Lesson One is the value of air power."*  
— President George Bush, 1991

The Gulf conflict demonstrated the preeminence of airpower in modern conventional warfare. For the first time in any large-scale war, air forces, rather than those of land or sea, were the decisive form of military power. Immediately following the campaign, commentators began to study and analyse the coalition's astonishing military success. A vast array of literature soon emerged that advocated the dominant role of airpower in warfare. Within this growing wave of airpower fervour, in March 1992 the USAF released the successor to its 1984 doctrine manual.

This chapter will examine the 1992 AFM 1-1: *Basic Aerospace Doctrine of the United States Air Force* and determine whether the application of airpower in the Gulf War substantiated or contradicted its doctrinal tenets. The study will establish whether the experiences of the Gulf War may have caused any major departures to prevailing doctrinal thought or whether those experiences were merely a confirmation of recent evolving airpower theory and practical trends.

Although the Air Force's tenth official doctrine manual appeared over a year after its stunning victory in the Gulf, the 1992 version of AFM 1-1 was the culmination of nearly eight years of research and work.<sup>1</sup> The Air Force had begun preparing a draft for a new manual almost immediately after the publication of its 1984 AFM 1-1. By the time a new manual had been released, however, a number of changes had taken place within the Air Force over the direction of its doctrinal development. The origins of these changes can be traced back even before the publication of the 1984 edition. These eventually led to the Air Force's first manual of the 1990s which would be remarkably different to that of any of the service's earlier doctrinal publications.

During 1979-80, the Air University (AU) at Maxwell Air Force Base, Montgomery, Alabama, established the Airpower Research Institute (ARI) which immediately began working on a monograph series of Air Force operations in Vietnam. One Air Force officer insisted that his service should follow the Army and Navy's lead by funding research institutes.<sup>2</sup> Several years later the ARI became part of a larger AU Center for Aerospace

Doctrine, Research, and Education (CADRE) which would focus on strategic aerospace and doctrinal studies. The Air Staff in Washington, which had been responsible for the Air Force's doctrinal development since 1958, saw the new CADRE facility as infringing upon its own duties. The Air Staff wished to retain full control of the formulation and promulgation of the service's doctrine manuals. Reflecting this position, one officer stated that "the responsibility for doctrinal development ought to remain in Washington since the Air Force needed a doctrine spokesman in the Pentagon to look after its interests."<sup>3</sup> Despite the Air Staff's concerns, CADRE opened on 3 January 1983. The new organisation quickly established a reputation for producing quality critical historical works and, although it was only to advise the Air Staff on doctrinal matters, CADRE soon took the initiative and began preparing its own drafts.

After reviewing several revised drafts to replace the Air Force's 1984 AFM 1-1, CADRE officers, together with staff from ARI, started to write their own doctrine manual in early 1988, even though the Air Staff preferred that they remain purely as an advisory body.<sup>4</sup> CADRE felt that it was the only Air Force organisation that could formulate doctrine that was not subjected to political influences or interservice fiscal battles. According to one doctrine expert, "The successive AU CADRE directors ... maintained the strong climate of intellectual honesty necessary for the [analysis and writing of] history."<sup>5</sup> Thus, over the next two years, CADRE and the Air Staff's Doctrine and Concepts Division wrote their own doctrine drafts. Both faculties hoped that their own works would gain approval for official publication. Although the Air Staff's drafts were major improvements on the service's earlier manuals, CADRE was given responsibility for writing the next edition, much to the disappointment of Air Staff officers, including Colonel Warden.<sup>6</sup>

By late January 1990, CADRE had finished a completed draft of AFM 1-1 and over the next year, it would be reviewed by the AU and other Air Force commands. The work was quite different to anything the Air Force had produced since 1953. Following the suggestion made by ARI reviewers during the mid-1980s, CADRE had written a two-volume manual. The first volume was basic doctrine as previous editions had been, while the second volume contained expanded information which verified the assertions made in volume one. The CADRE writers felt determined to produce a doctrine that was based on the proper evaluation of historical evidence. The two-volume work would not only prove more valuable to Air Force practitioners, but also more qualified to critical scholars. Until the release of this manual, very little had been done by writers to justify their basic doctrinal concepts.<sup>7</sup>

As CADRE commentators reviewed their draft during late 1990, unbeknown to them events half-way across the globe were about to test the doctrinal beliefs that they had formulated in their new proposed edition. Eventually, the decisive application of

airpower in *Desert Storm* offered CADRE further historical evidence to reinforce its manual's tenets. Although the writers needed more time to incorporate the experiences from the conflict into the draft, they felt that the war further substantiated their doctrinal thought. "Information on the effects of airpower in the Gulf War did not cause any editing of the doctrinal tenets in volume 1", claimed one Air Force doctrine analyst, "but it did confirm in the minds of the CADRE officers the validity of much of their work."<sup>8</sup> After further revisions to the second volume, the manual was ready for print by February 1992. The Air Force released their newest version of AFM 1-1 the following month, finally replacing the 1984 edition after eight years of doctrinal research and writing.

The 1992 edition of AFM 1-1 defined doctrine as: "what we hold true about aerospace power and the best way to do the job in the Air Force. It is based on experience, our own and that of others. Doctrine is what we have learned about aerospace power and its application since the dawn of powered flight."<sup>9</sup> Although this definition may have reflected earlier doctrinal publications, the evidence in the new AFM 1-1 supported the assertion. This was in marked contrast to previous manuals which continually used selective examples from history to formulate their doctrinal statements.

The new manual was based on all past experiences of American airpower—including the previously ignored Korean and Vietnam wars—and incorporated all of the primary concerns of Air Force doctrine, such as organisation, operational art, training and education; all fundamental shortcomings of Air Force operations in Southeast Asia. The most visible change was the two-volume format. The first volume contained the "bare bones" of the Air Force's doctrine, while the second contained 25 essays that "provide the evidence and supporting rationale for each doctrinal statement".<sup>10</sup>

The application of airpower in *Desert Storm* vindicated the doctrine expressed by the CADRE writers in volume one. The manual asserted that airpower had the ability to apply military power against all elements of the enemy's warfighting capabilities.<sup>11</sup> This was proven in the Gulf, which the doctrine manual directly acknowledged in its second volume, stating that *Desert Storm* demonstrated the "ability of aerospace forces to independently (or in conjunction with surface forces) attack strategic, operational, and tactical objectives, simultaneously or separately."<sup>12</sup> The Gulf War, more than any other previous conflict, had validated the Air Force's belief in the versatility and capability of airpower being able to conduct operations against any component of the enemy's structure.

*Desert Storm's* strategic air offensive also validated the Air Force's emphasis upon strategic attack theory. The war verified the doctrinal statement that one proper way of applying airpower was through a "strategic air campaign that directly attacks an enemy's centers of gravity."<sup>13</sup> The coalition air campaign was based exactly upon this type of

employment. The manual further stated that even when strategic attacks are not enough to attain desired objectives, they will contribute to the neutralising of the enemy's forces while also complementing other air and surface attacks.<sup>14</sup> This statement demonstrated the Air Force's willingness to recognise that strategic air warfare may not force a conflict to an end by itself, something that its earlier doctrinal editions were not inclined to point out. In fact, at one point the new AFM 1-1 states that strategic air attacks such as those during *Desert Storm* were "worthwhile".<sup>15</sup> This certainly devalues the contribution of the strategic air offensive to the campaign's successful outcome rather than overstating it, a tendency amongst airpower theorists and doctrine writers.

The new manual was also the first Air Force doctrine statement to recognise airpower's inability to bring conflicts to a quick and decisive conclusion through strategic bombardment against population morale. Although advocated by many airpower theorists since Douhet, the strategic air campaigns of the twentieth century had disproven this. It took nearly forty years, however, for the USAF to recognise this fact in its basic doctrine manuals when the 1992 version of AFM 1-1 stated that achieving a "demoralizing psychological impact can be an elusive object."<sup>16</sup> The increased historical awareness of the Air Force that had emerged during the 1980s was now having a significant effect on the service's doctrinal statements. The 1992 doctrine writers may have demonstrated more critical analytical thought than their predecessors, yet they were obviously still very eager to point out how their doctrine had been validated in the Gulf.

One of the clearest successes of Air Force doctrine in *Desert Storm* was the tenet of centralised control of airpower.<sup>17</sup> The JFACC concept executed by Horner proved very successful against Iraq. Although the new manual pointed out some of the disadvantages of centralisation, it also claimed that experiences since the outbreak of the Second World War demonstrated that this was the most efficient and effective form of control.<sup>18</sup> Operations in the Gulf received special attention when the manual later declared that an air campaign's "best chance of achieving success is one in which a single airman acts as the joint force air component commander to integrate employment of aerospace forces".<sup>19</sup> As one Air Force general declared after the conflict, the Gulf War "confirmed what we've known since 1942: that airpower must be highly integrated."<sup>20</sup> While the success of centralised control in the Gulf may have vindicated Air Force doctrine, the new manual was less willing to address the favourable conditions that facilitated this unique employment.

*Desert Storm* also justified the Air Force's belief that "Precision weaponry has greatly enhanced the efficiency of strategic attack."<sup>21</sup> The AFM 1-1 claimed that precision attack reduces the time and effort to destroy a selected target, while also reducing the amount



of collateral damage.<sup>22</sup> This was confirmed in the Gulf with the first major employment of PGMs. Although they only constituted eight percent of all ordnance delivered by the coalition and proved far less accurate than the Air Force initially claimed,<sup>23</sup> precision weapons provided Horner's air commanders with unparalleled leverage. By the time of *Desert Storm*, a single strike aircraft carrying two "smart" bombs could theoretically function as effectively as 108 World War II B-17 bombers that carried 648 bombs and needed over a thousand crewmen.<sup>24</sup> After the conflict, former Air Force Chief of Staff, General Michael Dugan (who was dismissed by Secretary Cheney during *Desert Shield*, partially for publicly promoting airpower's potential if war erupted<sup>25</sup>), confirmed the vindication of precision bombing, stating that, "Technology has caught up with the doctrine".<sup>26</sup> The new AFM 1-1, though, directly acknowledged the necessity of precise intelligence to effectively and efficiently employ precision weaponry.<sup>27</sup>

Although the manual's first "bare bones" volume did not mention the abilities of stealth aircraft, the second volume did point out the greater efficiency of aerial operations when precision weaponry are employed together with stealth platforms.<sup>28</sup> This was shown during *Desert Storm* when a raid by eight non-stealth attack aircraft against one target required 30 support planes—excluding tankers and surveillance aircraft—giving an aircraft-to-target ratio of 38-to-1. While this raid occurred, according to the Air Force, 21 stealth fighters were independently attacking 37 targets.<sup>29</sup> Doctrine writers decided to acknowledge this improved capability in their second volume, stating that "this increase in efficiency may lessen the degree of concentration required."<sup>30</sup> The combination of precision weapons and stealth aircraft has certainly reduced the extent of mass previously required to destroy a target.

The extensive use of PGMs in *Desert Storm* also proved vital in the operational and tactical levels of the campaign, as coalition airpower first isolated and then destroyed the Iraqi armed forces.<sup>31</sup> Aerial operations within the KTO represent the strongest possible evidence of the Air Force's assertion that "Interdiction can be an extremely effective means for destroying enemy surface forces."<sup>32</sup> For the first time in the history of military aviation, airpower had achieved almost complete interdiction of the enemy's ground forces. Saddam's LOCs were effectively severed and his forces, immobilised and without any air support, offered the Air Force, as it declared in its doctrine manual, "lucrative targets for air interdiction."<sup>33</sup> Although aerial interdiction in the Gulf proved highly successful without major ground engagements, the manual preferred to acknowledge the lessons of previous wars, rightfully claiming that interdiction is much more effective through the synergy of combined aerial and surface operations.<sup>34</sup>

Before the allied air fleet could achieve this successful interdiction, however, it had to first establish air superiority within the theatre of operations, the essential prerequisite of

all aerial missions. This followed air doctrine which maintained that aerospace control should usually be the first priority of aerospace forces.<sup>36</sup> Control of the air, therefore, remained the Air Force's primary mission which was then followed by force application; strategic attack, interdiction and close air support. Gulf operations, though, had demonstrated that these roles can be prosecuted simultaneously while the advent of stealth fighters meant that force application could be achieved without necessarily having first to gain air superiority. Despite the new capabilities provided by stealth, there was no significant doctrinal change to the Air Force's prioritisation of roles and missions.

Thus, Horner's operations to gain and retain aerial superiority followed those as advocated in the AFM 1-1.<sup>36</sup> From the outset of the campaign, the coalition air fleet launched strong counter air offensive, SEAD and EW operations against the Iraqi warning and control systems, air bases and defences in order to obtain control of the air. Air Force doctrine claimed that "the most effective and efficient method for achieving the appropriate degree of aerospace control is to attack the enemy's aerospace assets close to their source."<sup>37</sup> This was vindicated by Horner, who directed strikes against the IQAF's airfields and then against its protective HASs after its refusal to fight in the air.

Fighter operations during *Desert Storm* also provided further evidence of the growing blur between the traditional distinctions of strategic and tactical airpower. Ever since the birth of the USAF, employment concepts centered on strategic and tactical considerations, resulting in the organisational subdivision between SAC and TAC. Yet this segmentation of airpower into two separate components tended to interfere with its overall effectiveness and undermined its versatility. The Gulf War proved to be the conflict that permanently blurred this perception. Long-range B-52 bombers that were originally designed to strike at the enemy's heartland attacked front-line formations in the KTO while specialised CAS A-10 aircraft conducted *Scud* hunting missions deep in Iraq. *Desert Storm* demonstrated that the versatility of modern aircraft allows them to undertake varying missions and that it is the purpose of a sortie, rather than the actual aircraft itself, that determines whether or not that particular sortie is strategic or tactical. As the Air Force Chief of Staff during *Desert Storm*, General Merrill McPeak, commented: "I no longer know what the division between tactical and strategic is."<sup>38</sup> The Air Force finally acknowledged this fact officially in September 1991 when it announced the restructuring of SAC, TAC and MAC into new operational commands, Air Combat Command and Air Mobility Command.<sup>39</sup> The AFM 1-1 reflected the reasoning behind this organisational change, declaring that: "Strategic attacks are defined by the objective—not by the weapon system employed, munition used, or target location."<sup>40</sup> *Desert Storm* provided final evidence for the Air Force to recognise this operational reality through the reorganising of its force structure.

The Gulf War also demonstrated to the Air Force the organisational efficiency of “composite” wings. As strike operations almost always required a wide variety of combat and combat support aircraft (a ratio of support aircraft to attack aircraft of nearly 5-to-1 for most non-stealth aerial operations<sup>41</sup>), the traditional air force wings—most of which are organised to perform specialised and limited functions—had to integrate with each other in order to achieve maximum operational effectiveness. The success of the composite force packages in the Gulf challenges the Air Force’s belief of maintaining air wings on the basis of specialised capabilities. Indeed, the provisional composite wing based in southern Turkey demonstrated the effectiveness of this concept. The air wing, code-named Operation *Proven Force*, proved the efficacy of the composite force structure, as well as providing the coalition with an invaluable base from which to launch operations against targets in the further reaches of northern and central Iraq.<sup>42</sup> McPeak and Air Force Secretary Donald Rice announced after the war that the Air Force would undergo further restructuring based on composite air wings.<sup>43</sup> Actually, even prior to his appointment as chief of staff, McPeak had already acknowledged the importance of composite air wings before *Desert Storm*.<sup>44</sup>

The Gulf War was also testament to the Flag-series exercises commenced by the Air Force during the mid-1970s. The success of fighter operations and low loss rates during *Desert Storm* validated the Air Force’s belief that “Training should be realistic as possible.”<sup>45</sup> The USAF air and ground crews that fought in this war were well-trained for combat and well-prepared for the assignments that were required of them. *Desert Storm* personnel were some of the most qualified that had served the USAF since its inception.<sup>46</sup> The Air Force referred to this in its manual’s second volume, claiming that the high loss rates of aircrews over North Vietnam was due to the poor training of pilots at aerial combat and conventional air-to-ground strikes, because of the emphasis previously placed on nuclear war.<sup>47</sup> This had, in effect, pointed out the failures of the service’s own earlier doctrine. The Air Force also acknowledged the importance of the human component in warfare, rightfully claiming that “People are the decisive factor in war.”<sup>48</sup> Although many Air Force leaders have preferred to focus on their machines and weapons,<sup>49</sup> it is an indisputable fact, that, despite technological developments such as stealth platforms and PGMs, the “smartest” weapon is a highly-trained, skilled and innovative airman.

Thus, the 1992 version of AFM 1-1 was strongly vindicated by operations in the Gulf War. However, although the new doctrine manual appeared after the war, it is not a direct response to the experiences of that conflict, as many people seem to believe.<sup>50</sup> The first volume of the manual reflected nothing specific from the campaign against Iraq and CADRE had already produced its final draft by the time of *Desert Storm*. Once

combat operations commenced on 17 January, then, the 1984 version of AFM 1-1 was still regarded as the official current air force doctrine manual. The 1992 doctrinal edition that appeared after the war, had already been basically formulated before it began. Only in their expanded second volume did the CADRE writers incorporate direct experiences from the Gulf. After eight years had passed since the publication of its last basic doctrine manual, the Air Force, understandably, was eager to release a new AFM 1-1. Thus, the exact impact of the Gulf War on airpower doctrine can only be properly evaluated by examining the Air Force's succeeding version to the 1992 AFM 1-1.

