Chapter Three: The Forces Engaged - Opposing Military Cultures and The Human Element

The Gulf War involved complex mixes of forces from two very different military "cultures". The first such "culture" was the military culture of Iraq: A Third World military force whose military history and combat experience was limited to civil war, ethnic struggles, and a prolonged war against Iran. Like many of the military cultures of the Third World, Iraq was authoritarian in nature and dependent on developed nations for virtually all of its military technology, tactics, and supply. While many aspects of its military culture were unique, other aspects are typical of the severe qualitative weaknesses of Third World forces, and provide important lessons as to how such forces are likely to behave in the future.

The forces of the Arab states in the Coalition shared some of these weaknesses, but Saudi Arabia and Egypt had assimilated many transfers of technology and tactics that Iraq had not. The other Arab states were not aggressors or authoritarian regimes, had different styles of government, and different military histories. At the same time, the Saudi Air Force was the only Third World force to engage in the conflict approaching Western levels of technology and effectiveness. Their experience of the other Coalition Arab forces reinforce several of the lessons that Iraq's military reveals about the strengths and weaknesses of Third World forces.

The second military "culture" was that of the West, led by the United States. Western military culture emphasized technology, tactical innovation, high tempos of war, maneuver, and deep strikes. It had developed and produced the technology it used. Its political base was democratic in character, and it had a different process of command and motivation. It was also a military culture shaped by two European World Wars, Korea, and by America's experience in Vietnam. At the same time, it was already in transformation from a four decade long focus on a Soviet and Warsaw Pact threat to a new focus on regional contingencies.

The US forces -- which dominated the UN Coalition in size, technology, and combat power -- were engaged in an additional transformation. US forces had steadily reorganized and restructured after the American defeat in Vietnam. They had become a professional all-volunteer force -- the first such force in American history. They had adopted fundamentally different methods of training, and had spent nearly two decades

developing a new emphasis on maneuver, combined arms, and combined operations. While the British, French and other Western forces committed to Desert Storm were the product of a considerable continuity, the US forces were the product of change and experiment.

Because of the critical role played by US air power and armor, many aspects of the war reflected the resulting differences between Iraqi and US forces. At the same time, the West had the great advantage of being able to cooperate with Arab forces inside and outside of the region. The Coalition blended two military cultures, while Iraq fought in isolation. The West was able to use the advanced infrastructure and support of Saudi Arabia and the other southern Gulf states. The US had also learned a great deal about desert warfare from a long series of exercises with Egypt and Saudi Arabia. As a result, the West was able to borrow far more effectively from its Arab allies than Iraq was able to borrow from the West and Soviet Union. The West had massive support from regional allies, and benefited from cooperative security, while Iraq was effectively isolated from the nations that had supplied most of its previous military build-up. Iraq also gave the West the gift of five critical months in which to adapt its forces to the special conditions of warfare in the upper Gulf.

Table 3.1 shows an estimate of the total forces that the two opposing military cultures could draw upon in mobilizing for Desert Shield and Desert Storm, and the approximate peak size of the forces actually engaged in the theater. War does not occur, however, between force ratios. It occurs between broad mixes of forces under conditions where only limited portions are fully engaged and where force quality is as important as force quantity. While the data in Table 3.1 illustrate the approximate quantitative ratios of the involved, they tell little about force quality, the number of forces each side could commit to combat, and the relative ability to sustain those forces.

Table 3.1

Iraqi vs. UN Coalition Forces at the Start of the Gulf War

Total National Orders of Battle

	Iraq (1 January, 1991)	US	Other UN (1 December 1990)	
Total Active Personnel	1,140,000		2,038,300	1,110,000
Active Ground Force Personnel	1,100,000		930,358	831,500
Divisions	66		21	21
Maneuver Brigades	270		-	123
Tanks	5,800-7,000		15,075	8,600
Armored Vehicles	11,200		27,972	15,000
Artillery (100mm+)	3,8500		6,988	3,750
(Self Propelled)-	3,720		550	
(Towed)	-		3,268	3,200
Multiple Rocket Launchers	340		400	800
SSM Launchers	110		65	80
Active Air Force Personnel	18,000*		527,069**	105,100
Bombers	15		366	?
Fighter/fighter bombers	728		3,879	1,386
Combat Capable Trainers	400		-	514
Reconnaissance	12		346	?
Transports	70		824	257
Tankers 2	555		?	
Helicopters	511		9,762	849
(Attack)	-		-	220
(Other) -	-		527	
Civil Aviation Transports	60		-	256

Table 3.1

Iraqi vs. UN Coalition Theater Forces at the Start of the Gulf War

Total Forces in Theater

	Iraq	US [1]	Britain	France	Saudi Arabia	Egypt	Syria	
Ground Force Personnel	336,000	334,000	35,000	9,500	50,000	30,200	14,000	
Division Equivalents	43	9 2/3	1	1	1 2/3	2	1	
Maneuver Brigades	-	32	2	1-2	6	7	4	
Tanks	3,475	2,000+	180	40	280	350	240	
Armored Vehicles	3,080+	2,425+	215	120	950	750	250	
Artillery (100mm+)	2,475	784	24	18	115	145	100	
(Self Propelled)	-	-	84	-	-	-	-	
(Towed)	-	-	-	18	-	-	-	
Multiple Rocket Launchers	-	-	12	-	30	-	-	
SSM Launchers	-	-	0	-	-	-	-	
Air Force Personnel	18,000*	48,680	7,000	1,200	16,000	None	None	
Fighter/fighter bombers	819	1,215	84	58	245			
Combat Capable Trainers	-	-	-	-	71			
Transports	400	-	-	-	81			
Helicopters	511	1,500+	-	120-130	74			
(Attack/Armed)	70	343	48	60-85	20			
(Other)	441	-	39	60-70	74			
Civil Aviation Transports	60	-	-	-	-			

Note: The data reported are not comparable in many ways, and the data on other armored vehicles are particularly unreliable. The Saudi ground forces include all regular army and active National Guard personnel and equipment and the entire Saudi Air Force. The Iraqi air force manning would total 35,000, and the Saudi Air Force would total 22,00o, if air defense personnel were counted. US totals only include US Air Force personnel for the air force manpower total. All Marine manpower and equipment are counted in ground force total. Naval aviation personnel not included. Totals for US air combat strength include aircraft in all services, except for helicopters which only include US Army and USMC. Estimates of US ground strength are very difficult because so many forces finished deployment during the final days before Desert Storm, and build-ups of manpower continued throughout the conflict. Total US Army forces rose from 247,637 on January 16 to a peak of 304,648 on February 27; US Marine Corps forces rose from 85,447 on January 16 to a peak of 92,538 on February 27; US Air Force forces rose from 48,679 on January 16 to a peak of 54,364 on February 27; and US Navy forces rose from 67,851 on January 16 to a peak of 83,278 on February 27.

Sources: Adapted from data in Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 15,18-19, 44 and Volume I, pp. 203-207; John M. Collins and Dina E. Rennack, "US/Soviet Military Balance: Statistical Trends, 1980-1989 (as of 1 January, 1990, Congressional Research Service, 1990; Department of Defense press release dated January 26, 1991; Steven R. Bowman, "Persian Gulf War: Summary of U.S. and Non-U.S. Forces," Congressional Research Service 91-167F, February 11, 1991, pp. 1-2; IISS, Military Balance, 1991-1992; JCSS Military Balance in the Middle East, 1990, and the author's data files. Some data are taken from Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, p. 321, 353; David Miller, U.K. Forces in the Gulf War," Military Technology, July, 1991, pp. 39-50. Some Arab Coalition Forces data are taken from Saudi MODA briefing aids of March, 1991.

Preparing for the Past: Iraqi Military Forces At the Beginning of Gulf War

When Iraq invaded Kuwait on August 2, 1990, Iraq was the dominant military power in the Gulf region and the Iraqi army was the fourth largest army in the world. Its active regular strength had increased from 180,000 men in early 1980 -- before the start of the Iran-Iraq war, to over 800,000 men in early 1990 -- before Saddam Hussein took his decision to invade Kuwait. Iraq had the potential to mobilize to as many as 2,000,000 men, or roughly 75% of all Iraqi men between 18 and 34. The Iraqi army's tank strength had risen from 2,700 to at least 5,700 weapons between 1980 and 1990, and its total tube artillery strength had risen from 2,300 weapons to 3,800.[2]

A detailed post-war estimate of the growth of Iraqi forces during and immediately after the Gulf War is shown in Table 3.2. As Chapter Five discusses in more detail, wide differences existed in the estimates of Iraqi strength before and during the Gulf War between the various intelligence services in the UN Coalition, and within the US, that have never been resolved. US estimates of Iraqi strength during the war also exaggerated the Iraqi forces in the KTO, and some doubts still remain about the size of many elements of forces used in combat. Nevertheless, the estimates in Table 3.2 seem likely to be broadly correct in estimating the total size of Iraqi forces.

Table 3.2

The Iraqi Order of Battle 1990 to 1991

Force Element	1 August 1990	1 January 1991	1 February 1991	1 April 1991
Land Forces				
Personnel	1,000,0000	1,100,000	1,100,000	400,000
Divisions	63	66	66	30
Maneuver Brigades	275	270	270	135
Tanks	5,700	7,000	7,000	2,300
Armored Vehicles	10,000	11,200	11,200	3,100
Artillery (100mm+)	3,400	3,800	3,800	1,250
Multiple Rocket Launchers	300	340	340	60
SSM Launchers	80	110	105	60
Air Forces				
Personnel	18,000	18,000	18,000	18,000
Fighter/fighter bombers	718	728	699	362
Bombers	15	15	9	7
Combat Capable Trainers	370	400	400	252
Reconnaissance	12	12	12	0
Transports	76	70	70	41
Helicopters	517	511	511	481
Civil Aviation Transports	59	60	60	42
Air Defense				
Personnel	17,000	17,000	17,000	17,000
Air Defense Artillery	7,500	7,600	7,600	5,850
SAM Batteries	120	120	200	85
Navy				
Personnel	5,000	5,000	5,000	5,000
Frigates 0	0	0	1	
Missile Boats	9	13	3	1
Other Patrol Craft	50	50	50	4
Coastal Defense Missiles	50	50	50	4

Source: adapted from data in Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 18-19.

Force strength is rarely, however, the decisive issue in war. This is particularly true when the forces on each side are so different in character. While Iraq was a strong military power in regional terms, and had just decisively defeated Iran, Iraqi armed forces had severe problems in fighting an enemy with the capabilities of the Coalition. Some of these problems have already been discussed, and others are discussed in detail in the chapters covering the lessons of each phase of the battle. In broad terms, however, Iraqi forces suffered from the limitations shown in Table 3.3.

Many of these limitations involve judgments that cannot be quantified or related to Iraq's order of battle, or to the level of the manning and equipment in its combat units. Some are a function of the political character of Iraq, although they are likely to be common in other authoritarian nations. This is an important lesson of the Gulf War. Military capabilities cannot be judged simply in terms of things that can be counted -- even if accurate counts are available. While qualitative value judgments are inevitably subjective, they are necessary to provide a realistic picture of relative military capability and effectiveness in war, and the problems listed in Table 3.3 are almost certain to occur in other Third World forces in future conflicts.

Table 3.3

Major Qualitative Limitations in the Iraqi Armed Forces

- *Authoritarianism and over-centralization of the effective command structure:* Leadership was over-centralized at the level of Saddam Hussein, and Iraq lacked an effective central staff system. Each service tended to report through a separate chain of command, sector and corps. Commanders often reported independently, as did branches within a given service. Coordination between the Army, Air force, and Air defense force was weak. Within the Army, coordination between Corps, and the Republican Guards and regular army was often weak. Command interference was common at the political level.

- *Lack of strategic assessment capability:* Iraq's political leadership lacked the ability to objectively assess the political and military situation, and often seemed to have believed its own rhetoric and propaganda. It did not understand how Saudi-Arabia would react to the threat that Iraq deployed on its borders, and it fundamentally miscalculated US political reactions and willingness to fight. There is no sign in Iraqi statements before or during the war that it made a realistic effort to assess Coalition and US military capabilities, or its own vulnerabilities. It dealt with military planning and strategy largely in terms of the war that it had just fought with Iran. Its actions were not necessarily irrational, but Iraq's leadership lacked the ability to look beyond the political process of confrontation with the Coalition and

understand and evaluate both the change in military situation as well as its true strengths and weaknesses.

- *Defensive and reactive character:* In spite of the Iraqi victories against Iran in 1988, the bulk of the Iraqi Army was a defensive infantry force trained to fight in static defensive roles. The strategy of attrition came naturally to Iraq because it had adopted this strategy during much of the Iran-Iraq War, and employed it in the early phases of air combat against the Iranian Air Force. Its forces had never been threatened by a well-organized Iranian armored offensive; rather, they had exploited static defenses and barriers against Iranian forces that were largely infantry, supported by massed tube artillery fire. Maneuver was seen largely in terms of reinforcing threatened positions or exploiting a proven weakness in the enemy. This made Iraq highly vulnerable to Coalition air attacks, and armored thrusts when it did not achieve its planned level of attrition. At the same time, the over-centralization and political character of Iraq's military forces discouraged adaptation and innovation when this went beyond limited efforts to modify or adapt weapons and technology.

- *Major Weaknesses in every aspect of battle management, command, control, communications, intelligence, targeting, and battle damage assessment.* Iraq lacked access to space based systems, and had only limited theater reconnaissance and intelligence assets. It was used to retaining the initiative and having time to plan and react. It had no sophisticated reconnaissance, intelligence, and targeting assets, other than some RPVs, which could penetrate behind the forward line of Coalition forces. Communications security was limited, as was Iraq's electronic intelligence capability. Iraqi forces were not trained in aggressive and long range scouting efforts, or in rapid cycles of reaction. They did not organize effectively to provide in-depth targeting for their artillery units or forward scouts and observers for their armor.

- *Manpower quality:* The Iraqi Army relied heavily on the mass use of conscripts, which often received limited training. At the same time, promotion in Iraqi armed forces was heavily politicized and subject to nepotism and favoritism. Iraq was seriously hurt by the lack of initiative granted to officers at every rank, and the lack of adequate status, pay, and training for NCOs and technicians.

- *Slow tempo of operations:* Iraq's tempo of operations was generally faster than that of Iran and other regional power, but was slower than that of the UN Coalition in virtually every important aspect of military operations.

- *Indifference to air superiority:* Iraq's experience with air warfare was limited to a brief surge of Iranian air attacks against its air base's early in the Iran-Iraq War. It achieved air superiority by default, and had no real experience with air attacks of any kind, much less the kind that the Coalition was able to launch. This affected its Army deployments and defenses, its efforts to employ air defense fighters, and its use of ground based air defenses.

- *Problems air-to-air combat:* Iraq had several weaknesses in air combat. Its training levels were low, it lacked effective air battle management systems, it had only limited beyond-visual-range and look down-shoot down capability, and it depended heavily on ground controlled vectoring for intercepts -- which made Iraqi fighters vulnerable to attacks on Iraq's radars and control centers.

- *Problems in air defense and air-to-air combat :*Iraq did not deploy long range surface-to-air missile systems effectively to cover its forces in the KTO, which left its ground forces vulnerable to air attacks from ranges beyond the kill capability of its short range air defense systems. Iraq's long range surface-to-air missile systems in Iraq were concentrated on the defense of Iraqi key facilities and urban areas in patterns where they were easy to locate and attack. Iraq was heavily dependent on Soviet weapons and French command and control systems to integrate its surface-to-air missile defenses. This integration had achieved only limited success and readiness, and Iraq's individual major systems had significant vulnerabilities to Coalition strike systems, electronic countermeasures, anti-radiation missiles, and direct air attack.

- *Lack of effective survivable long range strike systems:* Iraq had some Su-24 and Mirage F-1 aircraft capable of long range strikes, but they were not survivable against Coalition defenses. Its rockets and guided missiles could attack area targets, but could do only limited damage, and could not be used in precision strikes against critical targets. Its Scud missiles ultimately had a significant impact in political terms, and in diverting Coalition air assets, but did little to affect the impact of the battle.

- *Combined Operations, Combined Arms, and the AirLand Battle:* Iraq's military forces remained highly compartment by service and branch. Its air force was not capable of effective coordination with its land force, and it had serious problems in using its helicopters effectively. Its land forces were able to coordinate in preplanned attacks against an infantry-dominated Iranian force by 1988.

- *Desert warfare:* Iraq existed in a desert, but its forces were trained to fight nearly major lines of supply, and from fixed set piece positions. It had relatively little experience in terms of maneuver warfare in open deserts, and AirLand battle in desert areas.

- *Night and All-Weather Warfare:* Iraq's problems were compounded by its lack of night and poor weather warfare capabilities. The Iraqi Army had limited effectiveness in every aspect of night warfare operations.

- *Failure to defend in the proper depth - the shallow battlefield:* Iraq's forward defenses were formidable in the sense that they provided strong barrier and mine defenses backed by large amounts of infantry, and limited to moderate amounts of artillery and armor. At the same time, they were not deep in terms of defending against an enemy relying on swift, deep armored penetrations, modern combat engineering, and air power. They tied down much of the Iraqi army in covering

parts of the front and the Kuwaiti and Iraqi coast that might never be attacked, and gave Iraq little prospect of retreating as a fighting force.

- *Lack of cohesive defensive quality:* Inspection after the war showed that given unit sectors had shown very different levels of proficiency in creating forward defenses and rear defense positions. Some were very well constructed and well thought out. Other neighboring positions were not fully implemented, or they made obvious mistakes in implementing given aspects of the defense.

- *Misuse and maldeployment of reserves:* The Iraqi units in reserve were strong, but were too far in reserve to help compensate for the fact the Coalition could penetrate and exploit the breech in Iraq's forward defenses much more rapidly than Iraqi Armored and Mechanized reserves could counter-attack -- particularly once the Iraqi forces were crippled by the Coalition air offensive. Iraq's Republican Guards and elite regular forces could counter-attack in the face of continuing Coalition air attacks, and an unexpected envelopment from the West. More generally, Iraq massed in the forward area in Kuwait in much the same way as it massed in southern Iraq during the Iran-Iraq War. This greatly increased the potential advantage of a Coalition envelopment from the West.

- *Infantry operations:* Iraq's infantry was not organized or mechanized in ways that allowed it to maneuver effectively or deal with the complicated problems of withdrawing as a cohesive combat force. Iraq also failed to use its infantry defensively in Kuwait City or in other built-up areas. As a result, it quickly became isolated in the desert, and lost its military effectiveness.

- *Armored operations:* Some Iraqi units were relatively well trained in armored operations by regional standards. However, Iraq's armored forces lacked the sensors and fire control systems to successfully engage the Coalition's best tanks and other anti-tank systems at long ranges, and its forces had little effective training for night and poor weather warfare. Most Iraqi forces had severe problems in overall battle management, in carrying out unrehearsed maneuvers, and at anything approaching the UN's tempo of operations. Iraq's armored forces were also used to operating in an environment with secure lines of communication, and near-total air superiority. They were also used to counter-attacking or launching offensives against a much slower moving enemy.

- *Artillery operations:* Iraq had large numbers of effective artillery weapons, but lacked the training, tactics, targeting and fire-control systems to rapidly and effectively allocate fire. Iraq made little effort to provide adequate long range targeting capability, even forward of its fixed defensive positions, and could not swiftly reallocate fire or move its artillery once its forward defenses were penetrated. It had little or no capability to rapidly shift artillery to deal with the advanced Coalition Armored and Mechanized forces.

- *Combat training:* Iraqi training was often physically rigorous, but militarily unrealistic. Air combat training was poor in every respect, as was the general level

of training in Iraq's surface to air missile units and air command centers. Fixed and rotary wing air attack training was surprisingly bad, particularly in terms of effectively allocating significant numbers of forces to high priority targets. Individual Iraqi pilots were often good, and showed considerable courage, but lacked specialized training, unit training, and force-wide training. A number of Iraqi land units trained well during the Iran-Iraq War, and fought well afterwards. Overall training, however, lacked cohesion and was still oriented towards dealing with a very different Iranian threat when the Gulf War began. Many of the Iraqi units deployed in the KTO were filled with conscripts and new recruits that had not seen significant combat service during the Iran-Iraq War. Few Iraqi armored and mechanized units seemed to have trained realistically to deal with the possibility that the Coalition AirLand offensive would succeed in major breakthroughs of Iraq's forward defenses.

- *Uncertain readiness:* Iraqi units had very different standards of individual unit readiness. Maintenance, sheltering, and other activities varied sharply by unit, and a number of cases occurred where oversupply of some items existed in a given sector, while other items were missing.

- *Failure to provide adequate reparability and sustainability:* The Iraqi armed forces were not capable of many aspects of major maintenance activity, and relied heavily on replacement and returns to depot. They had poor combat repair and recovery capability. The Iraqi Army did establish extensive logistic stockpiles, but the overall supply system was weak, often omitting some key component. The battlefield supply system paid insufficient attention to food, water, and other basic troop supplies, and this presented growing problems once Coalition air attacks began to disrupt the normal flow of supply.

- *Division of force:* When Iraq concentrated its military assets in the Republican Guards forces in the rear of the KTO, and in the regular Army mechanized and armored forces in the central KTO, it effectively divided its forces. The moment that the Coalition won air superiority, and demonstrated that it could effectively attack Iraqi ground forces, the Iraqi defensive concept made it almost impossible for Iraq to concentrate its force effectively and achieve local superiority in a counterattack.

- *Inability to use weapons of mass destruction effectively:* While Iraq could pose a potential chemical and biological threat, and make many threats to use such weapons, it never made an organized effort to maximize intimidation by developing a war- fighting capability either to increase attrition, or act as a deterrent. Instead, it took levels of risk in engaging the UN Coalition that threatened the survival of its regime while effectively accepting deterrence of any use of chemical and biological weapons because of its fear of Coalition retaliation. While it is uncertain that Iraq could have intimidated the Coalition, or developed selective uses of such weapons to prevent a Coalition offensive, to liberate Kuwait or support its strategy of attrition, Iraq made no serious attempt to do so.

The Iraqi Army

The key element shaping Iraq's military effectiveness during the Gulf War was the Iraqi Army. By the time that Iraq had invaded Kuwait, some analysts estimated that this force had mobilized to as many as 955,000 men (including 480,000 reserves). It was organized into seven to eight corps, and had more than 60 to 66 division equivalents. While estimates differ as to the exact number of major combat units involved, they seem to have included nine armored and mechanized divisions, 12 Republican Guard divisions, 51 infantry divisions, 20 special forces and commando brigades. They also included 2 surface-to-surface missile brigades with at least 50 FROG-7 launchers, and 800-1,200 Scud and Scud variant missiles. These estimates would have given the Iraqi Army a total mobilized strength of about 270 brigade equivalents, with more than 50 armored and mechanized brigade equivalents.[3] The Iraqi Army had a large modern military infrastructure, with 389 major installations, 124 major material and storage depots, and seven fortifications and defense systems.[4]

By January 15, 1991, Iraq had deployed a land order of battle similar to that shown in Table 3.5. USCENTCOM estimated Iraq's total ground forces strength at 1.2 million men, 69-71 divisions and forces commands, 5,800 tanks, 5,100 armored personnel carriers, and 3,850 artillery weapons. There is no precise agreement among Western intelligence agencies on the size of the forces that Iraq deployed in the KTO, and estimates of Iraq's strength have been substantially revised since the war. According to the revised estimates, Iraq deployed 11 divisions with 57% of full strength and 33 divisions with 85% strength -- for a total average strength of 78%. This still, however, indicates that Iraq deployed a total force of around 336,000 men, 12 heavy and 31 light divisions, 3,475 battle tanks, 3,080 other armored vehicles, and 2,475 major artillery weapons in the KTO by the time Desert Storm began.[5] Further, almost all of the divisions with 57% manning were low quality infantry divisions deployed near the border. Armored and mechanized units -- particularly those with T-72s -- had high manning and readiness.

Table 3.5

The Iraqi Divisional Land Order of Battle at the Time of Desert Storm

	Inside the KTO	In Other Parts of Iraq
Republican Guards (12 Divisions)		
Armored Divisions	Hammurabi Medina	
Mechanized Divisions	Tawakalna Baghdad	
Infantry Divisions	Al-Faw Nebuchadnezzar Adnan	Al-Nida Al-Abad Al-Mustafa Al-Quds
Special Forces Divisions	Special Forces	
Sub-total	8	4
Regular Army (60 Divisions)		
Armored Divisions (6)	3rd, 6th, 10th, 12th, 17th, 52nd	
Mechanized Divisions (3)	1st, 5th, 51st	
Infantry Divisions (51)	2nd, 7th, 8th, 11th, 14th, 15th 16th, 18th, 19th, 20th, 21st, 25th, 26th, 27th, 28th, 29th, 30th, 31st, 36th, 37th, 42nd, 45th, 47th, 48th, 49th	4th, 22nd, 23rd, 24th, 32nd, 34th, 35th, 38th, 39th, 40th 41st, 44th, 46th, 50th, 53rd, 54th, 56th
Sub-total	34	17
Total	42	21

Note: Estimates differ according to source. The Hammurabi, Medina, and Tawakalna Divisions led the attack on Kuwait, while the remaining Republican Guard forces were follow-on and reserve forces. The Al-Nida, Al-Abad, Al-Mustafa, and Al-Quds Divisions were created after the invasion, and only performed internal security duties during the Gulf War. Eight regular Army infantry divisions remain unidentified
Source: Adapted from Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume I, Washington, US Air Force/Government Printing Office, 1993, pp. 204-205.

The Republican Guards were Iraq's best equipped forces. Iraq had recognized the need for elite forces once Iran had invaded Iraqi territory, and had expanded a two-brigade guard force -- that was originally was designed to protect the capital and the President -- to more than eight elite divisions. The Republican Guards had a total of 28 combat brigades, and received special equipment and training. While regular army also had elite armored and mechanized divisions did most of the fighting during the Iran-Iraq War, and which dominated the battle to liberate Faw from Iran, the Republican Guards played a major role in defending Basra in 1987 and in the Iraqi offensives 1988 -- exploiting the successes of the regular Army 3rd Corps in a number of critical battles.

By August, 1990, however, the Republican Guards had over-expanded at the cost of force quality. They totaled nearly 20% of the Iraqi Army. They also were heavily politicized. They reported to the state special security apparatus in peacetime, rather than the Ministry of Defense. This meant they effectively reported directly to the Presidential Palace -- although they technically reported to the Iraqi General Headquarters, and were subordinated to military headquarters for specific military operations. They had special training in offensive and maneuver warfare, chemical warfare, and counter-attacks. They were equipped with Iraq's best weapons: T-72 main battle tanks, BMP armored fighting vehicles, French GCT self-propelled howitzers, and Austrian GHN-45 towed howitzers, the most modern weapons in the Iraqi Army. The Republican Guard battalions had nine more tanks than the regular army battalions, and the Republican Guard's support, armored recovery, and engineering equipment was superior to that of other Iraqi Army forces.

While Iraqi Army units never had a standard or uniform mix of equipment and manpower of the kind common to Western forces, the size of "typical" Republican Guards divisions is shown in Table 3.6. It is clear from this Table that Republican Guard units were notably larger than those of regular army units, and some Republican Guards divisions had as many as 312 tanks, including the latest Soviet-made T-71M1 tank. The artillery brigades in the Guard were equipped with the best long range weapons, including Austrian, French, and South African artillery systems. The air defense units include SA-6 missiles, which were normally reserved for the fixed defense of strategic targets.

The Republican Guard forces in the KTO were deployed as a separate elite Republican Guards Forces Command. According to some reports, they had special political officers to ensure that they would not retreat and acted to block any retreat by regular army forces. They also had separate bunkers, and were privileged to obtain loot from Kuwait. The fact that they were also positioned close to Kuwait meant that they never experienced the supply problems that other Iraqi units did during Desert Shield, or suffered as much from supply problems during the air campaign phase of Desert Storm. They also had

exceptional mobility, with over 2,000 heavy equipment transporters (HETs). Iraq estimated, before the air campaign began, that it could move the three heavy Guard divisions in the KTO to any position within Kuwait in 24 hours.[6]

Table 3.6

Iraqi Division Organization

Type	Regular Army			Republican Guard		
	Armored	Mech.	Infantry	Armored	Mech.	Infantry
Personnel	12,100	12,200	14,100	13,800	13,800	14,300
Tanks	245	175	78	308	220	44
OAFVs	472	544	6	538	622	6
Artillery	114	114	78	144	138	18
Air defense guns	90	90	54	90	90	54
SAMs	50	50	0	50	50	0

Source: Department of Defense Public Affairs press briefing handout, September, 1990

The regular Iraqi Army totaled more than 60 division equivalents by mid-1990. Its basic operational level was the corps, which normally consisted of several divisions and large numbers of support units. Divisions normally consisted of three brigades. The bulk of the regular army divisions were infantry forces -- equipped with 1960's vintage Soviet and PRC-made equipment -- but there were several high quality armored and mechanized divisions. The regular army armored divisions had two armored brigades and one mechanized brigade. The mechanized divisions had two mechanized brigades and one armored brigade. Infantry divisions had three infantry divisions and one tank battalion. Iraqi divisions generally had four artillery battalions and sometimes more. Most brigades had four battalions. The armored brigades had three armored and one mechanized battalion. The mechanized brigades had three mechanized and one tank battalion.[7]

Iraq also had a Popular Army, which had been created in 1971 as a Ba'ath Party militia. This was a highly political force designed to counter any threat from the regular forces, and had poor training and equipment before the Iran-Iraq War. In spite of several efforts to improve the Popular army during the early 1980s, it continued to perform poorly during the Iran-Iraq War -- even when Popular Army units were finally integrated into regular army formations. Some experts estimate this led Iraq to cut the Popular Army to 250,000 by mid-1990, from a wartime high of 650,000. It no longer was integrated into the regular army. The remaining forces consisted largely of Ba'ath party members and it was organized for rear area and internal security missions.[8]

The Iraqi Army was well equipped by third world standards. It had at least 5,700 tanks in January, 1991, and many experts feel the figure was closer to 7,000.[9] Most of these tanks were comparatively low grade T-54s, T-55s, and T-62s. About 20%, however, were T-72s, T-72Ms, and T-72M1s. Some Western experts estimated before the war that the advanced armor on the T-72s was able to defeat the anti-tank round used by the 105mm gun on the M-1 and most other Coalition tanks at ranges of 2,000 meters, and that the T-72M and T-72M1 had 125mm guns that could penetrate the armor of the M-1 and Challenger at ranges of up to 1,000 meters.[10] In addition to its main battle tanks, Iraq had more than 3,000 heavy tank transporters.

Iraq also had at least 3,500 to 4,000 other armored fighting vehicles, and in excess of 11,000 other armored vehicles including APCs and special purpose vehicles. The Iraqi Army had large numbers of anti-tank weapons, including AT-3 Saggers, AT-4 Spigots, SS-11s, Milans, and HOT.

Iraq had one of the largest artillery forces in the world. Its major tube artillery included 3,000 to 5,000 towed and 500 self-propelled weapons. Iraq also had extensive surface-to-surface rocket missile forces. These included a minimum of 24-30 FROG launchers and 100-150 Scud launchers.

The army had more than 500 helicopters, of which around 190 were armed. The armed types included 56 BO-105s with AA-11s and HOT, 40 Mi-24s, 30 SA-316s with AS-12s, 13 SA-321s, some armed with Exocets, and 20 SA-342s armed with machine guns and cannon. The other helicopters included 15 heavy transports, 225 medium transports, and 124 light helicopters.

Iraq had a separate air defense command that cooperated with the air force as part of an integrated air defense system. Most of its equipment was deployed in 972 sites scattered throughout Iraq. By the time Desert Storm, began, there were at least 100 fixed anti-aircraft sites in Kuwait with at least 124 guns and an unknown number of missiles. There also were an additional 167 sites and 442 guns near Basra, and 73 sites and 180 guns in the area at the northern edge of the KTO [11]

Iraq also had many lighter air defense weapons that could be deployed with army units at the corps level or lower. These included some 6,100 mobile anti-aircraft guns, with a number of ZSU-23-4 radar guided self-propelled weapons, and 2,404 towed heavy AA guns ranging from 85mm to 130mm. Iraq also had some 8,000 mobile and man portable surface-to-air missile launchers, including 6,500 SA-7s, SA-8s, 400 SA-9s, 192 SA-13s, 288 SA-14s, and SA-16s, and roughly 100 Roland fire units on self propelled armored vehicles. [12]

The Iraqi Air Force

The exact active strength of the Iraqi Air Force at the time that the war began is a subject of considerable debate. US Government sources reported a much larger inventory of Iraqi combat aircraft during the war than most unofficial sources had reported before the conflict began. It was difficult to make precise estimates of the Iraqi Air Force's operational strength because some many aircraft were either in delivery to units, or in storage, and because of differing ways of counting the aircraft in training and conversion units.

US intelligence has never released a detailed agreed-upon unclassified Iraqi air order of battle for the period just before the war began. The most that it has done is to declassify data on total active manning within the combat air force, and total strength data by time. This estimate indicates a force with 18,000 regulars, and a total of 326 all-weather fighters, 140 visual flight rule (VFR) fighters, 292 fighter bombers, 46 ground attack aircraft, and 15 bombers. This is a total of 819 combat aircraft, less reconnaissance aircraft and attack helicopters.[13] Other estimates indicate that Iraq had 700 to 770 combat aircraft, including fighters, bombers, and armed trainer aircraft. These were supported by 200 other transport and special purpose aircraft, including an Iraqi-built Airborne early warning aircraft derived from a Soviet Il-76 transport.[14]

According to a US Air Force estimate issued after the war, Iraq had the sixth largest air force in the world by the summer of 1990. It had about 40,000 active personnel, including 10,000 air defense personnel. Iraq's aircraft were deployed in 24 major operating bases, and 30 military dispersal fields, with roughly 600 aircraft shelters.[15] Iraq had a total of 123 airfields (air based, reserve fields, and helicopter fields), plus seven bases in Kuwait. The Iraqi Air Force had a large modern military infrastructure, with modern air logistics centers, air depots, maintenance and repair facilities, and some production capabilities.

It is as difficult to be sure of Iraq's holdings of aircraft by type as of its total operational strength. The working estimate in Table 3.7 illustrate a possible order of battle by type which is typical of the various estimates of Iraqi air strength provided in post war estimates. It also illustrates that there are a number of different ways to count Iraqi forces, and that most of Iraq's aircraft did not approach the Coalition forces in quality. It is important to note, however, that most of the pre-war estimates of Iraqi combat aircraft strength issued in unclassified publications before the Gulf War seem to under count deliveries after 1987, and produce totals under 600. Conversely, most estimates during and after the war the maximum total number of Iraqi fixed-wing combat aircraft quoted in the US Air Force Gulf War Air Power Survey is 728:[16]

Iraq's combat aircraft included many different types, most of which were technically inferior to those in Coalition forces. Key types included French Mirage F-1 fighters, the export version of the Soviet MiG-29 Fulcrum interceptor and air superiority fighter, the

"MiG-27" Flogger strike fighter, the MiG-25 Foxbat interceptor, the MiG-23 Flogger fighter-bomber, the MiG-21 Fishbed fighter, the Sukhoi Su-25 Frogfoot ground attack airplane, the Sukhoi Su-24 Fencer long-range strike aircraft range, Tupolev Tu-16 Badger and Tu-22 Blinder bombers, and the Su-7, Su-20, and Su-22 Fitter family of attack fighters. Iraq also had PRC-made H-6 and J-7 aircraft, and Czech L-39 armed trainers.[17]

Although Iraq's overall inventory could not compete in technical quality with that of the US, British, Canadian, French, Italian, and Saudi Air Force contingents, Iraq operated three of the most sophisticated types of combat aircraft in the world: The MiG-29, Su-24, and the Mirage F-1.

