

The Lessons of Modern War  
Volume IV

The Gulf War

Anthony H. Cordesman and  
Abraham R. Wagner

October 15, 1994

**Copyright the author and not to be further copied, disseminated,  
referenced or quoted in any form without the author's written  
permission**

## **Dedication**

To Bridget Gail, Andrea Lynn, Justin Galen, and Alexander Scott

**Table of Contents**

**Chapter One: Analyzing The Lessons of The Conflict.....1**

- Sources and Methods .....2
  - Reliance on Official Sources.....2
  - Methodology and Value Judgments .....5
- Critique Versus Criticism .....6
- The Analysis of Strategic Lessons and Issues .....9
- The Analysis Of The Tactical Lessons Of The Conflict.....14
- The Analysis Of The Technical Lessons Of The Conflict.....18
- The Analysis Of Human Factors .....26
- The Analysis Of Major Areas Of Controversy .....29
- Analysis and the Problem of Uncertainty .....32

**Chapter Two: Desert Shield: The Historical Framework.....37**

- Iraq: Guns, Butter, and Bankruptcy.....37
  - Military Spending Becomes a National Crisis .....38
  - Fear and Ambition: The Other Reasons for Iraq's Invasion .....40
  - Iraq's Actions Before Its Invasion of Kuwait .....41
- Crisis Management: The Cost of Strategic Indifference.....44
  - The Kuwaiti and Arab Reaction.....44
  - US and Western Crisis Management: The Lesson of Strategic Warning .....45
  - Intelligence Failures Versus Policy Failures: The Lesson of Deterrence .....50
- Iraq's Invasion of Kuwait.....52
- Diplomacy versus War: Building the Coalition, the Embargo, and Iraq's Response .....55
  - US Reactions and Coalition Building .....60
  - The Iraqi Threat to Saudi Arabia .....61
  - Testing the Limits of US Power Projection Capabilities.....63
  - The Reaction of the Arab World and Iran.....65
  - The Reaction of Europe and the Soviet Union.....67
- The Prelude to the Conflict: Desert Shield.....69
  - First Steps in Power Projection .....69
  - Closing the Window of Vulnerability .....73
  - Restructuring Coalition Defense: The Lesson of International Command.....75
  - Making the Coalition Effective: The Lessons of Adaptation, Training, and Readiness .....77
- Maritime Operations Before Desert Storm: The Continuing Importance of Seapower .....80

Enforcing the Embargo: Lessons in Using Seapower to Intercept Cargoes and Merchant Vessels .....81

The Impact of the Interdiction Effort: The Limits of Embargoes and Sanctions.....84

The Prelude to the Conflict: Planning for Desert Storm.....86

    The Race to Save Kuwait and the Problem of Foreign Hostages .....86

    Initial Steps in Planning an Offensive to Liberate Kuwait .....88

    A "One Corps" versus a "Two Corps" Offensive.....90

    Continuing Problems in Power Projection and the Build-Up of Heavy Forces.....92

    A Further Build-Up of Coalition and Iraqi Forces .....94

    Force Deployments in the New Offensive Plan .....98

    Operational Imperatives and the Lesson of Deception.....99

    The US Decision to Go to War: The Lesson of "Consensus" and the Need For Changes in the War Powers Act.....101

The Final Preparation for Desert Storm .....103

    The Build-Up of the Coalition Forces.....103

    Coalition Forces in Mid-January, 1991: Racing Heavy Forces into the Theater.....104

    Iraq's Strategy, Defenses, and Force Strength.....108

    The Ratio of Coalition to Iraqi Forces At the Onset of Desert Storm .....110

Lessons for Power Projection.....111

**Chapter Three: The Forces Engaged - Opposing Military Cultures and The Human Element.....124**

    Preparing for the Past: Iraqi Military Forces At the Beginning of Gulf War.....128

        The Iraqi Army .....134

        The Iraqi Air Force .....138

        Iraq's Land Based Air Defenses .....146

        The Iraqi Navy .....150

    The Promise of the "Revolution in Military Affairs": US Forces and Capabilities and the Lesson of the "AirLand Battle" .....151

        The Unique Character of US Forces .....151

        The Problem of Interoperability.....152

        The "New" US Military .....159

    The Strengths and Weaknesses of European Power Projection: Lessons from British Forces and Capabilities .....171

        British Ground Forces .....173

        British Air Forces .....179

        British Naval Forces .....182

The Strengths and Weaknesses of European Power Projection: Lessons from French Forces and Capabilities .....183