The 1992 manual did demonstrate that aerial operations in the Gulf had occurred in accordance with the officially sanctioned beliefs of the Air Force. As one observer concluded: "The air campaign followed Air Force doctrine faithfully and was a convincing vindication of it."<sup>51</sup> The 1992 edition represented the culmination of nearly a full decade of doctrinal formulation and the Gulf War provided further substantial evidence to support it. Following the harrowing experiences of Vietnam and the increased historical awareness of the Air Force, officers within the service were now formulating sound doctrine based on an objective analysis of evidence. Although the 1984 doctrine manual marked the beginnings of this change, "The 1992 version of AFM 1-1", claimed one doctrine expert, "proved to be the first real attempt to rely on analysis of experience to develop Air Force doctrine."<sup>52</sup> There is no doubt that the 1992 edition of AFM 1-1 was the Air Force's most professional attempt to produce sound doctrine up to that date, far excelling anything the service had ever produced before. Thus, it is an irony that just one year after the most decisive application of airpower ever, the Air Force would release its most unbiased and analytical doctrine manual.

While the Air Force may have written a new AFM 1-1 that was rather reticent in relation to the results that airpower had achieved in the Gulf, a mass of literature passionately advocating the dominance of airpower in modern warfare soon accumulated.<sup>53</sup> To many observers, *Desert Storm* represented airpower's coming of age and verification of the theories of earlier airpower advocates such as Douhet and Mitchell. For some in the Air Force, the Gulf War proved conclusively that "Billy Mitchell was right".<sup>54</sup> Other analysts, however, felt that the conflict was so unique—as is every war—that any lessons drawn from this war are limited and must be regarded with caution.<sup>55</sup> While some airpower commentators have pointed out the connections between *Desert Storm* and the prophecies of much earlier air theorists,<sup>56</sup> the Gulf War vindicated no one's beliefs in the efficacy of airpower more than those of John Warden.

Although it is easy to point out the differences between *Instant Thunder* and the opening stages of *Desert Storm*, of more importance are the similarities between Warden's initial plans and those executed by the Black Hole several months later.



Warden's five concentric rings model remained the central focus of the air campaign planning, from the time that Schwarzkopf called the Air Staff, through to the final hours of the conflict itself. Aerial operations in *Desert Storm* basically followed the same pattern that Warden had argued in his 1988 thesis. Indeed, the coalition air offensive virtually reflected the outline of an air campaign as stipulated in FM 100-20 written nearly fifty years earlier. The air war fulfilled all six general basic tasks stated in the 1943 document, one of which was to wage offensive air warfare against the enemy's military and economic strength.<sup>57</sup> With initial efforts focused on gaining and retaining aerial superiority, the allied fleet was then able to conduct an interdiction campaign (both distant—essentially strategic attacks, anyway—intermediate and close, as devised by Warden), and then provide CAS for the coalition ground forces during the final stages of the war. The targeting of Iraq's strategic centers of gravity proved remarkably successful as Horner effected a national paralysis upon Saddam's state.

Uniquely favourable factors of time and circumstance, however, provided Warden with the ideal opportunity to see that his concepts were successfully put into practice, albeit not directly by himself. Saddam initially provided the *Instant Thunder* plan with any viability to US air strategists; if he had launched a full-scale invasion against Saudi Arabia as soon as it became apparent that Washington was beginning to deploy forces to the Gulf, a strategic air campaign such as *Instant Thunder* would have been a very precarious proposition indeed. It would not have mattered how many strategic COGs were hit, or how many bombs were being dropped on targets deep in Iraq, if its armoured forces were overrunning Riyadh and Dhahran. While the dispute between Horner and Warden over tactical and strategic targets has been well documented, along with Warden's belief that the CENTAF commander was placing too much emphasis on defensive planning, it was Horner, not Warden, who was responsible for the defence of Saudi Arabia and any mistakes would lay with him. It was quite understandable that he initially focused upon Saddam's tactical forces.

Fortunately for Warden, he correctly assumed that Iraq would not attack Saudi Arabia but halt their offensive at the Kuwaiti border. His calculation was probably influenced by Iraq's poor performance at conducting long-range offensive operations during its war against Iran where the Iraqi forces only proved efficient when operating on interior lines of communication.<sup>58</sup> Whatever the reasons for Warden's assumptions, they ultimately proved accurate. Saddam's decision to place his forces in defensive positions throughout Kuwait and southern Iraq conceded the initiative to the coalition and made *Instant Thunder* a credible and ideal option for air planners. It was at this time, that the Iraqi dictator had basically lost any chance of gaining a military victory. His forces were not prepared to wage a war against an aggressive adversary that possessed

overwhelming airpower. As Saudi Lieutenant-General Khalid Bin Sultan, the Allied Joint Force Commander, explained the plight of his northern neighbour: "The Coalition put more sorties in the air each day than Saddam Hussein had seen in eight years of war with Iran. He could have had no concept of what was hitting him."<sup>59</sup>

While some commentators have stressed the formidable power of the Iraqi war machine, including Air Force historian Richard Hallion who commented that it would provide the American forces a "worthy test",<sup>60</sup> these have usually been over-exaggerated and misleading. Although the Iraqi military arsenal comprised some very modern machines and weapons systems, Iraqis were only proficient in First World War-style tactics. Their obsolete concepts and doctrine were completely outmatched by those of the US military. As Secretary Cheney concluded in a Pentagon report a few months after the coalition triumph: "A revolutionary new generation of high-technology weapons, combined with innovative and effective doctrine, gave our forces the edge".<sup>61</sup> The Iraqis proved their own worst enemy, providing Warden and the coalition the perfect setting for a decisive application of modern airpower.

Yet despite Saddam's miscalculations, *Instant Thunder* would probably have never played a significant role in aerial planning if not for Schwarzkopf's phone call to the Air Staff, requesting that it develop him a strategic air campaign. This amazing stroke of luck, and the CENTCOM commander's subsequent "100 percent" approval, allowed Warden the opportunity to develop and expand a strategic air plan based on his five-concentric rings. It is quite astonishing, then, that the earliest opposition to *Instant Thunder* came from other Air Force personnel. The planning of an air campaign not only reflected the doctrinal variations between the USAF and the other service air arms, but also within the Air Force itself.

*Instant Thunder* stood in marked contrast to CENTAF's plans, which were based almost entirely on the Army's AirLand Battle doctrine of integrated surface manoeuvre and aerial support to cut the Iraqi LOCs as well as TAC's tactical-based campaign plan which also proposed gradual, demonstrative attacks against strategic targets.<sup>62</sup> The commander of Marine aviation during the Gulf War, Major-General Royal Moore, meanwhile, wanted the "first bomb [to] drop after the first Marine crosses the line".<sup>63</sup> While it has been stressed that the *Desert Storm* air offensive did not effect an Iraqi withdrawal from Kuwait, even after more firepower had been expended in a campaign that went considerably longer than Warden had ever anticipated, it is certain that any of the other proposed air campaigns would have proved considerably more costly to the coalition, both in the air and on the ground. Yet as time revealed, the coalition was able to wage an air campaign at the strategic, operational and tactical levels simultaneously. As planning proceeded during *Desert Shield*, the two approaches from CENTAF and

Checkmate eventually merged into a single, integrated and formidable campaign plan that would ultimately become *Desert Storm*.

It is interesting to note, however, that it took a phone call from an infantryman to see that an independent strategic air campaign be incorporated into operational plans. As one Air Force analyst observed: "Lacking any evidence to the contrary, one may conclude that CENTAF would have written a campaign plan that concentrated almost entirely upon the Iraqi army and allied maneuver plans".<sup>64</sup> CENTAF's staff was so influenced by the Army's AirLand doctrinal perspective of airpower employment that it was highly unlikely that a strategic campaign would have originated within the theatre. Although the 1992 version of AFM 1-1 stated in its second volume that "airmen must demonstrate vision, as was the case most recently in Operation *Desert Storm*, when examining how to best exploit the versatility of aerospace power",<sup>65</sup> it was Schwarzkopf's request for assistance that provided Warden and the Air Force a genuine opportunity to test their theories and doctrine. Without the general's call for outside help, a strategic air offensive may not have materialised at all. History may well record this as the CENTCOM commander's finest decision of the war.

The Gulf War, then, was not a conflict in which the coalition fought the Army's AirLand Battle, as is widely presumed. As *Desert Storm* clearly demonstrated, airpower was not subordinated to a system of supporting fires as proposed by Army doctrine.<sup>66</sup> Rather, aerial operations during *Desert Storm* were conducted in accordance with the broader perspective of Air Force doctrine. This allowed the application of an independent aerial campaign, but also CAS and other closely synchronised operations when needed.<sup>67</sup> Neither was the campaign planned as AirLand Battle. Although Powell and the JCS had approved of the air plan during October, plans for a ground offensive had not yet been decided.<sup>68</sup> Despite this, Horner and the Black Hole continued expanding and improving their own stratagem. The doctrine ultimately employed by the USAF in this war was its own, and its success confirmed its validity. As the world's most powerful air arm concluded in an official report after its victory: "The Air Force had the right doctrine, the right systems, the right people, the right leadership."<sup>69</sup>

*Desert Storm*, then, was a proving ground for the prevailing doctrinal trends within the Air Force. As one airpower commentator stated: "In the Gulf War, [the] USAF did what it was born to do."<sup>70</sup> This is a significant statement as it points to the situational limits that have restricted airpower's achievements since the Second World War. As mentioned earlier, the Air Force was formed primarily to serve the strategic mission against the Soviet Union and doctrine focused almost exclusively upon this. It was not until the Gulf War, however, 44 years after the Air Force's conception, that it would finally wage its first conventional large-scale conflict against an industrialised enemy without the concepts of

gradual escalation. The value of strategic air warfare depends on the value of the strategic targets that it can destroy and Iraq, in direct contrast to Korea and Vietnam, was a highly industrialised modern state that possessed many vital COGs vulnerable to air attack. Not since the 1940s had Air Force officers been given such an opportunity to exercise their main doctrinal tenets. Although some military commentators have marginalised the effects of the coalition's strategic air campaign as compared to the operational and tactical results that airpower achieved in the Gulf, this once again, unfortunately, compartmentalises the concept of airpower. The campaign phases of the *Desert Storm* air offensive can not be adequately evaluated individually as they were all integrally and synergistically related. As Horner, the triumphant JFACC recalled, "The preparation of the battlefield actually began with the first bomb falling on Baghdad."<sup>71</sup>

Thus, the Gulf War validated the doctrine of the United States Air Force. Although the service's 1992 version of AFM 1-1 was released after the conflict, its final draft had already been completed by the successful conclusion of *Desert Storm*. While nothing specific from the campaign was reflected in the manual's "bare bones" volume, the war did serve as further evidence for much of the doctrinal assertions made in it. However, CADRE's decision to produce a second volume of supporting essays allowed direct experiences from the Gulf to be incorporated to further solidify their soundness. Air Force doctrine benefited from the organisations that the service had formed during the 1980s which were designed to increase the awareness of airpower history. Officers were soon challenging some of the Air Force's traditional doctrinal beliefs and offering new critical analyses of evidence. This resulted in the Air Force's most unprejudiced basic doctrine manual in 1992. Rather than being based primarily on policy, budget rivalry and potential technology, the new AFM 1-1 was founded on a rigorous analysis of historical evidence. The doctrinal statements made in this latest version were completely vindicated by the application of airpower in *Desert Storm*. However, as the manual was basically formulated before the campaign, the specific impact of the war on airpower doctrine can only be assessed by examining the succeeding version to the 1992 AFM 1-1. This next edition, Air Force Doctrine Document 1: *Air Force Basic Doctrine*,<sup>72</sup> was released in September 1997, marking the 50th anniversary of the world's most formidable aerospace force.



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## Chapter V

### After the Gulf: Heeding the Storm

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*"As the 20th Century draws to a close, air power dominates warfare."*  
— Colonel John A. Warden III, 1997

The 1997 AFDD 1 is the service's first basic manual researched and was written entirely after the Gulf War. It is also the first manual to be published by the Air University's recently established Air Force Doctrine Center which had been given the responsibility for the formulation and promulgation of all the service's doctrinal publications.<sup>1</sup> This is the first time that the Air Force has institutionalised a systematic intellectual process for the writing of its doctrine.

This chapter aims to determine whether the experiences of the Gulf War may have effected any changes or modifications to the Air Force's basic doctrinal concepts. After six years since the end of the war, doctrine developers had ample time to study the conflict and draw any specific lessons from it in their work. This chapter will reveal and explain how the Gulf War influenced the writing of the new AFDD 1 while establishing the extent to which it may have altered doctrinal thinking.

Rather than following the comprehensive two-volume layout that CADRE had produced five years earlier, the writers of the 1997 basic doctrine manual returned to a single text format, although it is considerably much larger and thorough than CADRE's first "bare bones" volume. Despite this straightforward change, AFDD 1 developers maintained the emphasis that CADRE officers had instigated during the previous decade by producing sound doctrine based upon the study and analysis of experience. The new manual recognised the importance of the lessons from the past, stating that "Doctrine evolves from military theory and experience and addresses how best to use military power."<sup>2</sup> However, the manual also pointed out that circumstances and practical realities may sometimes force military leaders to adopt alternative approaches that are not consistent with accepted doctrine.<sup>3</sup>

Although AFDD 1 stated that "doctrine reflects what has usually worked best",<sup>4</sup> it also acknowledged where air doctrine had proven incorrect in the past. The manual referred to shortcomings such as the Army Air Forces' doctrine of unescorted bombers during World War II and the Air Force's doctrinal inadequacies that led to its poor performance

over Southeast Asia as instances in which doctrine had not always worked “best”.<sup>5</sup> As the CADRE writers had aspired to produce sound doctrine “based on experience, our own and that of others”, so too did the following doctrine developers. Rather than focusing on large scale—usually nuclear—warfare against an industrialised enemy based on untested presumptions which had characterised so many earlier basic doctrine editions, AFDD 1 declared that the Air Force must be prepared to meet a variety of challenges during peace, crisis and conflict.<sup>6</sup> The willingness of AFDD 1 writers to produce pragmatic and relevant doctrine for their service as it approaches the twenty-first century is illustrated by the emphasis placed on the role of air and space power in Military Operations Other Than War (MOOTW).<sup>7</sup> This is the first time that Air Force doctrine has seriously attempted to address the vast spectrum of military operations that are not associated with major conventional warfare.<sup>8</sup> Air theorists perceive MOOTW to play an increasingly important role in future contingencies.<sup>9</sup>

Despite the greater awareness shown by doctrine writers concerning operations outside of the standard conventional sense, AFDD 1 maintained its primary focus on the preparation, planning and employment of air and space forces in major, sustained combat operations. The unique nature of modern air and space assets is reemphasised as, unlike surface forces, they do not have to follow a sequential process of achieving tactical objectives before attaining those at the operational or strategic levels.<sup>10</sup> Air and space forces are able to pursue objectives at all three levels of war simultaneously as they did in *Desert Storm*. AFDD 1 also resumed the belief in the primacy of strategic air warfare. The manual declared that if airpower is applied properly, strategic attack will prove the most efficient means of employment, gaining decisive effects against an enemy while also minimising the loss of friendly lives and resources.<sup>11</sup> The new manual, however, also warned that “Given sufficient time, even the most devastating strategic effects can be circumvented by resourceful enemies”.<sup>12</sup> Doctrine writers were well aware of some of the limitations of strategic air campaigns conducted in previous conflicts and were willing to disclose these to their service.