Iraq's 64 French made Mirage F-1s were the elite section of the Iraqi Air Force.[18] They carried a wide range of the latest French and Soviet-guided missiles and munitions, and laser-guided air-to-surface weapons. Their pilots were French-trained and had more air-to-air combat training than the pilots that flew the Soviet-made aircraft. The Iraqi Mirage F-1s included Mirage F-1EQs that could be refueled in flight, and that could carry Exocets and other advanced French Air-to-ground missiles. The F-1EQ5s carried a Thompson CSF Atlas laser designator pod which could designate targets for laser-guided bombs at ranges of up to 10 kilometers. Iraq's Mirage F-1s could deliver the Aerospatiale AS-30L laser-guided, bomb which can glide to ranges of 12-15 kilometers, and had been modified to carry the Soviet AS-14 Kedge air-to-ground missile, which has a maximum range of 12 kilometers and used semi-active laser guidance with a active laser fuse.[19]

Iraq was just developing the capability to make effective use of its new types of Soviet fighters. It had just begun to exercise and train its MiG-29 units, and integrate their operations with its "Adnan" airborne warning aircraft. It was also absorbing the Su-24, which had a sophisticated radar warning receiver, an improved electronic warfare suite,terrain avoidance radar, an aerial refueling probe, and the ability to deliver electro-optical, laser, and radar-guided bombs and missiles.[20] Unlike many strike-attack aircraft that the former Soviet Union had delivered to the Third World in the past, the Su-24 could carry the latest Soviet munitions, and payloads of nearly 25,000 pounds, and operate on missions with a 1,300 kilometer radius when carrying 6,600 pounds of fuel. With a more typical 8,818 pound (4,000 kilogram) combat load, it has a mission radius of about 790 kilometers in the LO-LO-LO profiles, and 1,600 kilometers in the LO-HI-LO profile.[21]

Table 3.7

Iraq's Air Order of Battle Before the Gulf War
(includes entire inventory, estimates of operational strength are much lower)

Fixed Wing	
High Quality: Equivalent to Many Coalition Types	
Mirage F-1EQ/EQ4-200/EQ5-200/EQ6-200	64
MiG-29 Fulcrum B	35
MiG-29U Fulcrum C	10
Su-24D Fencer E	48
MiG-25 Foxbat A/E	22
Subtotal: High quality	179
Moderate Quality: Inferior to Most Coalition Types	
MiG-23BN Flogger G	37
MiG-23 Flogger E	23
Su-25 Frogfoot	46
Su-7/20/22 Fitter A/C/D/J/H	150
MiG-23BN Flogger F	50
Tu-22 Blinder A	8
Tu-16/B6D Badger	14
Subtotal: Moderate-High Quality	328
High and Moderate Quality	507
Moderate-Low Quality: Very Inferior to Most Coalition Types	
F-6s, Xian F-7's and unidentified types of MiG-21	91
MiG-21PFM Fishbed F	65
MiG-21MF Fishbed J	30
MiG-21UTI Mongol	20
Subtotal: Moderate-Low Quality	206
Combat Effective in Some Competitive Role	713
Low Quality and Training: Not- Competitive	
MiG-17 Fresco	30
Hawker Hunters (up for sale for several years)	34
MiG-19/F-6 Farmer	30
MiG-15r and MiG-25 Foxbat B	8
Low Quality	102

Total resources	815
Iraqi Air Force Helicopter Inventory	
Hughes-300 / 530 combat helicopters in 1983	60
Hughes-530 combat helicopters in late 1985	26
Mi-8 hip assault transports	40
Mi-24 hind gunships	40

Source: adapted from Dr. Eliot Cohen, *Gulf War Air Power Survey*, Washington, US Air Force, 1993, briefing aids and Dick Palowski, *Changes in Threat Air Combat Doctrine and Force Structure, 24th edition*, Fort Worth, General Dynamics DWIC-01, February, 1992, p. II-361; US Department of Defense, *Conduct of the Persian Gulf War: Final Report*, US Department of Defense, April, 1992, pp. 13-14, and the IISS Military Balance

Any estimate of the organization of the Iraqi Air Force is as uncertain as an estimate of Iraqi force strength, and is complicated by the fact that Iraq relocated and shifted many units during the period between its invasion of Kuwait and the beginning of Desert Storm. The Iraqi Air Force's offensive units seem to have included two bomber squadrons with 7-12 Tu-22 Blinders, and 8-14 Tu-16 Badger (including 4 PRC-made B/H-Ds). It had 22 Fighter-ground attack squadrons: one with 16-48 Su-24s, five with 70-90 MiG-23BM/Ns (24 Flogger E and 50 Flogger F), four with 23-34 Mirage F-1EQ-200s with Exocet and 35 Mirage F-1EQ5s and EQ6s), four with 40-60 Su-25A/Bs, 4 with 70 Su-20/Su-22s, 2 with 30 Su-7s, and 2 with 30 J-6s. According to some reports, it also had up to 40 MiG-27 Flogger Js.[22]

Iraqi air attack forces had considerable combat experience in basic attack missions against an Iranian opponent with minimal air defense capabilities, but had an uncertain mix of capabilities against more advanced opponents. Iraq's bomber units lacked the electronic warfare and low altitude penetration capability necessary to survive against Western air defense. Its Su-24 units were just entering service and had lacked the experience and advanced training to be fully effective. Its Mirage units were relatively well trained, but had no experience in operating against strong air defenses. They lacked the sophisticated electronic warfare equipment necessary to challenge the Coalition's advanced defenses, although Iraq did succeed in some of its jamming efforts.

Iraq's Su-25 units had an A-10-like close air support fighter. The Su-25 aircraft had been refined in response to Soviet experience during the Afghan war, and had a maximum speed of 526 NM/H versus 368 NM/H for the A-10, and the pilot was protected by a titanium shield, by large areas of 5 mm steel between the engines and behind the rear fuel tanks, and by flare dispensers with up to 256 rounds. This gave Iraq an aircraft with considerable capability against armor and ground troops, but also one that could not survive without air superiority. Iraq's MiG-23 units had uncertain readiness and training, and some had relatively poor attack avionics. Its Chinese-supplied J-6s were little more than glorified trainers, and its Soviet-supplied Su-7, Su-20, Su-22 force had very mixed training standards. Only part of the Su-17/20/Su-22 force was really combat effective.

The Iraqi Air Force had 13-17 interceptor squadrons. Its all-weather fighters included some high performance types including approximately 22 MiG-25A/Es, and 35 MiG-29s. Its day fighters included 40 J-7s, and 206 MiG-21s.[23] This gave Iraq a total of around 300 Air defense aircraft. This count, however is somewhat misleading in that a number of Iraq's attack fighters were dual-capable in air defense roles. US experts counted Iraq's potential air defense assets as including 159 all-weather air defense fighters (35 MiG-29, 64 Mirage F-1EQ, 37 MiG-23G, 22 MiG-25A/E), and 246 day/visual flight rules (206

MiG-21 and 40 MiG-23E). These aircraft were normally based at main operating air bases such as H-3, H-2, Al-Asad and Al-Taqaddum in the West; Qayyarah West, Tall Afar, Mosul, and Kirkuk in the north; Balad, Rasheed, Shayka Mazar, and Al-Jarah in the center-east; and Kut Al-Hayy, Talil, Jalibah, and Shaibah in the south.[24]

Iraq's air defense units often had lower training and readiness than its attack units, but the units with newer aircraft had readiness rates of around 60% to 80%.[25] Their pilots had little combat experience from the Iran-Iraq War because Iran rarely challenged Iraqi air defenses after the first years of the war. Training standards were often low, although they were relatively high for the Mirage F-1 units. Iraq was attempting to improve its fighter performance by establishing training links to Jordan. This allowed some Iraqi pilots to fly missions near the Israeli border, as well as cooperate in limited reconnaissance missions.[26]

Many of Iraq's Soviet-made air defense aircraft had limited radar and electronic warfare capabilities by Western standards, although some had good infra-red countermeasures. Reports before the war that France had sold Iraqi electronic warfare equipment capable of jamming advanced Western aircraft were denied at the time, and no evidence surfaced of such capabilities during the war.[27] Most Iraqi aircraft were vulnerable to allied jamming, and to the superior radars and missiles on aircraft like the F-15. Further, while Iraq's training of some of its air units was adequate by Third World standards, its units had nothing approaching the kind of all-weather, night, and computerized air combat training available to NATO forces.

Iraqi fighters were highly dependent on the ability to receive data from ground-controlled intercept (GCI) stations to locate attacking aircraft, and had no training in fighting effectively as an air force once these stations were put out of action during the first days of the war. In fact, some experts feel that Russia concluded that attempts to provide battle management for air defense forces using GCI techniques are obsolete as a result of the Gulf War. The evidence the Soviets drew such a lesson is, however, uncertain. Soviet experts were highly critical of Iraq's ability to use its fighters, surface-to-air missiles and C^4/BM assets long before the Gulf War. Soviet advisors in Baghdad were often outspoken critics of Iraq's offensive and defensive tactics, when they talked to Western attaches during the Iran-Iraq War, and there is considerable evidence that the Soviets had seen the limits of a GCI dependent system in providing tactical control for advanced air defense fighter as early as the 1982 conflict between Israel and Syria.[28]

Iraq had one reconnaissance squadron with 5 MiG-21s and 7-8 MiG-25s, two types of Soviet-made remotely piloted vehicles (RPVs), and developmental versions of two Iraqi-built RPVs called the Al-Yamamah-A, a multi-mission RPV carrying daylight and infra-red cameras. It also had Sarab-3, a modification of the British TTL-3 Banshee target drone.

These reconnaissance assets were largely useless against the UN Coalition. They were far too limited in scale to cover the rapidly changing coalition forces, could not penetrate its defended air space, and were tied to a slow and cumbersome photo processing system that took far too long to process reconnaissance information. Iraqi reconnaissance units also generally had major problems in routing such information to the proper user even during the Iran-Iraq War when the Iraqi command and control system was fully intact. As a result, Iraqi forces were "blind" in comparison with the highly sophisticated mix of airborne and space reconnaissance systems available to the Coalition forces.

Iraq had recognized many of these defects during the Iran-Iraq War, and was trying to correct them when the Gulf War began. One example of such efforts was the Il-76 candid that Iraq modified to act as an "Adnan" AEW aircraft. The first such aircraft was called the Baghdad-1 and had its rear cargo ramp replaced by a GRC radome with an Iraqi-modified version of the French Thompson CSF Tiger surveillance radar. The radome had a 9 meter (30 foot) diameter dome that rose about 43 meters (13 feet) above the fuselage and the candid. The rotating mechanism and radar were integrated into the aircraft in Iraq. The radar's signal processing was modified to remove ground clutter. Electronic support measures (ESM) were also installed, along with an improved radio navigation system.

Iraq claimed that the Adnan could track targets out to 350 kilometers, and had a real time down-link using direct data transfer or voice. Coverage was said to exceed 180 degrees. The Adnan was used in the last stages of the Iran-Iraq War, and an improved version called the Baghdad 2, with direct fighter air control capabilities, was in development before the war began. It is important to note, however, that the Adnan had far less coverage and electronic warfare capabilities than the E-3A airborne warning and air control system (AWACS), flown by the Coalition, and had no real chance of survival against a Western-type air force.[29]

The Iraqi Air Force was also seeking major improvements in its mix of aircraft. Iraq recognized the superiority of Western fighters during the Iran-Iraq War, and sought the Mirage 2000 as a follow-on to its Mirage F-1s. At one point, it announced its intention to buy 54 Mirage 2000s fighter-bombers equipped with Matra Electronic countermeasure pods, with an option to buy 12 more. Baghdad also discussed plans to build a coproduction facility in Iraq, and eventually to buy over 100 Mirage 2000 aircraft.

Iraq had been unable to finance such purchases, however, because of its failure to meet the payment schedule on its existing arms debt to France -- which totaled nearly $6 billion.[30] As a result, Iraq was examining the purchase of additional MiG-29s, Su-24s, and advanced Soviet attack aircraft like the MiG-27 at the time it invaded Kuwait. Iraq was also considering orders of Alphajet trainers assembled in Egypt. It already had 80 Brazilian

EMB-212 Tucano trainers, was considering co-producing the Tucano in Iraq -- and had ordered Astros II multiple rocket launchers, Piranha air-to-air missiles, SS-30 and SS-60 rockets, and APCs from Brazil. It did, however, have the same financing problems with these orders that it had with France. Iraq owed Brazil at least $120 million for past purchases when the war began.[31]

Acquiring the Mirage 2000s might have made a difference in the outcome of the Gulf War, at least in terms of raising Coalition losses, but only if Iraq had had several years to absorb the new aircraft. In fact, the Iraqi Air Force's constant purchases of new aircraft and munitions had contributed to its qualitative problems by forcing it to constantly retrain and reorganize its forces. Many units were continually in the process of conversion to new aircraft, tactics, and munitions when the war began. This meant limited flying and training time for an Iraqi Air Force with which was poorly organized to train its pilots, even without such problems. Expansion of the force meant shortages of skilled pilots and ground crews, and created growing problems in trying to support so many different types and models of aircraft.

Iraq also had a major maintenance and sustainability problem. Something like a third of Iraq's total air combat strength had limited operational capability when the Gulf War began, and at least another third had relatively low operational standards and poor sustainability. Further, Iraq's use of so many different types of aircraft presented serious problems in redeploying air from base to base, and in many cases, given bases could only support a few types of aircraft.

At the same time, Iraq had some important advantages over many Third World Forces. Unlike many Middle Eastern air forces, Iraq was able to obtain a wide range of modern air ordnance from the West, and the Soviet bloc. Its air-to-air missile inventory included Soviet-made AA-2s, AA-6s, AA-7s, and AA-8s. Its French-made inventory included R-530s and R-550 Magics. Iraqi inventories of air-to-surface missiles included French-made As-30 laser-guided bombs, Soviet-made X29L laser-guided missiles, Thompson CSF Atlis laser designators, Armatts, Am-39 Exocets, electro-optical guided missiles, and up to three types of cluster bombs. It included AS-4 Kitchen and AS-5 Kelt long-range air-to-ship missiles, AS-14 Kedge air-to-ground missiles, and possibly an air-launched version of the PRC-made C-801 anti-ship missile. Iraq had large stocks of napalm, crude binary chemical bombs, bomblet dispensers, and some fuel-air explosive (FAE) weapons. Iraq exhibited 9,000 kilogram bombs for its Tu-16s, with up to 8,800 pounds worth of TNT. These have impact, proximity, and air burst fuses, and were developed for attacks on rear-echelon forces.[32]

The effectiveness of these munitions, however, depended on Iraq's ability to compete in air combat and electronic warfare, and penetrate enemy defensives without encountering effective land-based air defenses. In practice, the combination of the E-3A and F-15 gave the Coalition a decisive advantage in command and control, radar range and target characterization, and beyond-visual-range combat.

As has been discussed earlier, the Iraqi Army air corps added at least 160 combat helicopters to Iraq's air strength, including 40-45 Mi-24 Hind with the AT-2 Swatter, 20-50 SA-342 Gazelle (some with HOT), 56 Bo-105 with SS-11 and HOT, 30 SA-316B Alouette III with As-12, and 10-13 SA-321 Super Frelons. Some of the Super Frelons were equipped with Am-38 Exocet, and others with AS-12 missiles.

Once again, however, training was of uncertain quality. Many pilots acquired reasonable proficiency in attack missions during the Iran-Iraq War, but comparatively few learned to fly the complex attack and exit maneuvers, and nap of the earth the low altitude flight techniques, needed to survive against a sophisticated enemy. Like the Iraqi Air Force, the helicopter pilots were often easy to target, and had no experience in flying against a force equipped with advanced look-down/shoot-down radars and electronic warfare assets.

Iraq's transport aircraft included two squadrons with 10 An-12s, six An-24s, two An-26s, 19 Il-76s, 19 Il-14s, and one DH Heron. Iraq had been using the Il-76 as a tanker since 1985, and had modified some of its MiG-23BNs (Flogger Hs) for airborne refueling by using the same system as on its Mirage F-1EQs.[33] The Iraqi Air Force had large reserves of training aircraft, including MiG-15s, MiG-21s, MiG-23Us, 2 Tu-22s, 16 Mirage F-1BQs, 50 PC-7s, and 21 EMB-312s.

Iraq's air base and logistic system was excellent by regional standards. The air force operated from 24 main operating bases and 30 dispersal bases. The main operating bases were well designed and built, and were constructed to withstand conventional attack. Iraq could shelter nearly all its aircraft. Many bases had multiple taxiways with multiple runways. New underground shelters based on Warsaw Pact models had been built by Yugoslav contractors at the main operating bases near Basra, Kirkuk, Mosul, Rashid, H-3, Shaiba, Habbaniya, and other bases, and to standards believed be capable of withstanding air bursts from nuclear attacks. Iraq had structured its highway system to provide dispersal bases, had deployed runway repair kits, and provided large numbers of surface-to-air missiles and anti-aircraft guns to defend each base.[34] The weaknesses in this system were that it depended on (a) the survival of the Iraqi command, control, and warning system to use the sheltered aircraft, (b) effective surviving air defenses to cover the bases against sustained attack, and (c) the shelters proved vulnerable to the earth penetrating weapons that the US deployed in the final weeks before the air war.

Iraq's Land Based Air Defenses

Iraq's land-based air defenses had been extensively reorganized after Israel's Osirak raid in 1981. A network of radars, surface-to-air missiles, and anti-aircraft guns surrounded strategic and industrial areas, particularly in the Baghdad area. A French-supplied C^4 system called the KARI (Iraq spelled backwards in French) was completed in 1986-1987, but it was never really tested during the Iran-Iraq War.

The National Air Defense Operations Center (ADOC) in Baghdad controlled Iraq's air defenses. The ADOC maintained the overall air picture and established priorities for air defense engagements. There were five Sector Operations Centers (SOCs) covering the north, west, center-east, south-east and far south. Each was subordinate to the ADOC, and controlled air defense operations in a specific geographic area. The ADOC and SOCs controlled large numbers of ground-based weapons systems and extensive C^4I assets. There were also a large number of Intercept Operations Centers (IOCs) to provide local air defense control. These had headquarters at Ar-Rutbah, H-1, and H-3 in the West; Mosul and Qayyarah in the north, Al-Taqaddum, Salman Pak, Al-Jarrah, An-Najf, and An-Nukhayb in the center-east; and Al-Amrah, As-Salman and Az-Zubayr in the southeast; and Al-Jahrah in the far south.

The Iraqi system, however, was a mix of technologies from different nations with uncertain integration. Although part of Iraq's air defense system was French-supplied, Iraq patterned its overall air defense network and operations on Soviet models. It also concentrated its coverage around Baghdad, Basra, and key military and strategic targets. This left many areas uncovered, particularly in southern Iraq, and along air corridors striking north across the Saudi and Kuwait borders.

It had the fundamental flaw that the SOCs could not communicate effectively once the ADOC was destroyed or deactivated. This meant that the Coalition could attack and/overwhelm each sector in isolation from the others. Further, the destruction of a given SOC effectively opened up a corridor that could be used to attack the entire country. While it may not be a general lesson of the war, such design defects and vulnerabilities are common in Third World air defense systems, and almost universal in systems dependent on Soviet or PRC surface-to-air missiles, sensors, and electronics.

There were other problems. Iraq had created a strongly inter-netted, redundant, and layered air defense system that including a wide variety of radars, hardened and buried command and control sites, interceptors, surface-to-air missiles, and anti-aircraft artillery. In practice, however, much of the communications, data processing, and software were inferior. [35]

Even so, Iraq's air defense forces were formidable in some respects. According to one US estimate, Iraq had a total of 16,000 radar-guided and heat seeking surface-to-air missiles, including missiles for the large numbers of lighter army systems described earlier, and smaller numbers of missiles for the heavier SA-2s, SA-3s, and SA-6s. These heavier surface-to-air defense missiles were operated by an air defense force, organized into air defense units that were part of the Iraqi Army, but operationally tied to the Air Force.

Iraq had approximately 137-154 medium surface-to-air missile sites and complexes in Iraq and 20-21 in Kuwait, and 18 major surface-to-air missile support facilities.[36] These included 20-30 operational SA-2 batteries with 160 launch units, 25-50 SA-3 batteries with 140 launch units, and 36-55 SA-6 batteries with well over 100 fire units. Iraq claimed to have modified the SA-2 missile to use an infra-red terminal seeker, to supplement the SA-2's normal radio command guidance system, but it is unclear that such systems were actually deployed. All of these systems could still be fired on a target of opportunity basis. Iraq's medium surface-to-air defense sites in Iraq were also a threat to a modern air force. They were widely dispersed, often did not require the used of radar, and could be fired on a target of opportunity basis. The missiles on the sites in Iraq included at least 20 SA-8 batteries with 30-40 fire units, 60-100 SA-9 fire units, and some SA-13s, and 50 to 66 Rolands.[37]

To put this level of air defense strength in perspective, Baghdad had more dense air defenses at the start of the Gulf War than any city in Eastern Europe, and had more than seven times the total surface-to-air missile launcher strength deployed in Hanoi during the height of the Vietnam war. The US Department of Defense released a highly detailed Post-War estimate of Iraq's land-based air defense at the time that the Gulf War began that credited Iraq with 3,679 major missiles, not including 6,500 SA-7s, 400 SA-9s, 192 SA-13s, and 288 SA-14s. It indicated that Iraq had 972 anti-aircraft artillery sites, 2,404 fixed anti-aircraft guns, and 6,100 mobile anti-aircraft guns. The details of these deployments by region are shown in Table 3.8 below, and Iraq's surviving deployments reflect the same basic concentrations of air defense weapons.

Separate US estimates indicate that Iraq had extensive numbers of crew/vehicle deployed SA-9s and SA-13s, and man-portable SA-14s, and SA-16s, dispersed throughout the KTO. They also indicate that Iraq had deployed more than 3,700 anti-aircraft guns in the KTO with barrels larger than 14.5 mm, and that these AA guns were supplemented by more than 10,000 12.7 mm. guns in the ground forces in the KTO that could be used in some form of anti-aircraft role. While such weapons lacked accuracy, range, and high lethality, they could be deployed to expose aircraft flying under 12,000-15,000 feet to substantial cumulative risk.[38]

Table 3.8

Deployment of Iraq's Air Defense Weapons Before the Gulf War

Type	Mosul/Kirkuk	Baghdad	H-2/H-3	Talil/Jalibah	Al Basra	Total
Missiles 122	552	90	10	118	892	
Anti-aircraft sites	39	380	138	73	167	455
Guns	110	1,267	281	180	442	2,280
SA-2	1	10	1	1	2	15
SA-3	12	16	0	0	0	28
SA-6	0	8	6	0	8	22
SA-8	1	15	0	0	0	16
Roland	2	9	6	2	5	24
ZSU-23- 4	0	8	0	0	5	13
S-60	8	10	3	2	14	37

Source: US Department of Defense, The Conduct of the Persian Gulf War: Final Report, Washington, Department of Defense, April, 1992, p. 241. Note that other sources in the same data base produce different numbers.

Many of the individual surface-to-air missile, anti-aircraft gun, and command and control units in the Iraqi system, however, had low operational readiness and proficiency. System-wide and unit-level electronic warfare capability was good by Third World standards, but was scarcely competitive with that of the US. Iraq's overall sensor/battle management system remained poor, their training failed to deal with saturation and advanced countermeasure attacks, and was not realistic in dealing with more conventional penetrations by advanced attack aircraft. This was demonstrated all too clearly when Iraqi guns and missiles shot down an Egyptian Alphajet flying to an arms show in Baghdad in April, 1989, even though it flew along a pre-announced flight corridor at the scheduled time.[39] Iraq still could not keep its land-based air control and warning and C^4I systems operational 24 hours a day.

The Iraqi Navy

Iraq's navy has never been strong or effective. It played only a negligible role in the Iran-Iraq War. While the Iraqi Navy operated in local waters in the northern Gulf during the Iran-Iraq War, it acquired little real combat experience. Iraq's smaller ships occasionally attacked Iran's Khor Musa convoys, and mined some of the Iranian waters in the Upper Gulf. Most of Iraq's warships were kept trapped in port by Iran's air and naval forces during 1980-1987, while the rest were kept in port by Iran's mining and blocking of the Shatt al-Arab. The Iranian Navy dominated the Gulf until the Western intervention to protect Tanker traffic in 1987.

Ironically, Iraq had deliberately allowed its navy to run down in the period before the Iran-Iraq War because it was planning a massive order of four missile frigates, six missile Corvettes, an underway replenishment ship, a floating dry-dock, and naval helicopters to build-up to a strength that could directly rival Iran. As a result, it had not sought to modernize its missile patrol boats or other systems from the Soviet bloc, and had made little effort to use its existing ships to develop a Navy that was combat ready.

Iraq negotiated its orders for the frigates, corvettes, and support vessels with Italy in February, 1981, but Italy then declared an embargo on the delivery of combat vessels. Iraq only obtained possession of the underway replenishment ship and the dry-dock, which were unable to proceed further than Alexandria because of the threat posed by the Iranian navy. In any case, neither ship would have helped Iraq. The *Agnadeen* was a 8,706 ton Stromboli-class ship, capable of simultaneously supplying two combat ships while underway, although its value depended on the delivery of the frigates and corvettes. The same was true of the dry-dock. [40]

In short, the Iraqi Navy had virtually no opportunity to develop a significant open water capability before the Iran-Iraq War, and then remained largely inactive for the next eight years. When the Iran-Iraq War ended, the Iraqi Navy still had to wait for the delivery of the Italian ships, and combat helicopters with Anti-ship missiles. It was unable to take advantage of the time between the cease-fire and the beginning of a new conflict.

The Promise of the "Revolution in Military Affairs": US Forces and Capabilities and the Lesson of the "AirLand Battle"

By mid-January, 1991 the Coalition included troops from 31 countries, and military forces of some kind from 38 countries. According to US estimates, it had a total of 540,000 troops in theater, and 1,736 combat aircraft from 12 Coalition countries, plus 60 B-52s waiting outside the theater. Its naval forces included six carrier battle groups, two battleships, several submarines with cruise missiles, and an amphibious force with 17,000 US Marines -- the largest amphibious task force since the Korean War.

At the same time, the key military "culture" shaping the capabilities of the Coalition was clearly the United States. The strength of the US forces deployed during Desert Shield and Desert Storm is shown in Table 3.9, and the data in this table illustrate several important aspects of the US forces involved in the Gulf War. It shows how long it took to build-up US forces during Desert Shield, and reveals that US forces were still deploying in January and February, 1991. It also provides a good overview of the complexity of US forces, and the amount of specialized equipment that the US deployed.

More broadly, Table 3.6 shows the reliance that the US placed on combined operations, and on linking together its different military services to fight the "AirLand battle". There has been a tendency in some histories of the Gulf War to focus on "shooters" to the exclusion of command and control and support systems, and to emphasize US Air Force and US Army capabilities while paying less attention to the capabilities of the US Navy and Marine Corps. Table 3.9 shows that US Navy and Marine Corps forces were used in large numbers, and played a critical role during Desert Shield. It also shows the importance of US Army aviation -- another force whose role is sometimes understated.

The Unique Character of US Forces

A number of other Coalition air forces contributed highly effective combat units to Desert Storm -- including the forces of Britain, Canada, France, Italy and Saudi Arabia. Table 3.9 shows, however, that the US Air Force and US Navy were unique in being able to deploy a wide mix of specialized, high technology, intelligence, reconnaissance, electronic warfare, battle management, maritime surveillance, and air-control and warning aircraft.

Equally important, it shows that the US was the only country with a mix of naval and air assets capable of sustained power projection. No other country had carrier or amphibious forces capable of operating near a hostile power with the force strength and technical sophistication of Iraq. No other power had the mix of strategic airlift, refueling capability, and the strategic prepositioning ships and sealift necessary to deploy and sustain major combat formations on anything approaching the same scale.

US forces were also the only Coalition forces that were organized and trained to make extensive use of "space warfare," and able to draw on a wide range of space-based systems. These satellites included classified multi-spectral imagery, electronic intelligence, and communications intelligence satellites, and a wide range of unclassified systems like the Global Positioning System (GPS) navigation satellites, the Defense Meteorological Satellite Program (DMSP) weather forecasting satellites, the NOAA Television and Infrared Observation Satellites (TIROS) and the US land satellite (LANDSAT) for multi-spectral imagery, the Defense Support Program (DSP), missile detection satellites, the Defense Satellite Communication System (DSCS), and US Navy Ultra-high frequency Satellite Communications System (USCS). The only other major allied space-based asset used during the Gulf War was the French Satellite Probatoire d'Observation de la Terre (SPOT), a relatively low resolution multi-spectral imagery system.[41]

These assets helped give the US had a unique ability to manage extremely high tempos of warfare, obtain intelligence, sustain communications, and execute very complex air operations and combined operations. The impact of these unique characteristics on the fighting during Desert Storm is an important factor or "lesson" of the Gulf War. No other power, not even Russia, could have deployed the same mix of technologies. The unique nature of US capabilities is also a warning that simply ensuring some kind of "Western" presence in a peace keeping or military operation does not in any sense guarantee the ability to execute many of the operations that the Coalition executed in Desert Storm. They are also a warning that future coalition warfare and cooperative security are likely to involve significant problems -- in direct proportion to the required complexity of combat -- unless the forces involved have previously trained to become interoperable at the required level of sophistication, or have ample time to reorganize and retrain before combat begins.

The Problem of Interoperability

These assets not only gave US forces a different character from those of the other forces engaged in the Gulf War, they affected interoperability. While a number of other members of the Coalition could take extensive advantage of these assets, Britain was the only other member of the Coalition whose air force, armored forces, and navy was able to achieve something approaching full interoperability with the US forces. Saudi and Egyptian

forces had held many joint exercises with the US, but they were not organized and trained to operate at the same level of technical sophistication, or at the tempos of combat that US battle management technology made possible. France had highly capable air and naval systems, but could not deploy the kind of heavy armored forces needed to operate with US heavy divisions, and French forces had not exercised with US forces to the point of being able to utilize US battle management systems to allocate combat aircraft quickly and flexibly in the kind of dense air combat environment that took place during Desert Storm.

Even British forces had some problems in interoperability with US forces. The British armored division employed during Desert Storm only had a total of 117 tanks in its active strength on January 1, and a maximum of 176 tanks in theater when the land campaign began. This is about 50% of the tank strength of a US armored division. The British division was also comparatively light in terms of artillery, and other armored fighting vehicles. It could fight effectively alongside of the US heavy forces, and it did so. At the same time, it could not sustain itself over the same distances, and at the same tempo of maneuver as the US forces.

The RAF is one of the best trained air forces in the world, but it entered Desert Storm with the technical limitations enforced by more than a decade of severe funding constraints. These limitations affected the capability of the Tornado -- the key RAF aircraft employed during the war -- to carry out air attacks at stand-off ranges from short-ranged air defenses, as well as the RAF ability to fly complex missions involving electronic warfare and air-borne battle management assets.

The RAF also faced problems in carrying out joint air operations with the US, similar to those that affected the US Navy in cooperating with the US Air Force. Both the RAF and the US Navy used somewhat different mission planning and command, control, and communications systems than the US Air Force. These were not critical in many contingencies, where each service would be operating in different areas, but were important in Desert Storm, where all had to operate over the same comparatively small theater of operations.

Similarly, the Saudi Air Force had extensive experience in working with the US using the E-3A AWACS, and was able to conduct highly effective air defense operations, particularly over Saudi Arabia. It was not, however, trained to operate as effectively in offensive air operations, particularly in the extremely dense operating environment that occurred over the Kuwaiti Theater of Operations, where more than 600 aircraft sometimes operated in the same small area.

There is no doubt that interoperability problems would have been much greater if the US had not conducted joint exercises with its major allies in the region, and if Western

forces had not learned to work together in NATO. There is also no question that they would have been much greater if (a) the Coalition command had not been dominated and controlled by US commanders who knew how to exploit unique US assets, (b) there had not been five and one-half months to retrain, reorganize, and deploy the Coalition forces to minimize the problems of interoperability, (c) the friction between various national commanders had not been unusually low, (d) Saudi Arabia and the other southern Gulf states had not been able to offer basing and logistic support that compensated for the lack of sustainability in other Western forces, and (e) the individual countries deploying from outside the area had not had time in which to make use of commercial charters to bring in supplies and support assets that could not be rapidly deployed in peacetime.

By the time Desert Storm began, The Coalition made considerable progress in resolving many of these interoperability problems, and minimized the impact of the remaining problems by working command and control systems, air force assignments, and corps boundaries. This experience, however, is another lesson of the conflict. Interoperability will never be perfect, but effective coalition warfare requires extensive joint training and adaptation. This is particularly true when the forces in a coalition have major asymmetries in training and technology.

Table 3.9

The Growth of the US Forces for Desert Storm - Part One

Force Element	1 Sept 90	1 Oct 90	1 Nov 90	1 Dec 90	1 Jan 91	Peak*
US Air Force						
Personnel	17,752	31,607	31,456	31,194	39,927	54,468
A-10 attack	48	96	96	102	120	146
AC-130 gunship	0	5	5	4	4	8
B-52 bomber	20	20	20	20	20	66
F-4G Wild Weasel	24	36	36	36	48	49
F-15C fighter	48	72	72	72	96	96
F-15E bomber-attack	24	23	24	24	46	48
F-16 fighter attack	46	120	120	120	168	215
F-111F bomber	18	32	32	52	64	66
F-117A stealth bomber	0	18	18	18	36	42
Major combat	228	422	423	448	602	736
E-3 AWACS	5	6	6	6	7	11
EC-130E ABCCC	6	6	6	6	6	6
EC-130 (CC) electronic combat	5	5	5	5	5	5
EF-111 electronic combat	10	14	14	14	18	20
EC-135 electronic combat	0	0	0	0	0	2
RC-135 reconnaissance	4	4	4	4	4	4
RF-4C reconnaissance	6	6	6	6	6	18
TR-1A reconnaissance	2	2	2	2	4	6
U-2 reconnaissance	2	2	3	3	3	6
JSTARS surveillance & control	0	0	0	0	2	5
Total C^4I	40	45	46	46	55	83
EC-130 (VS) special operations	2	2	2	2	2	2
MC-130 special operations	4	4	4	4	4	4
MH-53 special operations	4	8	8	8	8	17
MH-60 special operations	0	8	8	8	8	8
HC-130 special operations	4	4	4	4	4	4
Special operations	10	26	26	26	26	35
Total combat	278	493	495	520	683	854
KC-10 aerial refueling	0	6	6	6	6	30
KC-135Q aerial refueling	79	94	114	115	164	202
C-130 tactical airlift	66	95	96	96	96	151
C-20 tactical airlift	6	8	8	8	8	13
C-21 tactical airlift	4	8	8	8	8	8
C-28 tactical airlift	0	8	8	8	8	4
Combat support	155	219	240	241	290	408
Total	433	712	735	761	973	1262

* Peak includes highest level of operational deployment during Desert Storm.

Source: Adapted by the author from Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 18, 27-28, 35-37, 40-41, 51, 53, 55-56.

Table 3.9

The Growth of the US Forces for Desert Storm - Part Two

US Army		1 Sept 90	1 Oct 90	1 Nov 90	1 Dec 90	1 Jan 91	Peak*[42]
Personnel		24,999	65,374	115,630	133,248	204,286	304,648
M-60 tank		-	9	9	9	9	0
M-1 tank		118	232	580	580	235	124
M-1A1 tank		-	-	123	123	594	1,834
Tanks	118	241	712	712	838	1,958	
ITV		10	88	125	125	127	-
M-551 AFV		43	43	51	51	57	57
LAV AFV		10	11	11	11	11	-
M-2 IFV	56	162	330	327	328	1,101	
M-3 IFV	16	57	286	272	394	592	
M-113A2 APC		68	367	762	762	762	-
Other Armored Vehicles		203	728	1565	1548	1679	-
TOW ATGM Launcher		169	290	386	404	468	-
105mm Arty		54	110	110	110	108	-
155mm Towed Arty		-	66	66	72	72	-
155mm SP Arty		11	72	196	216	288	-
203mm SP Arty		-	-	48	48	48	-
MLRS Rocket Launcher		13	37	63	63	90	189
ATACM Missile Launcher		-	9	9	18	18	18
Arty Weapons	78	220	492	527	624	-	
VULCAN AA		-	58	105	135	135	-
Pattiot SAM Launcher		7	21	45	60	92	132
M-728 CEV		-	-	-	-	12	55
AVLB bridge		-	-	-	-	54	110
AH-64 attack		46	109	144	144	189	245
AH-1S attack		4	48	82	86	112	141
Attack Helicopters		50	157	226	230	301	386
UH-60		56	154	205	205	279	303
UH-1H		4	35	127	127	169	197
OH-58C	40	118	175	178	257	324	
OH-58D	21	41	56	59	79	97	
CH-47		-	449	83	84	99	127
MH-47		-	-	-	-	-	4
UN-60V	-	-	-	-	-	64	
EH-60		-	-	-	-	-	27
UN-1V		-	-	-	-	-	115
Helicopters		171	954	872	883	1184	1644

* Peak includes highest level of operational deployment, include aircraft afloat, during Desert Storm.

Source: Adapted by the author from Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 18, 27-28, 35-37, 40-41, 51, 53, 55-56.

Table 3.9

The Growth of the US Forces for Desert Storm - Part Three

Force Element	1 Sept 90	1 Oct 90	1 Nov 90	1 Dec 90	1 Jan 91	Peak* [43]
US Marine Corps						
Total Personnel	18,776	40,526	41,783	39,085	60,348	92,538
M-60/M-60A1/M-60A3/M1A1	42	140	145	145	225	-
LAV-AT armored vehicle	8	30	30	28	34	54
LAV armored vehicle	19	149	149	163	220	296
AAV Assault Amphibious Vehicle	92	301	300	320	492	532
Other Armored Vehicles	119	480	479	511	746	882
TOW ATGM Launcher	57	306	280	272	470	-
105mm Arty	-	4	4	-	4	-
155mm Towed Arty	28	90	90	86	132	-
155mm SP Arty	0	6	6	6	12	-
203mm Arty	0	6	6	6	12	-
Arty	28	106	106	98	160	-
Hawk SAM launchers	8	16	16	16	16	-
M-9 armored combat earth mover	-	-	-	-	6	-
AVLB bridge	-	-	-	-	4	-
F/A-18 fighter attack	48	48	48	48	72	78
AV-8B attack	40	60	60	60	81	84
OV-10 surveillance & control	0	8	8	8	8	19
EA-6 electronic combat	12	12	12	12	12	12
A-6 bomber	9	10	10	10	20	20
Combat Fixed Wing	109	138	138	138	193	213
KC-130 tanker	6	8	8	8	12	15
AH-1W/T/J attack	34	45	47	43	43	75
CH-46 transport	15	60	60	48	72	120
UH-1 utility	18	28	26	24	36	50
CH-53-D transport	12	20	20	20	20	29
CH-53E transport8	35	35	29	33	48	
Helicopters	87	188	188	164	204	322

* Peak includes highest level of operational deployment, include aircraft afloat, during Desert Storm.

Source: Adapted by the author from Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 18, 27-28, 35-37, 40-41, 51, 53, 55-56.

Table 3.9

The Growth of the US Forces for Desert Storm - Part Four

Force Element	1 Sept 90	1 Oct 90	1 Nov 90	1 Dec 90	1 Jan 91	Peak*
US Navy						
Total Personnel	19,940	34,163	36,467	33,190	33,161	83,278
Carriers	2	2	3	3	2	6
Battleships	1	1	1	2	2	2
Guided Missile Cruisers	2	4	8	7	5	11
Cruisers 3	2	4	2	1	1	
Guided Missile Destroyers	2	1	2	1	1	2
Guided Missile Frigates	4	3	4	3	3	7
Major combat	14	13	22	18	14	29
Amphibious Command	1	1	1	1	1	1
Amphibious Assault	0	4	4	3	3	7
Amphibious	1	5	5	4	4	8
Ocean Minesweepers	0	3	3	3	3	3
Mine Countermeasures	1	1	1	1	1	1
Mine	1	4	4	4	4	4
F-14 fighter intercept	56	76	76	76	76	109
F/A-18 fighter attack	58	58	58	88	88	89
A-7E fighter attack	0	24	24	24	24	24
A-6E bomber	35	48	48	62	62	96
KA-6D tanker	8	12	12	16	16	16
EA-6B electronic combat	12	17	17	21	21	29
E-2C surveillance and control	12	17	17	21	21	29
S-3A/B reconnaissance	23	31	31	31	31	43
Combat aircraft 204	283	283	339	339	435	
C-2A airlift	0	0	0	2	2	2
USCENTCOM HQ	542	746	725	768	897	1,138
Joint Chiefs Special Element	-	220	182	174	184	307
US Special Operations Command, Central Command (SOCOCENT HQ)	797	3,017	2,911	2,940	2,951	5,123
Total Personnel	82,806	175,653	229,154	240,599	341,754	541,376

* Peak includes highest level of operational deployment, include aircraft afloat, during Desert Storm.