    The French Ground Forces .....185

    The French Air Force .....188

    French Naval Forces .....190

Other Western Military Forces.....190

Lessons for Cooperative Security: Saudi Forces and Capabilities .....191

    The Saudi Army .....194

    Saudi Land Forces and the Battle of Khafji .....198

    Saudi Land Forces During the Land Campaign .....201

    The Saudi National Guard.....206

    The Saudi Air Force.....207

    Saudi Naval and Air Defense Forces .....212

Lessons for Cooperative Security: Egyptian Forces and Capabilities .....214

Lessons for Cooperative Security: Syrian Forces and Capabilities .....218

Lessons for Cooperative Security: Kuwaiti Forces and Capabilities .....220

    Kuwait's Military Forces During the Gulf War.....225

    The Cost of Unpreparedness Before and After the War.....227

Lessons for Cooperative Security: Other Arab Forces .....229

The Lessons of a War Between Military "Cultures": Fighting World War III versus Fighting World War I.....230

**Chapter Four: Command, Control, Communications, Computers, And Battle Management .....245**

    The Need for Joint Central Command and Specialized US Support: Coalition Command, Control, Communications, And Intelligence (C4I) Systems.....247

        The Lesson of Joint Saudi-US Command .....247

        Drawing On Specialized US Command Expertise .....250

        Lessons For High Command.....252

    High Technology Central Air Battle Management: C4I/BM in the Air War.....256

        The Role of the Joint Forces Air Command (JFACC) .....256

        The Tactical Air Control Centers (TACC).....257

        The Special Planning Group or "Black Hole".....259

        The Master Attack Plan (MAP). .....261

        The Air Tasking Order (ATO):.....263

        Air Space Management System.....265

        Key Tools Supporting Command and Control of the Air War: The ABCCC, AWACS, Rivet Joint, and E-2C.....266

Dealing With Inter-Service Command Problems .....269

Lessons from C4I/BM During the Air War:.....271

Other Lessons for Joint Warfare.....275

The Need for a New Structure of C4/BM for the AirLand Battle in High Tempo mid and High Intensity Conflict .....278

    The Key Role of Satellite Communications .....279

    The Need for Improved Tactical Communications .....283

    Tactical Communications and C4I/BM: The Potential For "Fusion" .....284

    Lessons for Future Medium/High Intensity and Coalition Warfare .....285

Lessons for Countervailing Strategy: Iraqi Command, Control, Communications, and Battle Management (C4/BM).....289

Lessons For Coalition Warfare And International Peace Making: Desert Storm Versus Future Wars .....294

**Chapter Five: Intelligence and Net Assessment .....301**

Lessons for the Future: Key Weaknesses in the Coalition and US Intelligence Efforts .....301

Finding Alternatives to US Intelligence: The Problem of Coalition Dependence On US Assets .....305

    The Impact of Intelligence Satellites.....305

    The Role of Key Airborne Platforms .....308

    Dissemination Issues .....314

    Support of Coalition Warfare.....316

Improving the Policy Maker: The Problem of Strategic Warning.....316

The Need for Improved National Organization to Support Warfighting: Failure To Develop Adequate Capabilities To Exploit Space Intelligence Assets And National Technical Means In Regional Conflicts .....318

The Need for In Theater Capability: The Inability of National Intelligence Organizations To Meet Theater Needs.....319

The Need For Focused Regional Expertise: The Lack Of Prior US Collection And Analysis Priority:.....323

The Need for Countervailing Strategy: Lack Of Qualitative Analysis And Over-Emphasis On Order Of Battle And Quantitative Measures .....324

Creating Contingency Targeting Capabilities For Regional Conflicts: Lack Of An Effective Targeting System .....329

The Need To Measure Effectiveness: Lack Of Battle Damage Assessment (BDA) Capability:.....332

The Need For Additional Theater and Tactical Assets.....339

The Need for Improved Tactical Intelligence Capability at the Service Level .....340

Joint Surveillance and Target Attack Radar System (JSTARS).....344

Pioneer Unmanned Aerial Vehicle (UAV)/Remotely Piloted Vehicle (RPV) .....349

The Digital Video Imagery Transmission System.....354

The Critical Importance Of Weapons Of Mass Destruction: The Inability To Predict Iraqi  
 Capability To Produce And Deliver Weapons Of Mass Destruction .....355

    Intelligence on Nuclear Facilities.....355

    Intelligence on Biological and Chemical Warfare Capabilities .....356

    The Need for Better Intelligence on Regional threats .....358

Preparing to Fight a Theater Missile Threat: Inability To Properly Characterize Iraqi Scud  
 Forces And Target Them.....359

    The Failure of Air Strikes .....360

    The Failure of Special Forces .....362

    The Overall Effectiveness of the "Scud Hunt" .....363

    The Intelligence Lessons of the "Scud Hunt".....364

Intelligence And Conflict Termination: Inability To Predict The Impact Of Coalition  
 Actions On Iraq's Politics After The Cease-Fire: .....365