The 1997 basic doctrine developers were wary of producing prescriptive doctrine as did their preceding writers. Their edition, however, unlike the first volume of the 1992 AFM 1-1, zealously promoted the role of airpower as the dominant force in modern warfare. In more comparison with some of the Air Force’s earlier doctrinal editions during the early Cold War years, the new manual seemed to act as a propaganda instrument for the service. Throughout the edition, AFDD 1 writers argued the dominant and unique nature of Air Force assets. Although acknowledging that all air assets operate in the third dimension, it pointed out that only those of the Air Force operated with a global strategic perspective.<sup>13</sup> Rather than providing support for other tasks as did

the other service air arms, the Air Force is the only service designed purely to provide the nation's air and space power. AFDD 1 writers argued the preeminent status of the Air Force by confidently stating that, "Air and space power has become the great enabler that allows all land, sea, and special operations forces to optimize their contributions to America's national security".<sup>14</sup>

As the US military increasingly becomes an expeditionary force with the reduction of worldwide bases and forward deployed presence, the Air Force has assumed a more prominent role in military operations through its strategic global power projection capabilities.<sup>15</sup> The Air Force is the only service that can rapidly project power anywhere across the globe and is very eager to point this out, claiming that, "When combined with our inherent strategic perspective, Air Force operations can be both the theatres' first and potentially most decisive force".<sup>16</sup> The Gulf War provided firm evidence of this statement as US airpower demonstrated to Saddam and any other potential adversaries just how swiftly it can be mobilised, prepared and deployed for war.<sup>17</sup>

The tendency of AFDD 1 writers to accentuate the Air Force's global strategic leverage and its distinctiveness from the air arms of the other armed services is much more profound than what CADRE officers had written. Indeed, while the most recent doctrine developers may be correct in their perception of the Air Force playing a greater role in future military operations, their championing of the Air Force seems more than providing the service with sound doctrine or to instil confidence in its officers. The promotion of the Air Force over the other service air arms seems more likely to be linked to budget battles in the Department of Defense. AFDD 1 appears to argue the Air Force's case for its own share of Pentagon dollars as fiscal constraints are placed upon the defense establishment and America's total force structure is decreased. Rather than the reasonably moderated edition produced by CADRE, the new basic doctrine manual has greater emphasis on airpower's decisive impact. As AFDD 1 claims: "air and space power does now have the potential to be the dominant and, at times, the decisive element of combat in modern warfare."<sup>18</sup>

This more vigorous belief in airpower as a decisive force has, of course, been greatly influenced by the experiences of the Gulf War. Although aerial operations in the Gulf may have been conducted in accordance with basic Air Force doctrine, the conflict has effected some slight modifications to the service's basic doctrinal beliefs. Probably the most important of these within the new AFDD 1 is the greater emphasis placed on the role of information in modern warfare. Although war has long been associated with the different spheres of land, sea, air and space, AFDD 1 is the first doctrine edition to declare information as another sphere where some aspects of warfare can be conducted.<sup>19</sup> While information has always been part of land, sea and air warfare, it has

become even more central to the conduct of military operations and the concept of "Information Warfare" (IW) has now become an accepted part of Air Force doctrine. Referred to as "Command and Control Warfare" (C<sup>2</sup>W) by the Defense Department,<sup>20</sup> the Air Force claims that: "Information operations both enable air, space, and surface operations and, in some circumstances, constitute an emerging form of warfare."<sup>21</sup>

Since the beginning of warfare, information about oneself, the enemy and the battlefield has always proved invaluable. Before the electronic age and the advent of aerospace power, though, the means to collect and exploit any information were limited. The role of C<sup>3</sup>I was relatively minor as theatre and field commanders relied primarily on firepower and manoeuvre to win battles.<sup>22</sup> The Gulf conflict, however, demonstrated the increasing significance of C<sup>3</sup>I in modern warfare. Advanced aerospace technology has led to a variety of sophisticated air- and space-based Intelligence, Surveillance and Reconnaissance (ISR) systems being exploited for military purposes. The acquisition and analysis of detailed and precise near-real time information provides commanders with unprecedented situational awareness. They are now able to perceive the battlefield in greater detail and exercise a higher degree of operational control over their forces.

As most of these ISR systems are operated by the Air Force, IW has now become a vital aspect of modern of air and space power. One prominent analyst observed: "Airpower, coupled with information power, has arguably become the dominant force element in most circumstances of war."<sup>23</sup> The USAF now firmly believes that the side which is best able to gather, process and use information has a substantial strategic advantage over any adversary.<sup>24</sup> The collection, control, exploitation and defence of information while denying an opponent the same is now even more crucial to the conduct of modern military operations. Such is its importance that the Air Force now claims that control of the information spectrum is just as vital as gaining air superiority, or as the occupation of territory was in previous wars.<sup>25</sup> The employment of advanced information weapons and systems has significantly improved the cycle of orders and responses within a military force's own C<sup>3</sup>I network—or, as Air Force Colonel John Boyd termed during the 1970s, the Observation, Orientation, Decision, Action (OODA)-loop<sup>26</sup>—while also interfering with that of the enemy. "Information superiority", then, is now viewed by the Air Force as critical to the success of any military operation.<sup>27</sup>

The Gulf War is largely responsible for this development in Air Force basic doctrine. *Desert Storm* is viewed by many observers as the first modern "Information War" as all aspects of military operations depended to some degree on information provided by ISR systems.<sup>28</sup> Although other commentators seem more skeptical,<sup>29</sup> the Gulf War nevertheless provided the impetus for doctrine writers to acknowledge the significance of IW. This "emerging form of warfare" played a crucial role in the coalition war effort. The



Air Force acknowledged the strategic advantages of space systems for information gathering and dissemination.<sup>30</sup> The extreme elevation of satellites were "indispensable", as were high-flying reconnaissance aircraft, in detecting enemy assets and activities at long ranges. Iraq, meanwhile, was deprived of all means of strategic intelligence gathering as radar, telecommunications and satellite data-receiving stations were disrupted or destroyed. Electronic networks were also interrupted by the introduction of a computer virus into the Iraqi system.<sup>31</sup> Military commentators believe that nonlethal "cyber" attacks will play an increasingly greater role in warfare.<sup>32</sup> The Air Force is already developing electronically guided "information munitions" designed to destroy, expose or paralyse the enemy's information networks. Other nonlethal technologies were used in the Gulf to disrupt electrical circuits.<sup>33</sup> As the systems employed for waging war become more advanced, so too does the means to render these systems ineffective.

The air campaign ultimately enabled the coalition to achieve information superiority over the Iraqi armed forces. As well as being unable to protect their own information systems from disruption, the Iraqis also proved incapable of providing Offensive Counter Information (OCI) operations to hinder the coalition's own actions. The coalition's information superiority formed a synergistic effect with Horner's air superiority as Saddam's forces were denied the ability to collect their own information due to the coalition's control of the air. This disability made the Iraqis vulnerable to military deception as shown by their failure to anticipate the coalition's "Left hook" outflanking manoeuvre. "By blinding the Iraqi leadership," the Air Force claims, "air and space power allowed ground forces to move undetected to a point where the Iraqi army was least prepared to deal with a massive attack."<sup>34</sup> At the tactical level, the employment of specialised radar detection devices and ECM by SEAD aircraft effectively suppressed many Iraqi air defence sites even without resorting to lethal force. The coalition had completely disrupted Iraq's OODA-loop at the strategic, operational and tactical levels.

Thus, the proliferation of advanced information technologies has made the concept of information superiority an integral strategic component of Air Force doctrine and, indeed, of all warfare. *Desert Storm* would be the catalyst for this development. As one study claimed: "Information warfare, a subset of nonlethality, traces its independent existence directly to the success of electronic warfare during the Gulf War."<sup>35</sup> Today, IW now has its own bureaucratic institution within the US defence establishment. The Air Force acknowledged that the Gulf War had validated the concept of information superiority through the precise strategic attacks against Iraq's central command and control structure.<sup>36</sup> While this confirmed the growing importance of C<sup>2</sup>W, this declaration also provided official support for Warden's strategic-rings concept. After its stunning success in the Gulf, the Air Force acknowledged that "one of the key target systems is the

enemy's command and control (C<sup>2</sup>) system."<sup>37</sup> The service's doctrine manual asserted that severing the ability of the political-military leadership to communicate with its fielded forces would prove critical towards achieving "strategic paralysis".<sup>38</sup> Warden himself recognised this, triumphantly stating after the conflict that, "The Gulf War of 1991 was the first true demonstration of how air power alone can impose operational and strategic paralysis on a large, well-equipped offensive power."<sup>39</sup>

*Desert Storm*, then, had effected another slight modification to basic doctrine. Whereas previous doctrine writers had perceived strategic attacks as those aimed at ensuring "maximum destruction of the enemy's ability to wage war",<sup>40</sup> present doctrine developers are now taking into account the possibility of "disruption of the enemy's COGs" and "strategic paralysis".<sup>41</sup> As the Gulf War demonstrated, the simultaneous functional disruption of whole target systems proved much more effective than the sequential "maximum destruction" of individual target elements. *Desert Storm* confirmed an important conceptual shift from "destruction-based" to "effects-based" planning and execution.<sup>42</sup> The development of further precision nonlethal weapons by the Air Force points to the growing shift in emphasis away from destructive "iron" ordnance. As we come to the end of the twentieth century and a new generation of precision munitions become operational, "maximum destruction of the enemy's ability to wage war" may no longer be a politically desirable option at all.

Precision engagement has further modified basic Air Force doctrine in the application of the principle of mass, although not in the principle itself. As the Gulf War demonstrated, modern air and space forces have redefined the concept of massed forces.<sup>43</sup> The speed, flexibility and range of modern aircraft—combined with C<sup>3</sup>I technologies and the lethal accuracy of precision air weapons—allow them to achieve mass, manoeuvre and concentration faster and more efficiently than in previous wars. Modern airpower is able to execute precision engagement on a scale hitherto unknown. No longer do air commanders need hundreds of aircraft and bombs attacking a single target as they did during World War II and Korea, or even Vietnam. "Today," according to the USAF, "a single precision weapon that is targeted using superior battlespace awareness can often cause the destructive effect that in the past took hundreds of bombs."<sup>44</sup> Airpower's success in the Gulf eventuated even though the coalition dropped less than one percent of the bombs dropped on Vietnam.<sup>45</sup>

The unprecedented accuracy of modern precision air weapons, then, means that only a few aircraft are now needed to achieve national- or theatre-level objectives. "The Gulf War", Warden self-assuredly stated, "saw handfuls of airmen impose operational and strategic paralysis on a well-equipped opponent".<sup>46</sup> When combined with stealth and information technologies, air forces are able to provide "shock and surprise" to

adversaries, without having to unnecessarily expose massed friendly forces. Although the 1992 version of AFM 1-1 briefly addresses the importance of precision weapons, they were given much greater emphasis by the 1997 doctrine writers. Clearly, the experiences of the Gulf War provided the doctrine developers with firm evidence to further stress their significance. Fighter operations over Bosnia by US and other North Atlantic Treaty Organisation (NATO) forces in Operation *Deliberate Force* reaffirmed the Gulf experience and the employment of precision weapons.<sup>47</sup>

However, now that the American air arms are capable of precision engagement, it is also expected to perform it. Modern air warfare has become highly politicised and all bombs are now political ones. For the moment, at least, air commanders must strive to minimise enemy civilian casualties and collateral damage. It is this precise and discriminate nature of modern airpower, features that are rapidly increasing, that also serves as its greatest weakness. As the Al Firdos bunker strike demonstrated, airpower, as is every form of military power, will always have to be applied within the prevailing political ethos. The precision engagement demonstrated by airpower in the Gulf has also made it further appealing to Western politicians who are able to yield it.

Airpower has changed the face of international crisis and peacetime engagement as it has become the principal instrument of projecting global military power and presence of the world's only remaining superpower. Although operations such as *Eldorado Canyon* illustrates that this trend had already begun before *Desert Storm*, the 1991 air campaign proved that airpower can be conducted either as a stand-alone strategic operation, or as part of a larger joint force campaign. Political leaders are also impressed by the substantial contribution modern airpower can have in relation to the number of personnel it exposes to danger. Rapid and considerable military power can be projected by "handfuls of airmen" much more effectively than surface forces.

Neither does airpower need the considerable logistical organisations that characterise land or seapower. The Gulf War illustrated to the world that airpower can indeed act alone as a powerful instrument of national policy. Doctrine writers have acknowledged this, stating that, "Air and space forces can deter an adversary from taking actions contrary to US or allied interests by providing the capability to project potent military power anywhere on earth in a matter of hours."<sup>48</sup> The 1995 *Deliberate Force* campaign demonstrated that *Desert Storm* was not an exception as NATO air operations effected the Dayton Peace Accords. Intentional signs of force to conduct "punitive" air strikes have recently led to commitments to UN resolutions by political antagonists such as Saddam and Slobodan Milosevic. However, the recurring threat of air attacks against these two dissidents, in particular, also proves airpower's inability, by itself, to effect long-term political objectives.

While coercive airpower has changed the nature of international confrontation, so too has the Air Force changed its general perception of war. According to doctrine writers, wars have traditionally been fought in three phases: halting the invading force; the strengthening of combat power to weaken the enemy; and then to launch the decisive counteroffensive.<sup>49</sup> In this traditional concept, as formulated by the exalted Clausewitz, the offensive gradually weakens and reaches a "culminating point".<sup>50</sup> At this point, the attacker is no longer able to defend itself from a counterattack and, thus, it represents that moment just before the decisive counteroffensive. The Air Force, however, believes that modern air and space power can move forward the stage at which the culminating point occurs and has introduced a new way of perceiving conflict.

In this new view, the halt phase of the enemy is seen as the conflict's decisive phase and not just the prerequisite step for a build up of surface forces for a counteroffensive.<sup>51</sup> Rather, "The point of the "decisive halt", according to AFDD 1, "is to force the enemy beyond their culminating point through the early and sustained overwhelming application of air and space power."<sup>52</sup> It is this "decisive halt" at which the culminating point will occur. Following this phase, the initiatives and options of the US and any possible allies will grow while those of the aggressor subsequently decrease. As the build up of forces continues and pursued objectives are not met within a desirable time, only then may a surface counteroffensive be required. As the Air Force believes: "The global range, speed, and flexibility of air and space forces bring the "decisive halt" opportunity to reality."<sup>53</sup>

Although the Gulf War may not have exactly resembled this new view of conflict, the application of airpower during *Desert Shield/Storm* certainly influenced the thinking of doctrine writers in their official proposition of this new theory. The rapid deployment of air assets to the Gulf succeeded as a deterrent to any further Iraqi aggression and once the air campaign commenced, the coalition had virtually removed any chances Iraq had of gaining victory. Allied airpower, according to the Air Force, eliminated "Baghdad's ability to plan, execute, and sustain effective large-scale military operations."<sup>54</sup> Thus, Air Force theorists believe that America's present airpower strength offers it a decisive advantage over any potential adversary and can force any enemy offensive beyond its culminating point. Only time will tell if this new view of conflict is proven correct.

The Gulf War has effected further modifications to Air Force doctrine as demonstrated by the greater emphasis placed on parallel-force application theory.<sup>55</sup> By simultaneously pursuing strategic, operational and tactical objectives, modern airpower is able to conduct parallel operations. However, as air forces could only previously mass at the tactical level, any effects achieved at the operational and strategic levels took considerable time. Today, though, airpower is able to mass beyond the tactical level and



attack entire target sets at once. Whereas the Army Air Forces could only strike at 50 strategic targets during the whole of 1943, the coalition attacked more than double this number during the first 24-hours of *Desert Storm*.<sup>56</sup> Rather than the traditional form of serial operations where only a small number of targets came under attack in a given day, or even longer, parallel operations can strike a broad spectrum of an enemy's key target sets instantly, quickly overwhelming it and depriving it of the ability to respond effectively. Parallel operations can quickly induce paralysis upon the enemy state until it was ready to yield, whereas under serial attack, the enemy could alleviate its effects and launch counteroffensives.

Although this parallel process of war was hypothesised for many years, it was not undertaken on a large scale until *Desert Storm*. Only the exploitation of the most advanced technologies such as near-real-time C<sup>2</sup> capabilities, precision navigation and weapons guidance, electronic warfare and stealth permits an air force to attack many targets simultaneously. The Gulf War demonstrated that air, space and information power can be applied swiftly, precisely and in overwhelming force against strategic and operational centers of gravity that make it almost impossible for the enemy to make a coordinated and cogent response. The Air Force's belief that the reemphasis upon parallel operations is "essentially a product of the efficiency of high technology precision weapons, command and control techniques, ISR systems, and the resultant synergistic application" has certainly been instigated by experiences of the Gulf War.<sup>57</sup>

Parallel operations can either be conducted symmetrically against an enemy's air and space forces, asymmetrically against its surface forces, or, as *Desert Storm* showed, they can be conducted simultaneously. Asymmetric operations in the Gulf demonstrated that military analysts and commentators must now review the ancient beliefs of land and sea warfare that only armies can defeat armies and only navies can defeat navies. As General McPeak commented after the war, "This is the first time in history that a field army has been defeated by air power."<sup>58</sup> Although asymmetric operations would be the United States ideal way of conducting warfare in the future, especially given its superior aerospace advantage over the rest of the world, the Gulf War, paradoxically, was probably also the last time that large surface forces were defeated by airpower. One of the major lessons of the war was the extreme vulnerability of field armies to modern air forces. Due to airpower's immense success during recent times, it may seem that it is now entering a "golden age". However, despite these developments, this may not prove the case. Airpower's very success in the Gulf and elsewhere, ironically, has reduced the probability of major conventional warfare.

A further modification to doctrine caused by the Gulf War is the greater emphasis on airpower's effectiveness at interdiction. *Desert Storm* demonstrated that today's air

assets have the ability to achieve successful interdiction without the use of surface forces. Although air theorists learnt during the interdiction campaigns of the Second World War and Korea that these were much more effective through the combined synergy of air and surface manoeuvre, the Gulf proved that major ground engagements are no longer necessary. Precision information, weapons and night-time technologies allowed the coalition fleet to completely cut the Iraqi lines of communication. Doctrine writers acknowledged this, claiming that air forces are now able to “have a devastating impact on the enemy’s plans and ability to respond to the actions of friendly forces, even before friendly surface forces appear in the battlespace.”<sup>59</sup>

Doctrine writers, however, did not address the coalition’s new form of strike operations against Iraq’s forces in the KTO. Although they promoted the traditional roles of air and space forces that have always been integral to the employment of aerospace power,<sup>60</sup> Richard Hallion observed that the coalition air strikes on the fielded Iraqi army neither suited classic close air support or battlefield air interdiction.<sup>61</sup> Describing these attacks as strategic strikes against unengaged but fielded enemy forces, the official Air Force historian and another airpower scholar, conceived the term “Degrade Enemy Army” (DEA).<sup>62</sup> This title summarises the coalition air strikes against the Iraqi forces much more accurately than any other term, yet there was no mention of this new form of attack in official Air Force doctrine. Hallion, though, believes that strike operations in future wars will be of a similar nature, and, if in fact they are, it is essential that subsequent doctrine editions acknowledge them.