Source: Adapted by the author from Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 18, 27-28, 35-37, 40-41, 51, 53, 55-56; various sections in Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 115-116, and in Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992.

The "New" US Military

Another striking aspect of the US forces listed in Table 3.9 is that they were the product of nearly two decades of a massive effort to restructure the forces that had fought in Vietnam. There is no agreement within the US as to how to describe such changes, and even official publications by the US military services emphasize different factors and use different terms. However, the cumulative impact of such changes has been so great that many US officers and military analysts have begun to call it a " revolution in military affairs":

The major changes involved are summarized in Table 3.10. They make an impressive comparison to the weaknesses in Iraqi forces shown in Table 3.2, although there are obvious limits to any such comparison. It is clear that the US forces were strong in virtually every area where the Iraqi forces were weak, although there is no way to establish the degree of relative capability in any specific area. At the same time, some of these same differences existed between US forces and those of other members of the Coalition. Further, the path to the reforms and changes in US forces shown in Table 3.10 was anything but smooth, and was highly resource dependent.

Any effort to trace the history of the changes in US forces necessarily over-simplifies an extremely complex process. At the same time, neither the lessons of Desert Storm -- nor its outcome -- can be understood without a brief summary of the key events that reshaped the US forces from the time of Vietnam to Iraq's invasion of Kuwait.[44]

There were many seeds to the Post-Vietnam reform of US military forces. One example was the efforts of the US Naval Systems Command in restructuring the training of US Navy pilots in air-to-air combat in 1968 -- after the US only achieved a 2:1 kill ratio relative to the North Vietnamese fighters. As the result of studies and reports by Captain Frank Ault, the US Navy restructured its entire doctrine of air-combat to take account of unrealistic air combat training, unrealistic testing and evaluation of air-to-air missiles, and unrealistic air tactics and rules of engagement. The US Navy revolutionized its air combat training during 1969-1972 by creating the "Top Gun" program, with a new elite group of pilots who trained against aggressor squadrons that directly simulated North Vietnamese tactics.

This shift to high technology air combat training that taught pilots how to realistically employ technology, and target the enemies specific capabilities through demanding, computerized, simulated air combat, raised the Navy's air-to-air combat advantage from 2:1 at the start of Vietnam, to nearly 12:1.[45] It also helped lead the US Air Force to establish its own aggressor squadrons in 1972, although US Air Force fighter units

often finished the Vietnam war flying the same faulty tactics that made them unnecessarily vulnerable to the enemy.[46]

The Air Force then surpassed the Navy, however, by expanding its air combat training program from realistic training in small unit air-to-air combat to large scale air combat training in the form of what were called "Red Flag" exercises. These exercises were started at the suggestion of Lt. Colonel Richard M. Moody, and came to involve mass strike packages of the kind involved in a large scale air war, and integrated air combat operations. They also involved flying against simulated ground to air defenses and surface to air missiles. They rapidly expanded to the point where the USAF flew five Red Flag exercises a year after 1975. Their example led Canada to adopt a similar Maple Flag exercise, specialized Cope Thunder exercises in the Pacific, and ultimately led the US Navy to establish a similar "Strike University" in 1984.

These shifts to realistic aggressor training and large-scale combined arms training had other consequences which were more critical to improving US capabilities. They helped catalyze major improvements in US testing and evaluation, simulation technology, and efforts to integrate training, tactic, and technology into more realistic planning and exercises at every level. While the US has only begun to explore the potential of these techniques, and develop more realistic methods of test and evaluation, they advanced steadily after the late 1960s, and made major improvements in combat effectiveness.

Equally important changes and innovations took place within the US Army. The US Army emerged from Vietnam as a shattered force -- in part because of its own failures in training, leadership, and using technology. It is not possible to trace all of the changes that rebuilt the US Army after Vietnam in this analysis, or named more than a few of the key leaders involved, but General Creighton Abrams played a critical role in rebuilding morale and readiness during 1972-1974, while serving as the Chief of Staff of the US Army.

Inspired in part by the lessons of the October War of 1973, Abrams and others in the Army placed a new emphasis on rethinking the role of technology, combined arms, and the use of precision weapons. They helped shape the Army's focus on technology to concentrate on a few lead programs that could dominate the battlefield. These programs included what later became known as the "Big Five": the M-1 tank, M-2/3 Bradley armored fighting vehicle, AH-64 Apache attack helicopter, UH-60 Blackhawk helicopter, and Patriot air-defense missile -- all of which were to play a critical role in Desert Storm.

General William E. DePuy began fundamental shifts in Army training methods that led to a conversion from set piece instructions and exercises (which often trained US soldiers to fight against a force that was a mirror image of the US Army) to more realistic combat training. DePuy served as the first head of the US Army's Training and Doctrine

Command (TRADOC) during 1973-1976, and built upon the US Navy's example that the US Navy had set in revolutionizing air combat training. DePuy and his deputy, Major General Paul Gorman, helped shape a new Army Training and Evaluation Program (ATREP) to improve the evaluation of training in individual combat units in which formal advanced training of NCOs was made a high priority.[47]

As time went on, the Army adopted new technologies to simulate realistic combat. These technologies included the use of lasers and sensors to simulate fire, and produce a computerized result in the Multiple Integrated Laser Engagement Systems (MILES), and an integrated instrumentation and analysis system called the Core Instrumentation System (CIS). They made it possible to create the National Training Center at Fort Irwin in January, 1982, the first true large scale computerized ground combat and simulation system. Other facilities like the Joint Readiness Training Center at Fort Chaffee and the Combat Maneuver Training Center at Hohenfels, Germany, followed. These centers trained and tested officers at every level of command, and the Army later set up a computerized system to train general officers and their staffs called the Battle Command Training Program (BCTP).

Changes also took place in tactics. DePuy revised the US Army field manual on "Operations" (FM-100-5) to emphasize short, intense, and highly lethal wars of the kind that occurred in 1973 and which were likely to occur in Europe. This manual modified German and Israeli doctrine to emphasize paralyzing the enemy through suppressive fire, striking with surprise, using counter-attacks in "active defense", and the concentration of force at decisive points. These reforms received new impetus when General Don Starry replaced DePuy at TRADOC, and added an emphasis on maneuver, aggressive battle, and combined operations that helped lay the ground work for the AirLand battle. It was only the 1976 revision of FM-100-5 that first identified the Warsaw Pact as the enemy that the US Army should plan to fight, which formally shifted training and doctrine to focus on real potential enemies, rather than on vaguely defined "generic" combat.

Changes in doctrine, technology, and training, however, were not a substitute for adequate readiness and resources. Officers like General Michael Davison, the US Army Commander in Europe (USAREUR), had worked hard to restore discipline and reduce racial tension during 1972-1973 -- the period right after the Vietnam War. However, the Army could not properly implement many of its reforms during the mid and late 1970s because of a lack of funds.

It could not build up the quality of its personnel because the US failed to raise military pay in proportion to inflation and raises in civilian pay. Manpower quality declined in all four US services, but this decline reached the crisis point in the case of the Army. It

reached the point where the number of entrants scoring in the higher mental aptitude categories (I, II, IIIa) had dropped from 49% in 1973, to 26% in 1980, and only 50% of the intake had graduated from high school. By 1979, the US Army had 16 divisions, but 6 out of 10 of the divisions based in the US were unable to fight, as was one of the four "combat-ready" divisions in Europe. The US Army commander in Europe, General Frederick Kroesen called this force the "hollow army" -- a phrase that came to symbolize the lack of readiness and combat capability common to all US military services at the same.

This situation only began to change after the Desert One raid failed to free the US hostages in Iran, consequently exposed many of the problems in US forces to the world. This helped make promoting military readiness as a major issue in the 1980 presidential campaign, in the wake of Congressional hearings and media exposes. Major increases were made in recruiting funds during 191 and 1982, and military pay was raised by 25%.

This funding triggered a steady improvement in manpower quality that reached the point where more than 98% of all entrants to the US Army were high school graduates in 1991, 75% scored in the higher mental aptitude categories, and only 1% in the lowest. The number of military trials dropped 64%, and desertions and absences dropped to 80%. The number of NCOs entering the Sergeant's Major Academy with some college education rose from less than 8% in 1973 to more than 88% in 1991, and nearly 50% had earned college degrees. The number of personnel showing drug use during testing dropped from 25% to 1%.[48] During the mid-1970s, the US Army also began to reform its mixture of reserves and actives to create a "total force policy" that made more direct use of reserves to ensure the full readiness of combat deployable forces.

During 1982-1986, all of the US military services made major improvements in their large scale and joint training activities. The US Air Force had slowly improved the joint training portion of its Red Flag exercises, and the Marine Corps had gradually developed its own exercises at Yuma and Twenty-Nine Palms. The Navy finally developed its own strike training program in 1984, and the US Army's National Training Center became a central focus in improving US Army efforts to integrate land-air operations.

These developments reflected a growing emphasis on integrated operations by the US Army and US Air Force. This emphasis was driven by the fact that US war games and exercises made it painfully clear that US forces could not hope to defeat the Warsaw Pact unless land and air operations were fully integrated and drastically revised. Nearly a decade of effort also took place within NATO to develop more effective air doctrine in the form of documents like ATP-27A, "Offensive Air Support", (1975) and ATP-33 "NATO Tactical Air Doctrine". It was not until 1979, however, that NATO air planners really began the systematic evaluation of deep strikes in support of the land battle, and it was only in 1980

that NATO was able to agree on some of the critical portions of a revised ATP-33 involving effective support of the land battle.

These changes within NATO reflected the on-going revision of US Army and Air Force doctrine to emphasize integrated operations, and of US Army doctrine to emphasize *initiative, depth, agility, and synchronization* . The US made a fundamental shift away from a reliance on force ratios and firepower. *Initiative* stressed reliance of using the offensive and counter-attack to keep the initiative. *Depth* emphasized exploiting the entire battlefield to deny the enemy the ability to concentrate, maneuver, and exploit massed firepower. *Agility* not only meant moving faster than the enemy, but employing a much quicker cycle of decision-making to act before he does, and keep him in a disadvantaged mode of constantly reacting under conditions, in a cycle of reaction that continually lagged behind the developing situation on the battlefield. *Synchronization* meant using all the available elements of force quickly and decisively at the enemy's most vulnerable point.

By 1982, these shifts had evolved into what the Army came to call the "AirLand Battle" doctrine. This doctrine was refined under the leadership of General Starry and General Glenn Otis, and emerged as official Army policy with the 1982 revision of FM-100-5. It stressed intangibles like leadership, endurance, and will, as being equal to firepower and maneuver in importance. The US Army and Air Force emphasized aggressive counter-attacks as a primary method of defense, as well as attacks on follow-on Soviet echelons by "deep strikes" up to 150 kilometers behind the forward line of battle. This, in turn, helped lead to a similar emphasis in NATO in 1983, in what was called the follow-on forces attack (FOFA).

The US Army coordinated closely with the USAF Tactical Air Command at Langley, Virginia to ensure that the Air Force could provide the improved sensor, strike, and attack capabilities to jointly fight with the Army in such a war. These changes -- in what the USAF sometimes called "Joint Attack of the Second Echelon" -- firmly linked USAF air interdiction bombing, and suppression of the enemy's forward air defense, to the Army corps commander's scheme of maneuver. In April, 1983, General Edward C. Meyer (the Army Chief of Staff) and General Charles A. Gabriel (the Air Force Chief of Staff) signed a joint memorandum stressing cooperation in the Air Land Battle. They also set up a Joint Force Development Group to manage joint Army and Air Force efforts to implement the Air Land Battle, and agreed on a list of 35 detailed initiatives in different areas where improved AirLand cooperation was necessary.[49]

This list was announced on May 22, 1984, and a Joint Assessment and Initiatives Office was set up to implement the AirLand battle as a true joint capability. Many of these efforts included capabilities that proved critical during Desert Storm, and a list of the

initiatives, in many ways, is a list of the advantages that US forces possessed over Iraq: (1) Area SAMs/Air- defense fighters, (2) point air-defense, (3) counter heliborne assault, (4) tactical missile threat, (5) identification of friend or foe systems, (6) rear-area operation centers, (7) host nation support security equipment, (8 air-base ground-defense, (9) air-base ground-defense flight training, (10) rear-area close air-support, (11) mobile weapon-system, (12) ground electronic-combat versus enemy attack, (13) airborne radar-jamming system, (14) precision location strike-system, (15) J-SEAD, (16) combat search and rescue, (17) rotary wing support for special operations, (18) joint tactical missile system, (19) army/air force munitions research, development, test, and evaluation, (20) night combat, (21 battlefield air- interdiction, (22) joint target set, (23) theater air-interdiction system, (24) close air-support, (25) air-liaison and forward air-controllers, (26) manned aircraft systems, (27) Joint Surveillance and Target Attack Radar System (JSTARS), (28) Lockheed TR-1, (29) manned tactical reconnaissance system, (30) intratheater airlift, (31) program objective memorandum (POM) priority list, (32) rapid targeting capability, (33) future close air-support, (34) validating joint force development process, and (35) joint low-intensity conflict center. The Army also began to systematically restructure its light forces to give them better tactics and technology, and revitalize its elite Ranger program.

Further revisions took place in US doctrine, tactics, technology, and training during the 1980s. These revisions included changes to key field manuals like FM-100-5 that placed new emphasis on conventional warfare -- over chemical and tactical nuclear warfare -- and on increased flexibility in operations, to emphasize combinations of different operational maneuvers. It also placed new emphasis on using air power to shape the battlefield before large scale AirLand operations.

Two limited intensity conflicts also played a critical role in allowing the US to transform these reforms into real world military capabilities. The first was the US intervention in Grenada, or Operation Urgent Fury, in 1983. The second was US intervention in Panama, or Operation Just Cause, in December, 1989. The performance of US forces in both operations has received a great deal of criticism. Much of this criticism was justified in the case of Operation Urgent Fury. It exposed weaknesses in virtually every aspect of planning, joint operations, intelligence, and command, control, and communications. At the same time, US planners recognized many of these failures and acted upon them, and this experience played a critical role in improving US capabilities.

The criticisms of Operation Just Cause seem far less valid. Many outside critiques assume an impossible standard of effectiveness, or are more ideological and political than they are military. They also ignored the practical difficulties in long range power projection by air, and in complex politico-military warfare in built-up areas. In practice, Just Cause

demonstrated the improvements that US military forces had made in using joint operations and new technologies, and provided a further set of lessons in improving communications, air operations, and a number of other aspects of US military capability.

It is dangerous to put too much emphasis on the impact of either Urgent Fury or Just Cause in changing US forces. One of the minor ironies of Desert Storm is that it came at a time when many US military planners and analysts were emphasizing the special problems of politically dominated low intensity conflicts in the Third World, while the Gulf War came much closer to the kind of purely military air and armored combat that the US had planned to fight in NATO.

It is also important to stress that the changes being made in US forces in no way made them "ten feet tall." The following chapters show that US progress in achieving the "revolution in military affairs" was mixed. For example, Desert Storm demonstrated that the workload of some key aspects of the AirLand battle was about three times more intense than the US had ever previously exercised. It also revealed a fundamental imbalance between the ability to conduct operations, and the ability to support them with proper intelligence and battle damage assessment.

Some aspects of US planning and capabilities were not adequate to help US forces meet regional strategic requirements. The US was still focused largely on US-Soviet and NATO-Warsaw Pact conflicts at the time Desert Storm began. US efforts to develop advanced air campaigns and AirLand-land battle tactics, technologies, training, and operations was still Eurocentric. USCENTCOM was just finishing its first major exercise -- "Internal Look 90" -- at the time that Iraq began to build up its forces on the Kuwait border. Even "Internal Look 90" had many limitations -- and deliberately avoided examining many of the C^4I/BM issues that became serious problems during Desert Storm.

Many of the US planners and analysts that looked at regional contingencies focused on low-intensity conflicts, not major regional conflicts, although it is scarcely clear that the mix of US capabilities developed for the AirLand battle would have been nearly as effective in guerrilla wars, civil conflicts, mountain warfare, forests and jungle areas, or in conflicts in built up areas.

As Table 3.9 indicates, more than half of the forces deployed for Desert Storm were tailored for warfare in a very different theater. It was in many ways an accident of history that these forces were available for Desert Storm. They had been developed for other purposes, and little contingency planning had ever taken place to deploy them to the theater where they ultimately fought. Desert Storm just happened to come at the precise moment when the US had a unique ability to redeploy forces out of Europe without fear of the Warsaw Pact, but also before it began a series of massive force cuts in reaction to the end

of the Cold War. There is no guarantee that the US will have enough "decisive resources" to exert "decisive force" in the future.

These were other limitations to the advantages listed in Table 3.10. As will be discussed later, there was inadequate coordination between the US Air Force and the US Navy in employing tactical air power, inadequate coordination between the US Army and the US Navy in planning for the carrier support of ground forces, and inadequate preparation of the US Marine Corps for high intensity warfare and joint operations with the Army.

As has been pointed out earlier, the US could only exploit some of the advantages in Table 3.10 because Iraq remained on the defensive for nearly half a year. Some US commentaries on the Gulf War have stressed the fact that the US did not repeat the experience of sending a totally inadequate military force overseas of the kind that it sent to North Africa in World War II, or that existed in the "Task Force Smith" it first sent to Korea during the Korean War. Yet, the US did send a "Task Force Smith" to the Gulf. Chapter Two has shown that the US was forced to rush forces to the Gulf that were numerically and qualitatively inadequate to carry out Desert Shield until mid-October, 1990. It has also shown that the US initially planned to liberate Kuwait with forces that called for a direct attack through Iraqi defense positions in Kuwait that would almost certainly have been far more costly than the far stronger attack that it eventually made from the west. Further, as later chapters will show, the US often relied on mass in terms of forces and sustainability, and needed a constant process of adaptation over six months to improve its capabilities.

In case after case, the technology, tactics, and organization of US forces was still in a process of evolution. Some key technologies that the US was developing for the AirLand battle were not ready at the time of Desert Storm. There were also serious problems in many of the weapons and technologies that the US deploying because they either had not been fully integrated into the force structure or needed to be adapted for warfare in a different theater. Without the time that Iraq gave the United States, it would have been difficult to tailor US forces to use many of its capabilities as effectively.

In short, US forces did not have any innate superiority. US officers would be the first to admit that the US forces employed in the Gulf War still had significant defects in every area listed in Table 3.10. They would also admit that the US would have had far less superiority -- if any -- in comparison to first line Warsaw Pact and other NATO forces. Many Us advantages over the forces of other NATO countries were the result of the fact the US was willing to make a massive real increase in defense spending during the early and mid-1980s. Britain and France, for example, had similar levels of professionalism, shared

the same emphasis on realistic training, and gave NCOs and enlisted personnel the same degree of responsibility and advanced training, and officers, the same degree of initiative. At the same time, British and French forces faced sharp resource constraints relative to US forces in virtually every area of military capability. No one can argue that British and French forces were not the equal of US forces on a soldier for soldier basis; no one can afford to argue that their overall capabilities were not affected by a lack of similar investment in technology and readiness.

Table 3.10

The New US Military: The "Revolution in Military Affairs"

- *Decoupling of political and military responsibility:* During Vietnam, US higher command authority -- including Presidents Johnson and Nixon -- systematically abused the advances in modern communications to micro-manage and politicize the tactical conduct of warfare on a day-to-day basis, in spite of the fact that this interfered with effective operations and meant acting on the basis of inadequate information and understanding of the immediate tactical situation. In contrast, during Korea, a senior US military officer usurped political responsibility and attempted to manipulate grand strategic and strategic decisions from the theater in ways that deceived or bypassed proper political authority. No war is ever free of command controversy or friction between political and military leadership. US forces prepared for, and fought the Gulf War, however, with an extraordinary degree of proper delegation of authority and command responsibility. This was partly a matter of the individual personality of President Bush, Secretary Cheney, General Powell, and General Schwarzkopf, but it was also a product of the fact that both civilian and military decision makers recognized the mistakes of Korea and Vietnam.

- *Unity of command:* The impact of political-military friction during Korea and Vietnam was compounded by divisions within the US command structure, particularly by individual military service. This had a serious impact on the integration of air and ground operations in Vietnam. Further, unity of command during Vietnam suffered from a lack of proper integration at the theater and battlefield level of command authority over US forces, intelligence on threat forces, and command and intelligence data on friendly forces. It was not until the final period of the Vietnam conflict that all intelligence and operations data passed through a single "fusion" center in the US Pacific Command (CINCPAC), and even then, reporting on the advisory effort dealing with the problems South Vietnamese forces often went directly to Washington without being routed to US theater commanders. The level of unity of command, and "fusion," achieved during the Gulf War was scarcely perfect, but was far more functional than in Vietnam or Korea.

- *Emphasis on maneuver:* The US emphasized firepower and attrition through the end of the Vietnam War. In the years that followed, it converted its force structure to place an equal emphasis on maneuver, sustainment, and deception.

- *Decisive force:* During the period before the Gulf War, US forces developed a new approach to using "decisive force" in response to two areas of weakness in their capabilities. The first area of weakness was numerical inferiority to the Warsaw Pact --which meant that any battle of attrition based on force ratios could lead to defeat. The second weakness was the political reality that US military forces could not count on popular support for a prolonged war in limited or mid-intensity conflicts, or for support in any war that produced high US casualties that did not directly threaten the US. As a result, the US military entered Desert Storm with a new emphasis on concentrating superior forces in key areas of the battlefield that would allow US forces to establish decisive superiority and achieve quick and decisive tactical results.

- *Combined operations, combined arms, and the "AirLand Battle:"* While US doctrine had always placed a pro-forma emphasis on combined operations, many US operations in Vietnam did not properly integrate combined arms. Inter-service training in combined operations was limited, and air operations were not properly integrated into land operations. In the years that followed, the US placed far more emphasis on combined arms and combined operations. It greatly strengthened combined operations training and career rotations into joint commands. At the same time, it developed tactics that closely integrated air and land operations into what the US came to call the "AirLand battle".

- *Renewed emphasis on deception and strategic/tactical innovation:* No country has a monopoly on the use of deception and strategic/tactical innovation. The US had, however, placed far more emphasis on such activity after Vietnam, and became more capable of employing such techniques in combined operations. The US had often talked about initiative and flexibility while restricting it at the high command and combined operations level. The forces it sent to the Gulf War emphasized such capabilities as essential aspects of trying to defeat a quantitatively superior enemy, and avoiding the rigid patterns of combat the US sometimes employed in Vietnam. Further, US officers had better training in these areas, and more experience in using advanced technology and superior command and control and intelligence systems.

- *A new tempo of operations:* US over-reliance on mass and firepower from World War II through Vietnam often slowed the tempo of US military relations. The US was also limited by technical and organizational problems in its C^4I/BM systems, mobility, particularly in support forces, problems in rapidly completing the cycle between determining the situation on the battlefield, reallocating forces, and executing orders. New control and communications technologies also allowed the US to speed up every aspect of targeting, intelligence-gathering and dissemination, integration of combined arms and multi-service forces, and night and all-weather warfare. While many aspects of such technological and organizational changes were still in their early development stages at the time of the Gulf War, the US was far more advanced in making these changes than the military forces of most other countries.

- *Focused and effective strategic and interdiction bombing:* The US had often employed strategic and interdiction bombing in the past. The Gulf War was the first

war, however, in which the US organized effectively to use its deep-strike capabilities to carry out a rapid and effective pattern of focused interdiction bombing where planning was sufficiently well-coupled with intelligence and meaningful strategic objectives so that such strikes achieved the major military objectives that the planner set. At the same time, US targeting, force allocation, and precision kill capabilities had advanced to the point where interdiction bombing and strikes were far more lethal and strategically useful than in previous conflicts.

- *Expansion of the battlefield: "Deep Strike":* As part of its effort to offset the Warsaw Pact's superiority, US tactics and technology emphasized using AirLand battle capabilities to extend the battlefield far beyond the immediate forward edge of the battle area (FEBA). The resulting mix of targeting capability, improved air-strike capabilities, and land force capabilities played an important role in attriting Iraqi ground forces during the air phase of the war, in breaking through Iraqi defenses, and in exploiting the breakthrough. This achievement is particularly striking in view of the fact that the US was not yet ready to employ many "deep strike" targeting technologies and precision strike systems designed to fight the Warsaw Pact because these were still in development.

- *"24 hour war" - Superior night, all-weather, and beyond visual range warfare:* "Visibility" is always relative in combat. There is no such thing as a perfect night vision or all-weather combat system, or a way of acquiring perfect information at long ranges. US air and land forces, however, had far better training and technology for such combat than they had ever had in the past, and were the first forces designed to wage warfare continuously at night and in poor weather. Equally important, they were far more capable of taking advantage of the margin of extra range and tactical information provided by superior technology.

- *A new tempo of sustainability:* In previous conflicts, the US had emphasized volume of supply over speed and focus of supply. It showed limited regard for maintainability, reliability, reparability, and the speed and overall mobility of logistic, service support, and combat support forces. The forces the US employed in the Gulf War had corrected many of these shortcomings during the 1980s, and used equipment which had far less demanding service cycles and far more time between failures. The benefits of these new capabilities were reflected in such critical areas as the high operational availability and sortie rates of US aircraft, and the ability to support the movement of heliborne and armored forces during the long thrust into Iraq from the West.

- *"Information Warfare," Near Real-Time Integration of C^4I/BM/T/BDA:* The Coalition was able to exploit a major US advantage in the organization, technology, and software to integrate various aspects of command, control, communications, and intelligence (C^4I; battle management (BM), targeting (T), and battle damage assessment (BDA) to achieve a near real time integration and decision-making execution cycle that was far more sophisticated and effective than had been employed in any previous operation. At the same time, this breakthrough in "information warfare" and C4I/BM capability provide only a crude illustration of the capabilities to

come. Many aspects of the "systems" the US employed were outdated, required five months of preparation to achieve moderate capability, exposed serious limitations, or used "experimental" technologies like the JSTARS which are capable of far more effective operations than could be fielded at the time.

- *Integration of space warfare:* No other country, except possibly the Soviet Union, had the same resources and opportunity to integrate space-based intelligence, communications, and command and control assets into its tactics and organization. US space-based systems had many limitations, but they also offered many strengths and advantages. While the US forces had only begun to explore what space-based systems could ultimately contribute to theater and battlefield level operations -- and many aspects of the use of space systems the US employed had only moderate success -- the forces that the US deployed in the Gulf War were the first to make broad use of such capabilities on a combined-operations basis.

- *Technological superiority in many critical areas of weaponry:* The US scarcely had a monopoly on effective weapons, and the technology in its forces faced direct competition in many areas in Soviet and West European forces. The US still, however, had a significant superiority in deployed technology over Iraq in virtually every area, and a critical edge in key weapons like tanks, other armored fighting vehicles, artillery systems, long range strike systems, attack aircraft, air- defense aircraft, surface-to-air missiles, space, attack helicopters, naval systems, sensors, battle management and a host of other areas. As has been discussed in Chapter One, this superiority went far beyond the technical "edge" revealed by "weapon-on-weapon" comparisons. The US forces dealt with technology in terms of broader systems that integrated weapons into other aspects of force capability and into overall force structures to a far greater degree than in earlier US forces and in most competing forces.

- *Integration of precision--guided weapons into tactics and force structures:* The US did not have a monopoly of precision-guided weapons, except for long range strike systems. The Gulf War also occurred before many of its developmental "smarter" and "fire and forget" weapons could be employed. What the US did have, however, was a decisive technical edge in the capability of most of its weapons over Iraq, for more realistic training in using them, and the ability to link their employment to far superior reconnaissance and targeting capability.

- *Realistic combat training and use of technology and simulation:* The US had entered most previous wars with forces that emphasized training that was unrealistic in preparing troops, pilots, and commanders for force on force and combined operations warfare. Training for the Normandy Campaign, for example, was so bad that a lieutenant entering combat had a life expectancy of two weeks, while a similar but more experienced officer had a life expectancy of 10 weeks by the time of the Battle of the Bulge. Commanders and units in previous wars were not properly trained to deal with an aggressive and competent enemy. It was technically impossible to simulate realistic combat, and the US lacked the technology and simulation methods to adequately train pilots and weapons crews in many of the real world problems in

using their equipment. The training methods and technology that the US employed in Desert Storm still had many limitations -- including failures in many aspects of intelligence and command and control. They were, however, far superior to previous methods and they were coupled to a far more realistic and demanding system for ensuring the readiness of the forces involved. Equally important, they emphasized the need for the kinds of additional training that allowed US forces to adapt to the special desert warfare conditions of Desert Storm.

- *All volunteer military/higher entry and career standards:* The US forces deployed in the Gulf War were the first all-volunteer professional force to fight a major war in American history. They had far more professional experience and training than the conscript dominated forces that the US had deployed in World War I, World War II, Korea, and Vietnam. Entry standards were much higher than in Vietnam, with a much higher percentage of high school graduates and better entry scores. Career training was more intensive and retention and promotion standards were higher. Rigorous efforts had removed most of the drug problem of the 1960s and 1970s, and decades of effort had greatly reduce the racial and ethnic tensions that had been a severe problem through at least the mid-1970s. To put these qualitative improvements in perspective, the US forces in Vietnam recorded 800 grenade attacks, or "fraggings" of US officers between 1969 and 1975, 45 of which were fatal. Roughly 40% of the US Army in Europe in the early 1970s confessed to some drug use, 7% were addicted to Heroin, and 12% of all enlisted men were charged with serious offenses.[50]

- *Emphasis on forward leadership and delegation:* US ground forces in Vietnam suffered from over-control from the rear, and from tactics that often kept mid-level commanders isolated from troops. Reorganization and retraining during the years that followed led to a far more effective command structure in terms of delegating responsibility, and ensuring the proper situational awareness of officers in the ranks of Captain through Colonel.

- *Heavy reliance on skilled NCOs and enlisted personnel:* There was nothing new about the heavy reliance that US forces placed on the technical skills, leadership quality, and initiative of non-commissioned officers (NCOs) and experienced enlisted personnel. This is a reliance which is also common to virtually every Western military force, and which has been a major advantage over the Soviet and Third world forces which do not give the same authority and expertise to NCOs and career enlisted personnel. The forces that the US deployed in Desert Storm, however, were largely high school graduates, many had some college, and virtually none were soldiers with low mental aptitude. This contrasted with an Army which drafted forces at the end of Vietnam, of which 40% had no high school diploma, and 41% were in Category IV, or the lowest category of aptitude.[51] It had better educated, trained, and experienced NCOs and enlisted personnel than any previous US force. The improvement in the quality of NCOs and enlisted men was critical to the US ability to exploit technology, and sustain high tempo operations.

- *Adequate resources and a high degree of overall readiness:* Military readiness is a difficult term to define since it involves so many aspects of force capability. However,

the US forces entered the Gulf War with two great advantages. The first was that far more realistic standards were implemented for measuring readiness and ensuring proper reporting. The second was that adequate funding was available over a sustained period of time, which is infinitely preferable to crash efforts to fund quick fixes to long standing problems. US forces reaped the benefits of a major increase in readiness funding during the first Reagan Administration and were able to draw down on global readiness assets with great freedom because of the end of the Cold War.

- *Clear Doctrine for Collateral Damage:* The US entered the Gulf War with explicit criteria for limiting collateral damage to Iraq's population and civilian facilities, and with the ability prosecute the war within those limits. It avoided significant direct damage to Iraqi civilians and tailored its strikes against civil facilities to sharply reduce damage to civilian buildings, plants, and infrastructure. This proved to be an important part of shaping the political side of the battlefield.

- *Management of Media Relations:* While the US Armed forces were often criticized after the war, for placing limits on the press and manipulating the information provided to the media, the fact remains that modern war inevitably involves a struggle to shape media opinion. US forces did a far better job than in previous conflicts of using media access and information to achieve military goals.

The Strengths and Weaknesses of European Power Projection: Lessons from British Forces and Capabilities

Like estimates of Iraqi and US forces, estimates of the strength of the British deployments in Desert Storm differ in detail. Some estimates of the British forces used in "Operation Granby" ignore later deployments and rotations, and round the numbers to estimate that Britain deployed a total of 43,000 troops with an armored division, a Special Air Service (SAS) contingent, 180 tanks, 72 combat aircraft, and a naval task force. Another estimate of total British forces shows a peak of around 42,100 personnel, with 30,000 in the Army, 7,000 in the RAF, 5,000 in the Navy, and 100 civil servants. It indicates that Britain had 176 main battle tanks, a peak of 84 combat aircraft, and a peak deployment strength of 8 destroyers and frigates, 2 MCMV command ships, and 8 mine countermeasure vessels.[52]

Regardless of the precise numbers, deploying these forces was not an easy task. Britain had already demonstrated its ability to improvise power projection task forces during the Falklands conflict, but it faced far different problems in the Gulf. The Falklands conflict called for relatively light amphibious task forces, and air forces dealing with a relatively unsophisticated threat whose aircraft had to operate at the limits of their range. The Gulf War required heavy armored forces and air power capable of dealing with sophisticated land based air defenses as well as advanced fighters.

This presented serious problems because all of Britain's major armored formations were located in Germany and tailored to operations in NATO. British forces had little strategic lift, and Britain had to move far heavier cargoes to support operations in Desert Storm than it did in the Falklands. It was relatively easy to move personnel by air, and the RAF flew a total of 25,000 passengers into the theater, while allied aircraft and charts flew another 21,000. Equipment and supplies were a different story. Although Britain deployed only 180 main battle tanks, it deployed a total of 2,611 armored vehicles, and 12,069 logistic and engineering vehicles.[53] The size of the logistic burden involved is indicated by the fact that the British 1st Armored Division alone consumed 3,500,000 liters of fuel, 350 tons of rations, and 2,800,000 liters of water a week by Desert Storm, and Britain eventually deployed a total of 400,000 tons of freight, of which 80,000 were munitions. Britain moved 355,000 tons of cargo by sea, and 45,000 tons by air.[54]

Moving and supplying this force required Britain to draw extensively on commercial transport for lift. Sea transport required more than 146 voyages through April 1, 1991. While Britain used two logistic landing ships, it relied primarily on 11 British flag charters and 133 foreign charters. It took 30 commercial cargo vessels, including roll on-roll off ships and ferries, just to move its heavy equipment from Germany.[55] Similarly, Britain used its entire RAF transport fleet. The RAF's Tristars provide strategic range and some heavy lift capability, but were scarcely sufficient.

As a result, British forces had to make use of US C-5 transports, and British commercial cargo aircraft- - including 38 Belfast sorties 30 Tristar sorties, 23 Guppy sorties, three B-747 sorties, and 186 B-707 and DC-8 sorties from British owned aircraft. Britain also had to used C-130 flights flown by the Belgian, Portuguese, and Spanish Air Forces and chartered commercial aircraft. These commercial charters included one Aeroflot, AN-124 heavy lift aircraft sortie, 23 Sabena DC sorties, 28 US DC-8 sorties, 88 Romanian B-707 sorties, 30 Cathay Pacific B-747 sorties, 20 Evergreen Airways B-747 sorties, and 59 DC-8 and B-707 sorties by British owned but foreign registered aircraft. Finally, Britain made use of two Kuwaiti C-130's, and all the Kuwaiti 747s that had escaped the Iraqi invasion. This need to obtain airlift from so many sources illustrates the problems an military power encounters when it attempts long range strategic lift operations without having extensive strategic airlift capability.[56]

The vital importance of logistics and sustainability is a key lesson of power projection in any mid or high intensity conflict, but four aspects of the British experience in these areas are of special importance. First, Britain could only deploy and sustain effective armored forces because it had months in which to prepare, deploy, reinforce, and retrain. Second, Britain could not have made these deployments with anything approaching the

same security if the Cold War had not ended -- it even used transports chartered from Warsaw Pact countries. Third, the physical logistic burden was only part of the sustainability problem since the British forces involved had to be restructured and adapted to desert warfare. Fourth, Britain was the only European state that committed heavy armored forces, and was probably the only European state with the mix of technology, readiness, and political freedom to do so.

At the same time, British forces provided many illustrations of the fact that no force can rapidly overcome the problems imposed by long term limitations in funding investment and readiness. British forces had long been subject to far more serious resource constraints than the US forces. These constraints limited many aspects of Britain's deployed military technology and power projection capabilities, and made British forces heavily dependent on US electronic warfare and command and control systems, and on external logistic and service support.

British forces were not designed for independent power projection in high intensity conflict, and this point was made quite clearly in the House of Commons Defense Committee's examination of the lessons of the war, "Preliminary Lessons of Operation Granby," which was published in August, 1991.[57] This makes a long analysis of some of the limitations in British forces pointless because so many of these limitations were the product of different resource levels, a focus on European defense, and decisions to design forces for coalition warfare in ways that assumed cooperation with US forces. At the same time, these differences in resources mean that fewer lessons can be drawn about the impact of modern technology and battle management systems.