    Battle Damage and Conflict Termination.....365

    Strategic Intelligence Analysis and Conflict Termination.....369

Defining Responsibility For Assessing Risk: The Problem Of Estimates Of Probable US  
 And Coalition Casualties .....370

Intelligence On Human Losses: The Choice Not To Analyze Iraqi Casualties: .....372

    Iraqi Casualties and Killing Mechanisms: The Problem for Analysis.....373

    The Pros and Cons of Intelligence Analysis of Enemy Casualties .....377

Iraqi Intelligence: The Limits of Third World Authoritarianism.....381

    Iraqi Intelligence Organization .....381

    Iraqi Intelligence Technology .....383

Summarizing the Intelligence Lessons of the Gulf War .....385

    The Need to Measure Effectiveness: The Problem of Battle Damage Assessment.....386

    Lack Of A Clear Doctrine Relating To Direct Intelligence Support Of Battlefield  
 Commanders: .....389

    The Need For A Better Intelligence Communications Architecture: Inadequate  
 Secure Communications And Dissemination .....390

    The Need for Integrated Planning, Operations, and Intelligence Efforts, and  
 Integrated National Intelligence Support of Operations: The Problem of "Fusion"  
 .....391



Ensuring Suitable Reaction Times: Lack Of Adequate Near Real Time Capabilities: .....393

**Chapter Six: Desert Storm: Shaping Coalition Air Power and the Air Campaign, and Fighting the War for Air Supremacy.....405**

    The Unique Conditions of the Air War .....405

    Comparative Air Strength And Capabilities .....407

        The Role of US Air Forces .....411

    The Iraqi Air Force.....418

    Coalition Air War Planning and The Importance of Air Supremacy.....423

        Strategic Bombing and "Instant Thunder" .....423

        The CENTAF Air Campaign Plan and the AirLand Battle .....424

        Planning for Air Supremacy and the Shift to Simultaneity .....428

        The Iraqi Air War Plan -- or Lack of It .....430

    Winning Air Superiority .....431

        Air to Air Combat .....434

        The Role of Key Aircraft Types in Air Combat .....439

        Air-to-Air Missiles and the Importance of Beyond Visual Range Air Combat.....440

    The Coalition Battle Against Iraqi Surface-to-Air Missile Forces .....444

        The Counter Surface-to-Air missile Effort and the Value of Penetrating Bombs .....444

        Strikes Against Iraq's Ground-Based Air Defense System.....446

        The Value of Anti-Radiation Missiles and Decoys in Air Defense Suppression.....447

        Iraq's Shorter Range Surface-to-Air Missiles: The Other Side of the Story.....454

    Air Base Attacks and Killing Iraqi Aircraft in Their Shelters .....456

        The Tornado GR1 and JP233.....457

        Attacking Iraqi Airfields and Aircraft in Their Shelters.....459

    The Impact of Electronic Warfare.....464

    January 27, 1991: "Air Supremacy" and Environmental Warfare.....469

    The Cost of the Gulf War to the Iraqi Air Force .....469

    The Revolution or Non-Revolution in Defensive Air Warfare.....472

**Chapter Seven: Offensive Air Power, Strategic Bombing and Preparation for the Ground Offensive.....481**

    The Overall Structure of Coalition Offensive Air Power .....482

        Airpower in Transition: The Role of Key Weapons and Technologies .....483

        No Aircraft is Smarter than its C4/BM system.....484

    The Strike/Attack Aircraft in the Gulf War: Mission Packages and "High-Low" Capabilities.....485

Precision and Non-Precision Offensive Aircraft .....488

The Value of Mixed Packages of Aircraft.....490

Simultaneous, Constant, and Cumulative Pressure .....491

The Role of Bombers: The B-52.....491

Quasi-Precision: Radar and Infrared Assisted Bombing .....494

Modern Strike Fighters: The Role of the F-15E.....495

Old Platforms: Modern Avionics: The F-111F .....497

Old Platforms: Modern Avionics: The A-6E .....499

Stealth Technology With Limited Attack Capability: The F-117A.....500

Multi-Mission Fighters with Moderate Strike/attack Technology: The F/A-18.....505