Besides slight modifications to doctrine, the experiences from the Gulf presented in AFDD 1 reaffirmed the service’s officially sanctioned beliefs. One of the clearest successes was, of course, the tenet of centralised control/decentralised execution. The manual pointed out how far the Air Force had come since *Rolling Thunder* when it declared: “The outcome of the Gulf War stands in stark contrast to that of Vietnam.”<sup>63</sup> Equally important was the concept of decentralised execution. Without the overbearing direction and interference of higher echelons, Horner’s commanders were able to execute over 2,000 sorties each day.<sup>64</sup> Air Force doctrine also reaffirmed the continuing importance of the concept of air and space superiority as it “remains a critical prerequisite for all joint force operations.”<sup>65</sup> Joint forces are given decisive advantage through air and space power’s ability to control the depth, breadth and height of the battlespace, as was so clearly proven in the Gulf.<sup>66</sup> Airpower’s contribution is now even more central to a battle’s outcome. Given the proper circumstances, air and space power can dominate all forms of military operations. Aerospace power plays a crucial role in the new operational concepts developed by the Joint Chiefs of Staff—dominant manoeuvre, precision engagement, focused logistics and full-dimensional protection—

which are designed to achieve “full spectrum dominance” across the range of military operations in the future.<sup>67</sup> The Air Force believes that its “core competencies” of air and space superiority, precision engagement, information superiority, global attack, rapid global mobility and agile combat support make invaluable contributions to these new operational concepts.<sup>68</sup> The Gulf War undoubtedly proved the validity of these core competencies as the Air Force prepares for the battles of the twenty-first century.

In conclusion, then, the Air Force’s 1997 basic doctrine manual certainly reveals many small changes of doctrinal position caused by the experiences of the Gulf War. *Desert Storm*, however, had not effected any *major* changes to the service’s basic doctrinal beliefs. Those doctrinal modifications that did occur in AFDD 1 resulted from the culmination of already evolving trends in airpower theory and practice rather than any sudden developments. The only real test of doctrine—actual combat—confirmed those trends during the 1991 air campaign. *Desert Storm* merely affirmed the verity of several evolving patterns which were then subsequently represented in Air Force doctrine. As one observer concluded: “The air war in the Gulf tended to confirm forecasts and well founded principles rather than produce surprises.”<sup>69</sup> Fighter operations over Bosnia have reaffirmed many of those doctrinal developments. AFDD 1 was not a major departure from the doctrine stipulated in the 1992 version of AFM 1-1, but merely expanded and modified the beliefs of that manual’s first “bare bones” volume.

Although the new writers of the Air Force Doctrine Center produced a very sound doctrine for their service as it enters the new century, a trace of zealous airpower championing taints the new manual. While it is not a complete return to the manuals of the Cold War era, the new AFDD 1 does tend to promote the service to a far greater degree than the CADRE officers had done five years earlier. Nevertheless, the Air Force’s 1997 doctrinal edition has continued its preceding manual’s attempt to rely on analysis of experience to develop doctrine. This development process remains continuous and alive. The manual noted, “We must remain alert and receptive to the lessons of the past and technologies of the future that may alter the art of air and space warfare.”<sup>70</sup> As doctrine developers are now fully aware of their responsibilities to produce sound doctrine based on the study and analysis of experience, so too has the Air Force learnt from its past mistakes. The AFDD 1 writers concluded in their manual: “The shining success of air and space power in *Desert Storm* and in the skies over Bosnia illuminates the ability of the Air Force to learn and apply its lessons.”<sup>71</sup>

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## Conclusion

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The 1991 Persian Gulf War is now seen as one of the most astonishing conflicts of modern, and indeed, of all warfare. The campaign was remarkable in many aspects, the central role of air and space power being the most prominent. For the first time in warfare, air forces, rather than those of land or sea, proved the decisive form of military power. From the initial launches of B-52 bombers at US air bases through to the destruction inflicted upon the retreating Iraqis on the "Highway of Death", airpower served as the coalition's dominant arm during the 43-day campaign. Many military practitioners, historians and commentators see this conflict as the beginning of a trend in major conventional warfare: the dominance of airpower.

The path leading to this assumption is relatively short compared to the long history of land and naval warfare. Not even ninety years separates the Wrights' achievement at Kitty Hawk and the decisive application of airpower in *Desert Storm*. The journey of airmen, however, has also been plagued by repeated mistakes, disappointment and unnecessary loss of blood and treasure. Doctrine lies at the heart of many of these errors. Although the doctrinal history of American airpower may be brief, it has also been troubled. One sees this in the air wars that the United States has waged throughout this century.

The key tenets of the early airpower beliefs formulated by officers at the Air Corps Tactical School were largely based on theories that had little or no empirical evidence to support them. Central to these theories was the decisive role of airpower based on the assumption that it would overwhelm an enemy's ability and will to resist through the destruction of its vital economic centers. Originally conceived by "Billy" Mitchell during the 1920s, the untested beliefs of ACTS faculty members eventually became official Air Force doctrine. The First World War, however, offered no support to these theories and indicated the beginning of a tendency among doctrine developers to dismiss history that did not substantiate their beliefs. The Great War provided airmen with the first experimentation in doctrine, yet many of the battle-tested principles that emerged during the war years faded away following the Armistice.

Although technological advances during the interwar period gave the ACTS's theories further credibility, the test of combat during the Second World War proved that they were still well in advance of what technology enabled airmen to achieve. While the Army Air Corps entered World War II with a well defined doctrine that emphasised the decisive role of strategic bombardment, the available technology once again restricted capability



and airmen soon realised they could not fulfil their promises. Employment practice further hindered the ability of airmen to execute their doctrine as the reality of combat proved that operations were much more difficult and complex than theory had indicated. The doctrine developed at ACTS was so ingrained in the minds of Army Air Force commanders that they pursued it relentlessly, even though their unescorted bomber fleets were systematically threshed by the *Luftwaffe*'s fighters in 1943. The introduction of long-range fighter escorts remedied this dogmatic approach and allowed the strategic air campaigns to continue without prohibitive losses. The doctrinal emphasis on strategic bombardment explains why the United States began the war with the world's two finest heavy bombers, yet could not produce a first-rate fighter until late 1943.

Although the strategic air offensive gathered momentum after 1943, theory once again exaggerated the effects that this form of warfare would have. Despite massive and sustained air raids, strategic bombardment did not effect any swift and conclusive victory over Germany or Japan. The Axis powers continued bitter resistance and only finally capitulated after the destruction of their armed forces. Although it made a significant contribution to the allied victory, strategic bombing during World War II could neither destroy the enemy's capability or will to fight. Mitchell's prophecies and Army Air Corps doctrine were not realised.

For the most part of this great conflict, then, airpower was not employed to its maximum potential. Air theory was still obviously in front of technological capability while employment practice had not yet been adequately developed to allow airpower to be a decisive factor. Although the war demonstrated the importance of tactical airpower—which, ironically, rather than strategic bombing, led to the first official recognition by the US military establishment of the equality between air and army forces—it was once again neglected in favour of the long-range bomber after the war as “atomic airpower” became the central focus of the newly independent Air Force. Although the Army Air Forces' doctrine may not have been proven during the Second World War, most Air Force leaders believed that the atomic bomb would vindicate their theories. Thus, many of the untested beliefs that had become dogma within the AAF were then translated to the Air Force.

Atomic and later, thermonuclear, weapons dominated airpower thought for the next three decades after World War II. Strategic deterrence became the basis of military strategy and doctrine. Despite the establishment of Air University to develop basic doctrine based on the experience of war, the Air Force's first doctrinal publications during the 1950s indicated the beginning of a propensity to concentrate on weapons of mass destruction as a means of conducting strategic air warfare. The Air Force further shifted its basic doctrine away from experience as the foundation for operational

guidance.

The Korean War proved the inapplicability of the principle of strategic bombing. The assumptions guiding the theories of strategic warfare were irrelevant as North Korea had little or no vital economic centers. Nor did the nature of the war allow Air Force commanders to pursue a strategy that would destroy the enemy's capability to fight. Political considerations limited the employment of airpower as a decisive instrument. Technology had not bridged the gap between theory and practice while political restrictions would not allow the Air Force's strategic doctrine to be correctly executed. The Korean conflict, then, should have demonstrated to the Air Force the greater need for doctrinal emphasis on limited, conventional warfare.

However, despite these problems, the Air Force continued its drive towards the acquisition of instruments for general nuclear war. Air commanders viewed the Korean conflict as having no significance and so it did not receive any attention for future doctrinal development. This reflected an institutional bias against anything that did not validate the Air Force's dogmatic beliefs. Beginning with the service's first AFM 1-2 released in 1953, the Air Force's post-Korea doctrine manuals emphasised the supposedly decisive role of strategic bombing based on perceived successes of World War II while dismissing the experiences of Korea. Air Force doctrine continued to focus almost exclusively on large-scale war against an industrialised adversary. As the Air Force entered the 1960s facing increasing challenges to its roles and missions by the other services, basic doctrine became further encompassed in national policy and justification of the service's independence and budgetary appropriations. Clearly, sound doctrine was not being formulated through the proper interaction of airpower theory, practice and technology.

The Air Force's doctrinal woes were painfully revealed during the wars over Southeast Asia. The doctrine advocated during the decade after Korea proved to be largely immutable and unsubstantiated dogma. Although employment practice was once again largely restrained by political circumstances, airmen themselves also lacked the ability to employ airpower effectively. Despite further advances in technology, the reality of combat proved that the Air Force's doctrinal beliefs were unfitting for another limited war. Its operational methods and tactics, especially during the earlier stages of the war, were poor and cost unnecessary lives. Once again, Air Force commanders were determined to apply the doctrinal precepts of strategic air warfare, only to find airpower constrained by concepts of gradual escalation. Air campaigns such as *Rolling Thunder* failed to have any decisive effect. The Air Force, eventually realising that its doctrine had disappointed yet again, emerged from the Vietnam ordeal uncertain over many of its beliefs. The doctrinal tenets that pledged decisive results in war had not materialised. One prominent

CADRE officer claimed that after *Rolling Thunder*, the Air Force entered a "doctrinal wilderness."<sup>1</sup>

Official written doctrine continued to emphasise nuclear strategy and deterrence. The Air Force's versions of AFM 1-1 released in the 1970s ignored the experiences of Vietnam just as the post-Korea editions had ignored that conflict. Strategic deterrence and nuclear weapons had so dominated airpower thinking since World War II that nonnuclear airpower doctrine and historical lessons were largely missing from the service's basic doctrine manuals. The problematic nature of Air Force operations over Vietnam confirmed the mistake of basing doctrine on anything rather than the critical analysis of experience.

Although official doctrine writers persisted in emphasising nuclear warfare, informal doctrine had already shifted to a more conventional and, therefore, applicable context. Vietnam finally demonstrated to the Air Force that the early theories of Mitchell and the ACTS could not be achieved purely through the marriage of air and atomic power. During Vietnam, airmen eventually rectified many of the problems they had encountered, just as their predecessors had done in World War II and Korea. Unlike after those conflicts, however, they did not forget any valuable lessons learnt. The Vietnam War actually signalled the end of this expensive and repetitious process. Technology and employment practice shifted towards nonnuclear warfare while the Air Force began a revival of airpower awareness and intellectual study. This led to the development of air theory and doctrine based on a critical analysis of experience. The Air Force began attempting to formulate sound doctrine where all three driving elements were mutually supportive of each other.

*Desert Storm* represented a realisation of these efforts. The Gulf War brought together the technology, concepts, and employment methods, tactics and techniques that the Air Force had developed and modified since the Vietnam era. The three factors of doctrine converged perfectly to produce the "apotheosis of twentieth-century airpower." This success occurred as theory, available technology and practice concepts promoted each other in the strategic application of airpower. Air and space power technology proved to be the most noticeable of these elements during *Desert Storm*.

The Gulf War was the first major demonstration of the weapons and systems that had been in development for the previous two decades. Although the world was captivated by images of precision weaponry and anti-missile missiles in early 1991, the Gulf War was largely fought with the technology first developed in the late 1960s and 1970s. Airpower technology finally caught up with doctrine, strategy and tactics. Many of the predictions of Mitchell and the ACTS were at last realised as available technology enabled airmen to prove airpower as a decisive force.

Prior to *Desert Storm*, Saddam Hussein confidently stated: "The United States relies on the Air Force and the Air Force has never been the decisive factor in the history of war."<sup>2</sup> Although the Iraqi dictator may have been correct, he was obviously unaware of the vast technological strides that US airpower had made since its last major engagement. Technological advances gave airmen the opportunity to perform feats which until then had only been the domain of the most imaginative visionary. By the time of *Desert Storm*, aircraft could fly virtually anywhere in the world at any time and deliver a payload with enormous accuracy. The coalition airmen gained substantial rewards from recent developments in technology, especially in the areas of stealth, electronic warfare, precision munitions and information systems.

Technological progress, then, permitted airmen to realise goals which were previously unattainable. Warfighting concepts such as "inside-out warfare" and "hyperwar" had long been hypothesised by airpower practitioners yet it was not until *Desert Storm* that they were finally put into practice. Modern technology enabled coalition airpower to achieve immediate strategic and operational objectives. As a jubilant Warden concluded: "Technology has made possible the near simultaneous attack on every strategic- and operational-level vulnerability of the enemy."<sup>3</sup> Saddam was wrong! The multiplier effect of high technology allowed coalition airpower to seize the initiative at all levels and dominate the war.

Although advanced technology provided coalition airmen with marvellous new capabilities, Horner's fleet also benefited from the concepts that experience has proven to be "the best way to do the job". As Vietnam demonstrated, sophisticated weapons and systems do not necessarily guarantee success if they are not exploited efficiently and effectively through proper tactical and operational concepts. The *Desert Storm* air offensive was characterised by employment concepts of concentration and mass of forces, simultaneous and synchronised strikes, surprise and deception, precise intelligence and flexibility through centralised control. Like the evolution of technology, these employment practices were mastered over many years.

The mistakes of Southeast Asia proved crucial to the successful application of these practices. Vietnam demonstrated the growing complexities of conventional air warfare and many of the concepts first tested during that war and then standardised in the "Flag" series exercises became established procedures by the time of *Desert Storm*. As the victorious Horner declared: "The experience gained during our involvement in Southeast Asia proved invaluable in our preparation, planning and execution in Southwest Asia".<sup>4</sup> The success of Horner's air offensive is testament to the employment concepts that the US air arms had developed and modified since *Rolling Thunder*.

In the aftermath of Vietnam, the Air Force also began examining its role in future



warfare in order to avoid another similar debacle. During the 1980s, air theorists moved away from the nuclear shadow that had dominated Air Force thinking since 1945 and focused upon developing sound doctrine for conventional theatre conflict. This doctrinal shift reflected itself in the Air Force's 1984 version of AFM 1-1 and even more so in unofficial papers and journals such as Warden's *Air Campaign*. The Air Force's *Global Reach—Global Power* White Paper demonstrated the service's growing emphasis on its contribution to US military objectives outside of the nuclear spectrum. The paper accurately predicted many of the 1991 air campaign's aspects. The growing emphasis upon producing sound and relevant warfighting doctrine proved crucial to the application of airpower in the Gulf. As the Air Force recalled after the war, "Collectively, this body of thought coalesced to create what became the most successful air campaign in military history."<sup>5</sup>

Thus, although the Gulf War represents the beginning of a new era in warfare, the conflict was merely the culmination of a number of evolving trends in airpower theory and practice. *Desert Storm* symbolised a continuation of the developments that had been in development since Vietnam. In fact, the origins of most of the concepts that proved successful in the Gulf can be traced back to the very early beginnings of airpower itself. Although superior technology enabled airpower to attain feats previously not possible, many of the doctrinal concepts that emerged from the Great War endure. After eighty years of evolving theory, technology and practice, the most decisive application of airpower occurred. As one senior analyst concluded: "In an unprecedented convergence of technology, doctrine, concepts of operations, and leadership, the coalition promptly attained an unquestioned dominance of the air."<sup>6</sup>

The Gulf War, then, proved to be a confirmation of the major developments in airpower theory and practice. This can be seen in the Air Force's 1992 basic doctrine manual which was in its final draft form at the time of the war. *Desert Storm* did not effect any changes to its main doctrinal tenets. The service's tenth edition of AFM 1-1 proved to be its first proper undertaking at formulating doctrine based on the analysis of experience. Airpower's success in the Gulf is reflective of the emphasis upon sound doctrine.

Although there were no extensive changes to basic doctrine, the conflict did cause a number of small but important modifications in official doctrinal position which emerged in the service's ensuing basic doctrine manual. The Air Force's 1997 basic doctrine edition is its first manual to be produced entirely after the Gulf War. The most significant of these modifications is the growing emphasis upon information superiority. The electronic age has made C<sup>3</sup>I such an essential element to the conduct of military operations that Air Force doctrine now considers Information Warfare as a new form of conflict. Information superiority is an integral strategic component of Air Force doctrine

due to the successful employment of advanced intelligence and communications system in the Gulf. The information sphere is regarded just as importantly as the traditional spheres of land, sea, air and space. The expanse above the earth's atmosphere is the "high ground" of the future. The Information and Space realms signal the new and increasingly important frontiers of the United States Air Force.

The enhanced information capability of airpower coupled with the precision, lethality and speed of modern air assets has also caused the Air Force to change its view of conflict. No longer following the Clausewitzian concept of the decisive counteroffensive, the Air Force now believes that the overwhelming strength of modern airpower can quickly force an enemy beyond its culminating point. Doctrine stipulates that airpower can bring any offensive to a "decisive halt", either against aerial opposition, or against enemy surface forces. The Gulf War proved airpower's dominance at asymmetrical warfare.