British Ground Forces [58]

Estimates of the precise size and equipment holdings of British ground forces also differ in detail, but most estimates provide figures similar to the estimate shown in Table 3.11. Britain accelerated a number of developments and equipment purchases to support this forces, including deployed of the Multiple Launch Rocket System, rifle launched grenades, an improved APFSDS round for the Challenger, 30mm APDS anti-armor rounds, the vehicle launched scatterable mine system, and logistic trackways. In addition, Britain obtained M548 high mobility load carriers and artillery ammunition from the US; Hummel armored VHF jammer vehicles, Fuchs NBC reconnaissance vehicles, Skorpion vehicle launched scatterable mines, and artillery ammunition from Germany; VSC501 satellite terminals from NATO; emergency fuel handling equipment and camp costs from Belgium, and artillery ammunition from the Netherlands.[59]

Total British equipment losses or damage during training included four Warriors, three Centurion ARVES, two M-109 howitzers, 2 M-548 transporters, one Lynx helicopter,

and one Gazelle. Total equipment destroyed or lost in combat included three Warriors, one Scorpion, two Spartans, and two M-548s. In addition, two Warriors were hit by USAF A-10 fighters.[60]

The build up of the British contingent began with the deployment of the 7th Armored Brigade or "Desert Rats" from Germany on October 15, 1990. This brigade was officially declared to be operational in the Gulf on November 15, 1991, but it took well into January before it completed modification of its Challenger tanks and Warrior armored fighting vehicles -- which had been configured for European warfare -- to meet the conditions of desert warfare.[61] British armor had to eliminate major problems with sand ingestion, cure serious problems with the transmission of the Challenger, and upgrade to Chobam armor. The 7th Armored Brigade had to be extensively reequipped with additional Warriors because of the vulnerability of its FV-432s -- an aging and lightly armored APC with roughly the same major drawbacks in modern armored warfare as that of the US M-113. The unit also required additional equipment for desert warfare and the same extensive adaptation to make it ready for combat in a new region as US forces. This included the purchase of water purification and desalinization equipment, sand filters for Army helicopters, GPS navigation aids, flails for mine clearing, and water tankers.[62]

The 7th Armored Brigade or "Desert Rats" brigade was initially stationed in the area under the tactical command of the US 1st Marine Expeditionary Force (1 MEF). The US decision to seek added reinforcements for a two thrust offensive to liberate Kuwait led the British government to decide to provide additional reinforcements on November 11, 1990. It announced on November 22, 1990 that it had decided to deploy the 4th Armored Brigade, and create a divisional headquarters and combat and service support structure, which began to deploy in to the area on December 5, and which made it main air move on December 19.[63] This force became the 1st British Armored Division, and built up to 20% of the total personnel of the British Army.

This reinforcement also led to a British request that British forces be shifted away from the command of the 1 MEF, and included in the main line of attack into Kuwait. According to the British commander, Sir Peter de la Billiere, this resubordination of British ground forces came largely at his insistence although other sources indicate that his subordinates played a major role.[64] De la Billiere was concerned that the subordination to the 1 MEF would not allow British armor to properly exploit its capabilities, and that it might involve British forces in an attack where the US Marines might take high casualties, and raise British casualties because they lacked effective armor. He argued that the British force was trained to maneuver, and that joining the Marines in a frontal assault through Iraqi defenses would "under-employ" the force, and employ it in a "battle for which it's not

trained or rehearsed." It is unclear that these arguments ultimately gave the British force a radically different role than it would have had in helping lead the Coalition advance through Kuwait, but the fact that Billiere was seriously concerned that the Marines and British might take 17% casualties if the Coalition offensive relied on a frontal attack throughout Kuwait, without reinforcement, illustrates how concerned senior commanders were with the risks posed by Iraq's capabilities.[65]

The final elements of what was now the British 1st Armored Division arrived in theater on December 10, 1990, although equipment continued to arrive until the end of January. This gave the British forces only six weeks to meet a deadline of January 31, 1991, for readiness for the ground offensive. This was little time for the newly arriving forces to adopt the changes in tactics and support methods necessary to meet the conditions of armored warfare in the desert. The 7th Armored Brigade had already had extensive retraining, and Britain had learned that it had to change its maintenance procedures for key systems like its Challenger tanks, Warrior armored vehicles, helicopters, and trucks. Further, like the US Army, the British Army had had to make extensive modifications to its equipment. For example, it provided added armor for both its Challengers and Warriors in mid-December -- a change that improved the reliability of both systems because the new armor deflected sand downwards and reduced sand ingestion by the their engines.[66] It is a considerable tribute to the professionalism of the British forces that it was not only was ready by the time the land war began, but it was able to carry out a number of complex maneuvers in responding to Schwarzkopf's call for a much earlier attack time.

By the time the land campaign began, the major elements of the British 1st Armored Division included:[67]

- o Three tank battalions, two with 57 Challengers and one with 43 Challengers. The entire division had a total of 180 Challenger tanks plus 41 more in war reserves. The Challenger has a fully stabilized 120mm gun, and advanced armor, night vision, and fire control/sight equipment. It has NBC protection and a coaxial machine gun.
- o Three mechanized infantry battalions, each equipped with 45 FV510 Warrior infantry combat vehicles. The entire division had 260 Warriors, plus 67 in war reserves. The Warrior has a 30mm gun and coaxial machine gun. It has a crew of three and carries a seven man squad fro dismounted combat. It has NBC protection and passive night sighting.
- o One armored reconnaissance battalion with 24 Scorpion light tanks with 76mm guns, 24 Scimitar armored fighting vehicles with 30 mm guns, and 12 Striker anti-tank vehicles armed with Swingfire anti-tank missiles.

- o Five artillery battalions: Two with 24 M-109A2 155mm self-propelled howitzers, one with 12 M-109A2 155mm self-propelled howitzers, one with 16 M-109A2 155mm self-propelled howitzers and 12 M-110A1 203mm self-propelled howitzers, and one with 16 M-270 Multiple Launch Rocket Systems (MLRS). The entire division had a total of 72 tube artillery weapons, plus six in war reserves.
- o Two brigade and one division engineer battalions equipped with armored engineer vehicles for breaching obstacles and minefields.
- o A reinforced helicopter battalion with 18 Lynx attack helicopters with 6 TOW anti-tank guided missiles each, and 24 Gazelle scout helicopters. The RAF provided 16 Puma and 11 CH-47 Chinook medium transport helicopters.
- o Two batteries which each had 36 Javelin short range surface-to-air missiles, and one battalion of 24 Rapier medium range surface-to-air missiles mounted on tracked vehicles.
- o One communications, one construction engineer, one tank transporter, and one truck transport battalion, and two field hospitals.

The logistic and divisional support for the two British brigades required extensive reinforcement with volunteer reserves from the Territorial Army. They also drew on support from a US Army MLRS battalion, helicopters from other services, combat engineers, signals units, additional infantry, and divisional artillery and air defense units. Britain lacked the capability to deploy heavy mobile surface-to-air missile forces.[68]

Even once the British 1st Armored Division was fully deployed, it was still a relatively light force compared to some Iraqi units. The 4th Armored Brigade actually only had one armored regiment versus two in the Seventh Armored Brigade. As a result, it only had 43 main battle tanks versus 114 tanks in the 7th Brigade.[69] The 4th Brigade was also forced to draw on the division combat support forces for reconnaissance, while the 7th Brigade had its own reconnaissance squadron.

This illustrates the practical limits of European power projection in high intensity conflicts -- a lesson that was recognized immediately after the war by the Defense Committee of the House of Commons.[70] It is also important to understand that these limits may be more severe in the future. Current British plans call for continuing force cuts, and British forces in Germany have been cut from around 56,000 during most of the Cold War to 23,000 in 1994. Britain plans to cut its total armored forces by about 40% and its infantry by 20% to 33%. General Sir Peter de la Billiere, the British commander during the Gulf War, has already warned that this could prevent Britain from carrying out another Operation Granby.[71]

Britain will retain its 1st Armored Division, but it will have less large-scale training, and will lack sufficient organic helicopter lift and combat support for some missions. The force will be modernized with Challenger II tanks, but the force changes resulting from the "Options for Change" review could cut the tank strength of its eight armored battalions from 43 to 57 tanks each to 38 each. This would give Britain a total tank force of 286 tanks versus around 450 at the time of the Gulf War -- a total inventory less than one US armored or mechanized Division. Britain does, however, plan to buy a modern attack helicopter to replace its Lynxes, has bought 63 MLRS fire units, and is buying the AS-90 155mm self-propelled howitzer.[72]

Table 3.11

The Size of British Ground Forces in Desert Storm

The Growth of British Army Forces Through January 1991

	1 September	1 October	1 November	1 December	1 January
Challenger tank	-	-	140	140	117
Scorpion lt. tank -	-	8	18	18	
Infantry Fighting Vehicle	-	-	75	75	75
Armored Reconnaissance Vehicle	-	-	18	18	18
Other Armored Vehicles	-	-	101	111	111
Major Anti-Tank Weapons					
Crew Served Launchers	-	-	0	24	24
Armored Vehicle	-	-	4	4	4
155mm SP Arty	-	-	24	24	24

Equipment in Major British Army Units

	4 Armored Brigade	7th Armored Brigade	Divisional Troops	Total
Main Battle Tanks (Challenger 1)	43	117	16	176
Other Armored Fighting Vehicles*				
Scorpion	-	-	24	24
Scimitar	-	16	24	40
Striker	-	-	16	16
Warrior	90	45	-	135
Sub-Total	90	61	64	215
Artillery				
MLRS	-	-	12	12
203mm M-110	-	-	24	24
155mm M-109	24	24	12	60
Sub-Total	24	24	48	96
Anti-Aircraft Weapons				
Rapier SAM -	-	24	24	
Javelin Manportable SAM	36	36	-	72
Sub-Total 36	36	24	98	
Helicopters				
Lynx Attack with TOW	9	9	6	24
Gazelle Attack	4	4	16	24
Subtotal	13	13	22	48
Puma (RAF) -	-	16	16	
Chinook (RAF)	-	-	11	11
Sea King (RN)	-	-	12	12
Total	13	13	83	135

* Reporting on British forces does not list all types of tracked armored vehicles. British sources report that the British Army had 5,100-5,200 track combat vehicles in theater, but do not separate APCs from engineering and unarmored vehicles.

Source: Adapted by the author from Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 40-41, the British Ministry of Defense; House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London,

HMSO, July 17, 1991, p. G47; and David Miller, U.K. Forces in the Gulf War," Military Technology, July, 1991, pp. 39-50.

British Air Forces [73]

The Royal Air Force had worked closely with both the Saudi and US Air Forces for many years, and Saudi Arabia was in the process of building up a large Tornado force when the Gulf War began. This made rapid reinforcement and interoperability relatively easy, and the British Minister of Defense announced Britain's decision to send an air contingent as early as August 9, 1990. Twelve British Jaguar attack fighters deployed to provide a deterrent to an Iraqi attack, and reached Oman and Bahrain on August 11, 1990. Eleven Tornado F-3 Air Defense fighters were sent to Dhahran the same day, and three Nimrod Mark 2 maritime reconnaissance aircraft deployed to Seeb in Oman during August 12-15.[74]

The RAF presence was reinforced when 12 Tornado GR1 strike fighters deployed to Bahrain on August 26, followed by six more on September 27, and an additional six in October. Six more Tornado F3s deployed on September 16. The Tornadoes were then concentrated largely in Dhahran and Tabuk in northwest Saudi Arabia, and all the Jaguars were moved to Bahrain from Oman. This gave the RAF a total of 54 combat aircraft in theater by November, and were reinforced by 18 more Tornado GR1s on January 2-3, 1991 (12 in Dhahran and 6 in Tabuk). Twelve more Buccaneer strike aircraft were deployed in January, producing a peak total of 84 deployed fighter/strike/attack aircraft. The total fighter/strike/attack assets that moved through the theater seemed to total 93 aircraft -- 18 Tornado F-3s, 45 Tornado GR1s, 6 Tornado GR1As, 12 Jaguar GR1As, and 12 Buccaneers. The RAF lost one Tornado GR1 and one Jaguar prior to hostilities, and seven Tornado GR1s during the conflict.[75]

The total RAF forces included:[76]

- o 51-60 Tornado GR1 and GR1A strike/attack aircraft. Out of this total 19 GR1 (15 with TIALD) were based at Tabuk, 13 GR1 and 6 GR1A were based at Dhahran, and 13 GR1 were based at Muhrraq.
- o 18 Tornado F3 air defense fighters, all based at Dhahran.
- o 12 Jaguar GR1A attack aircraft, based at Muharraq, used primarily for battlefield air interdiction.
- o 12 Buccaneer S2B maritime strike aircraft, based at Muharraq, used to designate targets for laser guided bombing by the Tornado.
- o 15 C-130 transports for intratheater lift. (They flew 1,275 sorties during Desert Storm and carried 13,912 passengers and 3,700 tons of freight.) The seven kept in theater were deployed to King Khalid International Airport.

- o Nine VC-10 tankers for the strike/attack aircraft (381 sorties during Desert Storm). They were deployed to King Khalid International Airport.
- o Eight Victor K2 tankers, deployed at Muharraq, which refueled British strike/attack aircraft and US carrier aircraft (299 sorties during Desert Storm).
- o One Tristar KC1 and 1 HS125 transport deployed at King Khalid International Airport and Air Force headquarters in Riyadh.
- o Three Nimrod MR2 maritime reconnaissance aircraft deployed at See in Oman.
- o Six Phantom FGR2 deployed at Akrotiri in Cyprus.

The RAF air defense regiment deployed air base protection and Rapier air defense forces to the bases at Muharraq, Dhahran. and Tabuk. The RAF also deployed four more Nimrods to Seeb, and possibly one Nimrod electronic intelligence/warfare aircraft. The RAF made significant improvements to the on-board electronic warfare capabilities of its combat aircraft -- reflecting the fact that such improvement had previously been underfunded, a problem that had also occurred in preparing for the Falklands. The RAF and Royal Navy deployed at least 39 helicopters by air and sea to support British ground forces, and made extensive use of Tristar, Victor, and VC-10 tankers for in-flight refueling during ferrying operations and then in combat.

The RAF also accelerated a number of key purchases and development programs for deployment in the Gulf -- including the ALARM anti-radiation missile, the TIALD thermal imaging and laser designation pod, additional electronic warfare equipment, the sensors for its GR1A reconnaissance aircraft, Havequick aircraft communications equipment, night vision goggles and laser visors, secure ground radios, GPS and other navigation aids, and an updated IFF system. It also modified much of its equipment for desert warfare. It had to modify its fighter and helicopter engines to improve hot weather performance or reduce sand ingestion; adapt its software to fight non-Warsaw Pact aircraft, improve air conditioning, provide radar absorbent coatings for its fighters, add an AIM-9L self defense capability to the Jaguar, and modify the Tornado F3 radar.[77]

The RAF flew a total of 5,417 sorties during January 16 to February 28, 1991. This was about 5% of all the sorties flown during Desert Storm, making the RAF the third most active air component in the Coalition after the US and Saudi Arabia. It flew a total of 1,256 interdiction sorties, 890 offensive counter air sorties, and 696 defensive counter air sorties. The RAF flew a total of 156 reconnaissance sorties and 40 electronic warfare sorties. Its support missions included 711 refueling sorties, 1,384 airlift sorties, 90 training sorties, and 74 other sorties. It maintained a high level of operational readiness, and canceled or aborted a total of 145 sorties, or about 2%. Only 10 of the sorties were canceled for maintenance reasons, while 106 were canceled because of weather.[78]

Its Tornado GR1 and GR1A fighters flew 1,644 strike sorties, and dropped some 3,000 tons of ordnance during Desert Storm, including 100 J-233 anti-airfield weapons, 6,000 bombs, 100 ALARM anti-radiation missiles, and 700 air-to-ground rockets. The Tornado GR1 sorties were flown as packages of strike, air-defense, and reconnaissance missions. They included 682 interdiction sorties, 740 offensive counter air sorties, 130 reconnaissance sorties, 40 support sorties, and 52 training and other sorties. The RAF also flew 600 Jaguar sorties. These included 530 attack-interdiction sorties, 25 reconnaissance sorties, 40 surface combat air patrol sorties, and 4 training sorties. The RAF lost a total of 7 Tornadoes in combat, and no Jaguars.[79]

A debate arose during the war regarding the attack tactics and capability of the Tornado GR1. This debate is discussed in depth in Chapter Six, but it occurred because four Tornadoes were lost in combat before the RAF flew its last JP233 anti-airfield munition strikes against Iraqi runways on January 21. Reports early in the war blamed these losses on the fact that the RAF was flying very low altitude ingress and delivery tactics to deliver the JP233 strikes. In fact, two of the losses were to radar-guided surface-to-air missiles at different altitudes, and only one occurred during delivery of the JP233.[80]

At the same time, the RAF found its emphasis on low altitude penetration tactics, and air-base suppression was not appropriate in an air environment where the primary threat was short range air-defenses -- rather than air-defense fighters and long-range surface-to-air missiles. This led to the emergency deployment of the Buccaneers to provide daytime laser designation. The Buccaneers flew a total of 226 sorties: 44 interdiction sorties, 150 offensive counter-air sorties, and 32 training sorties. It also led to emergency deployment of TIALD laser-designator pods to provide self-contained all-weather laser designation for the GR1s.

The RAF's Tornado F3/ADS air defense fighters flew 696 defensive combat air patrol sorties, 890 offensive counter air sorties, and 40 surface combat air-patrol sorties, for a total of 1,626 air defense sorties. The RAF did not score an air-to-air kill during the Gulf War, but its Tornado F3s were optimized for long range combat air patrols rather than complex close air battles, and were not committed to the air supremacy battle in the same way as the USAF and Saudi F-15s.

While the RAF was one of the most diverse Coalition air forces, it could not provide all of the specialized sensor, intelligence, communication, and reconnaissance assets available to the US, or project a self-contained force in terms of air-borne command and control aircraft, or heavy lift transports. At the same time, this imposed few operational limitations. The RAF was structured to fight with the USAF in NATO, and had trained extensively in using the E-3A AWACS and US targeting, intelligence, and electronic

warfare systems. As a result, the RAF was far more capable of projecting combat power in cooperation with US forces than any other European air force.

The value of this interoperability is an important lesson of the war, but it is important to note that even the RAF had to buy new communications equipment, ground support equipment, improved electronic warfare gear, and improved IFF capability to operate with US air units.[81] Further, Britain is again cutting resources. Like the British Army, the RAF has been cut back since the Gulf War. Britain plans to retire 65 Phantoms, leaving a force of 100 Tornado interceptors. The Tornado strike/attack force will be reduced from 148 to 112, Harriers from 74 to 52, the Jaguar force will be kept at 40, and the Buccaneer force will be retired. Britain does, however, plan to procure a total of 6 E-3A AWACS and retain a force of approximately 60 C-130 transports.[82]

British Naval Forces [83]

The Royal Navy played a major role in both Desert Shield and Desert Storm. Britain had long deployed an Armilla Patrol in the Gulf, and this force had one destroyer, two frigates, and a support ship at the time Iraq invaded Kuwait. During Desert Shield and Desert Storm, the Royal Navy made 3,171 challenges in enforcing the UN embargo and 36 boardings. As Chapter Ten discusses, the Royal Navy also played an important role in combat during Desert Storm.

A total of 11 frigates and destroyers, two submarines, 10 mine countermeasure ships, three patrol craft, three naval helicopter squadrons, and a Royal Marine detachment played a role in some aspect of UN and Coalition operations during Desert Shield and Desert Storm.[84] During its peak deployment period of February 1991, the Royal Navy deployed four air defense destroyers, four ASW frigates, two MCMV command ships, five mine countermeasure vessels, three tanker/supply ships, two ammunition stores ships, one casualty receiving ship, and four logistic landing ships. A total of 12 Sea King Mark IV helicopters were assigned to the 1st British Armored Division on November 29, 1990, and were operational in theater by January 5, 1991.[85] The Royal Navy's key combat ships included:[86]

- Three Type 42 destroyers, each armed with a twin Sea Dart surface-to-air missile launcher, 1 Lynx ASW helicopters, two three-rail anti-submarine torpedo tubes (ASTTs), and one 114mm gun. One of these ships, the *HMS Gloucester*, achieved the Coalition's only kill of an Iraqi anti-ship missile.
- Five Broadsword-class frigates, each armed with four MM38 Exocet, 2X6 Sea Wolf surface-to-air missiles, two three-rail ASTTs, and two Lynx ASW helicopters. (Helicopters from these ships, armed with Sea Skua air-to-ship missiles either damaged or sank at least 10 Iraqi vessels.)

- o One Leander-class frigate armed with four MM38 Exocet, two times six Sea Wolf surface-to-air missiles, 1 Lynx ASW helicopter, and two three rail ASTTs.
- o Five Hunt-class minesweepers.

British and US naval forces had long cooperated in both NATO and power projection activities, and Desert Storm did not require the same adaptation for Coalition warfare by British naval forces as it did for its ground and air forces. The Royal Navy did not deploy its V/STOL carriers for combat during Desert Storm, but the *Ark Royal* was the command ship for Coalition forces in the Red Sea. The Royal Navy used some 20 Sea King helicopters in counter-mine and patrol operations in the Gulf, and deployed 12 more in support of British ground forces.

British Type 42 destroyers provided nearly 40% of the forward air defense coverage for US carriers and battle groups, destroying one Silkworm missile in mid-flight. British submarines carried out covert missions, Lynx helicopters attacked Iraqi ships, scoring fifteen hits with Sea Skua anti-ship missiles, and British mine countermeasure vessels played a major role in sweeping Iraqi mines. Mine warfare was an area where the British Navy had notably better capabilities than the US Navy, although mine-sweeping was a major problem for all of the Coalition naval forces.

Some of these capabilities, however, will not be available in future conflicts. Like the US and other Western navies, the Royal Navy is experiencing force cuts. It will retire its fleet of conventional submarines and reduce its destroyer and frigate force to 35. It will, however, retain three light VSTOL carriers and a helicopter carrier, and the Royal Marines will remain at a strength of three battalion-sized commandos.[87]

The Strengths and Weaknesses of European Power Projection: Lessons from French Forces and Capabilities [88]

Although Canada and Italy contributed combat aircraft, France was the only Western country aside from Britain and the US to make a major contribution to the AirLand battle. France was one of the first nations to condemn Iraq's invasion of Kuwait, and the messages and speeches of the President of the Republic, Prime Minister Rocard, Pierre Mauroy of the socialist majority, and opposition leader Edouard Balladur all condemned the Iraqi invasion of Kuwait at a special meeting of the National Assembly on August 27.

France began to move its ground and air forces as early as August 10, 1990. It removed its fighters from the carrier *Clemenceau*, and loaded 30 Gazelles and 12 Pumas from the 5th Combat Helicopter Regiment. The *Clemenceau* then headed for the Gulf on

August 13, as part of Operation Salamandre, which was originally shaped as an operation to evacuate French citizens from Kuwait.

France's reaction to Iraq's invasion of Kuwait does, however, provide a lesson in the political problems inherent in Coalition warfare, and shows that cooperative security will often mean independent national action. Condemning Iraq presented special political problems for France because it had been Iraq's strongest Western supporter during the Iran-Iraq War, had been a major supplier of arms, and a number of senior French officials had close ties with the Ba'ath regime.[89] Minister of Defense, Jean-Pierre Chevenement, was a particularly strong supporter of Iraq, and opposed active military intervention. A communiqué published in Rennes on August 9, 1990, by the Association of French-Iraqi friendship (founded by Jean-Pierre Chevenement) stated that France had lost all credibility with the Arab world and condemned all intervention in Arab affairs. Other French political figures, such as Cheysson, Giraud, Jobert and other opposition leaders such as Jean-Marie Le Pen, believed that France should not become involved in a Gulf conflict.[90]

These attitudes influenced French diplomacy during Desert Storm, and affected some aspects of the French deployment to the Gulf. For example, France differed with Britain and the US over the interpretation of Resolution 661. According to French diplomats, Resolution 661 did not call for a blockade or military measures, and only envisaged an embargo. French President Francois Mitterrand reflected some of this ambiguity over the use of force in his speech before the General Assembly of the United Nations on September 24, 1990. Although he condemned the invasion of Kuwait by Iraq, Mitterrand advocated an international conference and direct talks between the parties involved.

French military deployments to the Gulf were delayed while France's Minister of Defense Jean Pierre Chevenement -- a major advocate of arms exports to Iraq and founder of an Iraqi-French friendship group -- attempted to find an accommodation with Iraq. The *Clemenceau* remained at Djibouti from August 22-28 for "training," and then made port calls at Fujairah and Abu Dhabi before finally off-loading French helicopters and transport aircraft from the 4th Airmobile Regiment in Yanbu during September, 22-25. Some elements of French forces deployed to Saudi Arabia before that time, but President Mitterand only decided to commit an air mobile brigade (the 6th Light Armored Division), and 30 combat aircraft to the Gulf on September 14, 1990. This decision occurred after Iraqi troops forcibly entered the French embassy in Kuwait, and French forces did not actually began to reach combat positions near King Khalid Military City until September 26.

Even after these deployments, France continued to pursue a separate track of negotiations.[91] This effort included the decision of the Iraqi Parliament to support the proposition of Iraqi President Saddam Hussein to free the French hostages on October 23, 1990; reports of separate negotiations by Cheysson, meetings between President Chadli Bendjedid and Mitterrand in Paris on December 18; submission of a French peace plan to the Security Council of the United Nations on December 14, 1990; the meeting of Michel Vauzelle, President of the Commission of Foreign Affairs in the National Assembly, with Saddam Hussein in Baghdad on January 2, 1991, meetings between Secretary General of Elysee Jean-Louis Bianco and the Algerian President in Algiers on January 8; meetings between Roland Dumas and Foreign Minister Ahmed Ghozali on January 10.[92]

France did continue to slowly build up its forces. Chevenement announced on December 11, 1990 that France would send an additional 4,000 troops to reinforce its initial 6,000-man contingent, and stated that this decision responded to the Security Council Resolution 678 of November 29.[93] The National Assembly also voted to approve the legitimacy of using force to free Kuwait on January 16, 1991 by 574 to 43, and the Senate voted by 290 to 25e.[94] These votes allowed France to commit a task-force -- for what it now called "Operation Daguet" -- that included a total of 16,500 personnel, with 9,860 personnel in north-east Saudi Arabia, the 6th Light Armored Division, 58 fixed wing combat aircraft, and 60 attack helicopters.[95]

Nevertheless, France continued to pursue a different diplomatic path. It indicated that it would send a French delegation to Iraq for separate negotiations just before the UN deadline expired, and this mission was only canceled on January 14, 1991 -- after considerable British and US pressure. French made a last minute proposal to accept the Iraqi suggestion for an international peace conference to address all of the Middle Eastern issues, which the UN Security Council rejected on January 15, 1991.[96] Finally, President Mitterrand supported last-minute Soviet efforts to prevent a ground war -- although he also declared that Iraq's demands for 21 days in which to leave Kuwait, and for an immediate cease-fire, were terms that the allies could not accept.[97]

These differences in the French diplomatic approach to the Gulf War seem to have been the reason Chevenement resigned on January 29, 1991 -- seemingly because he did not agree with French involvement in attacking Iraq.[98] They did not, however, limit the effectiveness of French forces during Desert Storm. French forces acted as an integral part of the US XVIII Corps, while elements of the 82nd US Airborne Division were subordinated to the French command-- a demonstration that military realism can triumph over political rhetoric. French forces carried out extensive liaison and exercise training with US and British forces during Desert Shield. France provided information on the military

equipment that it had sold to Iraq. French forces also adapted their C4I/BM systems to make use of US support in command and control, communications, sensors, intelligence, and electronic warfare.

The French Ground Forces [99]

The core of the ground units France deployed to the Gulf was drawn from a special power projection force called the Force d'Action Rapide (FAR). This force consisted of the 6th Light Armored Division, which normally had a combat strength of around 4,200 personnel -- equivalent to about one heavy US Army brigade. Its key elements included the 1st Foreign Legion Armored Regiment (35 AMX-10RC), the 1st Regiment de Spahis (35 AMX-10RC), the 2nd Foreign Legion Infantry Regiment (VAB APCs), the 21st Marine Infantry Regiment (VAB APCs), the 68th Marine Artillery Regiment (four towed 155mm howitzer batteries and a Mistral battery), and the 6th Foreign Legion Engineer Regiment.[100]

The 6th Light Armored Division did not have heavy armor, and only had two armored reconnaissance battalions with 72 AMX-10RC light armored vehicles. The AMX-10RC is a comparatively lightly armored 6X6 amphibious vehicle -- although it does have NBC protection, low-light TV night vision and sights, a laser range finder, and a 105mm gun. The division had two additional motorized infantry battalions, with three rifle companies and an anti-tank company with HOT missiles. These battalions used the VAB armored personnel carrier, which could be airlifted by the C-130 (an amphibious 4X4 with NBC protection, night vision, and normally equipped with a heavy machine gun.) Special variants acted as command vehicles, logistic vehicles, 81mm and 120mm mortar carriers, and HOT and Milan anti-tank guided missile carriers. It also had a VAB-mounted combat engineer battalion that could fight as infantry, and also had some Panhard ERC-90s.

This mix of combat elements was suitable for low intensity combat in Africa, but was scarcely heavy enough for high intensity tank warfare against Iraq. As a result, the 6th Light Armored Division needed substantial reinforcement from three additional formations. These formations included the 4th Airmobile Division with the 5th Combat Helicopter Regiment equipped with 10 SA-341 20mm gunships, 30 SA-342 attack helicopters with HOT, and the 1st Transport Helicopter Regiment with 62 SA-330 Pumas. They included a separate air mobile anti-tank guided missile battalion with Milans, and the 4th Dragoon Regiment of the 10th Armored Division with 44 AMX-30B2 tanks. This regiment was composed of volunteers from outside the FAR, and the AMX-30 is a comparatively lightly armored tank with NBC protection, a coaxial 20mm machine gun, a laser range-finder and ballistic computer, and a 105mm gun.

France deployed elements of the 9th Marine Division, including the 2nd Marine Infantry Regiment (VAB APCs), a 269-man detachment of the 3rd Marine Regiment, and

the 11th Marine Artillery Regiment. This regiment had three batteries with Atila fire control and inertial navigation systems, and a total of 18 towed 155mm TR-F1 guns. (maximum range 24 kilometers with regular rounds and 33 kilometers with rocket assisted rounds). France also kept 2,400 Marines in the Red Sea as part of "Operation Artimon".[101]

Two air defense batteries were deployed, with Mistral man portable surface-to-air missile systems augmented by US Stingers. The 11th Parachute Regiment provided elements of an engineer battalion, an armored reconnaissance battalion, and two long range reconnaissance units. Support was provided by the logistical support battalion of the 6th Light Armored Division, reinforcing elements of the 11th Parachute Division's logistic support battalion, a logistic support battalion, a communications battalion, and two electronic warfare companies from the FAR.

These added elements expanded the total French ground force expanded to about 9,000 personnel, including 2,200 men in combat and service support, and 2,000 men in logistic support. Heavy weapons strength was expanded to include 40-44 AMX-30 main battle tanks, 18 155mm towed artillery weapons. They brought the total number of combat vehicles to 160. French also deployed 130 helicopters, 60 of which were equipped with guns or anti-tank missiles. It had a reinforced logistic support group with 300 heavy transport vehicles, VLTs, tank transporters, and tanker trucks.[102]

This force did not have the high intensity armored warfare capabilities of British and US forces, but it had considerable air mobility and considerable anti-armor capability. It lent itself precisely to the kind of long range thrust that USCENTCOM planned in the West. Allocating French forces such a mission had the additional advantage that the French commander-in-chief, General Michel Roquejoeffre, could cooperate with General Schwarzkopf, and still maintain the *de jure* independence of command -- a key aspect of French doctrine.

Fortunately, General Michel Roquejoeffre, and General Bernard Janvier (the commander of the 6th Light Armored Division) emphasized cooperation with General Schwarzkopf and developed common plans and tactics with the XVIIIth Corps of the US Army. French forces worked closely with the 2nd Brigade of the 82nd US Airborne Division, obtained extensive fire support from the 18th US Army artillery brigade, and obtained occasional close air support from the US Air Force. This allowed France to preserve independence of command, and keep ultimate command authority under the control of President Mitterand, without dividing operational command or creating the kind coordination problems that had weakened so many coalitions in the past..

As Chapter Eight describes, French forces fought well during Desert Storm, and played a major role in securing the Coalition's western flank and the advance of the XVIII

Corps. At the same time, France was only able to participate effectively in Desert Storm because it had months to assemble, re-organize, and retain its forces, and because it had the time to send four convoys of chartered cargo vessels and car ferries. French forces required substantial Saudi and US support. The total French force also had a combat strength of less than half that of a US division, and was too light to directly engage the best Iraqi armored or mechanized divisions.

As General Forray, the Chief of Staff of the French Army pointed out -- France badly needed the new LeClerc tank, since the French force lacked adequate long range artillery, and the AMX-30 was an aging tank incapable of effectively engaging Iraqi armor like the T-72M.[103] It was clear to senior officers like the Chief of Staff of the French Army that Desert Storm raised serious questions about the French capability to quickly engage in high intensity combat without a modern tank, more artillery, and major reorganization of its power projection forces, and that France could only engage significant enemy armored and mechanized forces as part of a coalition.[104] The order for French part of the XVIII Corps advance was also 600 pages long -- which demonstrates the fallacy of trying to maintain true independence of command in complex coalition operations. It was scarcely a list of military actions that the 6th Light Armored Division could have improvised in passing.[105]

Like Britain, it is also far from clear that France will maintain the land force power projection capabilities it had at the time of the Gulf War. Recent French defense white papers do indicate that France will buy new tanks and retain a significant pool of land forces. They also, however, raise serious questions about French willingness to fund adequate readiness and overall equipment modernization.[106]

The French Air Force [107]

France decided to deploy combat air units to the Gulf when Iraq forcibly entered the French Embassy in Kuwait on September 14, 1990. The first French combat aircraft -- four Mirage 2000s and four Jaguars -- refueled by French C-135FR tankers -- reached Al-Ahsa in Saudi Arabia on October 3, 1990. Al-Ahsa was near Hofuf, about 130 kilometers south of Dhahran. These initial deployments were reinforced at relatively long intervals. Four more Mirage 2000s and four Jaguars only reached Al Ahsa on October 8, and eight more Jaguars did not arrive until October 15-17. The political factors discussed earlier kept the total French combat force below squadron strength, although insufficient basing space at Al-Ahsa had some impact. France also deployed Crotale surface-to-air missiles and 20mm guns to protect the aircraft.

These deployments began to give the French Air Force a meaningful combat capability, and France signed a military agreement with Qatar as part of "Operation Meteil" and deployed eight Mirage F-1Cs to Doha on October 17. It also deployed 260 men

equipped with Crotale and Mistral air defense weapons to the UAE as part of "Operation Busiris".

As time went on, the French Air Force built up an air bridge between France and Saudi Arabia using C-160s, C-130s, and DC-8s, and established a base in Riyadh for intra-theater lift and for its C-135R tankers. Like Britain, France had no heavy strategic airlift. Even so, France flew 21,000 military passengers and 10,500 tons of freight into the theater. It flew 1,020 sorties of theater lift, and delivered 12,400 passengers and 5,500 tons of freight.

By January 15, 1991, French forces at Al-Ahsa totaled nearly 1,300 personnel. The total French air presence in the Gulf included 24-18 Jaguar attack fighters, and 12-14 Mirage 2000C multi-role fighters It deployed Mirage F-1CR reconnaissance fighters, which carried out the surveillance of Iraqi fortifications during Desert Shield, and led French Jaguars in Desert Storm. Its main air base at Al Ahsa had 24 Jaguars, 12 Mirage 2000Cs, and 4 Mirage F-1CR reconnaissance fighters with SLAR and IR sensors. It was protected by two Crotale SAM units, 10 Mistral surface-to-air missile launchers, and 8 20mm guns. France's 8 Mirage F-1C multi-role fighters in Qatar reinforced the Mirage F-1Cs in the Qatari forces. France also deployed four C-160F/NG Transall transports, one C-160NG electronic warfare aircraft, and C-135F tankers based at Riyadh.[108]

The French Air Force established a tactical control and detection unit, protected by two Crotale units, near the Saudi border in the area of Hafr al-Batin. These units coordinated with the USAF and Saudi E-3As, and provided air control for the air cover over French ground forces, and had the ability to provide real-time down link analysis of the reconnaissance data collected by the Mirage F-1CRs.[109]

The French Air Force faced more training and interoperability problems in organizing for coalition warfare than British and US units. It had not carried out extensive exercises with the Saudi Air Force before the war, and had more limited interoperability with the Saudi Air Force than did the USAF and RAF. Similarly, the French Air Force had less experience than the RAF in operating with the USAF, and although many French pilots had flown in US Red Flag exercises, the USAF had provided strategic airlift support to France during its operations in Chad. France's Mirage F-1s also presented some minor initial recognition problems because the type was operated by Iraq. French forces could, however, build on their experience in NATO, and in joint exercises with the USAF and RAF. They adapted quickly to operating in a coalition environment, and the French Air Force flew a total of 2,258 sorties during Desert Storm from January 16 to February 28, or about 2% of all the sorties flown, making it the fourth most active air component in the Coalition after the US, Saudi Arabia, and the RAF.

French air units flew a total of 531 interdiction sorties, 58 offensive counter air sorties, 172 offensive escort sorties, 340 defensive counter air sorties, and 62 reconnaissance sorties. Support missions included 62 refueling sorties, 855 airlift sorties, one rescue sortie, four training sorties, and 12 other sorties. They maintained a high level of operational readiness, although they canceled or aborted a total of 222 sorties -- about 10% of all sorties planned. Only 25 of the sorties were canceled for maintenance reasons. Minor command and control problems in allocating French aircraft, and rapid changes in the battlefield, led to about 73 sortie cancellations, while 102 were canceled because of weather.[110]

Mirage 2000s flew 512 sorties -- 340 defensive counter air sorties, and 172 offensive counter air sorties -- including combat air patrol sorties with US and Saudi forces, and provided air cover for the French Jaguars. French Mirage F-1CR fighters flew 92 sorties. They included 36 interdiction sorties, 8 offensive counter air sorties, 44 reconnaissance sorties,, and 4 training sorties. The French Air Force also flew 571 Jaguar sorties. These included 495 attack-interdiction sorties, 50 offensive counter-air sorties, 18 reconnaissance sorties, and 8 other sorties. French Jaguars carried out numerous attack stories, sometimes cooperating with USAF F-16s and F-4C Wild Weasels to provide air cover.

French Naval Forces [111]

French naval forces played a major role in enforcing the UN embargo -- and operated near critical choke points like the Straits of Hormuz, Bab al-Mandab and Gulf of Aden -- but only played a limited role in the Gulf during Desert Storm. The main French ships deployed in support of the embargo, They included the guided missile destroyer *Du Chayla*, armed with a Standard SM-1 surface to air missile launcher and three anti-submarine torpedo tubes (ASTTs); three ASW destroyers armed with eight MM-38 Exocet, a 100 mm dual purpose gun, two Lynx ASW helicopters, an ASW mortar, and 2X6 ASTTs; and the frigate *Commandant Ducuing*, armed with four MM-40 Exocet, a 100 mm dual purpose gun, an ASW mortar, and four ASTTs. French support ships included a tanker, two replenishment ships, a maintenance ship, and two hospital ships.