Multi-Mission Fighters with Moderate Strike/attack Technology: The F-16.....507

Close Air Support Aircraft With Specialized Technology: The A-10.....509

Close Air Support Aircraft With Specialized Technology: The AV-8B .....514

The Lesson of Precision and Sophistication: Change Since the Gulf War.....516

Munitions and Less Than Surgical Bombing .....521

The Bombs, Rockets and Guns Used in the Gulf War .....524

The Guided Missiles Used in the Gulf War .....530

Strategic Bombing.....535

    Why Air Forces Bomb: Accelerating Victory and Grand Strategy .....536

    Improvising Strategic Bombing During the Gulf War .....538

    Setting Grand Strategic Objectives for Strategic Bombing.....543

The Attacks on Iraq's Leadership and C4 Capabilities .....543

    The Scale and Nature of the Attacks .....544

    The Attack on the Al-Firdos Bunker .....544

    The Hunt For Saddam Hussein .....545

    The Overall Impact of the Strikes on Leadership Targets.....546

    The Overall Impact of the Strikes on C4 Targets.....546

Attacks on Iraqi Electrical and Oil Facilities.....548

    Attacks on Electrical Facilities.....548

    Attacks on Oil and Refining Facilities .....549

Attacks on Iraqi Lines of Communication.....550

Attacks on Iraqi Ground Forces Before the Ground Offensive .....553

    Lessons from the Battle of Khafji .....554

    Making Attacks on Iraqi Ground Forces More Effective.....555

    "Kill Boxes" .....556

    "Killer Scouts" .....557

"Tank Plinking" With Laser Guided Bombs .....559

The A-10, Maverick, and Battle Damage Assessment .....560

The Impact of Weather on Air Attacks on Iraqi Ground Forces .....560

Levels of Damage to Iraqi Forces Before the Ground War Began: 50% or Not? .....561

Direct Air Support to the Ground Battle .....565

    "Flow CAS" and "Demand Pull" .....565

    Support of the Breaching Operation .....566

    Air Support in Preparing for the Land Battle .....567

    Close Air Support During the Land Battle .....568

    The Role of Interdiction Attacks .....571

    The Role of Individual Coalition Air Forces and Aircraft During the Land Battle .....573

    The Impact of the Cease-Fire and the Overall Impact of Airpower on the Land  
Battle .....579

Source: Adapted by the author from Eliot Cohen, ed., Gulf War Air Power Survey,  
Volume II, Section II, pp. 259-261. ....582

    Readiness and Maintenance .....583

    Refueling and Sustained Operations .....587

    Training and Readiness .....587

Strategic and Theater Airlift .....589

The Revolution or Non-Revolution in Offensive Air Warfare .....591

**Chapter Eight: The AirLand Battle.....606**

    Comparative Land Strength And Capabilities .....607

        The Coalition Ground Forces .....607

        Coalition Movements to Prepare for the Land Attack and the Lesson of Logistics  
and Lessons Regarding Requirements and Lift .....612

        Iraqi Army Strength at the Time of the Ground Campaign: Perceived and Real .....617

        Qualitative and Leadership Problems in Iraqi Land Forces .....622

        Iraqi Forward Barrier Defenses: Perceived and Real .....627

        Force Ratios and The Art Of Operations .....631

    The Final Coalition Battle Plan .....634

    Preparing the Battlefield .....640

        Focusing on Iraqi Artillery .....640

        Psychological Warfare and Deception .....641

        Probing and Blinding Iraqi Forces .....642

        Probing Into Iraq .....644

    G-Day: February 24, 1991 .....645

The Thrust by the XVIII Corps.....648

The Thrust by the VII Corps .....653

Joint Forces Command - North .....660

The 1st Marine Expeditionary Force.....661

Joint Forces Command - East.....670

G-Day + 1: February 25, 1991 .....673

    The Advance By XVIII Corps .....676

    The Advance By VII Corps .....677

    Joint Forces Command - North .....682

    The Advance by I MEF.....682

    The Advance by Joint Forces Command - East .....683

    The Situation at the End of G+1 .....684

G+2: February 26, 1991 .....685

    The Advance By XVIII Corps .....688

    The Advance by the VII Corps .....690

    The Advance by Joint Task Force - North .....698

    The Advance by I MEF.....698

    The Advance by Joint Forces Command East.....700

    The Situation at the End of G+2 .....701

G-Day + 3: February 27, 1991 .....702

    The Advance by XVIII Corps.....705

    The VII Corps Advance .....707

    The Advance of Joint Forces Command - North.....713

    The Advance of the I MEF .....713

    The Advance of Joint Forces Command - East .....714

    The Situation at the End of G+3 .....714

G+4: February 28, 1991 .....715

    Final Advances by the XVIII Corps.....717

    Final Advances by the VII Corps .....717

    Final Advances by Joint Forces Command - North.....719

    Final Advances by the I MEF .....719

    Final Advances by Joint Forces Command - East .....719

    The Situation at the End of G+4 .....719

G-Day +5 and Beyond.....721

    The Battle With the Hammurabi Division.....721

    The Incident at Safwan and Uncertain Terms For Ending the Conflict.....722

The Impact of the Gulf War on the Iraqi Army .....723

The Strategic Outcome of the Land Battle .....731

**Land Warfare: Preparation, Combat, and Power Projection.....750**

Key Uncertainties in Analyzing the Detailed Lessons of the Land Battle .....750

The Importance of Manpower and Training.....752

Combined Arms, Combined Operations, Jointness, and Roles and Missions .....755

AirLand Integration.....758

Evolving Towards the Electronic Battlefield: Command, Control, Communications,  
Battle Management, Intelligence, Targeting and Damage Assessment .....760