Another warfighting concept has evolved that emphasises the effects of airpower, rather than the destruction. The precision of modern weapons allows airpower to paralyse an enemy state without having to destroy it. The development of further nonlethal munitions emphasises the move away from the destruction that has characterised twentieth century air warfare. Modern airpower is increasingly moving towards one-target, one-round accuracy, if it has not reached that stage already. This symbolises an important conceptual shift in the conduct of future operations as airpower becomes increasingly politicised.

The greater accuracy of precision weapons has also played a key role in the adjustment of the application of mass. Fewer aircraft are required to destroy or neutralise targets and air assets are now able to mass at the operational and strategic levels. This has contributed to the verification of concepts such as "strategic paralysis" and "parallel-force application" which are now accepted terms of official written doctrine. Although these are not new to airpower practitioners—they have, in fact, been theorised by airmen since Mitchell and the ACTS—the Gulf War transformed these concepts into operational reality on a large-scale for the very first time.

Thus, the Gulf War did not effect any major changes to doctrine but did confirm many of the developing trends in airpower theory and practice that were not yet proven in combat. The war is the culmination of an evolutionary process that stretches back eighty years. Although the conflict demonstrated to the world that airpower can be the dominant—at times, decisive—factor in warfare, Air Force doctrine had always promoted this. As the service concluded after the Gulf War: "The dominance of [Schwarzkopf's] air arm during *Desert Storm* saw the fruition of airpower's early promise."<sup>7</sup> The journey in the "wilderness" is over.

## Endnotes

### Notes to pages 3-7

#### Chapter I The Evolution of American Airpower, 1903-63

1. A. Stephens, *In Search of the Knock-Out Blow: The Development of Air Power Doctrine, 1911-1945* RAAF Paper Number 61 (Fairbairn: Air Power Studies Centre, 1998), p. 2
2. Department of the Air Force, Air Force Doctrine Document 1: *Air Force Basic Doctrine* Publication for September 1997 (Montgomery: Headquarters Air Force Doctrine Center, 1997), p. 2 [hereafter cited as **USAF, 1997 AFDD 1**]
3. Department of the Air Force, Air Force Manual 1-1: *Basic Aerospace Doctrine of the United States Air Force* Publication for 16 March 1984 (Washington D.C.: HQ USAF, 1984), p. i [hereafter cited as **USAF, 1984 AFM 1-1**]
4. D. Drew, 'Inventing A Doctrine Process', *Airpower Journal*, 9, No. 4 (Winter 1995), p. 51
5. I. Holley, *Ideas and Weapons. Exploitation of the Aerial Weapon by the United States during World War I: A Study in the Relationship of Technological Advance, Military Doctrine, and the Development of Weapons* (Washington D.C.: Office of Air Force History, 1983), p. 27
6. L. Kennett, *The First Air War, 1914-1918* (New York: Free Press, 1991), p. 17
7. R. Higham, *Air Power: A Concise History* (New York: St. Martin's Press, 1972), pp. 21-3
8. R. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1960*, Vol. I (Montgomery: Air University Press, 1989), p. 17
9. B. H. Liddell Hart, *A History of the World War, 1914-1918* (London: Faber and Faber, 1934), p. 457
10. T. Mason, *Air Power: A Centennial Appraisal* (London: Brassey's, 1994), p. 19
11. B. H. Liddell Hart, *A History of the World War*, p. 458
12. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 23
13. B. Collier, *A History of Air Power* (London: Weidenfeld and Nicholson, 1974), pp. 55-6
14. N. Jones, *The Origins of Strategic Bombing: A Study of the Development of British Air Strategic Thought and Practice upto 1918* (London: William Kimber, 1973), pp. 17-8
15. R. Higham, *Air Power*, pp. 35-6
16. R. Fredette, *The Sky on Fire: The First Battle of Britain, 1917-1918* (New York: Holt, Rinehart and Winston, 1976), pp. 7-9
17. R. Higham, *Air Power*, pp. 50-2
18. H. Hyde, *British Air Policy Between the Wars, 1918-1939* (London: Heinemann, 1976), pp. 29-30
19. R. Fredette, *The Sky on Fire*, pp. 231-3
20. A. Stephens (ed.), *The War In the Air: 1914-1994* (Fairbairn: Air Power Studies Centre, 1994), p. 40
21. I. Holley, *Ideas and Weapons*, p. 87
22. T. Greer, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* USAF Historical Studies: No. 89 (Washington D.C.: Office of the Air Force History, 1955), pp. 4-5
23. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 29
24. R. Schaffer, *Wings of Judgment: American Bombing In World War II* (Oxford: University Press, 1985), pp. 25-6
25. T. Greer, *The Development of Air Doctrine in the Army Air Arm*, pp. 24, 30
26. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 33
27. R. Schaffer, *Wings of Judgment*, p. 27
28. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 68-70
29. M. Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale University Press, 1987), pp. 29-30
30. R. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (New York: Macmillan, 1975), pp. 236-7

## Notes to pages 7-12

31. G. Douhet, *The Command of the Air* Translated by D. Ferrari (New York: Arno Press, 1972)
32. Ibid, pp. 28-31
33. Ibid, pp. 19-20
34. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, p. 69
35. T. Greer, *Development of Air Doctrine in the Army Air Arm*, p. 50
36. R. Schaffer, *Wings of Judgment*, pp. 28-9
37. T. Greer, *Development of Air Doctrine in the Army Air Arm*, p. 74
38. Ibid, pp. 55, 66-7, 89
39. R. Kohn and J. Harahan (eds.), *Air Superiority in World War II and Korea: An Interview with Gen James Ferguson, Gen Robert M. Lee, Gen William Momyer, and Lt Gen Elwood R. Quesada* (Washington D.C.: Office of Air Force History, 1983), pp. 14-6
40. A. McKee, *Strike From the Sky: The Story of the Battle of Britain* (London: Souvenir Press, 1960), pp. 180-215
41. D. Irving, *Hitler's War* (London: Hodder and Stoughton, 1977), pp. 159-60
42. E. Rommel, *The Rommel Papers* Edited by B. H. Liddell Hart and Translated by Paul Findlay (London: Collins, 1953), p. 498
43. Ibid, pp. 476-93
44. B. Cooling (ed.), *Case Studies in the Development of Close Air Support* (Washington D.C.: Office of Air Force History, 1990), pp. 165-85
45. V. Orange, *Coningham: A Biography of Air Marshal Sir Arthur Coningham* (London: Meuthen, 1990), p. 135
46. J. Morris, *History of the US Navy* (London: Bison Books, 1984), p. 81
47. D. Macintyre, *The Battle for the Pacific* (Sydney: Angus and Robertson, 1966), p. 51
48. R. Hallion, *Air Warfare and Maritime Operations* RAAF Paper Number 45 (Fairbairn: Air Power Studies Centre, 1996), p. 18
49. T. Greer, *The Development of Air Doctrine in the Army Air Arm*, p. 116
50. R. Overy, *Why the Allies Won* (London: Pimlico, 1996), pp. 118-22
51. W. Craven and V. Cate (eds.), *The Army Air Forces in World War II—Europe: Torch to Pointblank, August 1942 To December 1943*, Vol. II (Washington D.C.: Office of Air Force History, 1983), p. 706
52. Ibid, pp. 682-3, 704-6
53. *The United States Strategic Bombing Survey: Over-all Report (European War)* (Washington D.C.: Government Printing Office, September, 1945), pp. 1, 10
54. C. Webster and N. Frankland, *The Strategic Air Offensive Against Germany, 1939-1945: Annexes and Appendices*, Vol. IV (London: H.M.S.O., 1961), p. 384
55. *The United States Strategic Bombing Survey: The Effects of Strategic Bombing on the German War Economy* (Overall Economic Effects Division, October 1945), pp. 13-4
56. C. Webster and N. Frankland, *The Strategic Air Offensive Against Germany*, Vol. IV, p. 383
57. R. Schaffer, *Wings of Judgment*, p. 140
58. G. Alperovitz, *The Decision to Use the Atomic Bomb and the Architecture of an American Myth* (New York: Alfred A. Knopf, 1995), pp. 334-49
59. *The United States Strategic Bombing Survey: Summary Report (Pacific War)* (Washington D.C.: Government Printing Office, July 1946), p. 26
60. D. Eisenhower, *Crusade in Europe* (London: William Heinemann, 1949), p. 493
61. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 191-200
62. B. Cooling (ed.), *Case Studies in the Development of Close Air Support*, pp. 16, 26
63. A. Tedder, *Air Power In War* (London: Hodder and Stoughton, 1947), p. 91
64. V. Orange, *Coningham*, p. 130
65. W. Momyer, *Air Power in Three Wars* (Washington D.C.: Office of Air Force History, 1978), p. 40
66. R. Kohn and J. Harahan (eds.), *Air Superiority in World War II and Korea*, pp. 31, 33-4
67. Ibid, p. 9
68. War Department, Field Manual 100-20: *Command and Employment of Air Power* Publication for 21 July, 1943 (Washington D.C.: Government Printing Office, 1944) [hereafter cited as **War Department, FM 100-20**]
69. Ibid, p. 1
70. Ibid, pp. 10-1
71. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 242-3, 249



## Notes to pages 12-15

72. W. Momyer, *Air Power in Three Wars*, p. 2
73. C. MacDonald, *Korea: The War Before Vietnam* (London and other centres: Macmillan Press, 1986), p. 226
74. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 239, 307
75. W. Momyer, *Air Power in Three Wars*, p. 2
76. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 300-1
77. W. Momyer, *Air Power in Three Wars*, p. 56
78. C. LeMay, *Mission With LeMay* Written with MacKinlay Kantor (New York: Doubleday, 1965), p. 458
79. M. Armitage and R. Mason, *Air Power in The Nuclear Age, 1945-82: Theory and Practice* (London: Macmillan Press, 1983), 25
80. W. Momyer, *Air Power in Three Wars*, pp. 16-7
81. Ibid, p. 158
82. B. Cooling (ed.), *Case Studies in the Development of Close Air Support*, p. 353
83. C. MacDonald, *Korea*, p. 239
84. E. Mark, *Aerial Interdiction in Three Wars* (Washington D.C.: Center for Air Force History, 1994), p. 317
85. R. Kohn and J. Harahan (eds.), *Air Superiority in World War II and Korea*, p. 10
86. M. Armitage and R. Mason, *Air Power in The Nuclear Age*, pp. 22-3, 43
87. W. Momyer, *Air Power in Three Wars*, p. 59
88. J. Stokesbury, *A Short History of the Korean War* (New York: William Morrow, 1988), pp. 184-5
89. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. I, pp. 346, 419-20
90. R. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1961-84*, Vol. II (Montgomery: Air University Press, 1989), p. 10
91. J. Jones, *Development of Air Force Basic Doctrine, 1947-1992* (Internet web site: <http://www.airpower.maxwell.af.mil/airchronicles/cc/doctrine/jones.html>)
92. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, pp. 711-3
93. J. Jones, *Development of Air Force Basic Doctrine*
94. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, pp. 231-2
95. D. Drew, 'Inventing A Doctrine Process', p. 43
96. R. Hallion, *Storm Over Iraq: Air Power and the Gulf War* (Washington D.C.: Smithsonian Institution Press, 1992), p. 16
97. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 288
98. Quoted in R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 172

## Notes to pages 16-22

**Chapter II**  
**Vietnam and its Aftermath:**  
**From Rolling Thunder to Instant Thunder**

1. R. McNamara, *In Retrospect: The Tragedy and Lessons of Vietnam* Written with Brian Van De Mark (New York: Times Books, 1995), p. 319
  2. C. Berger (ed.), *The United States Air Force in Southeast Asia, 1961-1973* (Washington D.C.: Office of the Air Force History, 1977), p. v
  3. M. Armitage and R. Mason, *Air Power in The Nuclear Age*, p. 113
  4. R. McNamara, *In Retrospect*, pp. 165-6, 179-80
  5. W. Momyer, *Air Power in Three Wars*, pp. 14-5, 70; R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 259
  6. W. Momyer *Air Power in Three Wars*, pp. 19-20
  7. C. LeMay, *Mission With LeMay*, p. 565
  8. W. Momyer, *Air Power in Three Wars*, pp. 17-8
  9. *Ibid*, pp. 19, 173, 227
  10. J. Jones, *Development of Air Force Basic Doctrine*
  11. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 227
  12. Quoted in R. Futrell, *Ideas, Concepts, Doctrine*, p. 717
  13. D. Isby, *Fighter Combat in the Jet Age* (London: Harper Collins, 1997), p. 88
  14. R. Fogleman, 'Aerospace Doctrine: More than Just A Theory', *Airpower Journal*, 10, No. 2 (Summer 1996), p. 45
  15. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 288
  16. W. Momyer, *Air Power in Three Wars*, pp. 16-7
  17. D. Isby, *Fighter Combat in the Jet Age*, p. 80
  18. W. Momyer, *Air Power in Three Wars*, pp. 125-7
  19. *Ibid* pp. 130-1
  20. R. Dorr, *Air War Hanoi* (London: Blanford Press, 1988), pp. 34-5
  21. M. Armitage and R. Mason, *Air Power in The Nuclear Age*, p. 108
  22. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, pp. 277-8
  23. M. Armitage and R. Mason, *Air Power in The Nuclear Age*, p. 101
  24. War Department, FM 100-20, p.2
  25. W. Momyer *Air Power in Three Wars*, pp. 79, 105-6
  26. D. Isby, *Fighter Combat in the Jet Age*, p. 162
  27. *Ibid*, p. 136
  28. R. Hallion, *Storm Over Iraq*, pp. 29-30
  29. W. Momyer, *Air Power in Three Wars*, p. 156
  30. R. Hallion, *Precision Guided Munitions and the New Era of Warfare* RAAF Paper Number 53 (Fairbairn: Air Power Studies Centre, 1997), p. 4
  31. M. Armitage and R. Mason, *Air Power in The Nuclear Age*, pp. 103-4
  32. W. Momyer, *Air Power in Three Wars*, pp. 123, 133, 327-8
  33. R. Hallion, *Storm Over Iraq*, p. 39
  34. J. Winnefeld, P. Niblak and D. Johnson, *A League of Airmen: U.S. Air Power in the Gulf War* (Santa Monica: RAND, 1994), p. 246, 303
  35. R. Nixon, *No More Vietnams* (New York: Arbour House, 1985), p. 100
  36. W. Momyer, *Air Power in Three Wars*, pp. 32-3
  37. J. Jones, *Development of Air Force Basic Doctrine*
  38. *Ibid*
  39. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 725
  40. D. Drew, 'Two Decades in the Air Power Wilderness: Do We Know Where We Are?', *Air University Review*, 37, No. 6 (September-October 1986), pp. 11-2
  41. Department of the Air Force, AFM 1-1: *Functions and Basic Doctrine of the United States Air Force* Publication for 14 February 1979 (Washington D.C.: US Government Printing Office, 1979)
- [hereafter cited as USAF, 1979 AFM 1-1]**

## Notes to pages 22-29

42. Ibid, pp. 1-7—1-11, 2-7—8
43. Ibid, p. 6-1
44. R. Futrell, *Ideas, Concepts, Doctrine* Vol. II, pp. 735-6
45. D. Drew, 'Two Decades in the Air Power Wilderness', p. 12
46. Ibid; J. Jones, *Development of Air Force Basic Doctrine*
47. Department of the Air Force, *Reaching Globally, Reaching Powerfully: The United States Air Force in the Gulf War* Written by the Office of the Secretary of the Air Force (Washington D.C.: HQ USAF, 1991), p. 11 **[hereafter cited as USAF *Reaching Globally, Reaching Powerfully* ]**
48. USAF, 1984 AFM 1-1
49. Ibid, p. A-3
50. Ibid, p. 1-2
51. Ibid, p. 1-1
52. Ibid, p. 1-3
53. Ibid
54. Ibid, p. 2-2
55. Ibid, p. 2-12
56. Ibid, p. 2-6
57. Ibid, p. 2-12
58. Department of the Air Force, Air Force Manual 1-1: *Basic Aerospace Doctrine of the United States Air Force* Two Volumes Publication for March 1992 (Washington D.C.: HQ USAF, 1992) **[hereafter cited as USAF, 1992 AFM 1-1]**
59. R. Hallion, *Storm Over Iraq*, p. 118
60. J. Warden, *The Air Campaign: Planning For Combat* (Washington D.C.: Permagon-Brassey's, 1989)
61. Ibid, p. 20
62. Ibid, p. 135
63. Ibid, pp. 80-1
64. C. von Clausewitz, *On War* Edited and Translated by Michael Howard and Peter Paret (New York: Alfred A. Knopf, 1993), pp. 587-8
65. J. Warden, *The Air Campaign*, p. 117
66. Ibid, p. 126
67. For post-Gulf War writings by J. Warden, see, 'Employing Air Power in the Twenty-first Century', *The Future of Air Power in the Aftermath of the Gulf War* Edited by R. Shultz and R. Pfaltzgraff Montgomery: Air University Press, 1992), pp. 57-82; and 'The Enemy As A System', *Airpower Journal*, 9, No. 1 (Spring 1995), pp. 41-55
68. Ibid, p. 43
69. R. Hallion, *Storm Over Iraq*, p. 103
70. Ibid, p. 106
71. J. Winnefeld, P. Niblak and D. Johnson, *A League of Airmen*, p. 18
72. M. Armitage and R. Mason, *Air Power in The Nuclear Age*, p. 113
73. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, pp. 546-51
74. Department of the Army, Field Manual No. 100-5: *Operations* Publication for May 1986 Written by the US Army Training and Doctrine Command (Washington D.C.: HQ US Army, 1986) **[hereafter cited as USA, 1986 FM 100-5]**
75. Ibid, p. 47
76. Ibid, p. 30
77. Ibid, p. 47
78. USAF, 1984 AFM 1-1, p. 2-13
79. C. Powell, *A Soldier's Way* Written with Joseph Persico (London: Hutchinson, 1995), p. 422
80. R. Hallion, *Storm Over Iraq*, p. 119
81. Department of the Air Force, *The Air Force and U.S. National Security: Global Reach—Global Power* Written by the Office of the Secretary of the Air Force (Washington D.C.: HQ USAF, 1991), p. 8 **[hereafter cited as USAF, *Global Reach—Global Power* ]**
82. Ibid
83. Ibid, p. 2
84. R. Mason, 'The Decade of Opportunity: Air Power in the 1990s', *Airpower Journal*, 1, No. 2 (Fall 1987), p. 4