The carrier *Clemenceau* did not engage in operations but did carry 48 French Army Aviation helicopters to the port of Yanbu, including larger numbers of SA-342M attack helicopters with HOT anti-armor missiles, and AS-332 Super Puma transport helicopters which deployed to positions near King Khalid Military City and Hafr al-Batin. France deployed three mine countermeasure ships and a support ship to Port Said in Egypt to help secure the Red Sea. French mine warfare ships did not play a role in the Gulf, although they are some of the most effective counter-mine forces in NATO.

Other Western Military Forces

A number of other Western countries sent combat forces to Turkey or deployed forces in a support role. Only two other Western nations , however, contributed combat forces to Desert Storm. The Canadian Air Force sent a composite squadron of 26 CF-18s to Qatar, with about 500 personnel. This force deployed from Germany and Canada and was supported by C-130 transports and KC-130 tankers. Its initial mission was to provide air cover for the three Canadian warships in the Gulf, but it later began to provide air defense escorts for Coalition attack fighters on their way to Iraq, and flew some attack sorties against Iraqi naval and ground targets.

Canadian forces flew a total of 1,302 sorties. They flew 961 combat sorties with CF-18s, 163 airlift sorties with B-707s, 124 airlift sorties with C-130s, and 54 airlift and support sorties with CC-144s.[112] Its CF-18s flew 48 interdiction sorties, 693 defensive counter air sorties, 144 offensive counter air sorties, 64 training sorties, and 12 other sorties.[113]

The Italian Air Force sent 10 Tornado strike aircraft to Al-Dhafra in the UAE, with about 200 personnel, and deployed C-130 and G-222 logistic support aircraft. Its Tornadoes flew 224 sorties in Desert Storm and its G-222s flew 13 sorties. The Italian Air Force faced special operational problems because it did not have its own tankers for airborne refueling. While 135 of its Tornado sorties were flown in interdiction missions, another 89 of its Tornado sorties had to be dedicated to refueling. Italy averaged about 4 interdiction and 3 refueling sorties per day. [114]

Lessons for Cooperative Security: Saudi Forces and Capabilities

It was Saudi Arabia, and not Europe, which made the second most important contribution to the Coalition victory. Saudi Arabia made the second largest contribution to the military forces of the Coalition. It financed the expanses of many other members -- including Egypt, Syria, and the United States, and provided bases, infrastructure, logistic support, and supplies to all Coalition forces. Some analyses of the war understate the importance of this aspect of Saudi contribution to the Gulf War, but the commanders of the other Coalition forces who have written on the Gulf War have consistently praised the Saudi effort and Saudi willingness to accommodate the needs of other nations.

There is no way to estimate the overall cost of the Saudi contributions to other states, since some have never been made public and involved indirect expenditures. Saudi Arabia almost certainly, however, had spent or pledged over $48 billion on the Gulf War from August 2, 1990 to the end of January, 1991. At least $16.5 billion of this money was

committed to the US, and $1 billion was committed to the U.K.[115] It has since spent at least $50 billion more in terms of additional expenses, improvements in its forces as a result of the Gulf War, and improvements in basing and other capabilities that can aid future Western power projection efforts -- at least $30 billion of which will be spent in the US.[116]

The Coalition could not have fought Desert Storm with anything approaching the effectiveness that it had without the support of Saudi Arabia, and without the massive investment that Saudi Arabia had made in Western military equipment and supplies, and in military bases and infrastructure over the previous decade. It is questionable whether any Coalition military effort could have liberated Kuwait without Saudi aid.

Saudi Arabia also played an important role in shaping the political and strategic context of the war, both in persuading other Arab states to support the Coalition in the face of Iraqi pressure, and in the way that it handled the politics of coalition warfare. This Saudi role is reflected in all of the political histories of the war, and the tangible benefits in terms of Coalition force strength are clearly reflected in the Arab order of battle shown in Table 3.12.

This Saudi support was scarcely disinterested, but no discussion of the lessons of the Gulf War can ignore the critical value of strong regional partners in cooperative security, and the value the West's effort in developing regional military partners. The fact that many of these partnerships may have originated in the Cold War is immaterial. They are, if anything, more important in an era of regional threats, declining Western military forces, and power projection capabilities.

There were occasional disagreements over strategy and tactics between Saudi Arabia and the United States, and clashes over specific issues, but these differences were resolved with far less tension and bitterness than many similar debates between the British and US planners in World War II. In general, the frictions described in General Schwarzkopf' and General de la Billiere's memoirs of the war are surprisingly minor. Both officers worked well with the Saudi commander Prince Khalid bin Sultan al-Saud, and most of the problems that they describe are more a matter of temperament and cultural differences than matters of military planning and policy.[117]

At the same time, Saudi forces did suffer from many of the same qualitative problems as Iraqi forces, and were far less experienced in combat and maneuver than British, Egyptian, French, Syrian, and US forces. Saudi Arabia only had about 67,500 men in its regular armed forces at the time Iraq invaded Kuwait, plus about 35,000 "actives" in its National Guard. These forces were well equipped in some respects: Saudi Arabia had 550 main battle tanks and 189 combat aircraft. At the same time, Saudi defense doctrine was static and defensive, Saudi Arabia had never used armored forces in combat, and the

Saudi Air Force had only fought one limited air-to-air clash with Iran. It had no real experience in offensive air operations.

If the fighting between Iraqi and the US forces represented was a conflict between two military cultures, the Coalition was an alliance of two military cultures and one that has many potential lessons for cooperative security in the Gulf and elsewhere in the world.

Table 3.12

The Arab Land Order of Battle in Desert Storm

Joint Forces Command - North (JFC-N) (Saudi Command)

	Egyptian Corps	Syrian Division	Force Muthanna	Force SADD	Joint Troops
Saudi Forces	-	-	20th Mech. Bde	4th Arm. Bde	1st Avia. Btn 15th FA Btn*
Kuwaiti Forces	-	-	35th Mech. Inf Bde	15th Inf. Bde -	
Egypt	3rd Mech. Inf. Div 4th Arm Div Ranger Regt.	-	-	-	-
Niger	-	-	-	-	Inf. Btn
Syria	- -	9th Arm. Div Special Forces Regt	-	-	-

Joint Forces Command - East (JFC-E) (Saudi Command)

	Force Abu Bakr	Force Othman	Task Force Omar	Task Force Tariq	Joint Troops
Saudi Forces	2nd SANG Bde	8th Mech. Bde	10th Mech. Bde	Marine Btn	14th FA Btn* 18th FA Btn** Saif Allah Engineer Force
Kuwaiti Forces (UAE)	-	Al-Fatah Bde	-	-	Avia. Btn.
Bahrain	-	Infantry Co	-	-	-
East Bengal Btn	-	-	-	-	1st Inf.
Morocco	-	-	-	6th Mech. Inf Btn	-
Oman	-	Mot. Inf. Btn	-	-	-
Qatar Btn	-	-	-	-	Mech. Inf.
Senegal	-	-	-	Inf. Btn	-
UAE (Ku)	-	-	Mot. Inf. Btn	-	Avia. Btn.

Non-Affiliated Forces

Kuwaiti Forces:
Al-Haq Brigade
Khulud Brigade
Commando Battalion

*155mm **MLRS
Source: Adapted by the author From Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 317, 325-327

The Saudi Army [118]

The Saudi Army only had a total of 38,000-43,000 men in late 1990, even though it accepted large numbers of volunteers after August, 1990. It had long had significant problems in recruiting and training ordinary enlisted men, skilled technicians, and NCOs. In spite of crash efforts to build up the army's manpower during the Gulf War, its force structure was still undermanned by about 20-35% at the time that Desert Storm began, and many individual units had worse manning levels. These problems were so severe that Saudi Arabia had to fund the deployment of an 8,000 Pakistani brigade in August, 1990, in order to defend its border with Yemen and to allow the Saudi Army to assemble significant forces near Kuwait and Iraq.[119] While there were another 56,000 full and part-time men in the National Guard, only a small fraction had any real degree of military professionalism and only two comparatively small mechanized infantry brigades had any real combat power.

The Saudi Army had a total combat unit strength of two armored, four mechanized, one infantry, one airborne brigade, and one Royal Guards regiment. Only one of these armored brigades -- the 4th Armored Brigade -- could be retrained for offensive combat during Desert Storm. However, all four of the mechanized brigades -- the 8th Mechanized, the 8th Mechanized Infantry, 10th Mechanized Infantry, and 20th Mechanized -- were strengthened and trained for Desert Storm. In addition, the 2nd Motorized Infantry Brigade of the Saudi National Guard was deployed forward towards the border, and the Saudi forces in the area were reinforced with elements of the Saudi Airborne Brigade and the Saudi Marines. The Saudi Army had an aviation command, and five independent artillery battalions, but it lacked the helicopters and independent artillery brigades that it needed. As a result, the Saudi Army had to rely on the US for long range artillery, heliborne assets, and close air support.[120]

The resulting Saudi force represented the entire fighting strength that could be reinforced, deployed, and made combat-effective to face a threat as serious as the Iraqi Army. At the same time, the Saudi Army faced considerable logistic and deployment problems in making this force effective. The Saudi Army is normally deployed throughout the Kingdom. It had brigade-sized casernes at Khamis Mushayt and Shahrurah in the southeast, a garrison at Najran and Jubail in the south, and brigade-sized forces at King Khalid City in the north, Tabuk in the West, and Dammam in the East. The Gulf Cooperation Council's small Peninsular Shield Force was located at King Khalid City, near the border with Kuwait and Iraq. These deployments reflected the fact that the Saudi Army could not leave any of its border areas undefended, although they were partly a matter of

internal security -- Saudi forces were usually kept far away from key cities and political centers of power.

The Saudi Army favored defensive tactics at the beginning of Desert Shield, and had little in common with the US emphasis on offense and the AirLand battle. Undermanning, deployment problems, lack of total force strength, lack of maneuver experience, and political concerns were all factors that helped shape a relatively static and defensive force. They were reinforced by the fact that the Saudi Army was largely a garrison army that operated out of fixed major bases (or military "cities"), that rarely deployed long distances from its casernes or engaged in large scale training and exercises. The Saudi Army had no significant helicopter contingent and rarely exercised with the air force in any kind of serious air support exercises.

Sir Peter de la Billiere described the Saudi Army as follows, in his memoir on Desert Storm,[121]

> "The inadequacies of their army did not reflect the incompetence of any individuals; rather they exposed the general local belief...that the army was unlikely to have to fight a major war. In the Arab world, people found it extremely difficult to come to grips with the idea that one state could attack another...The result of the Saudis' good faith in Arab solidarity was that they never made a serious effort to develop their ground forces. The army was there, more than anything else, for the defense of the Kingdom, and not surprisingly, had significant limitations for the type of operations in which it might now be involved.. they suffered from a lack of offensive training...."

These problems were compounded by the need to operate a complex mix of different equipment from many different nations. Much of this equipment required modification or changes to its original technical and logistic support plan before it could be operated in large numbers in Desert Storm. These problems were increased by the need to support so many different types of equipment in distant border areas, and by the heritage of an overly ambitious effort to create a modern logistical system that has lacked proper Saudi and US advisory management.

The Saudi Army also had equipment quality problems. Saudi Arabia had about 550 main battle tanks in the fall of 1990. These tanks included 50 US-made M-60A1s, 200 M-60A3s, and 300-310 French-made AMX-30s. Saudi Arabia bought 150 M-60A3s, along with 15,000 depleted uranium 105mm anti-tank rounds, as part of an emergency order in August, 1990, but it is unclear that any of these assets were used in Desert Storm.[122]

Only part of this tank force met Saudi needs. The M-60A1 was barely adequate to compete with the T-72M, and Saudi Arabia was converting all of its M-60A1s to the M-

60A3. The M-60A3s had the advantage of thermal sights, modern fire-control computers, laser range-finders, and engine and air intake improvements. Even the M-60A3s, however, presented some operational problems -- the crew compartment could not be cooled effectively, and the M-60s developed internal temperatures of well over 120 degrees.

The Saudi inventory of 300-310 French AMX-30s presented more serious problems. The AMX-30 lacked the armor, firepower, and operational availability to be kept in service against a threat armed with T-62s and T-72s. While the adoption of newer anti-armor round technology made up for some of the lack of penetrating power in the Obus G rounds that France originally sold to the Saudi Army, the AMX-30's fire control and range-finding capability was inadequate to help Saudi tank crews make up for their lack of experience, and the AMX-30 lacked the power, cooling, and filtration for desert combat. Saudi Arabia had needed to phase the AMX-30s out of its force structure for nearly half a decade. The Kingdom had decided to buy 315 M-1A2s tanks in September, 1989, but the details of sale had taken roughly a year to complete and none were in delivery by the time of Desert Storm.

The Saudi Army had problems with its holdings of other armored fighting vehicles, including the 230-240 AML-60 and the AML-90 reconnaissance vehicles. It had 430-550 AMX-10P and 250 VAB/VCI mechanized infantry combat vehicles, command vehicles and special purpose vehicles. It had 950-1,000 M-113, M-113A1, and other US armored personnel carriers. It also had 30 EE-11 Brazilian Urtu, 110 German UR-416, 120 Spanish BMR-600 and 40 Panhard M-3/VTT armored personnel carriers; 150 to 200 additional armored mortar carriers, including M-106A1 and M-125s, large numbers of French and US-made armored recovery vehicles, armored bridging units, and large numbers of special purpose armored vehicles. Many of these vehicles were individually effective, although none were equivalent to first line British and US infantry fighting vehicles. Collectively, supporting so many different types of equipment created major support and repair problems, and made it difficult to organize and train standardized armored and mechanized task forces.[123]

Saudi Arabia did have 200 Bradley M-2A2 Armored Fighting Vehicles entering service as a result of orders that it placed in 1988, plus orders of 200 more M-2A2s, 207 M-113 armored personnel carriers, 50 M-548 cargo carriers, 17 M-88A1 recovery vehicles, and 43 M-578 recovery vehicles. These vehicles, however, were still in delivery.[124]

The Saudi Army had an excellent mix of small arms, light weaponry, and anti-tank weapons in 1992. These included TOW, HOT, and Dragon anti-tank guided missiles. Some 200 TOW launchers were mounted on VCC-1 armored fighting vehicles, 300 were mounted on M-113A1s or other US-supplied armored vehicles, and 200 were mounted on

VCC-1 armored vehicles. It had 90 HOT launchers mounted on AMX-10P armored fighting vehicles.

The Saudi Army had large numbers of TOW crew-portable and Dragon man-portable anti-tank guided weapons systems It also had 450 Carl Gustav rocket launchers, M-72 LAW, and 75mm, 84mm, 90mm and 106mm rocket launchers and recoilless rifles. Saudi Arabia ordered 4,460 TOW-2 missiles in April, 1987, and 150 more TOW IIA missile launchers with night vision sights and support equipment on September 27, 1990.[125] These weapons were most valuable in defensive combat, however, and Saudi proficiency in using these anti-tank weapons was uncertain. Crew and operator training often lacked consistency and realism. The units equipped with anti-tank weapons in armored vehicles lacked maneuver and combined arms training, and tended to fire at high rates without proper targeting and positioning.

The Saudi Army had acquired large numbers of modern artillery weapons, including 14 ASTROS II multiple rocket launchers, and 110-120 M-109A1/A2 and 65 GCT 155mm self-propelled howitzers. It also had 24 Model 56 and 90 M-101/M-102 105mm towed howitzers, and 50-70 FH-70 and 90 M-198 155mm towed howitzers, plus some older towed weapons in storage. It had large numbers of mortars, including over 400 120mm and 4.2" weapons, over 1,000 81mm weapons, and large numbers of light 60mm weapons.[126] The Saudi Army, however, had only a limited ability to use artillery in maneuver and combined arms warfare, and was unable to shift and concentrate fires, and effectively target in counter-battery fire, or at targets beyond visual range. Saudi Arabia had ordered new target acquisition radars -- such as the AN/PPS-15A, MSTAR, or Rasit 3190B -- to replace 1960 vintage systems, and was improving its counter battery radars and fire control systems, but much of this equipment was still in delivery.[127]

It is not easy to separate the Saudi Army's air-defense assets from those in the Saudi Air Defense Force. The Saudi Army seems to have had 14-18 anti-aircraft artillery batteries. It was equipped with Crotale radar-guided missiles on tracked armored vehicles, over 300 Stingers, and 570 obsolescent Redeye man portable surface-to-air missiles. Saudi Arabia bought 50 Stinger launchers and 200 Stinger missiles on an emergency basis in August, 1990, and had additional Crotales and 700 launchers and 2,300 missiles for the French Mistral missile system on order.[128] The Army seems to have had 10 M-42 40mm, 50-60 AMX-30SA 30mm self-propelled, and 50-60 Vulcan M-163 anti-aircraft guns. It also seems to have had an unknown number of Bofors L-60/L-70 40mm and Oerlikon 35mm towed, and possibly 15 M-117 90mm, towed anti-aircraft guns.

These assets gave Saudi Arabia a stronger mix of air-defense assets than was possessed by many Arab armies, but training and readiness levels are moderate to low. They also gave

Saudi forces some air defense capability to deal with any major threat from the north. The Saudi Air Defense Corps was not a force that could easily support the army in mobile operations, and Saudi land forces were heavily dependent on air power for air defense.

The Saudi Army's lack of helicopter forces was also a serious weakness. Most of the Saudi Army was normally deployed close to 600 miles from the Kingdom's main oil facilities in the Eastern Province, although a brigade was deployed to the new King Fahd military city in the Eastern Province, and the combat elements of a brigade deployed to the new Saudi Army base at King Khalid City near Hafr al-Batin in 1984. Helicopters offered a limited solution to this dispersal problem. They could both provide rapid concentration of force and allow Saudi Arabia to make up for its lack of experience in large-scale maneuver.

The Saudi Army had studied plans for developing a helicopter force using a total of 60-100 US AH-64 attack, Blackhawk utility and support, and Chinook CH-47 transport helicopters from the US in the mid-1980s. However, growing political problems in obtaining weapons from the US led Saudi Arabia to turn to Britain, and purchase 88 Black Hawk helicopters through Westland. Roughly 80 of these Westlands were to be attack helicopters with TOW-2. The rest were to be configured for SAR missions. None of these systems, however, were operational by Desert Storm.[129] In 1990, the Saudi Army still had only 12 UN-60 Blackhawk troop transport helicopters, some UH-60 medical evacuation helicopters, some Bell 406 Helicopters, and six SA-365N medical evacuation helicopters. It also continued to experience serious support problems from some of its foreign contractors.[130]

Saudi Army logistic and support vehicles and equipment were good, as were Saudi Army facilities. The Saudi Army was one of the few forces in the developing world which is organized to provide as much sustainability as maneuver and firepower. It did not, however, have anything like the vehicle strength or capability to rapidly redeployed and sustain forces from the rest of the Kingdom to the Eastern Province. This helps explain why it ordered 10,000 support vehicles from the US on September 27, 1990, including 1,200 High Mobility Multipurpose Wheeled Vehicles (HMMWVs).

Saudi Land Forces and the Battle of Khafji

Some commentaries on the Saudi Army since the Gulf War have ignored the limitations that Saudi forces faced before the conflict, and criticized the Saudi Army for not being as capable as the US Army or the US Marine Corps. It should be clear, however, that judging Saudi ground forces by Western standards ignores fundamental differences in the readiness and equipment of the forces involved. The Saudi Army and National Guard have also been criticized for their failure to defend Khafji when Iraq attacked on January 29, 1991.[131] There is some legitimacy to such criticism. Saudi forces did not defend Khafji

when Iraq first attacked, the initial Saudi effort to retake the town was repulsed, and Saudi and Qatari troops advanced uncertainly, and sometimes used excessive and disorganized fire during the battle that retook the city. The battle of Khafji, however, needs to be kept in careful perspective.

There were good reasons why Saudi forces were not ready to defend Khafji. Saudi Arabia had deliberately deployed screening forces as far forward as possible near the border early in Desert Shield. This placed them in the most vulnerable location, and Saudi Arabia made taking first blood a matter of pride.[132] However, the Saudis have never attempted to defend as far forward as Khafji. This was partly because of US advice Khafji was too close to the border to defend against a sudden Iraqi assault. The Saudi army's limited armored and mechanized forces also were being retrained elsewhere for the advance into Kuwait, and providing long-range artillery, helicopter support, and air support in the border area was a US responsibility. Saudi Arabia had evacuated the city, and the only Saudi forces near Khafji at the time of the Iraqi attack were a light screen of Saudi special forces and National Guard forces.

Iraq's success in surprising the Coalition also had nothing to do with Saudi capabilities. Intelligence on Iraqi troop movements was a US responsibility. When the attack occurred, the US initially failed to detect the fact that it was not a small Iraqi raiding party. It was only later that the US determined it was part of a two-division thrust by forces from the Iraqi III Corps. These forces eventually included most of the Iraqi 5th Mechanized Division with supporting brigades from the 3rd Armored and 1st Mechanized Divisions. As a result, Iraq achieved tactical surprise, and the US Marines and special forces had to rapidly abandon the undefended city as rapidly as the Saudis.

It is also unclear what Iraq intended to accomplish by launching its attack. While Iraqi forces achieved a symbolic initial success, they advanced into a natural trap formed by the Gulf to the east, and salt marshes to the West. Iraq may have been reacting to a USCENTCOM deception operation which led it to believe that there was a Coalition corps headquarters south of al-Wafrah, but it seems likely that Iraq was seeking a quick propaganda victory to show that it could fight in spite of the massive Coalition air offensive that had been going on for nearly two weeks, and hoped to either inflict major losses on the Coalition forces or provoke it into a premature land offensive.

In any case, the Iraqi attack was badly executed and the battle of Khafji revealed more weaknesses in Iraqi forces than Saudi forces. When the leading elements of the Iraqi 5th Mechanized Division advanced, the three main probes got lost, and ceased to advance with any coordination. Two of the Iraqi probes were turned back by attack helicopters and fixed wing aircraft attacks. The thrust that penetrated into Khafji may or may not have been

formally tasked with seizing the city, but it was not properly supported by other elements of Iraqi forces.

These problems in the Iraqi advance helped the Coalition compensate for Iraq's ability to achieve surprise. Once the Coalition command realized what was happening, it tasked over 140 USAF and USMC aircraft to strike at the Iraqi 5th Mechanized Division and its supporting forces. These Coalition aircraft included AV-8Bs, A-10s, AC-130s, F/A-18s and AH-1Ws, supported by JSTARS targeting aircraft and B-52 strikes on Iraqi forces in the rear. At least 50 Iraqi armored vehicles were killed in the initial raids, and the total number of Coalition attacks eventually rose to about 1,000 sorties. One tank brigade of the 5th Mechanized Division was caught crossing an Iraqi minefield, and could not maneuver when its lead tanks were hit,. It was effectively destroyed as a fighting force. The supporting Iraqi 3rd Armored Division was never able to concentrate in the face of the Coalition air attacks, and never provided effective support. As a result, Coalition air attacks were able to severely weaken the Iraqi 5th Mechanized Division -- one of Iraq's most effective units during the Iran-Iraq War.

There is considerable debate as to whether the Iraqi Navy launched a supporting raid -- using TNC-45 missile patrol boats armed with Exocet missiles, and Osas armed with Styx missiles. Some experts feel the Iraqi naval force was maneuvering for other reasons. It is clear, however, that the Iraqi ships were no more successful than Iraqi armor. They came under fire from British Lynx helicopters using Sea Skua missiles, and took 18 hits for 25 missiles fired. The survivors of the Iraqi naval force then fled to Iran in the face of follow-up attacks from US Navy A-6E and USMC F/A-18s. Eleven Iraqi boats were damaged or sunk and only two reached Iran.[133]

The fighting inside Khafji did not go as well during the initial Coalition counterattack. Liberating Khafji presented a major challenge for Saudi and Qatari forces which had never been in combat before, and which were not equipped, or trained for urban warfare. Fighting was sometimes stiff and often dismounted. The Qatari tank unit withdrew under pressure, and had to be replaced by another Qatari unit. The Saudi forces kept up the attack, although the 7th Battalion had to withdraw to resupply its ammunition, and Saudi forces had to be reinforced by the 8th Battalion.

The situation inside Khafji changed, however, once the Second Mechanized Brigade of the Saudi National Guard (King Abdul Aziz Mechanized Brigade) was committed to retaking the city, and after the Saudi Commander-in-Chief -- Prince Khalid bin Sultan al-Saud -- personally reorganized the Saudi effort beginning on the morning of January 30.[134] The 7th battalion of the Saudi National Guard Brigade, elements of the 6th Battalion, and Qatari tank forces counter-attacked that day.

These reinforcements and Coalition artillery and air support enabled the Saudi and Qatari forces to retake Khafji by the late morning of January 31st, although finally clearing the city took another 36 hours. While the Saudi troops involved were criticized for sometimes showing poor fire discipline and organization, they fought in close infantry combat with considerable courage. They successfully defeated combat-experienced Iraqi armored forces, even though the Iraqis operated from defensive positions in a built-up area.[135]

While Iraq has attempted to glorify Khafji as a victory, the fact this battle took place at all is a symbol of the tragedy the Iraqi people faced in Desert Storm. As one expert on Iraq points out, [136]

> "(Saddam) "needed a symbol of heroism, a myth, before he could order withdrawal... An indication of the importance ascribed to this operation was the fact that it had to be approved by Saddam personally. Two days before the offensive, Saddam came to Basra to brief the commanders of the attacking force. The force was beaten back eventually, paying with very high losses, but the initial success was sufficient to create the myth...A legend was born, and a year later, the Iraqi media could boast, 'the battle of Khafji is an Iraqi epic...It is a heroic strategic lesson that testifies to the superiority of the Iraqi military mind, which carried out with utmost expertise the greatest military achievement in the twentieth century."

One can almost always achieve surprise in war by suddenly doing something that is truly stupid, but surprise alone is scarcely victory. If all Iraq wanted was a symbolic victory for propaganda purposes, it did not have to destroy anything approaching this level of forces in the process. Further, the propaganda value of the battle was more than offset by the fact that Khafji not only cost Iraq much of one of its best divisions, it showed the Saudis that they could fight Iraqi forces. It also showed the effectiveness of Coalition air power against deployed Iraqi armor, it revealed serious weaknesses in the coordination of Iraqi forces, and it showed the lack of aggressiveness in the Iraqi Air Force in protecting its own ground troops. Losing the equivalent of two brigades in a purposeless adventure -- that exposed Iraqi forces to Coalition air power on a perfect killing ground and without Iraqi air cover -- is a demonstration of the "superiority of the Iraqi military mind" that is likely to escape the military minds of other countries.

Saudi Land Forces During the Land Campaign

Saudi Army performance during the Coalition land offensive was considerably more impressive -- given the limitations of Saudi forces before than land war began. Saudi regular army forces showed they could fight well, and that they had improved significantly

during Desert Shield. This was partly a result of training. The US and Saudi Arabia agreed on a massive joint training effort on September 20, 1991. Interviews with senior Saudi commanders indicated that they felt this training was critical for their ability to breach the Iraqi forward defenses, and advance rapidly up the coast of Kuwait. Several indicated that they felt such training set a model for the future tactics and training of the Saudi Army.[137]

It was also the result of a build-up that included thousands of Saudi volunteers, and redeployment and concentration of force. By the time the AirLand phase of the war began, the Saudi ground forces in the theater totaled nearly 50,000 men, with about 270 main battle tanks, 930 other armored fighting vehicles, 115 artillery weapons, and over 400 anti-tank weapons.[138]

Saudi forces were also organized to fight as part of Arab task forces under the command of Lt. General Prince Khalid Bin Sultan al-Saud. These Arab task forces reported to Prince Khalid through a Joint Forces Command in the Saudi Ministry of Defense, and were divided into a Joint Forces Command (North), a Joint Forces Command (East), and a Joint Forward Forces Command Ar'Ar (the command of the Arab defensive forces screening the border area). The Ar'Ar command was subordinated to the Joint Forces Command (North). It included two Saudi National Guard battalions, a Saudi Army airborne battalion, and a Pakistani armored brigade with about 5,500 men, over 100 tanks, and about 90 other additional armored vehicles and artillery weapons. These forces did not play an offensive role in Desert Storm.[139]

The role that Joint Forces Command (North), and Joint Forces Command (East) played in Desert Storm is described in detail in Chapter Eight. In broad terms, the Saudi-led Arab task forces had the mission of driving through Iraq's defensive lines along the border with Kuwait, and moving north to Kuwait City. Their advance was designed to protect the right flank of the VII Corps, and the right and left flanks of the 1 (US) MEF. Their mission was also to prevent Iraq from redeploying for the purpose of checking on the advance of the VIIth Corps, and make Iraq keep its forces and reinforcements in place within the KTO.

While the Saudi forces in both Joint Forces Commands fought well, the thrust made by the Joint Forces Command (North), which had been headquartered in Hafr al-Batin, ran into trouble. This force attacked from along the Saudi-Kuwait border to the east of the Wadi al-Batin. While this thrust was under Saudi command, the military action was dominated by the 3rd Egyptian Mechanized Division and the 4th Egyptian Armored Division, with Task Force Khalid in support to the east. It was also supported by the Egyptian Ranger Regiment, the Saudi Army's 20th Mechanized Brigade, Saudi Army 4th Armored Brigade, the Kuwaiti Ash-Shahid Brigade, the Kuwaiti Al-Tahrir Brigade, a Syrian Special Forces Regiment, and a brigade of the 9th Syrian Division.

Two Saudi brigades successfully breached the Iraqi forward defenses, but Egyptian decisions and actions caused delays. The Egyptian forces were slow to pass through the Syrian 9th Armored Division, which stayed in reserve. They had problems passing through the Iraqi mine fields and oil-filled fire trenches that will be discussed shortly, and mistakenly believed that they faced an Iraqi counter-attack. They lacked both reconnaissance systems and adequate night vision equipment, and retreated to a blocking position. The Egyptians moved forward through the Iraqi defenses on the second day, but did not reach Objective Alpha -- their initial objective -- until January 27. In contrast, Force Khalid did reach its Objective Bravo on the second day. Egyptian forces then speeded up and advanced to Ali Salaam Airfield, and finally reached their final objective, Al-Jarah to the west of Kuwait City, close to their original schedule. The Saudi-led Force, Khalid, turned east and reach Kuwait City more quickly.

Interviews with Egyptian officers indicate that Egypt should take responsibility for most of the delays by JFC-N. They admit that they were overcautious and had faulty intelligence, but they also cite Syria's unwillingness to commit its combat forces to battle. Further, they complain that they suffered from a lack of counter-mine, barrier crossing, night vision equipment, and attack helicopter support which Egypt had requested from the US before the battle, but did not receive.

The other Arab thrust was made by the Joint Forces Command (East) (JFC-E), which covered Coalition positions along the Saudi-Kuwaiti border to the Gulf. This force was headquartered near the border, west of Saffaniyah. The attack by Joint Forces Command (East) was not only under Saudi command, but was composed principally of Saudi forces. The key elements were (a) Task Force Omar, with the Saudi Army 10th Mechanized Infantry Brigade, and the UAE's Motorized Infantry Battalion; (b) Task Force Othman with the Saudi Army's 8th Mechanized Brigade, the Omani Motorized Infantry Battalion, the Bahrain Infantry Company, and the Kuwaiti Al-Fatah Brigade, and (c) Task Force Abu-Bakr with the Saudi National Guard 2nd Motorized Infantry Brigade and a Qatari Mechanized Battalion.

US forces advisors present with Saudi forces during Desert Storm reported that the Saudis in JFC-E advanced with courage and determination. Unlike in Khafji, these forces were Saudi Army heavy units suitable for engaging the Iraqi Army. Although they were forced to attack ahead of schedule, they advanced rapidly according to plan, and carried out maneuvers that they had trained for. There were some glitches and delays, but these often occurred because USCENTCOM suddenly attempted to accelerate the pace of the battle, and Saudi forces advanced far more rapidly than planned by the third day of the ground offensive.

It is also important to note that the Saudi-led Arab forces in Joint Forces Command (East) engaged in a frontal assault on a well-established forward defense, which is one of the most dangerous military operations. They did not have the advanced reconnaissance and intelligence assets of Western forces. The forces in JFC-East also advanced at a time when the Coalition had no precise way to determine the level of damage and demoralization within the Iraqi forces. Further, the Saudi-led thrusts in Joint Task Force-East reached its first major objectives in Kuwait within several hours of schedule, and went on to reach their final objectives in Kuwait City ahead of schedule. The most serious delay in their operations had nothing to do with the Saudi Army, but was instead caused by the problems of dealing with a flood of Iraqis seeking to become prisoners of war.[140]

Saudi Army forces achieved a much higher standard performance in advancing into Kuwait than most senior US and British commanders had felt possible in the early fall of 1990.[141] This in part is a tribute to the leadership of Saudi commanders and their flexibility to rapidly revise their training methods, and many aspects of the Saudi Army organization to reflect US advice. Saudi units adopted some of the large scale battle training methods used by the US Army. With the full support of Saudi commanders, they worked closely with US Special Forces liaison and training teams -- one of which, the Special Forces Group from Ft. Campbell Kentucky, arrived in theater as early as August 31, 1991. Cooperation between the Saudi and US armies was also enhanced by the fact that Lt. General John Yeosock, the Commander of the US Army forces in USCENTCOM, had served in Saudi Arabia as an advisor to the Saudi National Guard and had extensive contact with the Saudi Army.[142]

The lesson that Saudi Army performance in the land offensive teaches about modern war is scarcely that Saudi forces were not perfect. No force ever is. It is rather that accurate assessment of allied strengths and weaknesses is critical, that time may be required to improve their effectiveness in Coalition warfare, and that effective planning must place allied forces in a role where they can win.

This lesson has important implications for the future. The Saudi Army has made further progress since Desert Storm. It has ordered more M-1A1s and M-2s, and it has strengthened its artillery, purchased the AH-64 attack helicopter, corrected most of its other equipment weaknesses, improved its logistic system and revised its training. The gap between Saudi Army capabilities and the threat posed by Iraq and Iran has also led the Saudi government to try to create at least one more armored, and mechanized brigade by the late-1990s, and expand to a total of five divisions by sometime in the early 2000s. This expansion may involve a conversion from a brigade-oriented command structure to a division-oriented structure. It would provide three divisions in the north to defend Saudi

Arabia's Gulf Coast and border with Iraq. Another division near al-Kharj or the capital, and a fifth division in the south.

Such improvements, however, cannot change the fundamental realities of coalition warfare in the Gulf. Saudi forces cannot do the impossible, relative to threats like Iran and Iraq. Even if all the Saudi Army's current plans are successful, it will face continuing problems. Saudi forces will be far to small to halt an Iraqi invasion. Saudi "divisions" will remain light, and the total Saudi Army combat unit manning will only reach around 70,000-80,000 actives -- about the total manpower that the US uses to project, man, and support two, full heavy-divisions. Saudi support forces will also remain limited in peacetime, and use temporary-duty civilians in their support forces in a major crisis. Unless Saudi land forces have significant strategic warning, they will not be able to concentrate significant forces on a given front unless they can move forces from another major military city, and all the way across Saudi Arabia. This would take a minimum of a week to 10 days. Even then, Saudi Arabia would lack the massive armored forces of its stronger neighbors.

It is also important to understand that the amount and types of equipment that the Saudi Army buys will be far less important than how well it organizes and trains to use it. US advisors helped bring Saudi forces up to a new level of readiness during the Gulf War , and gave them their first real experience with large scale unit and combined arms training. However, many of the Saudi Army's training plans since the war have not been fully executed, and maneuver training has sometimes been mediocre. Combined arms training and maneuver training has been weak, and promotion at senior command levels remains somewhat political. Professionalism, not politisation, is the key to the successful expansion of the Saudi Army, as well as any other military force.

The are several lessons to be drawn from the overall performance of Saudi land forces during and after the Gulf War:

- o First, Saudi dependence on Western power projection capabilities will continue indefinitely into the future, just as Western power projection capabilities will remain dependent on Saudi support. This interdependence is one of the most important strategic lessons of the war.
- o Second, the effectiveness of friendly Third World forces in cooperative security will vary sharply according to the specific force, but is more likely to match that of Iraq than that of the United States. This may be true regardless of the strength and equipment holdings of the Third World force. Iraq, for example, had none of the major resource problems faced by Saudi Arabia and had nearly a decade of combat experience. Realistic assessment of the limits of allied Third World forces will be as important as a realistic assessment of Third World threats.

- o Third, careful attention needs to be given to working with key Third World states to improve their combat-effectiveness and capability to cooperate with Western forces in fighting the AirLand battle. It is easy to focus on the lessons of war in terms of improvements to Western forces, but this does not enhance regional deterrence, in place of immediate defense capability, or coalition warfare capabilities, and it will often be cheaper and more cost-effective for the West to aid regional powers than fund internal force improvements.
- o Fourth, the US Army Special Forces teams deployed with every Saudi Army unit played a critical role in training Saudi forces, and in functioning as a liaison during the war. This kind of low-profile liaison effort, using specially trained personnel, is an important tool in coalition warfare.
- o Fifth, the US needs to consider how to adapt the AirLand battle to coalition warfare, and what specific improvements in allied forces will be the most effective. The US cannot count on dominating every future coalition with "decisive force" or having half a year to correct the major problems in the compatibility of US forces with a regional ally.
- o Finally, part of the problems in Saudi forces in 1990 were the product of Western arms sales and advisory efforts that gave more emphasis to equipment sales and recycling petrodollars than on making Saudi forces effective. Some of the British, French, and US competitions for arms sales to Saudi Arabia since the Gulf War have reflected the same lack of responsibility. The West needs to do just as much to reform many aspects of its arms sales and advisory effort as the Saudi Army does to improve its forces.