The New Tempo of Armored Operations.....766

The Changing Nature of Tank Warfare.....768

    The M-1A1 Abrams Versus the Soviet T-55, T-62, T-72, and T-72M Tanks .....769

    The Challenger.....772

    Armored Recovery Vehicles and Heavy Equipment Transporters.....774

Infantry And Mechanized Infantry Combat.....775

    The M-2/M-3 Bradley.....776

    The M-113A1 Generation of Armored Fighting Vehicles .....778

    The AAV Assault Amphibian Vehicles .....779

    The Guardian Light Armored Infantry Vehicle.....780

    The Warrior .....781

    Russian and French Armored Fighting Vehicles.....781

    Mixes of Tanks and Other Armored Fighting Vehicles: The Role of Armored  
    Cavalry.....783

Tube Artillery, Multiple Rocket Launchers, and Assault Weapons. ....786

    Tube Artillery and Battle Management Aids .....790

    Artillery Mobility.....792

    Laser-Guided Projectiles and DPICM Rounds .....792

    The Multiple Launch Rocket System (MLRS) and Army Tactical Rocket System  
    (ATACMS) .....794

    The Precision Revolution and Indirect Fire .....796

Helicopter Operations .....796

    General Lessons Regarding Helicopter Operations .....799

    French Experience .....801

    The AH-1 Attack Helicopter.....802

    Apache: AH-64 .....804

    Hellfire .....808

Kiowa Warrior, OH-58C/D.....810

Blackhawk: UH-60 .....811

The CH-46 Sea Knight and Chinook CH-47 Transport Helicopters.....812

The Changing Role of Helicopters in the AirLand Battle .....812

Land-Based Air and Missile Defenses .....814

Night Vision and Poor Visibility Warfare .....816

Barrier Warfare and Mine Warfare .....817

Barrier Warfare and Combat Engineering.....819

    Counter-Mine Systems .....819

    Other Breaching and Defense Suppression Equipment.....820

Support Vehicles and Other Aspects of Combat Mobility .....822

Support, Maintenance, and Logistics. ....823

    Deploying Sustainability: The Need for Strategic and Theater Lift.....824

    Creating In-Theater Logistics Systems.....825

    Creating Improved Logistics and Sustainment Capabilities for Power Projection.....829

Special Operations and Special Forces.....830

    The Size of the Special Forces Effort .....831

    The Advisory Mission.....831

    Other Special Forces Activities.....832

    Lessons from Special Forces Activity.....834

Fratricide and Identification Of Friend And Foe .....835

Role of Reserve Forces .....838

    Problems With Reserve Combat Units.....839

    Problems With Reserve Combat Support and Service Support Units.....841

The Revolution and Non-Revolution in Land Warfare .....843

**Chapter Ten: Naval And Amphibious Forces.....860**

    The Role of Seapower in Deploying and Protection Coalition Forces .....860

    The Role of Naval Airpower in the Air Campaign.....862

        The Strengths and Weaknesses of Naval Air Power .....864

        The Importance of Air Defense Operations By Naval Air.....868

        The Role of Surface Ships and Land-Based Aircraft in Air Defense,  
Reconnaissance, and Intelligence.....870