## Notes to pages 30-34

### Chapter III

#### Airpower in the Gulf: Darkened Skies

1. Quoted in USAF, *Reaching Globally, Reaching Powerfully*, p. 27
2. T. Allen, F. Berry and N. Polmar, *CNN: War in the Gulf* (London: Maxwell-Macmillan International, 1991), p. 29
3. H. Norman Schwarzkopf, *It Doesn't Take A Hero* Written with Peter Petre (New York: Bantam House, 1993), pp. 332-4
4. U. S. News and World Report, *Triumph Without Victory: The Unreported History of the Persian Gulf War* (New York: Random House, 1992), p. 42
5. R. Reynolds, *Heart of the Storm: The Genesis of the Air Campaign Against Iraq* Vol. I (Montgomery: Air University Press, 1995), pp. 8-9
6. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, pp. 347, 406
7. M. Gordon and B. Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston: Little, Brown and Company, 1995), p. 47
8. E. Mann, *Thunder and Lightning: Desert Storm and the Airpower Debates* (Montgomery: Air University Press, 1995), pp. 28-30
9. R. Reynolds, *Heart of the Storm*, p. 24
10. *Ibid*, pp. 28-9
11. M. Gordon and B. Trainor, *The Generals' War*, pp. 86-8
12. D. Putney, 'From Instant Thunder to Desert Storm: Developing the Gulf War Air Campaign's Phases', *Air Power History*, 41, No. 3 (Fall 1994), p. 41
13. R. Reynolds, *Heart of the Storm*, p. 56
14. C. Powell, *A Soldier's Way*, p. 473
15. R. Reynolds, *Heart of the Storm*, p. 73
16. Department of Defense, *Conduct of the Persian Gulf War: Final Report to Congress* (Washington D.C.: Government Printing Office, 1992), p. 92 [hereafter cited as **DOD, Conduct of the Persian Gulf War: Final Report**]; R. Reynolds, *Heart of the Storm*, p. 103
17. *Ibid*, pp. 39-41
18. *Ibid*, pp. 41-2, 44; E. Mann, *Thunder and Lightning*, p. 46
19. R. Reynolds, *Heart of the Storm*, pp. 120-30
20. M. Gordon and B. Trainor, *The Generals' War*, p. 93
21. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 360
22. B. Watson (ed.), *Military Lessons of the Gulf War* (London: Greenhill, 1991), p. 62
23. DOD, *Conduct of the Persian Gulf War: Final Report*, p. 36
24. J. Coyne, *Airpower in the Gulf* (Arlington: Air Force Association, 1992), p. 18
25. USAF, *Global Reach—Global Power*, p. 11
26. U.S. News and World Report, *Triumph Without Victory*, p. 112
27. DOD, *Conduct of the Persian Gulf War: Final Report*, p. 377
28. USAF, *Reaching Globally, Reaching Powerfully*, p. 10
29. House of Representatives, Committee on Armed Services, Rep. L. Aspin and Rep. W. Dickinson, *Defense For A New Era: Lessons of the Persian Gulf War* (Washington D.C.: Brasseys, 1992), p. 36 [hereafter cited as **House of Representatives, Defense For A New Era**]
30. House of Representatives, Committee on Commerce, *Operation Desert Storm: Evaluation of the Air Campaign* (Washington D.C.: General Accounting Office, 1997), p. 85 [hereafter cited as **House of Representatives, Operation Desert Storm**]
31. USAF, 1984 AFM 1-1, p. 3-6
32. J. Blackwell, *Thunder In the Desert: The Strategy and Tactics of the Persian Gulf War* (New York: Bantam Books, 1991), p. 99
33. DOD, *Conduct of the Persian Gulf War: Final Report*, p. 412
34. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 402
35. USAF, *Reaching Globally, Reaching Powerfully*, p. 14
36. C. Powell, *A Soldier's Way*, p. 473; H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 363



## Notes to pages 35-40

37. M. Gordon and B. Trainor, *The Generals' War*, p. 96
38. D. Putney, 'From Instant Thunder to Desert Storm', p. 47
39. J. McCausland, *The Gulf Conflict: A Military Analysis* (London: Brassey's 1993), p. 26
40. House of Representatives, *Operation Desert Storm*, p. 200
41. USAF, 1984 AFM 1-1, pp. 4-2-4
42. USAF, *Reaching Globally, Reaching Powerfully*, p. 14
43. E. Lauterpacht and others (eds.), *The Kuwait Crisis—Basic Documents* (Cambridge: Grotius Publications), p. 98. See U.S. News and World Report, *Triumph Without Victory*, pp. 416-48 for a detailed copy of all the U.N. Security Council Resolutions concerning the Gulf War.
44. USAF, *Reaching Globally, Reaching Powerfully*, p. 17
45. Department of Defense, *Conduct of the Persian Gulf Conflict: An Interim Report to Congress* (Washington D.C.: Government Printing Office, 1991), p. 4-3 [hereafter cited as **DOD, Conduct of the Persian Gulf Conflict: An Interim Report**]
46. USAF, *Reaching Globally, Reaching Powerfully*, p. 21
47. DOD, *Conduct of the Persian Gulf War: Final Report*, pp. 114-25, 787
48. House of Representatives, *Defense For A New Era*, p. 19; J. Coyne, *Airpower in the Gulf*, p. 79
49. R. Hallion, *Storm Over Iraq*, pp. 163, 171-2
50. R. Shultz and R. Pfaltzgraff (eds.), *The Future of Air Power in the Aftermath of the Gulf War* (Montgomery: Air University Press, 1992), p. 70; J. Coyne, *Airpower in the Gulf*, p. 70
51. DOD, *Conduct of the Persian Gulf Conflict: An Interim Report*, p. 6-1
52. USAF, *Reaching Globally, Reaching Powerfully*, p. 5
53. House of Representatives, *Operation Desert Storm*, p. 205
54. *Ibid*, p. 95
55. J. Coyne, *Airpower in the Gulf*, p. 59
56. R. Atkinson, *Crusade: The Untold Story of the Persian Gulf War* (New York: Houghton, 1993), pp. 44-5; U.S. News and World Report, *Triumph Without Victory*, p. 223
57. C. Horner, 'The Air Campaign', *Military Review*, 77, No. 24 (September 1991), p. 24
58. USAF, 1984 AFM 1-1, p. 3-6
59. C. Horner, 'The Air Campaign', p. 24
60. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 482
61. R. Shultz and R. Pfaltzgraff (eds.), *The Future of Air Power in the Aftermath of the Gulf War*, p. 81; B. Sweetman, 'Catching Up with Doctrine', *Jane's Defence Weekly*, 15, No. 26 (29 June 1991), p. 1174
62. DOD, *Conduct of the Persian Gulf War: Final Report*, p. 84; R. Mason, 'The Air War in the Gulf', *Survival*, 33, No. 3 (May-June 1991), pp. 212-3
63. J. McCausland, *The Gulf Conflict*, p. 22
64. B. Watson (ed.), *Military Lessons of the Gulf War*, p. 158
65. M. Hurley, 'Saddam Hussein and Iraqi Air Power: Just Having an Air Force Isn't Enough', *Airpower Journal*, 6, No. 4 (Winter 1992), pp. 6, 9
66. D. Hiro, *The Longest War: The Iraq-Iraq Military Conflict* (London: Collins, 1989), pp. 39, 48, 91-2, 183-4
67. DOD, *Conduct of the Persian Gulf War: Final Report*, p. 128; C. Horner, 'The Air Campaign', p. 24
68. J. Blackwell, *Thunder In the Desert*, p. 181
69. D. Hiro, *The Longest War*, p. 40
70. C. Horner, 'Desert Shield/Desert Storm: An Overview', *Air Power History* (Fall 1991), p. 7
71. U.S. News and World Report, *Triumph Without Victory*, p. 265
72. DOD, *Conduct of the Persian Gulf War: Final Report*, p. 127
73. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 493; DOD, *Conduct of the Persian Gulf War: Final Report*, pp. 130-3
74. M. Mandales, T. Hone and S. Terry, *Managing "Command and Control" in the Persian Gulf War* (Westport: Praeger, 1996), p. 143
75. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 493; C. Powell, *A Soldier's Way*, p. 512
76. House of Representatives, *Operation Desert Storm*, p. 154
77. R. Hallion, *Storm Over Iraq*, pp. 300-2
78. L. Ederington and M. Mazarr (eds.), *Turning Point: The Gulf War and U.S. Military Strategy* (Boulder:

## Notes to pages 40-46

- Westview Press, 1994), p. 61
79. C. Powell, *A Soldier's Way*, p. 513
  80. J. Coyne, *Airpower in the Gulf*, p. 87
  81. J. Blackwell, *Thunder In the Desert*, p. 152; B. Watson (ed.), *Military Lessons of the Gulf War*, p. 172
  82. USAF, *Reaching Globally, Reaching Powerfully*, pp. 38-9
  83. U.S. News and World Report, *Triumph Without Victory*, pp. 276-7
  84. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, pp. 371, 499
  85. USAF, *Reaching Globally, Reaching Powerfully*, p. 39
  86. J. Coyne, *Airpower in the Gulf*, p. 99
  87. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. 296
  88. W. Smallwood, *Warthog: Flying the A-10 in the Gulf War* (Washington: Brasseys, 1993), p. 86
  89. W. Momyer, *Air Power in Three Wars*, pp. 151-5; J. Coyne, *Airpower in the Gulf*, p. 121
  90. U.S. News and World Report, *Triumph Without Victory*, pp. 267-8, 307
  91. R. Atkinson, *Crusade*, p. 218
  92. M. Gordon and B. Trainor, *The Generals' War*, p. 200
  93. House of Representatives, Committee on Commerce, pp. 9-10; M. Mandales, T. Hone and S. Terry, *Managing "Command and Control" in the Persian Gulf War*, p. 128
  94. Department of the Army, Field Manual No. 100-5: *Operations* Publication for June 1993 Written by the US Army Training and Doctrine Command (Washington D.C.: HQ US Army, 1993), p. 6-17  
**[hereafter cited as USA, 1993 FM 100-5]**
  95. DOD, *Conduct of the Persian Gulf Conflict: An Interim Report*, p. 6-9
  96. R. Braybrook, *Air Power*, p. 60
  97. USAF, *Reaching Globally, Reaching Powerfully*, p. 50
  98. H. Norman Schwarzkopf, *It Doesn't Take A Hero*, p. 537, 542
  99. M. Gordon and B. Trainor, *The General's War*, p. 412
  100. House of Representatives, *Defense For A New Era*, p. xix
  101. USAF, *Reaching Globally, Reaching Powerfully*, p. 28
  102. T. Mason, *Air Power*, p. 163
  103. DOD, *Conduct of the Persian Gulf Conflict: An Interim Report*, p. 2-9
  104. USAF, 1984 AFM 1-1, p. 2-16
  105. M. Gorbachev, *Memoirs* (London: Doubleday, 1996), p. 551
  106. B. Watson (ed.), *Military Lessons of the Gulf War*, p. 158
  107. House of Representatives, *Defense For A New Era*, p. 40; T. Rhodes, 'Allies plan 200 Air strikes a Day on Iraq', *Dominion* (14 February, 1998), p. 27
  108. R. Mason, 'The Air War in the Gulf', p. 225

## Notes to pages 47-53

Chapter IV  
Lessons of the Air War

1. J. Jones, *Development of Air Force Basic Doctrine*
2. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, pp. 741-2
3. Quoted in R. Futrell, *Ideas, Concepts, Doctrine*, p. 742
4. J. Jones, *Development of Air Force Basic Doctrine*
5. R. Futrell, *Ideas, Concepts, Doctrine*, Vol. II, p. xiii
6. J. Jones, *Development of Air Force Basic Doctrine*
7. D. Drew, 'Inventing A Doctrine Process', p. 43
8. J. Jones, *Development of Air Force Basic Doctrine*
9. USAF, 1992 AFM 1-1, Vol. I, p. vii
10. Ibid, Vol. I, p. v
11. Ibid, pp. 5, 9, 11
12. Ibid, Vol. II, p. 83
13. Ibid, p. 129
14. Ibid
15. Ibid, p. 149
16. Ibid, Vol. I, p. 12
17. Ibid, pp. 8, 16, 18
18. Ibid, Vol. II, p. 114
19. Ibid, p. 130
20. Quoted in J. Canan, 'Lesson Number One', *Air Force Magazine*, 74, No. 10 (October 1991), p. 30
21. USAF 1992 AFM 1-1, Vol. I, p. 12
22. Ibid, p. 11
23. House of Representatives, *Operation Desert Storm*, pp. 29, 130-1
24. USAF, *Reaching Globally, Reaching Powerfully*, p. 31
25. See C. Powell, *A Soldier's Way*, pp. 476-8
26. Quoted in B. Sweetman, 'Catching Up With Doctrine', *Jane's Defence Weekly*, 15, No. 26 (29 June 1991), p. 1174
27. USAF, 1992 AFM 1-1, Vol. I, p. 6
28. Ibid, Vol. II, p. 120
29. USAF, *Reaching Globally, Reaching Powerfully*, p. 56
30. USAF, 1992 AFM 1-1, Vol. II, p. 120
31. P. Bingham, 'Revolutionizing Warfare through Interdiction', *Airpower Journal*, 10, No. 1 (Spring 1996), p. 29
32. USAF, 1992 AFM 1-1, Vol. I, p. 13
33. Ibid
34. Ibid, p. 12
35. Ibid, p. 10
36. Ibid, pp. 10-11, 14
37. Ibid, p. 11
38. Quoted in R. Shultz and R. Pfaltzgraff (eds.), *The Future of Air Power in the Aftermath of the Gulf War*, p. 222
39. R. Hallion, *Storm Over Iraq*, pp. 264-5
40. USAF, 1992 AFM 1-1, Vol. I, p. 11
41. R. Hallion, *Storm Over Iraq*, p. 61
42. J. McCausland, *The Gulf Conflict*, p. 27
43. R. Shultz and R. Pfaltzgraff (eds.), *The Future of Air Power in the Aftermath of the Gulf War*, pp. 220-2
44. See M. McPeak, 'For The Composite Wing', *Airpower Journal*, 4, No. 3 (Fall 1990), pp. 4-12
45. USAF, 1992 AFM 1-1, Vol. I, p. 18
46. House of Representatives, *Defense For A New Era*, pp. 21-2
47. USAF, 1992 AFM 1-1, Vol. II, pp. 241-2

## Notes to pages 53-58

48. Ibid, Vol. I, p. 18
49. A. Stephens, 'Aerospace Strategy', *Australian Defence Force Journal*, No. 98 (January-February 1993), p. 23
50. See E. Mann, *Thunder and Lightning*, p. 174
51. J. Coyne, *Airpower in the Gulf*, p. 173
52. J. Jones, *Development of Air Force Basic Doctrine*
53. See for example, R. Hallion, *Storm Over Iraq*; J. Coyne, *Air Power in the Gulf*; N. Ashworth, 'Air Power Can Win Wars', *Airpower Journal*, No. 112 (May-June 1995), pp. 13-5; P. Bingham, 'The United States Needs to Exploit its Air Power Advantage', *Airpower Journal*, 7, No. 3 (Fall 1993), pp. 62-71; E. Luttwak, 'Victory Through Airpower', *Commentary* (August 1991), pp. 27-30; J. Canan, 'Lesson Number One', pp. 26-31
54. D. Edmonds, 'In Search of High Ground: The Airpower Trinity and the Decisive Potential of Airpower', *Airpower Journal*, 12, No. 1 (Spring 1998), p. 17
55. See J. Winnefeld, P. Niblak and D. Johnson, *A League of Airmen*, pp. 276-88
56. See A. Forrest, 'Giulio Douhet's 'The Command of the Air': An Enduring Strategy?', *Australian Defence Force Journal*, No. 112 (May-June 1995), pp. 3-10 and P. Meilinger, 'Giulio Douhet and Modern War', *Comparative Strategy*, 12, No. 3 (July-September, 1993), pp. 321-38 as examples on studies between Douhet and his relevance to *Desert Storm*.
57. War Department, FM 100-20, p. 6
58. D. Hiro, *The Longest War*, p. 60
59. Khalid Bin Sultan, *Desert Warrior: A Personal View of the Gulf War by the Joint Forces Commander* Written with Patrick Seale (London: Harper Collins, 1995), p. 344
60. R. Hallion, *Storm Over Iraq*, p. 81
61. DOD, *Conduct of the Persian Gulf Conflict: An Interim Report to Congress*, p. I-4
62. E. Mann, *Thunder and Lightning*, pp. 28-9, 46; R. Reynolds, *Heart of the Storm*, pp. 41-2, 44
63. Quoted in E. Mann, *Thunder and Lightning*, p. 20
64. Ibid p. 60
65. USAF, 1992 AFM 1-1, Vol. II, p. 128
66. USA, 1986 FM 100-5, pp. 28-32
67. USAF, 1984 AFM 1-1, pp. 2-11—2-15, 3-2—3-8; USAF 1992 AFM 1-1, Vol. I, pp. 5-6, 9-13
68. C. Powell, *A Soldier's Way*, pp. 483-7
69. USAF, *Reaching Globally, Reaching Powerfully*, p. 54
70. J. Canan, 'Lesson Number One', p. 28
71. C. Horner, 'The Air Campaign', p. 24
72. USAF, 1997 AFDD 1