The Saudi National Guard

Saudi Arabia divides its land force manpower between the Army and the National Guard. The National Guard is the successor of the Ikhwan and its successor the White Army. It is a tribal force forged out of those tribal elements loyal to the Saud family, It is also a counterweight to any threat from the regular military forces. At the time of the Gulf War, the Saudi Arabian Nation Guard, or SANG, had 25,000-30,000 full time actives, 15,000 semi-active reserves, and 15,000 tribal levies. In any case, about 20-30% of the Kingdom's active trained military manpower will be used in what is still largely a paramilitary force.

When the Gulf War began, the National Guard was in a considerable state of turbulence, and was being expanded, and organized into modern military formations. Its first real combat formation, the 6,500-man Imam Mohammed bin-Saud Motorized Brigade held its first major exercise in the desert about 250 miles west of Riyadh in early 1983. The

National Guard formally inaugurated its second motorized "brigade" in a ceremony on March 14, 1985. This new unit was called the King Abd al-Aziz Brigade, and was formed after another relatively successful round of set piece exercises called "Al-Areen" near Bisha.

The Guard was organized into two mechanized brigades, with four battalions each. It also had five infantry brigades (which included substantial part-time elements), what seemed to be a special forces unit, a ceremonial cavalry squadron, an engineer battalion, and a special security battalion. The Guard was equipped with about 1,012 V-150 Commando wheeled armored fighting vehicles which have a number of different configurations, including anti-tank guided missile carriers, cannon turrets, and main guns. These included roughly 100 V-150s configured as AIFVs, 70 with 90mm guns, 100 armored command vehicles, 70-80 82 mm mortar carriers, 50 armored recovery vehicles, 30 special purpose vehicles, and 350 configured as APCs. The Guard had 40 M-102 105mm towed artillery weapons, 20-30 M-198 155mm howitzers, and 81mm mortars. It had large numbers of TOW anti-tank guided missiles, rocket launchers, and recoilless rifles. It also had a limited number of helicopters, and 30 M-40 Vulcan 20mm anti-aircraft guns. At least 100 TOW fire units were mounted on V-150s.[143]

The Guard helped secure the Eastern Province during the Iran-Iraq War, and played an important role during the battle of Khafji. While the Guard was unable to deal with the initial Iraqi assault on Khafji, and required extensive US air and artillery support during the battle to retake the city, it fought well during the rest of battle. The Saudi National Guard's 2nd Motorized Infantry Brigade was given special training and additional manning for Desert Storm, and fought effectively as a light-armored reconnaissance force for the Saudi forces advancing up the coast.

The Guard is continuing to modernize, but it is not designed or equipped to supplement the Saudi Army in high intensity combat. Its experience in Desert Storm indicates that it is not a significant offset to the quantitative weaknesses of the Saudi Army, and cannot cooperate effectively with Western forces in an AirLand battle against heavy armored forces.

The Saudi Air Force

The Royal Saudi Air Force (RSAF) played a major role in the conflict. It was the most combat effective element of the Saudi forces, and had reached a higher level of capability in air defense operations and air-to-air combat than any other air force in the Gulf. In 1990, the RSAF had 17,000 to 18,000 men, and 14 combat squadrons with about 189 combat aircraft. These forces included five fighter ground/attack squadrons with 3/53 F-5Es and 2/25 Tornado IDS. They included five interceptor squadrons with F-15C/Ds and

Tornado ADVs. The three large F-15C/Ds squadrons had 42 F-15Cs and 15 F-15Ds. The two Tornado ADV squadrons were in the process of formation and had approximately 19 aircraft. The RSAF had a reconnaissance squadron with 10 RF-5Es, an airborne early warning squadron with five E-3As, and two multipurpose squadrons with 21 F-5Fs and 14 F-5Bs. These latter two squadrons had both a training and combat mission.

The RSAF had the most advanced airborne warning and air control capability of any air force outside NATO. Its 5 E-3A AWACS aircraft had been steadily upgraded to replace their main computer memories, and substitute semiconductors and bubble memories for their magnetic drums, tripling their memory capacity. Major radar system improvements had been made to improve data handling, sensitivity, provide real time data to each console, and the same range coverage against smaller cross-section targets. Electronic support measures were installed in the aircraft for the passive detection, location, and identification of electronic emitters, infrared countermeasures were added to the engines, with global positioning systems, and the software has been updated beyond bloc 30/35, and five operator consoles have been added.[144]

The Saudi Air Force was equipped with modern munitions, including AIM-9L and AIM-9P infrared-guided missiles, AIM-7F Sparrow and Skyflash radar-guided missiles, and AGM-65 Maverick air-to-surface missiles. It had Rockeye, Sea Eagle, and Alarm air-to-ground weapons. Saudi Arabia had also bought MQM-74C Chukar II and Banshee remotely piloted vehicles for reconnaissance and target acquisition.

Saudi F-5E/F units had reached proficiency levels approaching those of many Western squadrons. Saudi Arabia had also done a good job of operating advanced fighters. The first of its F-15C/Ds were operational in Dhahran by early 1983. A second squadron was formed at Taif by the end of 1983, and a third became operational at Khamis Mushayt in July 1984. By late 1984 and early 1985, the Saudi Air Force was conducting joint exercises in both the Gulf and Red Sea areas, and Red-Blue or aggressor exercises similar to those employed by the US Air Force. Saudi crews operated its five E-3As with great success in 1987 and 1988. Saudi aircraft attrition levels were significantly higher than those of the US, but overall training levels were good. While the RSAF lacked some of the C^4I/BM systems, advanced avionics and electronics, munitions, and attack capabilities of the USAF, it demonstrated a high level of squadron readiness.[145]

The RSAF was one of the few Third World air forces with adequate refueling and support aircraft. It had a tanker squadron with eight KE-3As and 7 KC-130Hs, three transport squadrons with 7 C-130Es, 34 C-130Hs, 5 L-100-30HSs (hospital aircraft), and 35 C-212As. There were two helicopter squadrons with 13 AB-206Bs, 8 AB-205s, 27 AB-212s, and 7 KV-107s. There were 29 Hawk jet and 35 BAC-167 turboprop training aircraft

capable of performing COIN and light attack functions with machine guns, cannons, and rockets. There was also a Royal Flight with 4 BAe-125s, 4 CN-235s, 2 Learjet 35s, 2 C-140s, 6 VC-130Hs, 1 Cessna 310, and 2 Gulfstream III fixed-wing aircraft, and 3 AS-61 and AB-212 helicopters.

The Saudi Air Force had some of the most modern air facilities in the world. Saudi air bases were large enough to support forces in excess of three times their normal peace time load. No US or NATO base had sheltering or hardening equal to the Saudi bases at Dhahran and Khamis Mushayt. Saudi Arabia was able to perform advanced maintenance and support for many of its aircraft, and had massive stocks of supplies and air munitions.

These capabilities allowed the RSAF to play a major role in air defense combat during Desert Storm, and played a critical role in allowing rapid reinforcement by the USAF and RAF during Desert Shield, to provide air cover for ships and troop movements. The Saudi Air Force flew a total of 6,852 sorties between January 17, 1991 and February 28 -- ranking second after the US in total air activity, and flying about 6% of all sorties flown. These sorties included 1,133 interdiction missions, and 523 battlefield air interdiction missions, for a total of 1,656 offensive missions. The RSAF flew 2,050 defensive counter-air missions, 129 offensive counter air missions, and 102 escort missions for a total of 2,281 air defense sorties. The RSAF flew 118 reconnaissance sorties, 85 E3-A AWACS sorties, 485 refueling sorties, and 1,829 airlift sorties.[146]

During the slightly longer period of January 16 to February 28, Saudi Air Force F-15C units flew 2,088 sorties (over one-third the total F-15C sorties flown by the USAF) and 451 Tornado ADV sorties. Saudi pilots were as capable in these air defense sorties as most pilots in NATO. The RSAF also flew 665 Tornado GR1/IDS strike sorties, 1,129 F-5 sorties, and 118 RF-5 sorties. Saudi F-15Cs shot down three Iraqi Mirage F-1s with air-to-air missiles -- including the only double kill by a single fighter in the war on January 24, 1991. The RSAF lost only two aircraft -- one Tornado GR1 to anti-aircraft fire and one F-5 to unknown causes.[147]

The RSAF canceled or aborted 527 sorties, but 398 of these were the result of weather and 49 were the result of cancellation of the mission for operational reasons. The RSAF it made good use of the British and US contract personnel. It only canceled 71 sorties for maintenance reasons, and achieved operational availability rates of 80-85% for its major combat aircraft. This is very good performance for a Third World force flying some of the world's most modern aircraft in an environment as complex as Desert Storm.[148]

RSAF did suffer, however, from a lack of offensive capability. The RSAF had long recognized this problem, but it entered the Gulf War with significant equipment limitations. Its 12 BAC-167 trainers were only armed with 7.62mm machine guns, and

could no longer be used in anything other than light support functions. Saudi Arabia was able to use its F-5s, F-15s, and Tornadoes in the offensive role, but each aircraft had operational limitations.

Saudi F-5s flew a total of 1,129 sorties. These include 1,058 interdiction sorties, 62 offensive counter-air sorties, and nine support sorties.[149] Saudi Arabia's F-5E-IIs and F-5Fs were relatively advanced models of the F-5E/F, equipped with INS, refueling probes, and the ability to fire Mavericks (the F-5F can also fire laser guided bombs). The oldest of these aircraft, however, were nearing the end of their useful life, and the F-5 production line had long been closed. The F-5E/F-IIs were also too short-ranged and limited in avionics and payload to deploy from one Saudi air base in support of another, or adequately cope with the kind of advanced-threat aircraft being introduced into the region. While Saudi RF-5 s flew an average of 2-4 sorties per day, they lacked advanced sensors, near real time data down links, and secure data transmission systems.[150]

Saudi Arabia's F-15C/Ds presented very different problems. They were successful as air defense aircraft, and flew 1,940 defensive counter air sorties and 140 offensive counter air sorties. They averaged about 150-160 sorties per day, and reached a peak of 322 sorties on the first day. They only, however, flew 8 interdiction sorties during the entire war, dropping dumb bombs with little effect.[151] This was the result of the fact that Saudi F-15C/Ds were effectively configured as a one mission aircraft. Although the US Air Force had recommended that the Saudi Air Force be given a dual-capable advanced fighter back in 1977 -- when it conducted the original studies that led to the US sale of the F-15 -- the US did not sell Saudi Arabia the bomb racks and attack systems necessary to make the F-15C/D effective in the air-to-ground role. As a result, a key part of Saudi Arabia's total first-line fighter strength was unable to perform effective attack missions, or provide attack support to Saudi land and naval forces.

The Tornadoes presented problems in both the air defense and attack roles. In September, 1985, Saudi Arabia reached a tentative agreement with Britain to buy a total of 60 Tornado ADV air defense fighters, 60 Tornado IDS/GR1 attack strike-fighters, light-attack aircraft, trainers, helicopters, munitions, and British support services. The first phase of the program called for the purchase of 24 Tornado ADV air defense fighters; 48 Tornado IDS/GR1 ground attack fighters; 30 BAe Hawk 65 trainers; 30 Pilatus PC-9 trainers; and two Gulfstream aircraft, air weaponry, and ground support and training services.

Saudi Tornado ADVs flew over 450 defensive counter air sorties in Desert Storm, averaging about 8-12 sorties per day, but the aircraft did not prove to be a fully successful air defense fighter.[152] It had good beyond visual range and long range missile combat capability, but it was under powered. While its limited dogfight performance might not

have proved important in defending the United Kingdom -- where missile combat capability was likely to be critical --the short distances and reaction times involved in defending Saudi Arabia required dogfight superiority. The Tornado's radar warning receiver was not fully effective, and its radar and air defense avionics experienced development and performance problems, as did efforts to fully integrate and qualify advanced air-to-air missiles with the aircraft.

While such problems were not unusual in a new variant of an aircraft, they were severe enough in the case of the Tornado ADV to prompt the RAF to talk about converting its air defense Tornadoes to reconnaissance, strike, or electronic warfare missions the moment that it could obtain some form of Eurofighter. In fact, the RSAF's experience with the first eight Tornado ADVs before the Gulf War had been was so negative that it halted deliveries. The RSAF converted its order for the remaining 12 ADVs to IDSs, and it sought to convert the 12 Tornado ADVs that it received to reconnaissance or strike-attack aircraft.[153]

The Tornado GR1/IDS proved to be more effective in long-range strike missions. RSAF Tornado GR1s flew 590 interdiction missions, 75 Tornado offensive counter-air support missions, and two training missions, for a total of 667 sorties. They averaged around 15 sorties per day, with peaks of up to 29 sorties per day.[154] The Tornado proved during Desert Storm that it could be an effective strike fighter, once it was equipped with new FLIR and laser designator pods, and delivered over 1,000 laser guided bombs and ALARM missiles. Saudi Arabia signed a letter of intent to buy 48 more Tornado strike-attack fighters in July, 1988, and the reinforced Tornado GR1 force should meet part of Saudi Arabia's need for a long range deterrent to Iraq and Iran. The Tornado GR1, however, lacked the flexibility, maneuverability, and avionics to fly demanding missions using precision-guided munitions against advanced air defenses. It did not meet all of Saudi Arabia's needs for a first line strike aircraft.

Saudi Arabia's solution to this complex mix of modernization problems has been to buy 48 dual-capable strike/attack variants of the F-15E Strike Eagle that have been designated the F-15S.

This purchase will provide the attack capabilities the Saudi Air Force needs. At the same time, it illustrates the importance of balanced air capability and advanced attack capabilities. It also involves differences in the US Air Force and Saudi versions of the F-15E which provide an important lesson in technology transfer. The F15S sale shows that the West can provide tailored technology packages that meet the needs of a regional ally without creating a potential threat to Western forces:

- The F-15S will use the AAQ-20 Path Finder navigation pods, the AAQ-20 Sharpshooter targeting pods, and a laser illuminator. The Path Finder pods will have a terrain following radar, but will have reduced ECCM capabilities that will allow them to be tracked by US types of fighters. The Sharpshooter pods for the F-15S will only have limited versus full cluster bomb delivery capability. They will deliver the A/B version of the electro-optical Maverick and the D/G version of the IR Maverick, but will not have a missile boresight correlator, will only have a single-fire rather than multiple fire capability for Maverick, and will not be equipped to deliver the HARM anti-radiation missile.
- The F-15S will not be supplied with conformal fuel tanks of the kind supplied on the F-15E. This will deprive it of two extra tangential store stations for carrying extra munitions and some of its ability to carry precision-guided weapons. This will not affect Saudi Arabia in launching defensive missions against Iran and Iraq, but will force it to trade range for payload in any missions flown against Israel.
- The F-15S will have a de-tuned version of the APG-70 radar on the 15E, which cannot use the AMRAAM air-to-air missile. The radar on the F-15S will have only 60% of the bandwidth of the regular APG-70, and will only have 16 channels, rather than the regular 32. It will not have a computerized mapping capability, and will only have a resolution of 60 feet at 15 nautical miles, versus 8.5 feet at 20 nautical miles in the F-15E.
- The F-15S will have altered software for the AWG-27 armament control system. It will lack a data transfer module, and its ASW-51 auto flight control will not include the terrain following mode. It will use a commercial-grade secure voice and global positioning system navigation system.
- The F-15S's electronic warfare suite will only be missionized for use against non-US aircraft and threats in the Gulf and Red Sea area. This means substantial modifications to the ALQ-135 internal countermeasures set, the ALR-56C radar warning receiver, the ALE-45 countermeasures dispenser, and the MX-9287 interference blanker set. The ALQ-135 will not have the capability to jam friendly aircraft by type, and the radar warning receiver will not identify friendly aircraft by type.

Even so, the RSAF will not fully deploy its new offensive capabilities in combat-effective form until the end of the 1990s, and will still not have anything approaching the total strength and mix of special purpose aircraft to defend against Iraq or Iran without extensive foreign support from the USAF and other Western forces. It will be a minimum of ten years before the RSAF can adequately match its offensive and defensive capabilities.

It will need at least a decade more US and British assistance to become an effective air force capable of force-on-force operations and combined operations.

Saudi Naval and Air Defense Forces

The Saudi Navy played a limited role in mine-sweeping operations during Desert Storm. It carried out some ocean patrols in the upper Gulf -- although its claims to successful anti-ship missile attacks on Iraqi vessels have not been verified -- and it successfully cleared 40-60 mines during the course of the war.

Saudi Air Defense Forces did not fight during Desert Storm, although they did provide land-based air defense converge of Saudi bases, facilities, and cities. Nevertheless, some aspects of the Saudi air defense capabilities illustrate lessons of the war. The Saudi Air Defense Force has reacted to Iraq's use of Scuds against Saudi Arabia and Israel by ordering six Patriot fire units or batteries, 384 Patriot long-range air defense missiles, six AN/MPQ-53 radar sets, six engagement control stations, and 48 launcher stations. These Patriot systems greatly improve Saudi Arabia's low to high level air defense capability, they will provide substantial defense against medium range and theater ballistic missiles.

Saudi Arabia purchased these units on September 27, 1990, as part of its Gulf War arms package. Saudi Arabia indicated in 1991 that it wanted to buy 14 more Patriot fire units (with 64 Patriot long-range air defense missiles, 1 AN/MPQ-53 radar set, 1 engagement control station, and 8 launcher stations each) to defend all of its cites, military bases, and major oil facilities.

Such purchases indicate the scale of the effort required for even limited theater missile defense. While Saudi Arabia and the US Army have not completed full planning for such a system, preliminary studies indicate that it might require a total of 26 fire units.[155] The Saudi Patriot units are also to be upgraded to the PAC-3 version of the Patriot with far better software, radar processing capabilities, longer range missiles, better guidance systems, and more lethal warheads. Unlike the PAC-1 and PAC-2 systems used during the Gulf War, these Patriots are specifically designed to kill missiles at comparatively long ranges and fully discriminate between warheads, decoys, and parts of the missile body.[156]

Another lesson the Saudi Air Defense Force has drawn from the war is the importance of modern C^4I/BM capability. At the time that Iraq invaded Kuwait, Saudi Arabia lacked some of the systems integration, battle management systems, and C^4I/BM software and integration that it needed for effective operation and integration of its land based air defense operations. The Saudi Arabia air defense network evolved from a crude system that began to be deployed in the 1960s, which used US and British radars and British missiles. Saudi Arabia then bought a Thomson CSF air command and control system, and four Westinghouse AN/TPS-43 three dimensional radars. It ordered AN/TPS-

43G radars in 1981 to further modernize its system as part of the Peace Pulse program, and then updated its system to provide command and data links to its E-3A AWACS. These purchases left Saudi Arabia with major communications and C4I integration problems which it attempted to solve by giving major contracts to Boeing and Litton.[157]

The Litton system involved a $1.7 billion effort to provide C4I, sensors, communications systems, handle the interface between missiles and other air defense systems, build sites, and train personnel. Key elements involved providing 17 major communications links installed in S-280C militarized transportable shelters, providing both line-of-sight and tropospheric scatter links with 72 channel capacity, and building 34 low-level and 34 high-level shelters. This system proved to have a number of design problems, however, and experienced serious delays. It was only partially operational when the Gulf War began.[158]

The Boeing Peace Shield program was a far more ambitious $8.5 billion effort to give Saudi Arabia a system of 17 AN/FPS-117(V)3 long range three-dimensional radar systems, fully netted with its AN-TPS-43 and AN-TPS-72 short and medium-range radars. It had (a) a central command operations center (COC) at Riyadh, (b) five sector command centers (SCCs) at Dhahran, Raif, Tabuk, Khamis Mushayt, and Al-Kharj to cover the country, and (c) additional sector operations centers (SOCs) at each major air base. It was to use a tropospheric scattering and microwave communications system to integrate Saudi Arabia's surface-to-air missile defenses, some anti-aircraft gun units, its radars, its E-3A airborne warning and control systems (AWACS) aircraft and fighters, and six major regional underground operating centers and numerous smaller sites -- all of which were to be managed by a command center in Riyadh.

The system proved to be so ambitious that many key aspects could not be delivered and the software and systems integration efforts required to make Peace Shield effective were years behind schedule at the time of the Gulf War. These delays and failures did not affect the outcome of Desert Storm, but the US Air Force Electronic Systems Division terminated Boeing's work on the program in January 1991. Saudi Arabia had to begin again with a new contractor.[159] Similar problems could be far more costly to friendly states and Western power projection capabilities if the West does not put a higher priority on making its arms sales and advisory efforts effective.

More generally, even a fully functional Saudi air and missile defense system would have the problem that it would not meet regional needs or even provide Saudi Arabia with maximum warning and defense in depth. Saudi Arabia can only provide adequate coverage of its Gulf ports and key oil facilities if it integrates its air defense system with that of Kuwait and Bahrain, and can only meet its needs in defending against Iran if it expands this

integration to include Qatar, the UAE, and Oman. This emphasis on creating a regional and integrated air defense system is crucial to both the Southern Gulf's future security and to the ability of the West to effectively reinforce Bahrain and Kuwait because of their small size and air space. Kuwait is particularly vulnerable because it shares a common border with Iraq, close proximity to Iran, which desperately requires it to have a survivable air defense and land and maritime surveillance system. At the same time, the other smaller Gulf states cannot develop effective air defense against Iran unless their systems are integrated with the Saudi system.

Lessons for Cooperative Security: Egyptian Forces and Capabilities [160]

A number of other Arab states contributed military forces to Desert Storm. Qatari forces played a significant role in the battle of Khafji, and the forces of Egypt, Syria, and Kuwait joined Saudi forces in playing a major role in Desert Storm. Egypt played by far the most important role. It had the most capable forces of any Arab state, it made the largest contribution in forces, and it played a key role in the land offensive through Kuwait as the leading element in Joint Forces Command-North.

Once again, an assessment of these Arab forces requires careful perspective, and illustrates the critical importance of accurately assessing the qualitative aspects, or "intangibles", affecting both allied and threat forces. Since the war, some analysts have over-emphasized Egypt's problems in spearheading Joint Forces Command-North, citing the Egyptian delays in entering Kuwait city, after the initial effort to cross the Iraqi defense line paused and turned back. Other analysts have suggested that Egyptian and Syrian forces could replace Western power projection capabilities. However, neither perspective seems to reflect a valid view of the lessons of the war. Egypt cannot possibly afford the kind of combined operations capabilities, training, technology, and readiness that the US has developed to fight the AirLand battle. The resulting limitations are not the result of any military failure by Egypt, they are the result of unavoidable resource constraints.

Egyptian forces have a number of highly capable land and air units by Third World standards, and proved their capability in both the October War and Gulf War. At the same time, they have long been divided into high quality units that have been re-equipped with Western weapons, and low quality units using older Soviet weapons dating back to the 1960s and early 1970s. They have never been designed for power projection purposes.

Egypt also has problems in its force structure and readiness that are the result of a different military culture. At the time of the Gulf War, Egypt was one of the few Middle Eastern states capable of planning and conducting operations at the Corps and division

level, but it had let its large scale unit exercises and command exercises declined since 1982. It had organized and tailored its forces to deal with two main contingencies. The first was a war with Libya that is felt to be a serious enough risk to keep 40,000-50,000 troops, and at least two heavy divisions, in the Western border area. The second was the risk of becoming involved in another Arab-Israeli conflict. This tailoring made the Egyptian Army heavily dependent on operation from fixed bases and supply areas near the Suez Canal.

Some Egyptian armored units were of high quality by Third World standards, but Egyptian units varied strikingly in quality. Egyptian exercise performance in armored maneuver and offensive warfare had improved since the mid-1970s, but only a relatively small part of its total forces had realistic maneuver training. Egypt has also chosen to fund total force size at the expense of force quality and war fighting capability. Less than half of Egypt's tank strength at the time of Desert Storm consisted of modern types, and about half of its mix of other armored vehicles was composed of obsolescent or worn weapons.

Egypt had done a better job of preparing for artillery and combined arms operations than most Middle Eastern states. Nevertheless, many of its artillery weapons were obsolete, and Egypt had less than one-third of the number of self-propelled weapons needed to keep up with its armor in modern combat. With the exception of its best trained self-propelled artillery units, Egyptian artillery also still emphasized mass over maneuver, and many units lacked modern fire control, communications, counter-battery radars, night vision, and other targeting systems. Supply and recovery vehicle numbers and quality were inadequate, and most artillery units had limited mobility.

Egypt's logistics system was partially computerized, but Egypt had to deal with a logistic nightmare driven by reliance on so many different types of equipment, including aging Soviet systems where adequate spare parts were often lacking. Maintenance, repair, and combat service and recovery capabilities varied sharply in quality and effectiveness, although units with US equipment were generally far better off than units with Soviet or European equipment.

Further, Egypt had emphasized equipment modernization at the expense of the proper modernization of its casernes and training areas. Living conditions for troops (particularly conscripts) and NCOs were often poor. Egypt was forced to concentrate its operating funds on its special forces, armored divisions, and selected mechanized divisions -- although operations and maintenance funding was still inadequate. It provided far less investment in facilities for many of its other combat units and support forces than necessary to make them combat effective. Egyptian reserve training had decayed steadily since the late 1970s, and Egypt often provided only minimal training for its conscripts. Its younger officers are often well educated, but manpower management is uncertain and assignments

often fail to make proper use of officer skills and the output of Egyptian army training programs.

All of these factors affected the Egyptian Army forces sent to Saudi Arabia. Further, Egypt's heavy forces were tailored to fight within Egypt's borders and near Egyptian supply facilities. In practice, this meant that Egyptian forces had to be reorganized to deploy to Saudi Arabia, and combat, service, and logistic support capabilities had to be improvised or provided by other nations. Further, the Egyptian Air Force was even less capable of rapid sustained power projection than the army. Some of its squadrons had excellent levels of proficiency and combat-readiness, and its aircraft were highly mobile, but the Egyptian air force was dependent on national bases and facilities for supply, maintenance, battle management assets, and sustained operations at high sortie levels.

Egypt had also failed to properly emphasize combined arms. Many Egyptian units are well-equipped by regional standards, have exercised with US forces, and have high individual unit effectiveness. Egyptian ground forces were not, however, trained to operate at the high tempos and in the Air Land battle context of Western forces. Further, Egypt could not afford the mix of specialized technologies needed to reach such levels of capability. While Egyptian forces were more offensive-minded than the Saudi forces, and had repeatedly proven themselves in combat, they faced many of the limitations common to Third World forces.

It is a tribute to Egypt that it was able to send some 30,0000-35,000 troops, and two divisions, to Saudi Arabia in spite of these problems. These forces were deployed as part of Joint Forces Command (North), which included the 3rd Egyptian Mechanized Division and the 4th Egyptian Armored Division, with support from the 6th Armored Brigade, paratroop forces, and an Egyptian Ranger Regiment. These combat formations were elite Egyptian units equipped with US equipment, and, which had trained in joint exercises with US forces. The exact strength of these forces is uncertain. A single Egyptian armored division typically has 16,000 men, 225 tanks, 150 other armored fighting vehicles, 84 artillery weapons, 36 anti-tank guided weapons launchers, and 36 anti-aircraft guns. Saudi sources, however, indicate that Egyptian forces included a total of around 30,000 men, 360 main battle tanks, 750 other armored vehicles, 140 artillery weapons, and 225 major anti-tank weapons.[161]

Egyptian forces, however, deployed slowly. The Egyptian 3rd Mechanized Division was only half-deployed by mid-October, and the deployment of the 4th Armored Division took much longer -- although part of this delay was the result of problems in Egyptian-Saudi negotiations.

Once Egyptian forces did deploy, the quality of their officers and career NCOs was good, and morale was consistently high. At the same time, even these carefully selected Egyptian forces lacked the realistic maneuver and mechanized warfare training of the kind practiced by the British and the US Army. Most enlisted personnel had not had realistic battle training and many unit elements lacked proficient and experienced technicians and specialized maintenance and support personnel.

These problems undoubtedly affected Egyptian performance in Desert Storm. When the land phase of Desert Storm began, Egyptian forces were not as capable of advancing the time of their attack, or as capable of reacting quickly and taking offensive risks, as the Western forces. The initial Egyptian assault on Iraqi lines faltered. Egyptian units did not quickly exploit the breech that the Saudi brigades and Egyptian and Saudi sappers made in Iraqi lines, and Egyptian forces retreated and took up blocking positions. Egyptian forces did not penetrate Iraqi lines until the end of the second day of land combat, and fell short of their initial deployment target (Objective Alpha).

Some of the delays in the Egyptian advance seem to have occurred because of an exaggerated fear of Iraqi counterattacks, and because Egypt sought to avoid the political consequences of taking high casualties or being seen as too aggressive in causing Iraq's defeat.[162] At the same time, such delays need to be put in historical context. Egypt has had ample experience with the risks of making unsupported advances into enemy territory without allied support. Its efforts to advance into the Sinai in 1973, to relieve Israeli pressure on Syria, had cost Egypt dearly and the resulting losses and disruption were an important factor in the success of Israel's attack across the Suez. Egyptian Army forces did face the risk of significant losses in a frontal assault on Iraqi positions, and had no way to be certain of the impact of the Coalition air campaign on the Iraqi troops they attacked. They could not count on strong Syrian support, and had relatively poor night warfare equipment.

The fact that some Egyptian forces delayed to establish blocking positions on G+1 was part of the original offensive plan, and the fact that Egyptian forces took this action even after it was no longer necessary may reflect the over-methodical character of Egyptian operations, rather than a lack of offensive spirit. Egypt also faced equipment and support problems. The Saudi and Egyptian forces in Joint Forces Command (North) had only received enough breaching equipment for the thrust through Iraqi defenses to advance across eleven lanes. The US was not able to provide the additional mine-clearing equipment and attack helicopter support that Egyptian officers wanted because this was reserved for the 1 (US) MEF, and one Egyptian division was forced to follow the other

through the breech. Further, Syrian forces were slow in advancing to support the Egyptian flanks and lines of communication.

It is also important to note that Egypt did reach its initial objective by the morning of February 27. Egyptian forces then began to advance more rapidly and reached Ali Al-Salaam Airfield and finally Al- Jahrah to the west of Kuwait City nearly on schedule. While they delayed their entry into Kuwait City, they did so by only two hours, and because they paused to receive President Mubarak's authorization to escort Kuwait's land forces.

The key lesson is that even the best Third World forces are not an effective substitute for Western power projection capabilities, although they can certainly supplement local forces, and conduct effective coalition warfare. At the same time, they are subject to regional political limitations and require major restructuring, retraining, and re-equipping to act as an effective power projection forces.

Lessons for Cooperative Security: Syrian Forces and Capabilities

On paper, Syria made a significant military contribution to Desert Storm. It deployed 19,000 Syrian troops to the Coalition during October and November, 1990. These forces included the 9th Armored Division -- with three combat brigades -- and a special forces regiment. Precise data are lacking on the size of these forces, but a typical Syrian armored division had up to 350 tanks, 200 BMPs and BTR APCs, 140 artillery weapons, and about 15,000 men. The Syrian force sent to Saudi Arabia seemed to have had at least 235 tanks, 200 other armored fighting vehicles, 90 artillery weapons, and large numbers of anti-tank weapons. Syria did not deploy any fixed or rotary wing aircraft.[163]

The 9th Armored Division had had limited combat experience in Lebanon, but suffered from more qualitative problems than the Egyptian forces sent to Saudi Arabia. Syria had tailored its forces to fight Israel in the Golan and had even less power projection support and sustainment capability than Egypt. It had not been able to sustain the overall training levels of its armored and maneuver forces in recent years because it was rapidly creating new units. Overall training standards had begun to decline in 1985-1986, and continued to remain at inadequate levels though early 1992, although Syria did improve some of its training in order to prepare for the Gulf War.[164] The special forces regiment had been kept at higher readiness. Syria concluded after 1973 that only elite forces could meet Israeli forces on anything approaching even terms.

Syria had steadily improved the mechanization of its combat infantry in previous years, but it had never acquired the overall level of armor that Israel and Western forces had

acquired for their infantry and rear services elements. Further, Syrian armored training and maintenance had many of the weaknesses of Iraqi forces. Most of Syria's armored training exercises had a set piece character, and there was comparatively little realistic training at the unit level and against a realistic adversary. Realistic gunnery training was limited, and so was large scale maneuver and combined arms training -- particularly above the brigade level. Maintenance of armored vehicles was uncertain, even for the elite T-72s, and there were serious shortfalls of spare parts and repair equipment. Combat repair and recovery capability was still limited.

Syria had improved some aspects of its artillery capabilities after 1982. It acquired a number of modern fire control and artillery radar systems. Syria also improved the training and target acquisition capabilities of its multiple rocket launcher forces, and deployed more of its 120mm mortar forces in direct support. These changes were not been radical, however, and over 80% of Syria's artillery consisted of older towed weapons. Syrian service support and logistics had improved steadily since 1973, but were still something of the step child of the Syrian Army, rather than a full partner to firepower and maneuver. The Syrians tried to compensate with a feed forward system modeled on the Soviet one that sends in supplies before commanders request them, which helps eliminate gaps between the request and supply. This system is not particularly discriminating, however, and it was heavily dependent on fixed facilities in the vicinity of the Golan.

These weaknesses are a further demonstration of the importance of carefully considering qualitative factors in coalition warfare, but had little practical impact on the battle. While President Asad of Syria had long been an enemy and rival of Saddam Hussein, and told senior Arab leaders that he hoped that the Gulf War would destroy Saddam's regime, he had no desire to see Syrian forces take the lead in destroying another Arab force. Somewhat to the surprise of other commanders, the Syrian commander announced on December 31, 1990, that Syrian forces would not play an offensive role in Desert Storm.

The bulk of the Syrian contingent was kept outside of the fighting until February 28, 1991. A single brigade then advanced to occupy Objective Bravo, which had already been captured by advancing Egyptian troops, and secured it against the now vanishing risk of Iraqi counter-attack. A second brigade then advanced to secure the Egyptian lines of communication to Al-Jarah. Syrian forces did no real fighting, and many Syrian units remained deployed as a "screen" along the border.[165]

The political constraints that Asad put on Syrian forces -- in spite of considerable pressure from the Saudi government and USCENTCOM -- are a further lesson about the dangers in trying to use proxies or substitutes for Western power projection capabilities. Military limitations are one thing, and political uncertainty is another. The commitment of Syrian forces was of major political value in demonstrating Arab support, and in preventing Saddam Hussein from exploiting divisions in the Arab world. However, the fact that Syrian forces did not play a major role in combat, even in the face of nearly united world and Arab opinion, is an indication of what might happen in other contingencies where political support for UN or cooperative military action was less clear.

Lessons for Cooperative Security: Kuwaiti Forces and Capabilities [166]

Kuwait's role in Desert Storm is still another lesson in the limitations of coalition warfare, and in the limits of regional military forces. At the time Iraq invaded, Kuwait's military forces had a paper strength of around 20,000 men. These included large numbers of what were little more than Bedouin mercenaries, and Kuwait was heavily dependent on foreign personnel for its technical support, service and logistic support, maintenance, and training. These included British, Jordanian, Pakistani, Egyptian, and French personnel, and were often of mediocre quality, when they were competent, and were generally ignored whenever their advice required any change in Kuwaiti bureaucratic procedures.

The officer corps and NCOs were relatively loyal and were recruited from the ruling family and loyal tribes. Unfortunately, recruitment and promotion were dominated by favoritism, rather than performance. Kuwait also was unable to recruit its other ranks from its own citizens. Its population before the Iraqi invasion was only about 2.2 million, and less than 30% were native Kuwaitis. Other Arabs, including Palestinians, totaled 39%. The rest included 9% South Asians, 4% Iranian, and 20.1% other. Only about 19,500 males reached military age in 1990, and the total male work force from ages 15 to 49 -- including expatriates -- totaled only about 442,000.[167]

While Kuwait did try to get its citizens to join the armed forces, and offered good pay and privileges, few volunteered in a country that offered so many more rewarding alternatives. A draft was little more successful. In theory, Kuwait has a draft requiring two years of service, except for university students -- who only had to serve one year. There were so many exemptions, however, that the draft existed largely on paper. As a result, most of the "Kuwaitis" in the military forces in 1990 were from tribal groups that were not really citizens. These Bedouin were raised as tribal levies, had no reason to be loyal to the Kuwaiti government, were poorly treated and paid, and often deserted.

Kuwait's total army manpower was only about 16,000 men when the Gulf War began in the middle of 1990. While Kuwait's order of battle had two armored brigades, one mechanized brigade, an artillery brigade with a self-propelled artillery regiment, and one surface-to surface-missile battalion, this order of battle was little more than a hollow shell. Its total army manpower was equivalent to only two Western brigade slices, and all of its forces were seriously undermanned.

Kuwait had limited ability to effectively employ its strength of 275 main battle tanks (of which 165 were first-line Chieftains, 70 were low quality Vickers Mark 1s, and 40 were obsolete Centurions) in anything other than a set piece defense. Even its Chieftain tanks were under-powered and experienced continued overheating and maintenance problems.[168] Kuwait had ordered the Yugoslav M-84, an inferior and poorly assembled version of the early Soviet T-72, as a replacement tank, but these were not in service. Kuwait's exact reasons for purchasing this system are unclear, but they were political rather than military.

Kuwait had more capability to use its lighter armor, but only in set-piece defensive maneuvers. This armor included 50 BMP-2 and 100 AT-105 Saxon and Saladin armored fighting vehicles, 100 Saracen and 200 M-113 APCs, and 90 Ferret armored cars. It had British Scorpions and roughly Soviet BMP-2 armored fighting vehicles on order.[169]

Kuwait had bought a wide range of anti-tank weapons, including the AT-4, BGM-71A Improved TOW, HOT, M-47 Dragon, and Vigilant, and it had 56 M-901 ITV armored TOW carriers. It has 4,000 Improved TOW missiles on order. This was a good mix of anti-tank weapons, but had an uncertain training and support effort.

The artillery strength of the Kuwait Army included 36 M-109A2 self-propelled and 40 AMX Mark F-3 towed 155 mm howitzers, and approximately 16 old M-101 towed 105mm howitzers, but it had no combat training in using such artillery beyond set piece and firing range exercises. Kuwait's surface-to-surface missile battalion had 12 FROG-7 launchers, but these had little more than symbolic importance.