        Lessons About the Future of Naval Air.....870

    Naval Missile Strike Capabilities .....872

        The Tomahawk .....872

        The AGM-48E Stand-off Land Attack Missiles (SLAM).....877

Integrating Naval Air and Missile Strike Capabilities.....878

The Surface Warfare Campaign .....879

    Iraq's Limited Naval Capabilities.....879

    Iraqi Missile Attacks on Coalition Surface Forces.....881

    The Beginning of Naval Surface Warfare During Desert Storm.....882

    Coalition Helicopters and Aircraft Versus Iraqi Missile Patrol Boats .....883

    The Weaknesses of Iraq's Guided Missile Patrol Boats .....885

    Other Lessons from Naval Surface Warfare .....886

    The Cost of Desert Storm to the Iraqi Navy.....887

Mine Warfare and Anti-Mine Warfare.....888

    Iraqi Minelaying Efforts and Capabilities .....888

    Western Mine Countermeasure Efforts and Capabilities .....890

    The Mine Warfare Duel During Desert Storm.....892

    Lessons of the Mine Warfare Duel During Desert Storm .....895

The Role of Naval Gunfire Support .....897

Amphibious Operations: Forced Deception .....899

    Planning for a Major Amphibious Landing.....900

    The Shift to Raids and Deception .....903

    Lessons for Amphibious Warfare.....904

Strategic Lift and the Critical Role of Sealift .....905

Lessons For Coalition Warfare And International Peace Making. ....909

**Chapter Eleven: Missile Systems And Proliferation .....920**

Coalition Readiness for Chemical and Biological Warfare.....920

Iraq's Use of Long Range Missiles.....925

    The Capabilities of the "Scud B" .....926

    Iraq's Search for More Advanced Missiles .....928

    Iraq's Missile Activity During The Gulf War.....935

    Iraqi Surface-To-Iraq's Missile Activity After The Gulf War.....939

The Scud Hunt.....942

    Why The Scuds Survived.....943

    Lessons from the Scud Hunt .....948

The Patriot and the Anti-Missile War. ....949

    The Technical Capabilities of the Patriot Systems Deployed in the Gulf War.....949

    Patriot Deployments in the Gulf War.....952

    Trying to Measure Effectiveness.....955

    Uncertain Lessons from an Uncertain Experience .....958

Iraq's "Super Guns" .....960

The Risk of Chemical Conflict.....962

    Iraqi Chemical Weapons Programs at the Time of the Gulf War.....963

    Counterproliferation: The Coalition Effort to Attack Iraqi Chemical Weapons .....967

    Iraq's Decision Not To Use Chemical Weapons .....972

    The Possible Impact of Iraqi Use of Chemical Weapons at the Tactical Level .....973

    The Possible Impact of Iraqi Use of Chemical Weapons at the Strategic Level .....974

    Iraq's Future Chemical Weapons Capabilities.....976

    Lessons For Future Conflicts .....977

The Risk of Biological Warfare .....979

    Iraqi Biological Warfare Facilities.....979

    Possible Iraqi Biological Agents.....981

    Counterproliferation: The Coalition Effort to Attack Iraqi Biological Weapons .....984

    Iraq's Future Biological Weapons Capabilities .....985

    Lessons For Future Conflicts .....986

Iraq's Nuclear Program and the Risk of Nuclear And Conflict.....990

    Iraqi Nuclear Capabilities at the Time of the Gulf War .....990

    Counterproliferation: The Coalition Effort to Destroy Iraqi Nuclear Weapons

    Production Capability .....1001

    Iraq's Future Nuclear Weapons Capabilities .....1003

    Lessons For Future Conflicts .....1004

The Problem of Counter-Proliferation.....1005

**Chapter Twelve: Strategic Lessons of the Conflict.....1026**

    "Extended Deterrence" in the Post-Cold War Era.....1026

    The Warfighting Character of Cooperative Security and Coalition Warfare.....1028

    The Role of the "AirLand Battle," "Combined Operations," and the "Revolution in Military Affairs" .....1029

    The Importance of Countervailing Strategy .....1034

    The Strategic Impact of Weaknesses in Western Military Capabilities.....1038

    The Importance Of Rapid Power Projection Capabilities and Readiness.....1041

    The Importance of the Edge in Training, Tactics, and Technology .....1043

    The Importance of Weapons of Mass Destruction .....1043

    Political Versus Military Action and "Decisive Force" .....1044

    Conflict Escalation and Conflict Control .....1045

    Conflict Termination .....1046

    Grand Strategy and Conflict Outcomes.....1047



Strategic Warning and Strategic Trade-Offs .....1051

**Selected Bibliography.....1053**

**List of Tables**

Table 2.1 UN Security Council Resolutions Affecting the Gulf War: 1990-1991.....57

Table 2.2 US Air Force Aircraft Deploying Into Theater Through September 1990 .....72

Table 2.3 The Growth of the US and British Forces Through Mid-January 1991.....97

Table 2.4 Smaller Allied Contingents in the Coalition Forces in Desert Storm .....107

  

Table 3.1 Iraqi vs. UN Coalition Forces at the Start of the Gulf War .....126

Table 3.1 Iraqi vs. UN Coalition Theater Forces at the Start of the Gulf War .....127

Table 3.2 The Iraqi Order of Battle 1990 to 1991 .....129

Table 3.3 Major Qualitative Limitations in the Iraqi Armed Forces .....130

Table 3.5 The Iraqi Divisional Land Order of Battle at the Time of Desert Storm .....135

Table 3.6 Iraqi Division Organization .....137

Table 3.7 Iraq's Air Order of Battle Before the Gulf War .....141

Table 3.8 Deployment of Iraq's Air Defense Weapons Before the Gulf War.....149

Table 3.9 The Growth of the US Forces for Desert Storm - Part One .....155

Table 3.10 The New US Military: The "Revolution in Military Affairs" .....167

Table 3.11 The Size of British Ground Forces in Desert Storm.....178

Table 3.12 The Arab Land Order of Battle in Desert Storm .....193

  