## Notes to pages 59-64

**Chapter V**  
**After the Gulf: Heeding the Storm**

1. J. Mowbray, 'Air Force Doctrine Problems, 1926—Present', *Airpower Journal*, 9, No. 4 (Winter 1995), p. 36
2. USAF, 1997 AFDD 1, p. 4
3. Ibid
4. Ibid, p. 1
5. Ibid, p. 73
6. Ibid, p. 6
7. Ibid, pp. 7-9
8. See D. Drew, 'Air Theory, Air Force, and Low Intensity Conflict: A Short Journey to Confusion', *The Paths of Heaven: The Evolution of Airpower Theory* Edited by P. Meilinger (Montgomery: Air University Press, 1997), pp. 321-55
9. See for example C. Builder, 'Doctrinal Frontiers', *Airpower Journal*, 9, No. 4 (Winter 1995), pp. 7-13
10. USAF, 1997 AFDD 1, p. 13
11. Ibid, p. 52
12. Ibid, p. 26
13. Ibid, p. 43
14. Ibid
15. Ibid, p. 32
16. Ibid
17. Ibid, p. 34
18. Ibid, p. 41
19. Ibid, p. 7
20. G. Stein, 'Information Warfare', *Airpower Journal*, 9, No. 1 (Spring 1995), p. 31
21. USAF, 1997 AFDD 1, p. 44
22. J. Coyne, *Airpower in the Gulf*, p. 153
23. B. Lambeth, 'Technology and Air War', *Air Force Magazine*, 79, No. 11 (November 1996), p. 50
24. USAF, 1997 AFDD 1, p. 32
25. Ibid, p. 31
27. U.S. News and World Report, *Triumph Without Victory*, pp. 159-60
27. USAF, 1997 AFDD 1, p. 53
28. See J. Winnefeld, P. Niblak and D. Johnson, *A League of Airmen*, pp. 181-221; C. Allard, 'The Future of Command and Control: Toward A Paradigm of Information Warfare', *Turning Point: The Gulf War and U.S. Military Strategy* Edited by L. Ederington and M. Mazarr, pp. 161-92
29. See E. Mann, *Thunder and Lightning*, pp. 145-61
30. USAF, 1997 AFDD 1, p. 59
31. U.S. News and World Report, *Triumph Without Victory*, p. 224-5
32. See for example J. Arquilla and D. Ronfeldt, 'Cyberwar is Coming', *Comparative Strategy*, 12, No. 2 (April-June, 1993), pp. 141-65
33. C. Morris, J. Morris and T. Baines, 'Weapons of Mass Protection: Nonlethality, Information Warfare, and Airpower in the Age of Chaos', *Airpower Journal*, 9, No. 1 (Spring 1995), p. 24
34. USAF, 1997 AFDD 1, p. 20
35. C. Morris, J. Morris and T. Baines, 'Weapons of Mass Protection', p. 25
36. USAF, 1997 AFDD 1, p. 20
37. Ibid, p. 52
38. Ibid, p. 53
39. J. Warden, 'Afterword: Challenges and Opportunities' *Air Power Confronts an Unstable World* Edited by R. Hallion (London: Brassey's, 1997), p. 236
40. USAF, 1992 AFM 1-1, Vol. I, p. 12
41. USAF, 1997 AFDD 1, pp. 51-3
42. E. Mann, *Thunder and Lightning*, p. 106

## Notes to pages 64-76

43. USAF, 1997 AFDD 1, p. 16. See also P. Meilinger, 'Ten Propositions Regarding Airpower', *Airpower Journal*, 10, No. 1 (Spring 1996), pp. 63-5
44. USAF, 1997 AFDD 1, p. 16
45. R. Shultz and R. Pfaltzgraff, *The Future of Air Power in the Aftermath of the Gulf War*, p. 78
46. J. Warden, 'Afterword: Challenges and Opportunities', p. 237
47. R. Hallion, *Air Power Confronts an Unstable World*, pp. 121-3
48. USAF 1997 AFDD 1, p. 43
49. Ibid, p. 41
50. C. von Clausewitz, *On War*, pp. 638-9. See also P. Paret (ed.), *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Princeton: University Press, 1996), p. 205
51. USAF, 1997 AFDD 1, p. 42
52. Ibid
53. Ibid, p. 43
54. Ibid, p. 15
55. Ibid, p. 24
56. D. Edmonds, 'In Search of High Ground', p. 20
57. USAF, 1997 AFDD 1, p. 24
58. Quoted in J. Winnefeld, P. Niblak and D. Johnson, *A League of Airmen*, p. 277
59. USAF, 1997 AFDD 1, p. 48
60. Ibid, pp. 46-60
61. R. Hallion, *Air Power Confronts an Unstable World*, p. 120
62. Ibid, pp. 120, 133—see footnote 30
63. USAF, 1997 AFDD 1, p. 23
64. Ibid
65. Ibid, p. 39
66. Ibid, p. 37
67. Ibid, pp. 36-40
68. Ibid, pp. 27-37
69. R. Mason, 'The Air War in the Gulf', p. 228
70. USAF, 1997 AFDD 1, p. 73
71. Ibid, pp. 73-4

## Conclusion

1. D. Drew, 'Two Decades in the Air Power Wilderness', p. 3
2. Quoted in J. Winnefeld, P. Niblak and D. Johnson, *A League Of Airmen*, p. 280
3. J. Warden, 'The Enemy As A System', p. 54
4. C. Horner, 'The Air Campaign', p. 17
5. USAF, *Reaching Globally, Reaching Powerfully*, p. 11
6. B. Lambeth, 'Technology and Air War', p. 50
7. USAF, 1997 AFDD 1, p. 73

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## Bibliography

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### Official Manuals, Reports and Doctrine Statements

Department of Defense, *Conduct of the Persian Gulf Conflict: An Interim Report to Congress* (Washington D.C.: Government Printing Office, 1991)

—, *Conduct of the Persian Gulf War: Final Report to Congress* (Washington D.C.: Government Printing Office, 1992)

Department of the Air Force, Air Force Manual 1-1: *Functions and Basic Doctrine of the United States Air Force* Publication for 14 February 1979 (Washington D.C.: US Government Printing Office, 1979)

—, Air Force Manual 1-1: *Basic Aerospace Doctrine of the United States Air Force* Publication for 16 March 1984 (Washington D.C.: HQ USAF, 1984)

—, Air Force Manual 1-1: *Basic Aerospace Doctrine of the United States Air Force* Two Volumes Publication for March 1992 (Washington D.C.: HQ USAF, 1992)

—, Air Force Doctrine Document 1: *Air Force Basic Doctrine* Publication for September 1997 (Montgomery: Headquarters Air Force Doctrine Center, 1997)

—, *Reaching Globally, Reaching Powerfully: The United States Air Force in the Gulf War* Written by the Office of the Secretary of the Air Force (Washington D.C.: HQ USAF, 1991)

—, *The Air Force and U.S. National Security: Global Reach—Global Power* Written by the Office of the Secretary of the Air Force (Washington D.C.: HQ USAF, 1990)

Department of the Army, Field Manual No. 100-5: *Operations* Publication for May 1986 Written by the US Army Training and Doctrine Command (Washington D.C.: HQ US Army, 1986)

—, Field Manual No. 100-5: *Operations* Publication for June 1993 Written by the US Army Training and Doctrine Command (Washington D.C.: HQ US Army, 1993)

House of Representatives, Committee on Armed Services, Rep. L. Aspin and Rep. W. Dickinson, *Defense For A New Era: Lessons of the Persian Gulf War* (Washington D.C.: Brassey's, 1992)

—, Committee on Commerce, *Operation Desert Storm: Evaluation of the Air Campaign* (Washington D.C.: General Accounting Office, 1997)

Royal Australian Air Force, AAP 1000: *The Air Power Manual* First Edition (Fairbairn: Air Power Studies Centre, August 1990)

—, AAP 1000: *The Air Power Manual* Third Edition (Fairbairn: Air Power Studies Centre, February 1998)

War Department, Field Manual 100-20: *Command and Employment of Air Power* Publication for 21 July 1943 (Washington D.C.: Government Printing Office, 1944)

### Published Primary Sources

Arnold, H., *Second Report of the Commanding General of the Army Air Forces to the Secretary of War* (27 February 1945)

—, *Third Report of the Commanding General of the Army Air Forces to the Secretary of War* (12 November 1945)

Clausewitz, C. von, *On War* Edited and Translated by Michael Howard and Peter Paret (New York: Alfred A. Knopf, 1993)

Douhet, G., *The Command of The Air* Translated by D. Ferrari (New York: Arno Press, 1972)

Lauterpacht, E. and others (eds.), *The Kuwait Crisis—Basic Documents* (Cambridge: Grotius Publications, 1991)

Narracott, A., *Air Power In War* (London: Frederick Muller, 1945)

Porter, G. (ed.), *Vietnam: A History in Documents* (New York: Meridian, 1981)

Seversky, A., *Victory Through Air Power* (London: Hutchinson, 1942)

Tedder, A., *Air Power In War* (London: Hodder and Stoughton, 1947)

*The Pentagon Papers* Written by N. Sheehan, H. Smith, E. Kenworthy and F. Butterfield (New York: Bantam Books, 1971)

*The United States Strategic Bombing Survey: Over-all Report (European War)* (Washington D.C.: Government Printing Office, September 1945)

—, *Summary Report (Pacific War)* (Washington D.C.: Government Printing Office, July 1946)

—, *The Effects of Strategic Bombing on German Morale* Two volumes (Washington D.C.: Government Printing Office, 1947)

—, *The Effects of Strategic Bombing on the German War Economy* (Overall Economic Effects Division, October 1945)

### Memoirs

Billière, P. de la, *Storm Command: A Personal Account of the Gulf War* (London: Harper Collins, 1995)



Eisenhower, D., *Crusade in Europe* (London: William Heinemann, 1949)

Gorbachev, M., *Memoirs* (London: Doubleday, 1996)

Khalid Bin Sultan, *Desert Warrior: A Personal View of the Gulf War by the Joint Forces Commander* Written with Patrick Seale (London: Harper Collins, 1995)

Kohn, R. and J. Harahan (eds.), *Air Superiority in World War II and Korea: An Interview with Gen James Ferguson, Gen Robert M. Lee, Gen William Momyer, and Lt Gen Elwood R. Quesada* (Washington D.C.: Office of Air Force History, 1983)

LeMay, C., *Mission With LeMay* Written with MacKinlay Kantor (New York: Doubleday, 1965)

McNamara, R., *In Retrospect: The Tragedy and Lessons of Vietnam* Written with Brian Van De Mark (New York: Times Books, 1995)

Momyer, W., *Air Power in Three Wars* (Washington D.C.: Office of Air Force History, 1978)

Nixon, R., *No More Vietnams* (New York: Arbor House, 1985)

Powell, C., *A Soldier's Way* Written with Joseph Persico (London: Hutchinson, 1995)

Rommel, E., *The Rommel Papers* Edited by B.H. Liddell Hart and Translated by Paul Findlay (London: Collins, 1953)

Schwarzkopf, H. N., *It Doesn't Take A Hero* Written with Peter Petre (New York: Bantam House, 1993)

Speer, A., *Inside The Third Reich* Translated by Richard and Clara Winston (London: Weidenfeld and Nicholson, 1970)

### **Secondary Literature: Books**

Allen, T., F. Berry and N. Polmar, *CNN: War in the Gulf* (London: Maxwell-Macmillan International, 1991)

Alperovitz, G., *The Decision to Use the Atomic Bomb and the Architecture of an American Myth* (New York: Alfred A. Knopf, 1995)

Armitage, M. and R. Mason, *Air Power in The Nuclear Age, 1945-82: Theory and Practice* (London: Macmillan Press, 1983)

Atkinson, R., *Crusade: The Untold Story of the Persian Gulf War* (New York: Houghton, 1993)

Berger, C. (ed.), *The United States Air Force in Southeast Asia, 1961-1973* (Washington D.C.: Office of the Air Force History, 1977)

Blackwell, J., *Thunder In the Desert: The Strategy and Tactics of the Persian Gulf War* (New York: Bantam Books, 1991)

Braybrook, R., *Air Power: The Coalition and Iraqi Air Forces* (London: Osprey, 1991)

Brenner, E., W. Harwood and the Editors of UPI, *Desert Storm: The Weapons of War* (London: Fontana, 1991)

Brittain, V. (ed.), *The Gulf Between Us: The Gulf War and Beyond* (London: Virago Press, 1978)

Brodie, B., *Strategy In the Missile Age* (Princeton: University Press, 1971)

Brown, A., *Modern Warfare: From 1939 to the Present Day* (London: Orbis, 1985)

Bulloch, J. and H. Morris, *Saddam's War: The Origins of the Kuwait Conflict and the International Response* (London: Faber and Faber, 1991)

Cable, L., *Unholy Grail: The US and the Wars in Vietnam, 1965-8* (London: Routledge, 1991)

Collier, B., *A History of Air Power* (London: Weidenfeld and Nicolson, 1974)

Cooling, B. (ed.), *Case Studies in the Development of Close Air Support* (Washington D.C.: Office of Air Force History, 1990)

Corum, J., *The Luftwaffe: Creating the Operational Air War, 1918-1940* (Kansas: University Press of Kansas, 1997)

Coyne, J., *Airpower in the Gulf* (Arlington: Air Force Association, 1992)

Craven, W. and V. Cate (eds.), *The Army Air Forces In World War II—Europe: Torch to Pointblank, August 1942 To December 1943*, Vol. II; *Europe: Argument To V-E Day, January 1944 To May 1945*, Vol. III (Washington D.C.: Office of Air Force History, 1983)

Danchev, A. and D. Keohane (eds.), *International Perspectives on the Gulf Conflict, 1990-91* (Oxford: Macmillan, 1994)

David, P., *Triumph in the Desert* (London: Random House, 1991)

*Desert Storm: The War in the Persian Gulf* By the Editors of Time Magazine (Toronto: Little, Brown & Company, 1991)

Dorr, R., *Air War Hanoi* (London: Blanford Press, 1988)

Duphy, T., *The Military History of World War I: The War In The Air* (New York: Franklin Watts, 1976)

Ederington, L. and M. Mazarr (eds.), *Turning Point: The Gulf War and U.S. Military Strategy* (Boulder: Westview Press, 1994)

- Frankland, N. (ed.), *The Encyclopaedia of 20th Century Warfare* (London: Mitchell Beazley, 1989)
- Fredette, R.H., *The Sky on Fire: The First Battle of Britain, 1917-1918* (New York: Holt, Rinehart and Winston, 1976)
- Freedman, L. and E. Karsh, *The Gulf Conflict, 1990-1991: Diplomacy and War in the New World Order* (Princeton: University Press, 1993)
- Friedman, N., *Desert Victory: The War for Kuwait* (Annapolis: Naval Institute Press, 1991)
- Futrell, R., *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1960*, Vol. I; *1961-1984*, Vol. II (Montgomery: Air University Press, 1989)
- Gooch, J. (ed.), *Airpower: Theory and Practice* (London: Frank Cass, 1995)
- Gordon, M. and B. Trainor, *The Generals' War: The Inside Story of the Conflict in the Gulf* (Boston: Little, Brown and Company, 1995)
- Greer, T., *The Development of Air Doctrine In the Army Air Arm, 1917-1941* USAF Historical Studies: No. 89 (Washington D.C.: Office of Air Force History, 1955)
- Hallion, R., (ed.), *Air Power Confronts an Unstable World* (London: Brassey's, 1997)
- , *Storm Over Iraq: Air Power and the Gulf War* (Washington D.C.: Smithsonian Institution Press, 1992)
- Herzog, C., *The Arab—Israeli Wars* (London: Arms and Armour Press, 1985)
- Hess, G., *Vietnam and the United States: Origins and Legacy of War* (Boston: Twayne, 1990)
- Higham, R., *Air Power: A Concise History* (New York: St. Martin's Press, 1972)
- Hiro, D., *The Longest War: The Iran-Iraq Military Conflict* (London: Collins, 1989)
- Holley, I., *Ideas and Weapons. Exploitation of the Aerial Weapon by the United States during World War I; A Study in the Relationship of Technological Advance, Military Doctrine, and the Development of Weapons* (Washington D.C.: Office of Air Force History, 1983)
- Hyde, H. M., *British Air Policy Between the Wars, 1918-1939* (London: Heinemann, 1976)
- Irving, D., *Hitler's War* (London: Hodder and Stoughton, 1977)
- Isby, D., *Fighter Combat in the Jet Age* (London: Harper Collins, 1997)
- Jackson, R., *The Guinness Book of Air Warfare* (Enfield: Guinness Publishing, 1993)