Kuwait was gradually developing improved land-based air defenses, but it had too many different types of weapons and poor training in operating them. Kuwait had Soviet supplied SA-7s, SA-6s, and ZSU 23-4s, and two batteries of SA-8s. The US had refused to sell it the Stinger, but Kuwait had more SA-7s, Egyptian Sakr Eyes, and gun-missile defense systems on order. There were reports of additional orders for SA-6s and SA-8s, and that Kuwait had ordered Crotale or Sea Wolf light surface-to-air missile systems, although Britain was then reluctant to sell Kuwait a key system in use by the British navy because of the fear of loosing the details of the technology to the USSR.[170]

In terms of basing, the Kuwaiti Army had a massive $100 million military complex about twenty miles from Kuwait City. These facilities, however, owed more to political

convenience, and an effort to maintain high living standards than to military effectiveness. They were vulnerable to air attack, and over-centralized both the deployment of Kuwait's forces and their support functions in fixed locations.

Kuwait's Army had poor overall training, little coordination or effective command above the "brigade" level, and a maintenance and logistic system that was a bureaucratic nightmare in which paper work had complete priority over military effectiveness. Further, Kuwait lacked the ability to deploy and sustain its forces in the field without foreign civilian support. Kuwait had concluded an agreement with Turkey to provide for more advanced training, but this came too late to affect its military proficiency.[171]

Kuwait was just beginning to create a real navy when Iraq invaded. It had created an 2,100 man naval force to replace its coast guard, but this force was completely dependent on foreign contractors for training, maintenance, logistics, and often actual operations. It was based at Ras al-Qulayah and Shuwaikh, and had recently acquired $29 million worth of new naval facilities. There were major civil ship repair facilities at Kuwait City's Shuwaikh harbor, including a 190 meter floating dock with a 35,000 DWT repair capability.[172]

The core of the Kuwait Navy consisted of eight Lurssen guided missile patrol boats. Two of these boats were FPB-57s, and six were TNC-45s. They had 76 mm OTO Melara guns, twin 40 mm guns, and four Exocet MM-40 missile launchers each. It should be noted that these patrol boats had some important limitations common to virtually all GCC naval vessels. They lacked air defense capability, and while their voice communications were good, they could not be integrated into a data link exchange network. Crewing them also required nearly 60% of Kuwait's native naval manning.[173]

Kuwait received five 55-meter South Korean missile patrol boats beginning in August, 1987, which were based in Kuwait's offshore islands. They had anti-ship missiles, helicopter pads, and a Hovercraft docking facility. The ships were not fully combat-ready, but they increased Kuwait's shallow water defense capability. Kuwait also had 47 eleven to twenty four meter patrol craft, 4 modern British Cheverton LCTs, 3 LCUs, 3 LSUs, 4 tugs, 6 launches and some light coastal vessels and support craft. The Kuwaiti air force provided additional support in the form of Super Puma helicopters equipped with Exocet.

Finally, Kuwait had six SRN-6 Hovercraft, Exocet-capable SA 365N Dauphin II helicopters, 20 Magnum Sedan patrol boats, two Italian 18.4 meter patrol boats, two 20-meter Italian patrol boats, and more South Korean patrol boats on order. It was negotiating with the Netherlands to buy two Alkmaar-class mine hunters, and the Dutch Parliament had approved the loan of two such vessels until new production is available.

While this naval strength was reasonable for a small navy, it required a manpower base of 5,000-8,000 men in uniform, or 3 to 4 times the manpower that Kuwait actually possessed. Kuwait got around some of there requirements by being heavily dependent on foreign technicians, but overall readiness was poor.

Kuwait's 2,200-man air force was slowly improving in effectiveness, and it had roughly 70 combat aircraft and 18 armed helicopters. It had good basing facilities at Kuwait International Airport, Ahmed Al-Jaber Air Base, and Ali Al-Salem Air Base. Housing and other facilities were good.

Its combat strength included 30 A-4KU/TA-4KU attack fighters, some of which were being placed into storage to await the delivery of new F-18 multi-role fighters which Kuwait had ordered from the US[174] The A-4s were adequate attack aircraft, but lacked air combat radars. They could only be used in dogfights where ground based radars or Kuwait's Mirage F-1s guided them to a target. This made them inferior to Iraq's modern fighters in air-to-air combat capability.

The air force had an active operational strength of 24 new Mirage F-1BK/CK fighters and 12 Mark 64 Hawk COIN/trainer aircraft. Kuwait's air weapons inventory included AIM-9 Sidewinders, Matra Super R-530, and R-550 Magic air-to-air missiles -- with AS-11 and AS-12 air-to-surface missiles, and 12 AM-39 air-to-ship missiles on order. Kuwait had also ordered the French SA-365N maritime attack system.

The Mirage F-1 aircraft had proved hard to maintain, however, and Kuwait had lost several of the aircraft to accidents. The radars of the Mirage F-1s was unreliable and its 55 kilometer air intercept range proved too short to meet Kuwait's operational needs, and was forced to use its A-4 attack aircraft in the combat air patrol role when it needed to create an air defense screen. Further, Kuwait was so short of air force personnel that it contracted for Pakistani service and support crews.[175]

Kuwaiti Air Force training was adequate for interdiction and close air support missions against targets that lacked good-ground based air defenses, but was not suited for attacks on Iraqi forces. Kuwaiti pilots also had relatively limited air-to-air combat training, and were severely hampered by an inadequate air command and control system, and air warning and surveillance coverage. Little effort was made to develop a force that could maintain a high alert status or work with the army in effective combined operations. The Mirage F-1s did, however, maintain a limited alert status during the Iran-Iraq War.

Kuwait had ordered 40 US F/A-18 fighters in July, 1985, at a cost of $1.9 billion. This sale also included 120 AIM-9 Sidewinder air-to-air missiles, 200 AIM-4 Sparrows, 40 AGM-84 Harpoon anti-ship missiles, and 300 Maverick AGM-65G anti-ship/anti-hard point missiles. Its US approval, however, only came after a bitter fight between the Reagan

Administration and Congress. The sale came so close to collapse for the USSR to offer Kuwait the MiG-29, and in order for the Administration to win approval of the sale, Kuwait had to give up its effort to order 200 IR Maverick AGM-65D anti-tank missiles. Kuwait also had to agree to base the F/A-18s only in Kuwait, to not acquire a refueling capability, and to exchange one A-4KU for every F/A-18 delivered to Kuwait.

This left Kuwait with limited levels of munitions stocks for its new aircraft, and without an advanced anti-tank weapon for the F/A-18. Further, the F/A-18s were not to begin delivery until January, 1992, and Kuwait would not receive its active strength of 28 fighters and eight fighter trainers until June, 1993. Its remaining four attrition aircraft would only be delivered after 1994. Had this schedule been followed, it would have meant major turbulence and transition problems for at least half a decade. Its chief virtue was that it promised to give Kuwait an advanced air defense/air attack fighter, and advanced munitions and support facilities, standardized with those used by the US Navy and US Marines, and which could significantly improve US over-the-horizon reinforcement capability. [176]

The Kuwait air force had nine transport aircraft, including one B-707-200, six C-130-30s, and two DC-9s.[177] The Air Force operated 46 helicopters. These included 23-30 SA-342K Gazelle attack helicopters, and 23 of these are equipped with HOT. They also included 5-6 AS-332 Super Pumas equipped with Exocet, and 10-12 SA-330 Pumas. It had 6 AS-332F Super Pumas on order. The helicopter crews had moderate training and good foreign maintenance support.

Kuwait had a French designed semi-automated air defense, control, and warning system, but it had only limited radar coverage of Iraq, Iran and the Gulf. It also had limited readiness, and operational reliability, and was unable to take advantage of many of the computerized features of the system because of software and training problems. The Kuwaiti Air Force did benefit from data exchanges with the E-3As flying in Saudi Arabia, but the quality of the data links was uncertain. This system did not allow Kuwait's fighters or surface-to-air missiles to react quickly and effectively enough to deal with Iranian or Iraqi intruders into Kuwait's air space.

In August, 1990, Kuwait's Air Force had five batteries of Improved Hawk surface-to-air missiles with 24 twin launcher fire units, 12 SA-8 surface to air missile launcher units, and an unknown number of SA-7 and SA-14 man portable surface-to-air missiles. It also had 20mm and 35mm anti-aircraft guns, and may have had two Shahine batteries on order. Kuwait had serious problems in absorbing its more sophisticated surface-to-air missiles. This became clear in 1987, when efforts were made to re-site the missiles to defend against attacks by Iran's Silkworm missiles. It is unclear how many IHawk units were really

combat ready when Iraq invaded. The US refusal to sell Kuwait the Stinger missiles in June, 1984, had led Kuwait to delay the purchase of Hawk systems and to respond by buying some $327 million worth of light Soviet arms for its Army -- none of which could be netted into an effective air defense system.

Finally, Kuwait had separate National Guards, Palace Guards, and Border Guards, equipped with a total of 20 V-150 and 62 V-300 Commando armored personnel carriers. The National Guards were intended for civil control and had little military capability. The Ministry of the Interior ran special political and anti-terrorist police forces, and was responsible for internal intelligence and security. These security and intelligence forces had a poor reputation before Iraq's invasion, and their actions after Kuwait's liberation indicate that this reputation was justified.

Kuwait's Military Forces During the Gulf War

Kuwait's forces were never given the opportunity to deploy and fight during the Iraqi invasion. Kuwait's government mobilized after Saddam Hussein's threats on July 17, but reduced the alert levels to 25% a week later, and did not bring its forces to combat readiness, because of fear of provoking Iraq, coupled with its conviction that its confrontation with Iraq could be solved through peaceful means. In spite of Kuwaiti military advice to the contrary, the key ministers in charge of Kuwait's defense and internal security did little to prepare Kuwait's forces for war.[178]

The Kuwaiti forces, however, lacked leadership and not courage. Scattered elements of the Palace Guards and army defended some key buildings for several hours and tried to recapture the palace. Elements of the Kuwaiti 35th Armored Brigade engaged the advancing Republican Guard forces. Scattered Kuwaiti Army units fought bravely in a rear guard action through Kuwait City. Other Kuwaiti soldiers stayed behind and helped form the resistance. Some minor elements of the land forces attempted to defend the southern part of the country. The Kuwaiti Air Force flew until its bases were about to be overrun, and then escaped to Saudi Arabia and Bahrain. The air forces that escaped included 15 Mirage F-1 fighters, 19 A-4 Skyhawks, 8 Gazelle attack helicopters with HOT, and a Puma transport helicopter.

Roughly 7,000 troops, an armored battalion with 50 Chieftain tanks, and a number of BMP-2 crews escaped into Saudi Arabia. Many army, navy, and air defense forces had no choice other than to surrender, however, and much of their equipment was captured intact. This equipment included 24 Improved Hawk surface-to-air missile launchers, whose loss might have aided Iraqi air defense capabilities if Iraq's Jordanian advisors had succeeded in allowing Iraq to make them fully operational. Iraq did absorb a number of Kuwaiti weapons, including 36 M-109 and 20 AMX-F3 155mm self-propelled howitzers.[179]

Iraqi forces were able to secure the country to the Kuwaiti-Saudi border by the end of August 3. On August 4, Iraq began a full scale movement of its forces to establish defensive positions. Additional Republican Guard infantry divisions that had deployed to the border in late July moved into Kuwait, occupied Kuwait City, and secured the routes of communication to Iraq. Other divisions moved south towards Saudi Arabia. By August 6, there were 11 Iraqi divisions in Kuwait, and Saddam Hussein announced that Kuwait was the "19th province -- an eternal part of Iraq" on August 8.

The real fight began after the Iraqi conquest. Iraq's subsequent brutality and looting of the country helped create a major resistance movement in Kuwait. The Kuwaiti government in exile created new volunteer liberation forces in Saudi Arabia. The first step was to form the 35th Free Kuwaiti Brigade at Hafr al-Batin, using escaped soldiers and volunteers. The Kuwaiti government in exile then began to form additional brigades of volunteers, and purchased 300 Yugoslav M-84 (T-72) tanks to equip them. The Chieftain-equipped brigade that escaped from Kuwait was renamed the Shahid (Martyr's) Brigade and the first of the new formations were called the Fahah (Opening) Brigade. Kuwaiti resistance forces received separate training from the 5th US Special Forces Group.

Several additional brigades existed in some form by the time that the AirLand phase of Desert Storm began, but all Kuwaiti formations were far smaller than the title "brigade" normally indicates. Some sources report that Kuwaiti forces built up to a strength of 14,000 men by the time of Kuwait's liberation in late February, 1991. Saudi data, however, indicated that Kuwait's ground forces in the combat theater only totaled about 9,300 men, with about 90 tanks, 90 other armored vehicles, and 3-5 artillery weapons.[180] It was impossible to organize and train these armored formations to become effective forces in the time available, and Kuwaiti ground forces had only limited combat effectiveness.

As a result, small Kuwaiti land force units were spread among the two major Arab formations. Joint Forces Command (North) was divided into Egyptian, Syrian, and two joint task Forces which both had full Saudi brigades. The Kuwaiti 35th Mechanized Brigade was paired with the Saudi 20th Mechanized Brigade in Task Force Muthanah, and the Kuwaiti 15th Infantry Brigade was paired with the Saudi 4th Armored Brigade in Task Force SAAD.

Joint Forces Command (East) included four task forces and a joint command force. The Kuwaiti Al-Fatah Brigade was paired with the Saudi 8th Mechanized Brigade in Task Force Othman, and Kuwait forces operated a joint combat aviation battalion with UAE forces in the joint command force. The Desert Storm order of battle also lists the Kuwaiti Al-Haq Brigade and Khulud Brigade as "non-affiliated forces", although these forces took part in the liberation of Kuwait City.[181]

The Kuwaiti Air Force was more effective. Less than 200 trained Kuwaiti Air Force personnel were in service at the start of Desert Storm, but Kuwait used French Air Force and US contract personnel to support its 15 operational Mirage F-1s , and 19 A-4s. The Kuwaiti Air Force also had 12 armed helicopters. Kuwaiti units flew 568 interdiction missions and 212 battlefield interdiction missions for a total of 780 sorties. About 650 of these sorties were A-4 sorties, and Kuwaiti A-4s flew an average of about 18-20 sorties per day. Kuwaiti Mirage F-1s flew the remaining 130 sorties, flying 4 to 10 sorties per day. Operational availability rates averages 80-85% per day. Kuwait lost one A-4 on the first day of fighting, but attacked Iraqi artillery and infantry locations, and some Iraqi air defense positions throughout the war.

It is no reflection on the Kuwaitis involved that the small Kuwaiti forces deployed in Desert Storm could do little more than play a limited role in supporting the land attacks, and act as a symbol of the willingness of ordinary Kuwaitis to defend their country. Given their limited strength and the fact that they had been driven into exile, Kuwaiti pilots and troops have fought well, and led the formal liberation of Kuwait City on February 28, 1991.[182]

Mission proficiency was often moderate to low, but some Kuwaiti pilots were highly effective. The Kuwaiti Air Force wad a relatively high number of sorties cancellations and aborts: 203 sorties vs. 780 sorties flown. Only 50 of these cancellations, however, were due to maintenance -- which was performed largely by foreign contract personnel. A total of 123 cancellations and aborts resulted from weather factors, and the Kuwaiti Air Force faced special problems because of the limited all-weather capability of its aircraft.[183]

The Cost of Unpreparedness Before and After the War

When the liberation of Kuwait City finally came, the cost of Kuwait's military weaknesses and appeasement before Iraq's invasion was a lesson that needed little further illustration. Iraq had set 732 of Kuwait's 858 operating oil wells on fire.[184] Kuwait's economy had ceased to exist, it had no functioning utilities and urban services, and most of its infrastructure needed repair. Unfortunately, Kuwait's government in exile was unprepared to deal with many aspects of the problems that it faced. It took nearly six months to organize its operations in Kuwait, largely ignored the freedom fighters that had helped liberate the country, and allowed massive purges of Palestinians and anyone else suspected of aiding Iraq. The results were deeply divisive and did nothing to unite the country around the search for effective defense.

The government's post-war actions also helped contribute to serious morale and leadership problems among Kuwait's officers and enlisted men. Rightly or wrongly, many felt that their senior commanders were often promoted purely for family and political

reasons and deserted in the face of the enemy when Iraq attacked. Many feel that the royal family deliberated ignored those who fought in the resistance, and allow post war contracts to be awarded out of favoritism and corruption. They also question the government's efforts to study what went wrong and learn from the lessons of the war.

These feelings went beyond silent resentment. In April, 1991, a group of senior officers sent the Emir a letter calling for the investigation and dismissal of Defense Minster Sheik Nawaf al-Ahmad al-Sabah for failing to mobilize, for pulling forces back from the border shortly before the invasion, for ordering the Kuwaiti tanks in the border area to avoid firing on the advancing Iraqi troops, and for fleeing the country without giving orders to Kuwait's forces once the war had begun. They also called for the investigation of Interior Minister Sheik Salem Sabah al-Salem for taking no action to provide suitable warning and internal security measures. The Emir dealt with this situation by making Nawaf Minister of Social Affairs and Labor, but he also made al-Salem the new Minister of Defense.[185]

In January, 1992, the government faced a revolt by junior and mid-grade officers. They demanded the resignation of up to 100 military officers and defense personnel, including 20 generals and a number of members of the royal family. Some 14 officers were retired, but this did not satisfy military or public opinion. While the new Minister of Defense, Sheik Ali Salem Sabah al-Salem has gradually improved relations with some of the military, the royal family still had much to do to rebuild the respect and loyalty of the armed forces. [186]

There are several lessons to be learned from this experience:

- o Southern Gulf states cannot approach Iraq or Iran in military strength, but this cannot be an excuse of appeasement or cosmetic military forces. They need to maintain as effective a forward deployed deterrent as they can, and be ready for actual combat. Words and rhetoric are not enough.
- o Even if Kuwait does create as an effective and deterrent a defense capability as possible, it is so small that its forces will still have only token capability against a full scale Iraqi or Iranian attack. The need for regional aid and Western power projection capabilities is likely to be an enduring strategic reality in the Gulf.
- o Any assessment of regional allies not only requires a realistic assessment of their military strengths and weaknesses, but those of their political leadership.
- o There will be many times in the future when strategic necessity forces the West and the Coalition to come to the aid of flawed and inadequate governments that cannot meet demanding tests in terms of Western values and democracy.

Lessons for Cooperative Security: Other Arab Forces

A number of other forces from the developing world were deployed in the combat theater and some took part in the fighting. The land combat units involved have already been shown in the order of battle in Table 3.12. Morocco provided about 1,300 troops, Oman provided about 950 troops, but did not commit its air force. It also reinforced its defensive positions against Yemen. Senegal provided 500 troops, and Bangladesh provided 2,200 troops. A 5,700 man Pakistani force provided reserve defenses behind the Saudi border.

Bahrain provided a 200-man infantry company to Joint Forces Command (East). Bahrain's air force was relatively new and just absorbing deliveries of F-16s. Nevertheless, the Bahrain Air Force flew a total of 266 combat sorties. It used its new F-16s to fly 166 defensive and offensive counter air sorties, averaging 4-6 sorties per day. It used its F-5s to fly 122 interdiction sorties, averaging about 3-4 sorties per day. It attacked targets like radar sites, Silkworm sites, artillery positions [187]

Qatar provided a 1,600-man mechanized battalion with 25 tanks, 60 other armored vehicles, and 3-5 artillery weapons. This force fought well at the Battle of Khafji, and in Joint Forces Command (East). Qatar also committed 700 men, 21 fighters, and 12 armed helicopters from its small air force. Qatari Mirage F-1s flew 41 interdiction sorties, with a maximum of about 5 sorties per day. Qatari Alphajets flew two sorties. The Qatari Air Force was forced to cancel or abort 22 sorties, but 16 of these cancellations were due to weather.[188]

The UAE committed a Motorized Infantry Battalion to Joint Forces Command (East) and created a joint aviation battalion with Kuwait. It used its 7,000-man air force to fly 109 sorties, including 58 Mirage 2000 interdiction sorties, 45 C-212 and C-130 airlift sorties, and six Mirage 2000 reconnaissance sorties. The UAE Air Force had reasonable readiness. It canceled or aborted 18 sorties, but only two due to maintenance reasons. Its Mirage 2000 fighters attacked targets like Iraqi infantry and mechanized forces, artillery positions, and supply areas.[189]

The Lessons of a War Between Military "Cultures": Fighting World War III versus Fighting World War I

The chapters that follow describe many of the detailed organizational, tactical and technical lessons of the Gulf War , but the analysis in this chapter clearly illustrates important lessons about the need for explicit deterrence, strong power projection and rapid deployment capabilities, and coalitions that can exploit the ongoing "revolution in military affairs" within Western forces. The Coalition's victory in the Gulf War came only because the US had the time to project "decisive force." The Coalition was capable of suffering a major defeat in Saudi Arabia until the end of September. It could certainly have taken far greater losses, and been far less effective in driving Iraq out of Kuwait. By the time of Desert Storm, however, the Coalition was ready to exploit the advances that the US made in its "revolution in military affairs," and air land battle. These US capabilities played a critical role in determining the outcome of the war, and its course would have been radically different if the US forces deployed against Iraq had been the force of Vietnam, Beirut, or the "hollow army."

The differences between the major forces within the Coalition, and between the Coalition forces and those of Iraq, were an equally critical factor in shaping the outcome of Desert Storm. An analysis of these differences inevitably seems to praise the US by comparison, but it is important to recognize that US superiority in many areas of technology and force capability was as much a matter of superior resources and scale as anything else. Further, the US could not have fought Desert Storm alone, nor could the West have collectively succeeded without Saudi and other Arab aid. The fact that all members of a coalition are not equal is in no way a reflection on the critical importance of coalitions.

The exploitation of Iraq's weakness and passivity between mid-August 1990 and the beginning of Desert Storm played a critical role in allowing the Coalition to reduce its remaining weaknesses and develop a coherent military capability. Time was as important as strength. It allowed the US to transform the tactics and technology that it had developed to fight World War III, to the specific context of a very different regional conflict. In contrast, Iraq in many ways prepared to fight World War I. The strategy, tactics, and deployments that it chose might have strengthened its forces in a slow-moving war of attrition like World War I or the Iran-Iraq War, but it actually increased Iraqi vulnerability to the AirLand battle tactics and technology employed by the West. Iraq not only wasted time, it misused it.

The West and its allies have no guarantee that future opponents will make the same mistakes. It seems likely that the US advantages combined in the Air Land Battle will give it major advantages over Third World opponents for a decade to come. It seems that the broader advantages that Western military culture offers, over the military culture of Third World powers like Iraq will provide similar advantages to Western-led Coalitions. These advantages, however, are relative and perishable. They are contingency-dependent, and are tied to whether they can be combined with decisive force. They are no guarantee that the UN, the West, or the US cannot lose a major regional conflict in the Gulf or in other areas like Korea if forces lack adequate strength and readiness, or inadequate time for power projection and coalition building.

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[1] There is no way to provide an accurate estimate of US peak forces because given strengths of manpower and equipment peaked at different times, and it is impossible to separate out the ground and air components of the Marine Corps and US Navy. Detailed counts of helicopters are not provided in the source material for the USN and USAF, and it is unclear how given services distinguish between combat and support aircraft, since each service varied the aircraft types involved in different aspects of its reporting. Estimates based on the data in Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 15,18-19, 44, 49, 51. provide the following break out by service on January 1:

	US Army	US Marine Corps	US Air Force	US Navy
Ground personnel	204,286	60,348	-	-
Air personnel -	-	-	39,927	-
Divisions	7 2/3	2	-	-
Tanks	838	225	-	-
Other Armored Vehicles	1,679	746	-	-
Artillery	-	193	683	339
Attack helicopters	301	43	-	-
All helicopters	1,184	164	-	-

[2] US Air Force, "Reaching Globally, Reaching Powerfully: The United States Air Force in the Gulf War," Washington, Department of the Air Force, September, 1991, pp. 4-5.

[3] The estimates of Iraqi strength used in the following discussion are adapted from Office of the Secretary of Defense, Conduct of the Persian Gulf Conflict: An Interim Report, Washington, Department of Defense, August, 1991, p. 2-4; Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 112-118, Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 15,18-19, 44; and Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 11-18, 51, 93, 104, 109-113. Some estimates show seven Iraqi Corps.

[4] Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 218-219.

[5] Estimates of Iraqi strength changed during and after the war. Initial estimates indicated there were 540,000 men in the KTO. These figures were adjusted downwards after interviews with prisoners indicated that the US had exaggerated the size of Iraqi divisions, and that 11 divisions had 57% of full strength and 33 divisions had 85% strength for a total average strength of 78%, See Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume II, Washington, US Air Force/Government Printing Office, 1993, pp. 165-170. Estimates of total equipment holdings differ according to whether the estimate is based on total probable holdings per combat unit or the amount of equipment actually confirmed by intelligence imagery. The combat unit strength estimate produces a total of 4,280 battle tanks, 2,870 other armored vehicles, and -3,100 major artillery weapons in the KTO. The estimate based on photo imagery indicates a total of 3,475 battle tanks, 3,080 other armored vehicles, and 2,475 major artillery weapons in the KTO

[6] Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 113-114.

[7] Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 10-12.

[8] Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 10-12.

[9] The higher estimate may well be correct, but probably includes armor in storage. Many estimates of Iraqi equipment are based on its strength at the end of the Iran-Iraq War. Iraq took delivery on major amounts of arms from August, 1998 to August, 1990.

[10] Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, p. 116, 118.

[11] US Air Force, Gulf War Air Power Survey, Volume II, April 15, 1993, p. 82.

[12] US Air Force, Gulf War Air Power Survey, Volume II, April 15, 1993, p. 82; London Financial Times, April 29, 1989, p. 11, July 26, 1989, p. 20; Jane's Defense Weekly, May 13, 1989, p. 837; April 22, 1989, p. 687, August 12, 1989, p. 255, September 30, 1989, p. 674, Defense News, May 8, 1989, p. 6; International Defense Review, 6/189, pp. 835-841.

[13] DIA estimate -- as declassified in Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume I, Washington, GPO, 1993, p. 207

[14] Estimate provided in Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 218-219.

[15] Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 13-14. Some estimates indicate there were 44 main operating bases. These estimates seem to include active main bases and major dispersal fields. For a range of estimates, see US Air Force, "Reaching Globally, Reaching Powerfully: The United States Air Force in the Gulf War," Washington, Department of the Air Force, September, 1991, pp. 4-5; London Financial Times, April 29, 1989, p. 11, July 26, 1989, p. 20; Jane's Defense Weekly, May 13, 1989, p. 837; April 22, 1989, p. 687, August 12, 1989, p. 255, September 30, 1989, p. 674, Defense News, May 8, 1989, p. 6; International Defense Review, 6/189, pp. 835-841; Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992; US Air Force, Gulf War Air Power Survey, April 15, 1993, p. 11.

[16] The extraordinary range of different estimates of Iraqi strength is illustrated in Norman Friedman, Desert Victory, Annapolis, Naval Institute Press, 1991, p. 308; Bruce W. Watson, Military Lessons of the Gulf War, London, Greenhill, 1991, pp. 61-81; James F. Dunnigham & Austin Bay, From Shield to Storm, New York, Morrow, p. 323; Roy Braybrook, Air Power: The Coalition and Iraqi Air Forces, London, Osprey, 1991, p. 7. The GWAPS estimate is contained in Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 18-19.

[17] US Air Force, "Reaching Globally, Reaching Powerfully: The United States Air Force in the Gulf War," Washington, Department of the Air Force, September, 1991, pp. 4-5.

[18] Estimate of Mirage strength is taken from Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 115.

[19] Jane's Defense Weekly, July 8, 1989. Dick Palowski, Changes in Threat Air Combat Doctrine and Force Structure, 24th Edition, Fort Worth, General Dynamics DWIC-01, February, 1992, p. II-358. Pawloski indicates that Mirage F-1's were utilized in both the

interceptor and attack roles. Iraq placed its first order for 30 multi-role F-EQ's and 6 dual-seat F-1BQ with Magic air-to-air missiles in 1977, and the aircraft began delivery in January 1981. They initially were deployed to Qayyarah Airbase, where a substantial French training and support organization was maintained. In late 1979, an additional order was placed for 24, and 29 more were ordered in 1982 that included 23 newly configured F-1EQ4-200s and 6 F-1BQ-200s with a fixed-probe air refueling system.

The Mirage F-1 is an "almost" all-weather (Pulse Radar) single seat interceptor with a short duration Mach 2.0 capability. The Cyrano IV Radar has a 25 NM acquisition capability against bomber sized targets and around 15 NM capability against fighters. The Cyrano IV has a "down look" track capability utilizing a "fixed echo elimination" scheme, but it will not support Super 530 Radar Missile requirements. The Iraqi F-1's are configured primarily with Magic One, R550 IR Missiles and Super 530 of both the IR and SA type. Aircraft performance and handling is similar to a hard-wing F-4. Some of the final delivered Mirage F-1's were fitted with the Agave Radar optimized for anti-ship operations with Exocet. The Agave is not compatible with air-to-air radar missiles.

Iraq ordered 20 F-1EQ5-200's and 4 F-BQ5-200s, with Agave Anti-Ship radar's replacing the Cyrano IV radar's, and these were delivered by October 1984. Up until that time, 5 Super Etendards were loaned to the Iraqi Air Force. By mid 1983 some 6 F-1's were lost in combat as well as 79 Soviet aircraft of various types. Another buy of 24 F-1E/BQ6-200 Exocet capable aircraft were ordered in September 1985 bringing the total F-1 fleet to 113 machines. The first of this last-batch arrived in 1987. A further 12-16 order was put in for attrition aircraft in 1988. Towards the end of 1983, France delivered to Iraq 5 Super Etendards which were utilized as Exocet platforms for several years, then returned to the French when Mirage F-1's were received in their place.

The Iraqi Mirage F-1s were delivered with a full complement of French weapons:

- Super 530 SA & IR air-to-air missiles
- R550 IR AIM
- Aerospatiale AS-30L ASM
- Thompson-Brandt 68/100 mm rockets
- Matra ARMAT ARM missile
- Exocets
- South African "Cluster" Bombs
- Matra conventional "slick" and "retarded" bombs

Mirage F-1's with Exocets operated long range missions that required airborne refueling with converted AN-12 "Cubs" using French buddy stores with drogues. There are

probably several air refueling candidates for the Iraqi Air Force, including IL-76 conversions as demonstrated by the Soviets.

[20] The Su-24 has a wing area of 575 square feet, an empty weight of 41,845 pounds, carries ,3385 gallons or 22,000 pounds of fuel, has a take off weight of 871,570 pounds with bombs and two external fuel tanks, carries 2,800 gallons or 18,200 pounds of external fuel, has a combat thrust to weight ratio of 1.02, a combat wing loading of 96 pounds per square foot, and a maximum load factor of 7.5G. Jane's Soviet Intelligence Review, July, 1990, pp. 298-300; Jane's Defense Weekly, June 25, 1985, pp. 1226-1227; and Dick Pawloski, Changes in Threat Air Combat Doctrine and Force Structure, 24th Edition, General Dynamics DWIC-91, Fort Worth Division, February, 1992, pp. I-65 and I-110 to 1-117.

[21] Aviation Week and Space Technology, April 10, 1989, pp. 19-20; New York Times, April 5, 1989, September 7, 1989; Washington Times, January 16, 1989; FBIS/NES, April 10, 1989.

[22] The high end of the range seems more correct and is based on Dick Palowski, Changes in Threat Air Combat Doctrine and Force Structure, 24th Edition, Fort Worth, General Dynamics DWIC-01, February, 1992, p. II-361. Some estimates of the Mirage F-1 strength go as high as 70 aircraft, but seem to include aircraft in the air defense role. These same estimates show 60 Su-20s in the FGA units, and 40 F-6s and 40 Su-7s in other combat units. The use of aircraft sub-type --such as MiG-23 "BM/N" -- involves major uncertainties. Most US government unclassified writing does not report such details. Unclassified sources disagree sharply even over what letters to use.

[23] Many of the MiG-21s were not operational. Iraq had up to 40 MiG-19s in quasi-operational status and possibly some F-6s.

[24] The US count and list of air bases is based upon slides circulated by the US Air Force in introducing the April 15, 1993 draft of the Gulf War Air Power Survey.

[25] Dick Palowski, Changes in Threat Air Combat Doctrine and Force Structure, 24th Edition, Fort Worth, General Dynamics DWIC-01, February, 1992, p. II-361.

[26] Jane's Defense Weekly, March 3, 1990, p. 386.

[27] Roy Braybrook, Air Power: The Coalition and Iraqi Forces, London, Osprey, 1991, pp. 8-9.

[28] The author took detailed notes of these Soviet criticisms of the Iraqi Air Force during visits to Baghdad in 1984 and 1987. Soviet officers also mentioned the problems inherent in GCI systems during their critics of Syrian air combat performance during the 1982 conflict.

[29] Jane's Defense Weekly, May 13, 1989, p. 836 and October 7, 1989, p. 693; Air International, March, 1991, p. 118; Dick Palowski, Changes in Threat Air Combat Doctrine and Force Structure, 24th Edition, Fort Worth, General Dynamics DWIC-01, February, 1992, pp. II-354 to II-355. Roy Braybrook, Air Power: The Coalition and Iraqi Forces, London, Osprey, 1991, pp. 8-9. Some estimates imply the second aircraft was fully operational, but this is uncertain.

[30] Defense Electronics, February 1989, p. 10; United States News and World Report, April 10, 1989, p. 18.

[31] Jane's Defense Weekly, April 22, 1989, p. 697-698; August 5, 1989, p. 196, September 30, 1989, p. 674, February 10, 1990, p. 267; International Defense Review, 6/189, pp. 835-841.

[32] Defense News, May 8, 1989, p. 6. According to work by Dick Pawloski, Iraq also has a supply of AS-9 "Kyle" anti-radar missile which is a scaled down derivative of the AS-4 "Kitchen". I It is believed that it has at least three interchangeable passive radar homing heads for each of the three main "ground and ship threat emitter" frequency bands. It is expected that the Iraqi's have modified it to engage the Western Hawk and Patriot systems. The missile must be built-up before each flight, specifically targeting the seeker to the specific threat system that is to be engaged. It is a bit smaller than the "Kitchen" being 6.0 m long, 0.5 m in diameter, and having a 2.0 m wingspan. The ARM version of the MiG-21 sized "Kitchen" utilizes a 1000 kg HE warhead. The scaled "Kyle" has a launch weight of around 750 kg and utilizes a considerably smaller 250 kg warhead. It has two delta wings a mid-body with a clipped delta vertical tail and horizontal tail planes. There is a folded lower vertical fin. It utilizes a liquid fueled rocket which requires fairly substantial ground support in preparation. It is employed as a "high flier", similar in profile to the "Kitchen". It will go up to a Mach 2.0 cruise altitude of around 70,000 ft for a range of around 90 km and eventually high dive down in a steep 80 degree dive on the target. The "Kyle" has been replaced in the Soviet Air Force by several other missiles such as the AS-11 "Kilter", AS-12 "Kegler" and other more modern systems. It is not believed that Iraq has any of these more advanced versions. See Duncan Lennox's assessment in the October 89 Jane's Soviet Intelligence Review, page 442.

[33] Defense News, May 8, 1989, p. 6.

[34] Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 13-15; Dick Palowski, Changes in Threat Air Combat Doctrine and Force Structure, 24th Edition, Fort Worth, General Dynamics DWIC-01, February, 1992, p. II-361.

[35] Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 13-15; Slides to US Air Force presentation of the April 15, 1993 draft of the Gulf War Air Power study; Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 115-116.

[36] Some estimates show 129-130 sites in Iraq.

[37] See Dr. Eliot A. Cohen, Director, Gulf War Air Power Survey, Volume V, Washington, GPO, 1993, pp. 218-219; Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 13-15; Slides to US Air Force presentation of the April 15, 1993 draft of the Gulf War Air Power study; Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 115-116. These estimates were projected by different sources and the launcher or fire unit counts seem to be either rounded or based on standard Soviet battery holdings. According to Palowski, Iraq had the following radar order of battle:

Early Warning & Surveillance

- Spoon Rest D/ P-12M USSR(147-161 MHz)
- Flat Face A/ P-15 USSR(800-900 HHz)
- Squat Eye/ P-15M USSR(800-900 HMz)
- Bar Lock/ P-35/37 USSR(2695-3125 MHz)
- Tall King/ P-14 USSR(160-180 MHz)
- TRS-2215 (mobile) FR (E/F)
- TRS-2230 FR (E/F)
- AN/TPS-32 (3D) US (2905-3080)
- AWACS (IL-76) FR

Surface-to-Air Missile Systems

- SA-2 Fansong/Guideline
- SA-3 Low Blow/Goa
- SA-5 Square Pair/Gammon
- SA-6 Straight Flush/Gainful
- SA-7 Grail (IR Hand Held)
- SA-8 Land Roll/Gecko
- SA-9 Gaskin (IR Vehicle Mounted)
- SA-13 Gopher (IR Vehicle Mounted)
- SA-14 Gremlin (IR Hand Held)

- SA-15 Track with Tube Launched Missiles (not confirmed)
- SA-16 (not confirmed)
- SA-19 Mounted on 2S6 Gun-Track (not confirmed)
- ROLAND
- HAWK
- ASPEDITE

London Financial Times, April 29, 1989, p. 11, July 26, 1989, p. 20; Jane's Defense Weekly, May 13, 1989, p. 837; April 22, 1989, p. 687, August 12, 1989, p. 255, September 30, 1989, p. 674, Defense News, May 8, 1989, p. 6; International Defense Review, 6/189, pp. 835-841.

[38] Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 115-116.

[39] The Iraqis were on alert after reports that Israel might attack Iraqi chemical and nuclear facilities. Washington Post, April 29, 1989, p. 16.

[40] Peter Gilchrist, Sea power: The Coalition and Iraqi Navies, London, Osprey Publishing, 1991, pp. 17-20; Arnold Meisner, Desert Storm: The Sea War, Osceola, Motor Books, 1991; IISS, The Military Balance, 1990-1991, IISS, London, 1990.

[41] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 126-127.