Figure 4.1 Command Structure for UN Coalition Forces in the Gulf War .....249

Table 4.1 The Impact of US Air Capabilities on UN Coalition Air Command, Control, Electronic Warfare and Reconnaissance Capabilities .....274

Table 4.2 The Space Order of Battle in Desert Storm.....282

Table 4.3 Iraqi Command and Control Centers and Related Facilities Involved in the Gulf War.....293

  

Table 5.1 Coalition Intelligence Weaknesses In Desert Storm.....303

Table 5.2 US Intelligence Satellites Used in Desert Storm .....306

Table 5.3 Major US Intelligence and Reconnaissance Aircraft Used in Desert Storm.....310

Table 5.4 Intelligence Problems in Estimating the Size of Iraqi Forces in the KTO .....327

Table 5.5 The Role of UAVs During Desert Shield/Desert Storm .....353

Table 5.6 The Size of Iraqi Forces in the KTO Killed During the Ground War: Differences Between the USCENTCOM and GWAPS Estimates .....367

Table 5.7 Estimates of Iraqi Casualties in the Gulf War - Part One .....376

  

Table 6.1 The Impact of Coalition Air Forces: Number of Sorties by Mission Type - Part One .....409

Table 6.2 US Air Force Strength In Theater.....412

Table 6.3	US Air Power Deployed in Desert Storm on February 24, 1991.....	413
Table 6.4	Iraqi Air Strength in Desert Storm.....	419
Figure 6.1	Iraqi Air Activity During Desert Storm.....	422
Table 6.5	Coalition Theater Campaign Plan and Military Objectives .....	430
Figure 6.2	Iraqi Air Activity Versus Coalition Air-to Air Combat Activity .....	436
Table 6.6	Coalition Air Losses in Combat During Desert Storm .....	437
Table 6.7	Coalition Air Attrition in Desert Storm Due to All Causes .....	438
Table 6.8	Iraqi Air Losses in Air to Air Combat .....	443
Figure 6.3	Range of Iraqi Early Warning Radars and Heavy Surface-to-Air Missiles .....	452
Figure 6.4	Iraqi Surface-to-Air Missile/EW Radar Activity During the Gulf War .....	453
Table 6.9	Iraqi Aircraft Seized by Iran after the Gulf War.....	464
Table 6.10	US Electronic Warfare Aircraft in the Gulf War - Part One.....	467
Table 6.11	Iraqi Combat Aircraft Losses in Desert Storm.....	470
Table 7.1	UN Coalition Air Strikes by Mission During Desert Storm .....	483
Table 7.2	The Role of Key Strike/Attack Aircraft During Desert Storm.....	487
Table 7.3	Bomb Capabilities of Key Coalition Aircraft By Type .....	490
Table 7.4	Key Munitions Used by US Aircraft in the KTO .....	524
Table 7.5	Major Guided and Unguided Bombs Used in Desert Storm.....	526
Table 7.6	Major Guided Missiles Used in Desert Storm - Part One.....	533
Table 7.6	Major Guided Missiles Used in Desert Storm - Part Two .....	534
Table 7.7	Bomb Tonnage Statistics: Gulf War vs. Previous wars .....	538
Table 7.8	The Growth of Target Sets During the Gulf War .....	542
Table 7.9	USCENTCOM Estimate of Cumulative Air Damage to.....	562
	Iraqi Major Combat Equipment in the KTO.....	562
Table 7.10	Coalition Sortie Rates in Close Air Support/Interdiction Missions .....	576
	By Aircraft Type During the Land War.....	576
Table 7.11	The Impact of Coalition Air and Land Forces on Iraqi Equipment Strength.....	582
Table 7.12	Aircraft Operational Availability and Readiness Rates in Desert Storm .....	587
Table 8.1	The Coalition Ground Force Order of Battle in Desert Storm -- Part One .....	610
Table 8.1	The Coalition Ground Force Order of Battle in Desert Storm -- Part Two .....	611
Figure 8.1	The Location of Coalition Ground Forces on February 23, 1991 (G-1).....	616
Table 8.2	Iraqi Army Deployments in the Kuwaiti Theater of Operations (KTO).....	622
Figure 8.2	The Location and Condition of Iraqi Ground Forces on February 23, 1991 (G-1) .....	626
Table 8.3	Coalition Advantages in the Conceptual Approach to AirLand Warfare.....	633