Jacobsen, H.-A. and J. Rohwer (eds.), *Decisive Battles of World War II: The German View* (London: Andre Deutsch, 1965)

Jones, N., *The Origins of Strategic Bombing: A Study of the Development of British Air Strategic Thought and Practice upto 1918* (London: William Kimber, 1973)

Kennett, L., *The First Air War, 1914-1918* (New York: Free Press, 1991)

Kross, W., *Military Reform: The High-Tech Debate in Tactical Air Forces* (Washington D.C.: National Defense University Press, 1985)

Liddell Hart, B.H., *A History of the World War, 1914-1918* (London: Faber and Faber, 1934)

—, *Strategy* (New York and other centres: Meridian, 1991)

MacDonald, C., *Korea: The War Before Vietnam* (London and other centres: Macmillan Press, 1986)

McCausland, J., *The Gulf Conflict: A Military Analysis* (London: Brasseys, 1993)

McKee, A., *Strike from the Sky: The Story of the Battle of Britain* (London: Souvenir Press, 1960)

Macintyre, D., *The Battle for the Pacific* (Sydney: Angus and Robertson, 1966)

Mandales, M., T. Hone and S. Terry, *Managing "Command and Control" in the Persian Gulf War* (Westport: Praeger, 1996)

Mann, E., *Thunder and Lightning: Desert Storm and the Airpower Debates* (Montgomery: Air University Press, 1995)

Mark, E., *Aerial Interdiction in Three Wars* (Washington D.C.: Center for Air Force History, 1994)

Mason, R. (ed.), *War in the Third Dimension: Essays In Contemporary Air Power* (London: Brasseys, 1986)

Mason, T., *Air Power: A Centennial Appraisal* (London: Brasseys, 1994)

Meilinger, P. (ed.), *The Paths of Heaven: The Evolution of Airpower Theory* (Montgomery: Air University Press, 1997)

Morris, J., *History of the US Navy* (London: Bison Books, 1984)

Mortensen, D., (ed.), *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-43* (Montgomery: Air University Press, 1998)

Murray, W., *Strategy for Defeat: The Luftwaffe, 1933-1945* (Montgomery: Air University Press, 1983)



- Orange, V., *Coningham: A Biography of Air Marshal Sir Arthur Coningham* (London: Meuthen, 1990)
- Overy, R., *The Air War, 1939-1945* (London: Europa, 1980)
- , *Why the Allies Won* (London: Pimlico, 1996)
- Paret, P. (ed.), *Makers of Modern Strategy from Machiavelli to the Nuclear Age* (Princeton: University Press, 1986)
- Pimlott, J., *Strategic Bombing* (London: Bison Books, 1990)
- Pimlott, J. and S. Badsey, *The Gulf War Assessed* (London: Arms and Armour Press, 1992)
- Reynolds, R., *Heart of the Storm: The Genesis of the Air Campaign Against Iraq* Vol. I (Montgomery: Air University Press, 1995)
- Scales, R., *Firepower In Limited War* (Novato: Presidio, 1995)
- Schaffer, R., *Wings of Judgment: American Bombing in World War II* (Oxford: University Press, 1985)
- Scutts, J., *Fighter Operations: The tactics and techniques of air combat, from World War I to the Gulf War* (Somerset: Patrick Stephens, 1992)
- Sherry, M., *The Rise of American Air Power: The Creation of Armageddon* (New Haven: Yale University Press, 1987)
- Shultz, R. and R. Pfaltzgraff (eds.), *The Future of Air Power in the Aftermath of the Gulf War* (Montgomery: Air University Press, 1992)
- Smallwood, W., *Warthog: Flying the A-10 in the Gulf War* (Washington: Brassey's, 1993)
- Stephens, A. (ed.), *The War In The Air: 1914-1994* (Fairbairn: Air Power Studies Centre, 1994)
- Stokesbury, J., *A Short History of the Korean War* (New York: William Morrow, 1988)
- U.S. News and World Report, *Triumph Without Victory: The Unreported History of the Persian Gulf War* (New York: Random House, 1992)
- Waddell, D. and N. Wood (eds.), *Air War—Vietnam* (London: Arms and Armour Press, 1978)
- Warden, J., *The Air Campaign: Planning For Combat* (Washington D.C.: Permagon-Brassey's, 1989)
- Watson, B. (ed.), *Military Lessons of the Gulf War* (London: Greenhill, 1991)

Webster, C. and N. Frankland, *The Strategic Air Offensive Against Germany, 1939-1945: Annexes and Appendices*, Vol. IV (London: H.M.S.O., 1961)

Weigley, R., *The American Way of War: A History of United States Military Strategy and Policy* (New York: Macmillan, 1975)

Werner, J. and L. Doan Huynh (eds.), *The Vietnam War: Vietnamese and American Perspectives* (New York: M.E. Sharpe, 1993)

Winnefeld, J., P. Niblak and D. Johnson, *A League of Airmen: U.S. Air Power In the Gulf War* (Santa Monica: RAND, 1994)

Winton, J., *Air Power At Sea, 1939-45* (London: Sidgwick and Jackson, 1976)

Wragg, D., *Airlift: A History of Military Air Transport* (Shrewsbury: Airline, 1986)

—, *The Offensive Weapon: The Strategy of Bombing* (London: Robert Hale, 1986)

### Articles and Papers

Arkin, W., 'Baghdad: The Urban Sanctuary in Desert Storm', *Airpower Journal*, 11, No. 1 (Spring 1997), pp. 4-20

Arnold, H., 'Isolation of the Battlefield', *Military Review*, 77, No. 1 (January-February 1997), pp. 131-3

Arquilla, J. and D. Ronfeldt, 'Cyberwar is Coming', *Comparative Strategy*, 12, No. 2 (April-June, 1993), pp. 141-65

Ashworth, N., 'Air Power Can Win Wars', *Australian Defence Force Journal*, No. 112 (May-June 1995), pp. 13-15

Barlow, J., 'Strategic Paralysis: An Air Power Strategy for the Present', *Airpower Journal*, 7, No. 4 (Winter 1993), pp. 4-15

Bingham, P., 'Revolutionizing Warfare Through Interdiction', *Airpower Journal*, 10, No. 1 (Spring 1996), pp. 29-35

—, 'The United States Needs to Exploit its Air Power Advantage', *Airpower Journal*, 7, No. 3 (Fall 1993), pp. 62-71

Boudreau, R., 'The New AFM 1-1: Shortfall in Doctrine?', *Airpower Journal*, 6, No. 4 (Winter 1992), pp. 37-45

Builder, C., 'Doctrinal Frontiers', *Airpower Journal*, 9, No. 4 (Winter 1995), pp. 7-13

Canan, J., 'Lesson Number One', *Air Force Magazine*, 74, No. 10 (October 1991), pp. 26-31

Centner, C., 'Ignorance is Risk: The Big Lesson from Desert Storm Air Base Attacks',

*Airpower Journal*, 6, No. 4 (Winter 1992), pp. 25-35

Cohen, E., 'The Air War In the Persian Gulf', *Armed Forces International*, 130, No. 1 (June 1993), pp. 10-4

Downing, W., 'Firepower, Attrition, Maneuver—US Army Operations Doctrine: A Challenge for the 1980s and Beyond', *Military Review*, 77, No. 1 (January-February 1997), pp. 144-50

Drew, D., 'Desert Storm as a Symbol: Implications of the Air War in the Desert', *Airpower Journal*, 6, No. 3 (Fall 1992), pp. 4-13

—, 'Inventing A Doctrine Process', *Airpower Journal*, 9, No. 4 (Winter 1995), pp. 42-52

—, 'Two Decades in the Air Power Wilderness: Do We Know Where We Are?', *Air University Review*, 37, No. 6 (September-October, 1986), pp. 2-13

Edmonds, D., 'In Search of High Ground: The Airpower Trinity and the Decisive Potential of Airpower', *Airpower Journal*, 12, No. 1 (Spring 1998), pp. 4-21

Fedorchak, S., 'Air Operations Must Be Joint', *Airpower Journal*, 9, No. 1 (Spring 1995), pp. 79-87

Fogleman, R., 'Aerospace Doctrine: More than Just a Theory', *Airpower Journal*, 10, No. 2 (Summer 1996), pp. 40-7

Forrest, A., 'Giulio Douhet's 'The Command of the Air': An Enduring Strategy?', *Australian Defence Force Journal*, No. 112 (May-June 1995), pp. 3-10

Franks, F., 'Full-Dimensional Operations: A Doctrine for an Era of Change', *Military Review*, 77, No. 1 (January-February 1997), pp. 178-81

Gardiner, S., 'Preparing For the Next Century: What Should the Role of the United States Air Force Be?', *Comparative Strategy*, 12, No. 3 (July-September 1993), pp. 263-76

Gilster, 'Desert Storm: War, Time, and Substitution Revisited', *Airpower Journal*, 10, No. 1 (Spring 1996), pp. 82-93

Green, G., 'USAF Electronic Combat Systems Put Enemy Air Defenses in HARM's Way', *Armed Forces Journal International* (February 1992), pp. 48-51

Hallion, R., 'Air Power Today and Tomorrow: A Post-Gulf War View', *The Royal United Services Institute Journal*, 139, No. 5 (October 1994), pp. 23-9

—, *Air Warfare and Maritime Operations* RAAF Paper Number 45 (Fairbairn: Air Power Studies Centre, 1996)

—, 'Doctrine, Technology, and Air Warfare', *Airpower Journal*, 1, No. 2 (Fall 1987), pp. 16-27

—, *Precision Guided Munitions and the New Era of Warfare* RAAF Paper Number 53 (Fairbairn: Air Power Studies Centre, 1997)

Holley, I., 'A Modest Proposal: Making Doctrine More Memorable', *Airpower Journal*, 9, No. 4 (Winter 1995), pp. 14-20

—, 'Fifty Questions for Doctrine Writers: Means Are As Important As Ends', *Airpower Journal*, 11, No. 3 (Fall 1997), pp. 27-31

Horner, C., 'Desert Shield/Desert Storm: An Overview', *Air Power History* (Fall 1991), pp. 5-9

—, 'The Air Campaign', *Military Review*, 71, No. 9 (September 1991), pp. 16-27

Hurley, M., 'Saddam Hussein and Iraqi Air Power: Just Having an Air Force Isn't Enough', *Airpower Journal*, 6, No. 4 (Winter 1992), pp. 4-16

Humphries, J., 'Operations Law and the Rules of Engagement in Operations Desert Shield and Desert Storm', *Airpower Journal*, 6, No. 3 (Fall 1992), pp. 25-41

Irving, N., 'The Gulf Air Campaign—An Overview', *Royal United Services Institute Journal* (February 1992), pp. 10-4

Jones, J., *Development of Air Force Basic Doctrine, 1947-1992* (Internet web site: <http://www.airpower.maxwell.af.mil/airchronicles/lcc/doctrine/jones.html>)

Keany, T., 'Surveying Gulf War Airpower', *Joint Force Quarterly*, No. 2 (Autumn 1993), pp. 25-36

Kennedy, K., 'Stealth—A Revolutionary Change in Air Warfare', *Naval War College Review*, 46, No. 2 (Spring 1993), pp. 118-36

Kolcum, E., 'Gulf War Reinforces Value of U.S. Stealth Technologies', *Aviation Week and Space Technology* (18 February 1991), pp. 40-1

Lambeth, B., 'Technology and Air War', *Air Force Magazine*, 79, No. 11 (November 1996), pp. 50-3

Lohide, K., 'Desert Storm's Siren Song', *Airpower Journal*, 9, No. 4 (Winter 1995), pp. 100-10

Luttwak, E., 'Victory Through Air Power', *Commentary* (August 1991), pp. 27-30

McCabe, T., 'The Limits of Attack', *Airpower Journal*, 7, No. 3 (Fall 1993), pp. 4-14

McMichael, W., 'First Shots Fired in Anger', *Soldiers: The Official U.S. Army Magazine*, 46, No. 4 (April 1991), pp. 21-4

McPeak, M., 'For the Composite Wing', *Airpower Journal*, 4, No. 3 (Fall 1990), pp. 4-12



Mann, E., 'One Target, One Bomb: Is the Principle of Mass Dead?', *Airpower Journal*, 7, No. 1 (Spring 1993), pp. 35-43

Mason, R., 'The Air War in the Gulf', *Survival*, 33, No. 3 (May-June 1991), pp. 211-29

—, 'The Decade of Opportunity: Airpower in the 1990s', *Airpower Journal*, 1, No. 2 (Fall 1987), pp. 4-15

Mason, T., *The Future of Air Power: Concepts of Operations* RAAF Paper Number 62 (Fairbairn: Air Power Studies Centre, 1998)

Meilinger, P., *Critical Factors in The Air Superiority Campaign* RAAF Paper Number 23 (Fairbairn: Air Power Studies Centre, 1994)

—, 'Giulio Douhet and Modern War', *Comparative Strategy*, 12, No. 3 (July-September 1993), pp. 321-38

—, 'Ten Propositions Regarding Airpower', *Airpower Journal*, 10, No. 1 (Spring 1996), pp. 50, 52-72

—, 'The Problem with Our Air Doctrine', *Airpower Journal*, 6, No. 1 (Spring 1992), pp. 24-31

Morris, C., J. Morris and T. Baines, 'Weapons of Mass Protection: Nonlethality, Information Warfare, and Airpower in the Age of Chaos', *Airpower Journal*, 9, No. 1 (Spring 1995), pp. 15-29

Mowbray, J., 'Air Force Doctrine Problems, 1926—Present', *Airpower Journal*, 9, No. 4 (Winter 1995), pp. 21-41

Mundy, C., 'Thunder and Lightning: Joint Littoral Warfare', *Joint Force Quarterly*, No. 4 (Spring 1994), pp. 45-50

Nalty, B., 'An Uncommon War: The U.S. Air Force in Southeast Asia', *Air Power History*, 41, No. 3 (Fall, 1994), pp. 27-37

Nelson, M. and D. Katz, 'Unity of Control: Joint Air Operations in the Gulf—Part Two', *Joint Force Quarterly*, No. 5 (Summer 1994), pp. 59-63

Putney, D., 'From Instant Thunder to Desert Storm: Developing the Gulf War Air Campaign's Phases', *Air Power History*, 41, No. 3 (Fall 1994), pp. 38-50

Record, J., 'Why the Air War Worked', *Armed Forces Journal International* (April 1991), pp. 44-5

Reimer, D. and R. Fogleman, 'Joint Warfare and the Army-Air Force Team', *Joint Force Quarterly*, No. 11 (Spring 1996), pp. 9-15

Rhodes, T., 'Allies plan 200 Air strikes a Day on Iraq', *Dominion* (14 February, 1998), p. 27

Richardson, W., 'FM 100-5: The AirLand Battle in 1986', *Military Review*, 77, No. 1 (January-February 1997), pp. 174-7

Rynecki, W., 'Transformational Leaders and Doctrine in an Age of Peace: Searching for a Tamer Billy Mitchell', *Airpower Journal*, 12, No. 1 (Spring 1998), pp. 22-36

Schoneburger, W., 'Allied Forces and McDonnell Douglas: The Winning Edge', *Janes Defence Weekly*, 15, No. 24 (15 June 1991), pp. 3-14

Starry, D., 'Extending the Battlefield', *Military Review*, 77, No. 1 (January-February 1997), pp. 151-61

Stein, G., 'Information Warfare', *Airpower Journal*, 9, No. 1 (Spring 1995), pp. 30-9

Stephens, A., 'Aerospace Strategy', *Australian Defence Force Journal*, No. 98 (January-February 1993), pp. 23-36

—, *Air Power Doctrine Revisited* RAAF Paper Number 44 (Fairbairn: Air Power Studies Centre, 1996)

—, *In Search of the Knock-Out Blow: The Development of Air Power Doctrine, 1911-1945* RAAF Paper Number 61 (Fairbairn: Air Power Studies Centre, 1998)

—, 'Key Concepts in Air Power', *Australian Defence Force Journal*, No. 112 (May-June 1995), pp. 17-26

Summers, H., 'Revisiting the Gulf War: A Review Essay', *Joint Force Quarterly*, No. 1 (Summer 1993), pp. 118-22

Sweetman, B., 'Catching Up With Doctrine', *Jane's Defence Weekly*, 15, No. 26 (29 June 1991), pp. 1174-5

Sweetman, D., 'Modern bombs in the Gulf' *Jane's Defence Weekly*, 15, No. 6 (9 February 1991), p. 178

Warden, J., 'The Enemy As A System', *Airpower Journal*, 9, No. 1 (Spring 1995), pp. 41-55

Waters, G., 'Conclusions for Doctrine for the Air War in the Gulf', *Australian Defence Force Journal*, No. 98 (January-February 1993), pp. 37-50

—, *The Strategic Air Lessons of the Gulf War* Working Paper No. 6 (Canberra: Australian Defence Studies Centre, 1992)

Whitlow, J., 'JFACC: Who's in Charge?', *Joint Force Quarterly*, No. 5 (Summer 1994), pp. 64-70

Winnefeld, J. and D. Johnson, 'Unity of Control: Joint Air Operations in the Gulf', *Joint Force Quarterly*, No. 1 (Summer 1993), pp. 88-99