[42] There a major differences over the figures for the peak land equipment in US Army forces, and the data provided in the Gulf War Air Power Survey. have a cut-off date that precedes the deployment of most of the equipment in the VII Corps. The figures for the peak land weapons in US Army forces shown in this column for tanks, the M-551, M-2, and M-3 are taken from data provided by Lt. Colonel Steve E. Dietrich of the US Army Center of Military History. They do not include 96 additional M-1s and 333 additional M-1A1s in the theater war reserve. Other figures for land weapons -- other than helicopters -- are taken from Annex T to the Conduct of the Persian Gulf War.

[43] Data for USMC land weapons were not provided in the Gulf War Air Power Survey. The data shown here are taken from Annex T to the Conduct of the Persian Gulf War. The 532 AAVs counted include 473 AAVP7A1s, 40 AAVC7A1s, and 19 AAVR7A1s deployed on land. An additional 93 AAVP7A1s, six AAVC7A1s, and four AAVR7A1s were deployed on the amphibious task force. A total of more than 350 LAVs of all types were used in Southwest Asia. These included 193 LAV-25s, 54 LAV-ATs, 26 LAV-Ms, 30 LAV-C-2s, 47 LAV-Ls and 22 LAV-Rs. These totals include both land and amphibious deployed

systems. The detailed equipment holdings of the 1 MEF are listed in Chapter Eight, and the holdings of the amphibious task force as discussed in Chapter Ten.

[44] For good discussions of these issues and the transformation of US forces see Romie L. Brownlee and William J. Mullen, III, Changing an Army: An Oral History of General William E. DePuy, USA Retired, Washington, D.C., US Army Center of Military History and US Military History Institute, 1986; Major Paul H. Herbert, Deciding What Has to Be Done: General William E. DePuy and the 1976 Edition of FM 100-5, Operations, Leavenworth Paper No. 16, US Army Command and General Staff College, Fort Leavenworth, Kansas, 1988; Anne W. Chapman, The Origins and Development of the National Training Center, 1976-1984, Fort Monroe, Virginia, Historical Office, US Army Training and Doctrine Command, 1992; John L. Romjue, From Active Defense to AirLand Battle: The Development of Army Doctrine, 1973-1982, Fort Monroe, Virginia, Historical Office, US Army Training and Doctrine Command, 1984; John A. Warden III, The Air Campaign: Planning for Combat, Washington, D.C., National Defense University Press, 1988, Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993; Richard P. Hallion, Storm Over Iraq: Air Power and the Gulf War, Washington, Smithsonian, 1992; and Colonel Harry G. Summers, Jr. (ret.), A Critical Analysis of the Vietnam War (Novato, Presidio, 1982, and A Critical Analysis of the Gulf War, New York, Dell, 1992.

[45] Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 20-23; Richard P. Hallion, Storm Over Iraq: Air Power and the Gulf War, Washington, Smithsonian, 1992, pp. 30-33.

[46] The US Air Force later found such problems as training pilots to fly in tight formations of four aircraft that made US formations ideal targets for slash and run Vietnamese fighter attacks since the tight formation increased the probability that at least one IR missile would track a target. Ironically, such tight formation flying was also a key factor increasing RAF losses relative the Luftwaffe early in World War II.

[47] The failures in previous US training efforts are illustrated by the fact the 90th Division trained for the invasion of Normandy for two years, and still suffered so many casualties that it took more than 100% losses, counting replacements.

[48] See William Bowman, Roger Little, and G. Thomas Siclia, All-Volunteer Force and a Decade, Retrospect and Prospect, Washington, Pergamon-Brassey's, 1986, pp. 266-288. 270; Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, p.16-18; Major

General Jack C. Wheeler, "In Recruiting, Quality is All," Army, September, 1991, pp. 35-43.

[49] The exercise originally examined 31 areas, and was later expanded to include 35. This version of the list is adapted from Richard P. Hallion, Storm Over Iraq: Air Power and the Gulf War, Washington, Smithsonian, 1992, pp. 79-80.

[50] Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, p. 6.

[51] Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, p.7.

[52] Sir Peter de la Billiere, the commander of British forces in the Gulf testified to Parliament that he had a peak of 45,000 personnel under his command, but the peak number deployed in theater seems to be 42,100. Daily Telegraph, May 9, 1991, p. 11.

[53] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 77-78.

[54] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 77-78.

[55] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 77, 80-82.

[56] The Belgian Air Force flew 25 sorties, the Portuguese 2, and the Spanish 34; each sortie carried 10 tons of freight. The US provided 28 C-5 sorties, carrying 2,800 tons. New Zealand provided two C-130s for use in the Gulf area. The Kuwaiti 747 flew 34 sorties. In addition, the Luftwaffe flew support sorties for the RAF in Europe to free RAF aircraft for operations in the Gulf. House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 81-82, 86.

[57] Also see Jane's Defense Weekly, August 17, 1991, p. 261.

[58] For sources and further references see ABC News Research Center, Persian Gulf Crisis Order of Battle, February 19, 1991, p. 10-12; House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991; Benson, Nicholas, Rats Tales The Staffordshire Regiment At War in the Gulf, New York, Brassey's, 1993; Delamain, Charles, "Challenging Times Ahead," Military Technology, August 1991, p. 65-72; Ripley, Tim, Desert Storm Special Land Power The Coalition And Iraqi Armies, London, Osprey Publishing Ltd., 1991, p. 27-54; Aviation Week & Space Technology, "UK Defense Spending to Decline Despite Gulf War," February 11, 1991, p. 26; Aviation Week & Space Technology, "United Kingdom Takes Key Role in Attacks Against Iraqi Targets," February 18, 1991, p. 47-48; Boyle, Colonel Walter J., USAF, Ret,

Weapons of Desert Storm; Kemp, Ian, "UK 'could not fight alone,' says study," Jane's Defense Weekly, August 17, 1991, p. 261; Miller, David, "UK Forces in the Gulf War," Military Technology, July, 1991, p. 39-62; O'Ballance, Edgar, The Second Gulf War About the Liberation of Kuwait (August 1990 - March 1991), London, Galago Books, 1992, p. 86.

[59] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 74-75

[60] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, p. 75

[61] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991. pp. 84-85.

[62] Fopr a summary of other modifications to British equipment, see House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991. pp. 74-75. Also see Nicholas Benson, Rat's Tales: The Staffordshire Regiment at War in the Gulf, Brassey's, London, 1993, pp. 3, 6, 9-12, 27-35, 50-51; General Sir Peter de la Billiere, Storm Command, London, Harpers, 1992, pp. 157, 177, 264-265, 286-289.

[63] General Sir Peter de la Billiere, Storm Command, London, Harpers, 1992, pp. 101, 143; House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, p. 85 (See the chronology on pages 84-86 for more details of British deployments.)

[64] See the discussion in Michael R. Gordon and General Bernard E. Trainor, The General's War: The Inside Story of the Conflict in the Gulf, Boston, Little Brown, 1994, p. 165-169, which attributes much of the decision to Colonel Tim Sullivan and Major General Rupert A. Smith (the 1st British Armored Division commander).

[65] General Sir Peter de la Billiere, Storm Command, London, Harpers, 1992, pp. 92-95, 148-154. Billiere was almost certainly right in his criticism of Marine forces as being too light in armor. They later required extra tanks, and reinforcement by a US armored brigade.

[66] Sir Peter de la Billiere, Storm Command, London, Harpers, 1992, pp. 122-123, 143-145, 157, 177, 265-266, and House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 13-24 and 74-76.

[67] Kyle C. Wycoff, "US and European Power Projection Capabilities in the Middle East," Washington, Georgetown University NSST-550, Spring, 1994, pp. 12-13. For a detailed order of battle of British ground forces, see House of Commons, Defense Committee,

Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, p. G47.

[68] These support forces are described by unit element in House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, p. G47.

[69] See Chapter Eight for more detailed discussions of unit holdings. These numbers are often uncertain. British forces built up to 176 tanks. The normal TO&E of the 7th Armored Brigade was also 100 tanks, not 114.

[70] Preliminary Lessons of "Operation Granby, Defense Committee, House of Commons, London, July, 1991; Jane's Defense Weekly, August 17, 1991, p. 261; London Financial Times, June 15, 1994, p. 14.

[71] Christopher Cooke, "Options for Change: An Academic Critique," Brassey's Defense Yearbook, 1993, London, Brassey's, 1993, p. 61.

[72] Ministry of Defense, Defending Our Future: Statement on the Defense Estimates 1993, London, HMSO, 1993, pp. 7,8, 66-67, 89.

[73] Air sources include Aviation Space & Technology, "Proximity of British Tornadoes Allowed Speedy Deployment," October 1, 1990, p. 105-106.; Dunnigan, James E., and Austin Bay, High-Tech Weapons, Military Strategy and Coalition Warfare in the Persian Gulf From Shield to Storm, New York, William Morrow and Co., Inc., 1992, p. 50; Jane's Defense Weekly, "EW: the missing link," August 10, 1991, p. 250; Heath, Major P B, RA, "To Kill Or Not To Kill? Recognition in the British Army," MS & T, April 1991, p. 24-26; Price, Alfred, "EW Additions for the RAF," Military Technology, December 1991, p. 82-84; Rental, Ian, and Tom Wakeford, Gulf War British Air Arms, Hong Kong, Concord Publications Co., 1991; Richardson, Doug, Bill Gunston, and Ian Hogg, Weapons of the Gulf War The Aircraft, Ships, and Vehicles Used In Conflicts Today, ed. by Graham Smith, London, New York, Salamander Books Limited, 1991; Watson, Bruce W., and Bruce George, Peter Tsouras, and B.L. Cyr, Military Lessons of the Gulf War, London, Greenhill Books, 1991, p. 231-232.

[74] A chronology of British air deployments is provided in House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 84-85.

[75] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, p. 76; Roy Braybrook, Air Power: The Coalition and Iraqi Air Forces, London, Osprey, 1991, pp. 26-29.

[76] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 84-85 and G47-G48. A list of units contributing aircraft and a map of nominal deployments are provided in G47-G48 and G51. Also see Kyle C. Wycoff, "US and European Power Projection Capabilities in the Middle East," Washington, Georgetown University NSST-550, Spring, 1994, pp. 15-16.

[77] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991. pp. 84-85.

[78] These figures use US definitions. British counts and definitions are slightly different. See Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey (GWAPS), Volume V, Part I Washington, US Air Force/Government Printing Office, 1993, pp. 232-233, 279-287, 325, 341, 344, 345, 402. Note that the GWAPS data are not consistent from table to table.

[79] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 25-38; and Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey (GWAPS), Volume V, Part I Washington, US Air Force/Government Printing Office, 1993, p. 641.

[80] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 25-38; Alfred Price, "Tornado in the Desert," Air Force Magazine, December 1992, p. 44.

[81] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 75-76.

[82] Ministry of Defense, Defending Our Future: Statement on the Defense Estimates 1993, London, HMSO, 1993, pp. 7,8, 66-67, 89; London Daily Telegraph, June 21, 1994, p. 4..

[83] Sources include House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 57-70, 72-83, G37-G-52; Aviation Week & Space Technology, "Britain Sends Air, Sea Forces to Persian Gulf," London, August 13, 1990, p. 23.; Gilchrist, Peter, Desert Storm Special Sea Power The Coalition and the Iraqi Navies 3, London, Osprey Publishing Ltd., 1991, p. 26-29.; Jane's Defense Weekly, "Meeting the UK's EW targets," September 1993, p. 60-61.; O'Connor, Robert, "Sealift Shortfall During Gulf Crisis Sent UK Scrambling for Transport," Armed Forces Journal International, October 1991, 38-40.

[84] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, p. G47.

[85] Some estimates show a total of two logistic land ships, a fleet tanker, a fleet replenishment ship, and a command ship. See House of Commons, Defense Committee,

Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 84 and G47.

[86] House of Commons, Defense Committee, Preliminary Lessons of Operation Granby, Tenth Report, London, HMSO, July 17, 1991, pp. 84 and G47; Kyle C. Wycoff, "US and European Power Projection Capabilities in the Middle East," Washington, Georgetown University NSST-550, Spring, 1994, pp. 13-14.

[87] Ministry of Defense, Defending Our Future: Statement on the Defense Estimates 1993, London, HMSO, 1993, pp. 7,8, 66-67, 89.

[88] For sources and general background, see Briganti, Giovanni de, "Logistics Impede French Effort Future Role of Troops May be Limited to NATO-Area Operations," Defense News.; Drozdiak, William, "War Fuels French Debate on Arms Forces in Gulf Faced Higher-Tech Weapons Sold by Paris to Iraq," The Washington Post, April 6, 1991, p. 17.; Dunnigan, James E., and Austin Bay, High-Tech Weapons, Military Strategy and Coalition Warfare in the Persian Gulf From Shield to Storm, New York, William Morrow & Co., Inc., 1992, p. 49-51;Declaration Du Gouvernement (Le Premier Ministre A L'Assemble) (Le Ministre D'Etat Au Senat), 19 Mars, 1991.; Interview Accorde Par Le Ministre D'Etat A. R.T.L., 27, Juin, 1991, p. 9-10.; Matignon, "Golfe La Conference De Press Du President De La Republique," 11, Fevrier 1991.; New York Times, "Theme of Reaction: Unshaken Unity Mitterrand Calls Iraqi's Choice Fatal," February 25, 1991.

[89] Hearn, Michael, "La France Et La Crise Du Golfe," Studia-Diplomatica, November 3, 1991, p. 53.

[90] Hearn, Michael, "La France Et La Crise Du Golfe," Studia-Diplomatica, November 3, 1991, p. 56-57.

[91] Hearn, Michael, "La France Et La Crise Du Golfe," Studia-Diplomatica, November 3, 1991, p. 59.

[92] Hearn, Michael, "La France Et La Crise Du Golfe," Studia-Diplomatica, November 3, 1991, p. 59-60.

[93] Clyde R. Mark and Renee Stasio, CRS Report for Congress, Iraq-Kuwait Crisis: A Chronology of Events July 17, 1990 - March 3, 1991, March 5, 1991, p. 33.

[94] Hearn, Michael, "La France Et La Crise Du Golfe," Studia-Diplomatica, November 3, 1991, p. 56.

[95] The initial nominal strength of the French land formation was 4,200 men, but it was reinforced to around 9,000.

[96] Clyde R. Mark and Renee Stasio, CRS Report for Congress, Iraq-Kuwait Crisis: A Chronology of Events July 17, 1990 - March 3, 1991, March 5, 1991, p. 27.

[97] [97]New York Times, "Allies, Theme of Reaction: Unshaken Unity, February 25, 1991.

[98] Clyde R. Mark and Renee Stasio, CRS Report for Congress, Iraq-Kuwait Crisis: A Chronology of Events July 17, 1990 - March 3, 1991, March 5, 1991, p. 21.

[99] For sources and further references see Albright, Joseph, "US, French Forces Move Into Iraq Flanking Maneuver Threatens to Isolate Region From Baghdad," Cox Newspapers, February 25, 1991; Frankel, Glenn, "The Allies, Britain, France Warn That Test On

Battlefield Has Just Begun," The Washington Post, February 25, 1991; Hammick, Murray, "Gazelle HOTs extend French anti-armor reach," International Defense Review, May 1991, p. 453; Matignon, "Golfe L'Engagement Des Forces Francaises," January 28, 1991; Richardson, Doug, Bill Gunston, and Ian Hogg, Weapons of the Gulf War: The Aircraft, Ships, and Vehicles used in the Conflict of Today, ed. by Graham Smith, London, Salamander Books Ltd., 1991; Ripley, Tim, Desert Storm Special 1, Land Power The Coalition And Iraqi Armies, London, Osprey Publishing Ltd., 1991, p. 55-56; Robberson, Tod, "British, French Troops Joining Ground Attack; Iran Pledges Neutrality," The Washington Post, February 24, 1991.; Watson, Bruce W., Peter Tsouras, Bruce George, MP, and B.L. Cyr, Military Lessons of the Gulf War, "French Ground Forces," London, Greenhill Books, 1991, p. 245; World Air power Journal, World Air War Debrief, ed. Stan Morse, England, Aerospace Publishing London, Airtime Publishing USA, 1993, p. 110-114; Kyle C. Wycoff, "US and European Power Projection Capabilities in the Middle East," Washington, Georgetown University NSST-550, Spring, 1994, pp. 13-14.

[100] Details of the French force vary by source. This description relies heavily on Gordon Rottman, Armies of the Gulf War, London, Osprey, 1991, pp. 24-28.

[101] See Bruce Watson, Bruce George, and Peter Tsouras, B.L. Cyr, Military Lessons of the Gulf War, London, Greenhill, 1991, p. 245. Tim Ripley, Land Power: The Coalition and Iraqi Armies, London, Osprey, 1991, pp. 55-56, shows a slightly different order of battle.

[102] Press release, French government, January 10. General G. Foray, "The Eight Lessons of Success," Military Technology, August, 1991, pp. 26-27. French reports indicate 120-130 helicopters and 150-160 armored combat vehicles. This is no way to be sure of the precise total.

[103] Foray cites acquisition of the Le Clerc, the Tigre attack helicopter, and MLRS as key priorities in view of the lessons of Desert Storm. He also stated that the need for more lethal firepower was one of the lessons of the Gulf War, and that "truth takes the shape of the main battle tank, which some misinformed opinions have downgraded to the position of an accessory. It is also represented by the capability of increasingly "intelligent" long range fire support systems." Military Technology, August, 1991, pp. 26-27.

[104] Military Technology, August, 1991, p. 28

[105] Military Technology, August, 1991, p. 28

[106] For typical reporting on such French budget developments see International Defense Review, 4/1994, p. 5.

[107] Sources include ABC News Research Center Persian Gulf Crisis Order of Battle, February 19, 1991, p. 12-13.; Boyne, Col. Walter J., USAF (Ret.), Weapons of Desert

Storm; Briganti, Giovanni de, "French Officials laud Gulf Weapon Performance," Defense News, April 15, 1991; Briganti, Giovanni de, "The French Army's Helicopters in Desert Storm," Rotor & Wing International, June 1991, p. 52-60; Comfor, General Rocquejeoffre, "Homage to Daguet," Military Technology, August 1991, p. 23-36; Gilmartin, Patricia A., "France's Spot Satellite Images Helped US Air Force Rehearse Gulf War Missions," Aviation Week & Space Technology, July 1, 1991, p. 22; International Defense Digest, "French general slams Gulf 'generalizations,' European fighters," May 1991, p. 389-390; Lenorovitz, Jeffrey M., "French Air Force Mirage F1CRs Join Attacks on Iraqi Targets," Aviation Week & Space Technology, February 4, 1991, p. 65; Lenorovitz, Jeffrey M., "French Use Jaguar Fighter/Bombers To Strike Desert Storm Targets," Aviation Week & Space Technology, January 28, 1991, p. 22-23; Lenorovitz, Jeffrey M., "France Uses C. 160G Aircraft To Perform ELINT, ESM Missions," Aviation Week & Space Technology, January 21, 1991, p. 62; Lenorovitz, Jeffrey M., "French AS30L Laser Missiles Scored High Hit Rate in Air-Ground Attacks," Aviation Week & Space Technology, April 22, 1991, p. 108-109; Micheletti, Eric, Operation Daguet French Air Force In The Gulf War, Hong Kong, Concord Publications Company, 1991; Military Technology, "The 39th Paris Air Show: after the Gulf War," p. 60-74; O'Ballance, Edgar, The Second Gulf War About the liberation of Kuwait (August 1990 - March 1991, London, Galago Books, 1992; Richardson, Doug, Bill Gunston, and Ian Hogg, Weapons of The Gulf War, ed. by Graham Smith, London, New York, Salamander Books Limited, 1991.

[108] Eric Micheletti, Operation Daguet: French Air Force in the Gulf War, Hong Kong, Concord, 1991. (No page numbers)

[109] Roy Braybrook, Air Power: The Coalition and Iraqi Air Forces, London, Osprey, 1991, pp. 29.

[110] These figures use US definitions. British counts and definitions are slightly different, See Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey (GWAPS), Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 232-233, 279-287, 325, 341, 344, 345, 402. Note that the GWAPS data are not consistent from table to table.

[111] In addition to the above sources, see Peter Gilchrist, Desert Storm Special 3, Sea Power The Coalition And Iraqi Navies, London, Osprey Publishing Ltd., 1991; Kyle C. Wycoff, "US and European Power Projection Capabilities in the Middle East," Washington, Georgetown University NSST-550, Spring, 1994, pp. 13-14..

[112] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 317.

[113] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 317, 326.

[114] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 317, 344.

[115] Washington Post, February 13, 1991, and New York Times, February 13, 1991; Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, p. 361.

[116] Washington Post, January 7, 1994, p A-1.

[117] For example, see the passages dealing with the battle of Khafji and the Syrian role in the offensive. Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, pp. 334-335, 372-374, 401-402, 424-427. Also, Sir Peter de la Billiere, Storm Command, London, Harper Collins, 1992, pp. 11, 36-37, 88-89, 104, 116.

[118] Sources used in this section include Cordesman, Anthony H., Saudi Military Forces in the 1990s: The Strategic Challenge of Continued Modernization and Cooperation With the Gulf Cooperation Council and the West, Woodrow Wilson Center, Washington DC, January 1994 and After the Storm, Boulder, Westview, 1993; Dunnigan, James E., and Austin Bay, High-Tech Weapons, Military Strategy and Coalition Warfare in the Persian Gulf From Shield to Storm, New York, William Morrow and Co., Inc., 1992, p. 45-47; Bin Sultan, General HRH Prince Khalid, "The Gulf War And Its Aftermath: A Personal Perspective," The RUSI Journal, Royal United Services Institute for Defense Studies, December 1993, p. 1-5; Fulgrum, David, and King Abdullah, "Desert Storm Gives Saudis Valuable Combat Experience," Aviation Week & Space Technology, April 22, 1991, p. 98-99; Fulgrum, David, "Saudis Claim Air Strikes Still May Break Iraq's Will," Aviation Week & Space Technology, February 4, 1991, p. 66-67; Hughes, David, "Saudi Order to Keep Patriot Line Open As Performance in Israel in Questioned," Aviation Week & Space Technology, November 25, 1991, p. 38; O'Ballance, Edgar, The Second Gulf War About the Liberation of Kuwait, London, Galago Books, 1992, p. 18-22; Ottaway, David B., "US Saudis to Study Long-Term Defense Needs of Gulf Region," The Washington Post, April 21, 1991, p. A26-A27; Triumph Without Victory The Unreported History of the Persian Gulf War, Time Books, Random House, 1992, p. 77-89.

[119] Tim Ripley, Land Power: The Coalition and Iraqi Armies, London, Osprey, 1991, p. 57.

[120] Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 357, 373, 386, 405.

[121] General Sir Peter de la Billiere, Storm Command, London, Harper Collins, 1992, p. 89.

[122] Richard F. Grimmitt, "Arms Sales to Saudi Arabia," Congressional Research Service, IB91007, August 28, 1991, p. 4.

[123] IISS, Military Balance, DMS computer data base, interviews in Saudi Arabia in February, 1991, discussions with Saudi experts in December, 1990, and Defense News, February 22, 1988, p. 3. These figures are based largely Saudi data obtained in March, 1991, and differ significantly from IISS and most Western data bases.

[124] The first 200 M-2s were produced at a rate of 2 in FY1989, 98 in FY1990, and 100 in FY1991. Jane's Defense Weekly, September 9, 1989, p. 452; Wall Street Journal, June 2, 1988, p. 56.; Aviation Week, June 17, 1991, p. 129.

[125] Richard F. Grimmitt, "Arms Sales to Saudi Arabia," Congressional Research Service, IB91007, August 28, 1991, p. 4.

[126] Aviation Week, June 17, 1991, p. 129; Richard F. Grimmitt, "Arms Sales to Saudi Arabia," Congressional Research Service, IB91007, August 28, 1991, p. 4; IISS and JCSS military balances; DMS computer data base, interviews in Saudi Arabia in February, 1991, discussions with Saudi experts in December, 1990, and Defense News, February 22, 1988, p. 3.

[127] Jane's Defense Weekly, March 11,. 1989, p. 393.

[128] Richard F. Grimmitt, "Arms Sales to Saudi Arabia," Congressional Research Service, IB91007, August 28, 1991, p. 4; Jane's Defense Weekly, December 17, 1988, p. 1546, June 25, 1989, p. 1296.

[129] Aviation Week, April 2, 1990, p. 44; Jane's Defense Weekly, November 16, 1991, p. 927; Wall Street Journal, October 7, 1991, p. 16.

[130] Jane's Defense Weekly, July 22, 1989, p. 105;

[131] For a further discussion of Saudi performance during the air-land phase of Desert Storm see Rick Atkinson, Crusade, New York, Houghton Mifflin, 1993, pp. 369, 391, 459-460; Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, pp. 82, 86-90, 92-94, 300, 364, 365, 393, 395; Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 1, 325-327; General Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, 312, 331-332, 340, 348, 352, 354, 382, 384-385, 401, 453-459, 465-466; Sir Peter De La Billiere, Storm Command, London, Harper Collins, 1992, p. pp. 11, 36-37, 88-89, 104, 116.

[132] Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, p. 348.

[133] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume II, Washington, US Air Force/Government Printing Office, 1993, Part I. pp. 273-275; Part II, pp. 234-238.

[134] For background on the role of General HRH Prince Khalid bin Sultan in the war, see General HRH Prince Khalid bin Sultan, "The Gulf War and Its Aftermath: A Personal Perspective," RUSI Journal, December, 1993, pp. 1-5.

[135] These are all points that General Schwarzkopf makes in his memoirs. Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, pp. 424-427; Also see Brigadier General Robert H. Scales, Certain Victory, pp. 189-192; Sir Peter de la Billiere, Storm Command, pp. 250-251; and Rick Atkinson's description of the fighting in Crusade: The Untold Story of the Persian Gulf War, New York, Houghton Mifflin, 1993, pp. 198-213.

[136] Amatzia Baram, "Calculation and Miscalculation in Baghdad During the Kuwait Crisis and the Gulf War," in A Danchev and Dan Koehance, The International Dimension of the Gulf War, London, MacMillan, 1994. (draft manuscript) The Iraqi quotation is taken from "A leader", Babil, January 29, 1992.

[137] Eliot Cohen, ed., Gulf War Air Power Survey, Volume V, Part II, p. 67.

[138] Interview with senior Saudi official, November, 1993.

[139] Interview with Prince Khalid bin Sultan., March, 1991.

[140] These summaries are based on interviews with Saudi and Egyptian officers. Also see Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, p. 395.

[141] Based on interviews with US and British officers in March, 1991.

[142] The author interviewed Saudi commanders and US special forces personnel in many Saudi combat units immediately after the cease-fire. For further details on this training effort, see Chapter Nine and Brigadier General Robert H. Scales, Certain Victory: The United States Army in the Gulf War, Washington, Office of the Chief of Staff, US Army, 1993, pp. 46-47, 122-123, 189-191.

[143] Author's estimate based on interviews in Saudi Arabia; "Saudi National Guard Fact Sheet," DSAA I-01514, June 5, 1990; FMC data; DMS computer print outs; and the IISS and JCSS military balances.

[144] Fax from Department of Defense, OSD/LA, January 11, 1987; Baltimore Sun, September 26, 1989, p. E-9; Jane's Defense Weekly, October 7, 1989, p. 744.

[145] Washington Post, July 30, 1991, p. A-12; Richard F. Grimmitt, "Arms Sales to Saudi Arabia," Congressional Research Service, IB91007, August 28, 1991, p. 4.

[146] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 232 and 279-287. Note that these data are not consistent form table to table.

[147] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 316-317, 335, 340, 343, 641, 653-654.

[148] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, p. 343, 396.

[149] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 340.

[150] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 366.

[151] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 335.

[152] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 343.

[153] These comments are based on an informal RSAF/RAF report on the Tornado written shortly after Desert Storm.

[154] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, pp. 343.

[155] Richard F. Grimmitt, "Arms Sales to Saudi Arabia," Congressional Research Service, IB91007, August 28, 1991, p. 3; Defense News, September 23, 1991, pp. 1 and 36; Washington Post, November 12, 1991, p. C-1, New York Times, November 9, 1991, p. 3; Jane's Defense Weekly, October 19, 191, p. 699; Washington Times, October 24, 1991, p. A-4; Defense Daily, November 8, 1991, p. 223;
, November 11, 1991, p. A-14.

[156] Raytheon background brief, February 1992; Defense News, September 23, 1991, pp. 1 and 36.

[157] Flight International, July 23, 1991, p. 18; Jane's Defense Weekly, July 15, 1989, p. 57.

[158] Flight International, July 23, 1991, p. 18; Jane's Defense Weekly, July 15, 1989, p. 57.

[159] Jane's Defense Weekly, July 15, 1989, p. 57, January 19, 1991, July 20, 1991, p. 97; London Financial Times, July 5, 1991, p. 5; Flight International, July 23, 1991, p. 18.

[160] For additional sources and reading see Lenorovitz, Jeffrey M., "Egyptair Airlifts Refugees Fleeing Iraq and Kuwait," Aviation Week & Space Technology, August 27, 1990, p. 28; Arundel, John, "Cairo Police Use Tear Gas to Disperse 2,000 Anti-War Protesters, " The Washington Post, February 25, 1991; Current Affairs, "Egypt ponders the lessons of war," The Middle East, no. 201, July 1991, p. 22; Frankel, Glenn, "Egypt's Alliance Role Meets Minimal Dissent," The Washington Post, February 18, 1991; Gauch, Sarah, "As allies press war, Mubarak's opposition grows," The Washington Times, February 26, 1991;

Haberman, Clyde, "Signs Drown Out War Cries as Arab Marches Against Arab," The New York Times, February 25, 1991; Hedges, Chris, "Cairo's Soldiers in the Saudi Desert: Against Hussein but Not His People," The New York Times, February 15, 1991, p. A14; Mayer. Jane, "Egypt Braces for Pro-Iraqi Shift at Home Major Unrest Is Feared if Gulf War Lasts Into Spring," The Wall Street Journal, February 6, 1991, p. A8; Miller, Judith, "Egyptians Now Replace Other Arabs in Saudi Jobs," The New York Times, February 5, 1991; O'Ballance, Edgar, The Second Gulf War About the Liberation of Kuwait (August 1990 - March 1991), London, Galago Books, 1992. Bishop, Patrick, "Slowly but surely, Egyptians topple Iraqi troops," London Telegraph, February 26, 1991; Dunnigan, James E., and Austin Bay, High-Tech Weapons, Military Strategy and Coalition Warfare in the Persian Gulf From Shield to Storm, New York, William Morrow and Co. Inc., 1992, p. 48-49; Gauch, Sarah, "Egypt Seeks to Beef Up Military Might, Maintain Its Leading Role in Arab World," The Christian Science Monitor, June 17, 1991, p. 3; Ibrahim, Youssef M., "Egypt Appears More Likely To Join in Ground Combat," The New York Times, February 5, 1991**;** Gilchrist, Peter, Desert Storm Special 3, Sea Power The Coalition And Iraqi Navies, London, Osprey Publishing Ltd., 1991.

[161] Based on Saudi MODA briefing aids of March, 1991. Also see the discussion of Egyptian forces in Anthony H. Cordesman, After the Storm, Boulder, Westview, 1993, and Tim Ripley, Land Power: The Coalition and Iraqi Armies, London, Osprey, 1991, pp. 55-56.

[162] Schwarzkopf and Powell seem to have been more sensitive to these realities than many of their subordinates. For a discussion of Egyptian performance during the air-land phase of Desert Storm see Rick Atkinson, Crusade, New York, Houghton Mifflin, 1993, pp. 248, 366, 391, 405, 427, 438, 440, 459; Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, pp. 97, 99, 393, 395, 398; Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 314, 357, 373, 384, 386, 395, 405, 410; General Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, 358, 384, 390-391, 401-404, 410-411, 448-449, 454, 458-460, 486-487; Sir Peter De La Billiere, Storm Command, London, Harper Collins, 1992, pp. 148, 288.

[163] See the discussion of Syrian forces in Anthony H. Cordesman, After the Storm, Boulder, Westview, 1993, and Tim Ripley, Land Power: The Coalition and Iraqi Armies, London, Osprey, 1991, pp. 55-56.

[164] Israeli reports of improved training in 1988 differ sharply with the information of British, French, and US sources.

[165] For a discussion of Syrian performance during the air-land phase of Desert Storm see Rick Atkinson, Crusade, New York, Houghton Mifflin, 1993, pp. 213, 245, 391; Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, pp. 95-97, 391, 393; Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 317, 357, 373, 384, 395, 405; General Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, 358, 384, 388-389, 401-403, 410-411, 433, 446-447, 454, 457-460, 466-467; Sir Peter De La Billiere, Storm Command, London, Harper Collins, 1992, pp. 148, 178.

[166] For sources and additional reading see Watson, Bruce W., Peter Tsouras, Bruce George, MP, and B.L. Cyr, Military Lessons of the Gulf War, "Force Deployments And The War: The Air War," by Rod Alonso, London, Greenhill Books, 1991, p. 61-63; Branigin, William, "Trainees Claim Special Stake in Ouster of Iraqis -- Kuwaitis Undergo Crash Preparation to Join Fight for Liberation of Their Homeland," The Washington Post, February 13, 1991, p. A21, A27; Cowell, Alan, "Arab Nations Put Off Talks To Create a Kuwait Force," The New York Times International, July 8, 1991, p. A2; Dunnegan, James E., and Austin Bay, High-Tech Weapons, Military Strategy and Coalition Warfare in the Persian Gulf from Shield to Storm, New York, William Morrow and Company, Inc., 1992, p. 44-45; O'Ballance, Edgar, The Second Gulf War About the Liberation of Kuwait (August 1990 - March 1991), London, Galago Books, 1992, p. 6-8; Ripley, Tim, Desert Storm Special 1, "Free Kuwaiti Forces," Land Power The Coalition and Iraqi Armies, London, Osprey Publishing Ltd., 1991, 58-59; Gilchrist, Peter, Desert Storm Special 3, Sea Power The Coalition and Iraqi Navies, London, Osprey Publishing Ltd., 1991, p. 21; Cody, Edward, "Kuwaiti Rulers Debate Reconstruction," The Washington Post, February 12, 1991; Combined Dispatches, "Allies promise to rescue Kuwaitis," February 26, 1991; Eshel, David, "Checkmate in Kuwait," Military Technology, March 1991, p. 54-62; Sisler, Peter F., "Freed, but not free Kuwaitis may seek democracy as rulers return," The Washington Times, February 26, 1991, p. B5; Smith, Jeffrey, "Massive Effort May Be Needed to Rebuild Kuwait US Army Experts considered Effects of a 'Scorched-Earth' Withdrawal Policy by Iraq," The Washington Post, February 26, 1991, p. 12.

[167] CIA, World Factbook, 1991, pp. 173-174.

[168] Kuwait is considering up-engining the tanks with new British or German engines. Jane's Defense Weekly, February 28, 1987, p. 323.

[169] Washington Times, July 14, 1988, p. 2.

[170] Jane's Defense Weekly, January 30, 1987, p. 151

[171] Jane's Defense Weekly, February 28, 1987, p. 314 and March 7, 1987, p. 359.

[172] I am indebted to Lt. Commander Jerry Ferguson, one of my students at Georgetown University, for much of the research, and many of the insights, on Gulf naval and air forces presented in this chapter.

[173] The 76 mm and 40 mm guns can provide some air defense, but with little lethality. The TNC-45s have very complicated electronics, virtually all of which are maintained by foreign technicians. The voice network system used by the TNC-45 is so slow that it is virtually hopeless for air defense operations and generally creates confusion and increases delay and vulnerability if any attempt is made to use it.

[174] Aircraft actually in storage included 12 Lightnings, 4 Hunters, and 9 BAC-167 Strikemasters.

[175] The A-4s lack an air intercept radar, and can only engage in visual combat using guns or Sidewinder missiles. There are 12 Lightnings and 9 Hunters in storage.

[176] Defense News, August 8, 1988, p. 7; Jane's Defense Weekly, August 13, 1988, p. 246; Washington Times, July 25, 1988, p. 1; Newsweek, August 25, 1988, p. 47.

[177] Sources differ. The JCSS is shown. The IISS says 2 DC-9, 4 L-100-30.

[178] New York Times, January 14, 1992, p. 4; General Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, 293, 297.

[179] Tim Ripley, Land Power: The Coalition and Iraqi Armies, London, Osprey, 1991, pp. 58-59

[180] Saudi MODA briefing aid, March, 1994.

[181] Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, pp. 398-399.

[182] For a discussion of Kuwaiti performance during the air-land phase of Desert Storm see Rick Atkinson, Crusade, New York, Houghton Mifflin, 1993, pp. 369, 391, 459-460; Lawrence Freedman and Efraim Karsh, The Gulf Conflict: 1990-1991, London, Faber and Faber, 1993, pp. 67, 278-279, 393, 398-399; Department of Defense, Conduct of the Persian Gulf War: Final Report, Department of Defense, April, 1992, pp. 1, 325-327; General Norman H. Schwarzkopf, It Doesn't Take a Hero, New York, Bantam, 1992, 293, 297, 333, 348, 349, 404, 415, 466; Sir Peter De La Billiere, Storm Command, London, Harper Collins, 1992, p. 31.

[183] Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, p. 232-233, 319, 329, 400, 653.

[184]Kuwait has a total of about 1,386 wells, including shut ins. Chicago Tribune, November 3, 1991, p. I-14; Joseph P. Rive, "Kuwaiti Oil Well Fires Updated," Congressional Research Service, 91-313, June 26, 1991.

[185] New York Times, May 24, 1991, p. 8; London Financial Times, June 21, 1992, p. 18.

[186] New York Times, January 14, 1992, p. 4; London Financial Times, July 8, 1991, p. 3, February 26, 1992, p. III-1; Jane's Defense Weekly, December 14, 1991, p. 1174.

[187] Interviews in Bahrain in March, 1991. Saudi MODA briefing aid, March, 1991.. Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, p. 232-233, 319, 338, 340.

[188] Saudi MODA briefing aid, March, 1991. Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, p. 232-233, 304-305, 317, 319, 329, 401.

[189] Saudi MODA briefing aid, March, 1991. Cohen, Dr. Eliot A, Director, Gulf War Air Power Survey, Volume V, Washington, US Air Force/Government Printing Office, 1993, p. 232-233, 304-305, 317, 401.