Figure 8.3	The Final Coalition Attack Plan.....	639
Figure 8.4	The Initial Coalition Attack on G-Day (February 24, 1991).....	647
Figure 8.5	The XVIII Corps Attack on G-Day (February 24, 1991).....	652
Figure 8.6	The VII Corps Attack on G-Day (February 24, 1991).....	660
Table 8.4	I MEF Battle Statistics.....	663
Figure 8.7	The I MEF Attack on G-Day (February 24, 1991).....	666
Table 8.5	Impact of Air Power on Iraqi Forces on G-Day in the Line of Advance of I MEF.....	667
Figure 8.8	The JFC-E Attack on G-Day (February 24, 1991).....	672
Figure 8.9	Coalition Advances on G+1 (February 25, 1991).....	675
Figure 8.10	The VII Corps Attack on G+1 (February 25, 1991).....	681
Figure 8.11	Coalition Advances on G+2 (February 26, 1991).....	687
Figure 8.12	Coalition Advances on G+3 (February 27, 1991).....	704
Figure 8.13	Key Iraqi Positions on G+3 (February 27, 1991).....	712
Figure 8.14	Coalition Advances on G+4 (February 28, 1991).....	716
Table 8.6	The Impact of Coalition Air and Land Forces on Iraqi Equipment Strength At the Time of the Cease-Fire.....	725
Table 9.1	Maximum Nominal Range of Artillery Weapons Used in the Gulf War.....	790
Table 9.2	Coalition Losses to Iraqi Land-Based Air Defenses in the Gulf War.....	816
Table 9.3	Air and Sealift Required to Deploy US Land Forces.....	830
Table 9.4	US Special Forces in Desert Storm.....	835
Table 9.5	US Activation of Selected Reserves in the Gulf War.....	843
Table 10.1	The Impact of US Navy and Marine Corps Forces on the Air Campaign.....	863
Table 10.2	Weapons Delivered by US Navy and USMC Aircraft and Ships During Desert Storm.....	868
Table 10.3	US Navy Use of Tomahawk Missiles During the Gulf War.....	877
Table 10.4	US Strategic Sealift and Airlift During the Gulf War.....	909
Table 11.1	Comparative Performance Of Iraqi Surface-To-Surface Missile Systems.....	934
Table 11.2	Iraqi Surface-To-Surface Missile Launches During The Gulf War.....	936
Table 11.3	Iraqi Surface-To-Surface Missile Launches During The Gulf War.....	939
Figure 11.1	Iraqi Scud Launch Rates During Desert Storm.....	947
Table 11.4	Chemical Agents that Iraq Now Has The Technical Capacity To Produce.....	967
Figure 11.2	Coalition Strikes/Sorties Against Nuclear, Biological and Chemical (NBC) Targets.....	971
Table 11.5	Typical Warfighting Uses of Chemical Weapons.....	976
Table 11.6	Key Biological Weapons That Iran And Iraq Might Weaponize.....	983

Table 11.7 The Comparative Effects of Biological, Chemical, and Nuclear Weapons Delivered  
Against a Typical Urban Target in the Middle East .....989

Table 11.8 Key Iraqi Nuclear Weapons Facilities .....992

  

Table 12.1 Western Military Advantages and the "Revolution in military affairs" .....1030

Table 12.2 Countervailing Limitations in Third World Armed Forces .....1034

Table 12.3 The Other Side of Countervailing Strategy: Weaknesses in US and Western  
Capabilities for Regional Warfare .....1039

## Acknowledgments

The author is indebted Abraham Wagner for his help in Chapters IV and V, and throughout the writing and editing of this series, and to Dr. Amatzia Baram for his constant help in the material relating to Iraq in both this book and the author's Iran and Iraq: The Threat from the Northern Gulf. He is deeply indebted to many others for interviews, background material and supporting research material, and to Debbie Bernstein and Rebecca Joubin Aghazadeh for their help in research and editing.

He would like to thank Samuel Wells, Robert Litwak, Charles Blitzer, and his other colleagues at the Wilson Center for their help and support in preparing this book while the author was a Wilson Fellow, and John Duke Anthony and the National Council on US-Arab Relations for their support while the author was an International Affairs Fellow.

He is indebted to to Peter Jennings and Christopher Isham for their support in analyzing the war during and after the conflict, and to many military officers and civilian experts in Coalition countries and the Middle East for reviewing this manuscript and interviews.

These officers and experts include General Walter E. Boomer, Lt. General Buster Glosson, Jeffery Cooper, Eliot Cohen, James Blackwell, St. John Armitage, David Boulton, Harlan Ullman, Lt. Colonel Steve E. Dietrich, Jeffery J. Clarke, Colonel William J. Davis, Lt. Colonel Charles H. Cureton, but only a small fraction of those who directly assisted the author can be publically identified by name or country. Most of the insights in this book come from the interviews and the work of experts who worked on official analyses histories of the Gulf War, and it would have been impossible to complete this work without their help.