

The Reader's Companion to
MILITARY HISTORY



Edited by

ROBERT COWLEY & GEOFFREY PARKER

An encyclopedia of warfare from the Persian Wars to the present, with
contributions from James M. McPherson, Stephen B. Oates, Caleb Carr,
Geoffrey Ward, Richard M. Ketchum, and many more

THE READER'S COMPANION TO

MILITARY HISTORY

ROBERT COWLEY
AND
GEOFFREY PARKER
EDITORS

SPONSORED BY

The Society for Military History

HOUGHTON MIFFLIN COMPANY

BOSTON • NEW YORK

First Houghton Mifflin paperback edition 2001

Copyright © 1996 by Houghton Mifflin Company

ALL RIGHTS RESERVED

For information about permission to reproduce selections from
this book, write to Permissions, Houghton Mifflin Company,
215 Park Avenue South, New York, New York 10003.

Visit our Web site: www.houghtonmifflinbooks.com.

Library of Congress Cataloging-in-Publication Data

The reader's companion to military history / Robert
Cowley, Geoffrey Parker, editors.

p. cm.

"Sponsored by the Society for Military History."

Includes indexes.

ISBN 0-395-66969-3

ISBN 0-618-12742-9 (pbk.)

I. Military history. I. Cowley, Robert. II. Parker,
Geoffrey, 1943- . III. Society for Military History (U.S.).

U27.R348 1996

355'.009 — dc20 96-8577 CIP

Printed in the United States of America

Book design by Robert Overholtzer

HWK 10 9 8 7 6 5 4 3 2 1

THE
READER'S COMPANION TO
MILITARY HISTORY



ADVISORY BOARD

BERNARD S. BACHRACH

D'ANN CAMPBELL

HOLGER H. HERWIG

DONALD KAGAN

WILLIAM H. McNEILL

ALLAN R. MILLETT

ELIHU ROSE

ARTHUR WALDRON

Contributors

Thomas B. Allen
Bethesda, Maryland

Thomas F. Arnold
Yale University

Jere L. Bachrach
University of Washington, Seattle

George Baer
Naval War College

Tami Davis Biddle
Duke University

David Birmingham
University of Kent at Canterbury,
England

Jeremy Black
University of Exeter, England

Michael Blow
Greenwich, Connecticut

Eugene N. Borza
The Pennsylvania State University

Clare Brandt
Rhinebeck, New York

Marshall Brement
Middleburg, Virginia

Malcolm Brown
The Imperial War Museum,
England

David Buisseret
University of Texas at Arlington

William Caferro
University of Tulsa

D'Ann Campbell
Austrian State University

Caleb Carr
*MHQ: The Quarterly Journal of
Military History*

Eliot A. Cohen
The Johns Hopkins University

Philippe Contamine
University of Paris-Sorbonne,
France

Theodore F. Cook, Jr.
William Paterson College

James S. Corum
USAF School of Advanced
Airpower Studies

Robert Cowley
*MHQ: The Quarterly Journal of
Military History*

David Culbert
Louisiana State University,
Baton Rouge

Carlo W. D'Este
New Seabury, Massachusetts

Malcolm Deas
St Anthony's College,
Oxford, England

Robert A. Doughty
United States Military Academy

William J. Duiker
The Pennsylvania State University

R. David Edmunds
Indiana University

Stanley L. Falk
Former Chief Historian,
U.S. Air Force

Steven Fanning
University of Illinois at Chicago

Byron Farwell
Hillsboro, Virginia

R. Brian Ferguson
Rutgers University

Arther Ferrill
University of Washington, Seattle

Caroline Finkel
Istanbul, Turkey

Thomas Fleming
New York, New York

M. R. D. Foot
London, England

General Sir David Fraser
Alton, Hampshire, England

Karl F. Friday
University of Georgia

David Fromkin
Boston University

William C. Fuller, Jr.
Naval War College

John Gillingham
The London School of Economics
and Political Science, England

Carroll Gillmor
Salt Lake City, Utah

David M. Glantz
Journal of Slavic Military Studies

Joseph T. Glatthaar
University of Houston

Anthony Goodman
The University of Edinburgh,
Scotland

Stewart Gordon
Los Angeles, California

David A. Graff
Bowdoin College

Molly Greene
Princeton University

Ira D. Gruber
Rice University

Bruce I. Gudmundsson
The Institute for Tactical
Education

John F. Guilmartin
The Ohio State University

Paul G. Halpern
The Florida State University

Michael I. Handel
Naval War College

Victor Davis Hanson
California State University, Fresno

Kenneth W. Harl
Tulane University

Ross Hassig
University of Oklahoma

Daniel R. Headrick
Roosevelt University

Holger H. Herwig
The University of Calgary, Canada

Don Higginbotham
University of North Carolina,
Chapel Hill

Thaddeus Holt
Point Clear, Alabama

Alistair Horne
Turville, Oxfordshire, England

Donald D. Horward
The Florida State University

Samuel Hynes
Princeton, New Jersey

Keith Jeffery
University of Ulster at Jordantown,
Northern Ireland

Francis Jennings
Newberry Library Emeritus

W. Scott Jessee
Appalachian State University

Robert W. Johannsen
University of Illinois
at Urbana-Champaign

Timothy D. Johnson
David Lipscomb University

Robert J. T. Joy
Uniformed Services University
of the Health Sciences

Walter E. Kaegi
The University of Chicago

David Kahn
Newsday

David Kaiser
Naval War College

Alvin Kernan
The Andrew W. Mellon Fund

Richard M. Ketchum
Former Editor,
American Heritage Books

Bernard Knox
Center for Hellenic Studies

Glenn LaFantasie
Warrenton, Virginia

A. D. Lambert
King's College, England

David Clay Large
Montana State University

J. F. Lazenby
University of Newcastle, England

Bradford A. Lee
Naval War College

Bernard Lewis
Princeton University

Edward N. Luttwak
Center for Strategic and
International Studies

John A. Lynn
University of Illinois
at Urbana-Champaign

Angus MacKay
The University of Edinburgh,
Scotland

Lawrence Malkin
New York, New York

John H. Maurer
Naval War College

Adrienne Mayor
Princeton, New Jersey

William H. McNeill
The University of Chicago

James M. McPherson
Princeton University

Ira Meistrich
New York, New York

Bruce W. Menning
U.S. Army Command and
General Staff College

Allan R. Millett
The Ohio State University

Daniel Moran
Naval Postgraduate School

Ted Morgan
New York, New York

Eric Morris
South Glamorgan, Wales

Lance Morrow
Millbrook, New York

Susan Brind Morrow
Millbrook, New York

Williamson Murray
Marine Corps University

Scott Hughes Myerly
Los Angeles, California

Larry Neal
University of Illinois
at Urbana-Champaign

Robert L. O'Connell
National Ground Intelligence
Center

Stephen B. Oates
Amherst, Massachusetts

Josiah Ober
Princeton University

Jane H. Ohlmeyer
University of Aberdeen, Scotland

Geoffrey Parker
The Ohio State University

- | | | |
|--|--|---|
| Rod Paschall
Carlisle, Pennsylvania | Morris Rossabi
City University of New York | Noah Andre Trudeau
Washington, D.C. |
| Mark R. Peattie
Hoover Institution on War,
Revolution and Peace | Gunther E. Rothenberg
Purdue University | Ulrich Trumpener
University of Alberta, Canada |
| Joseph E. Persico
Guilderland, New York | Edward J. Schoenfeld
University of Pittsburgh | Robert M. Utley
Moose, Wyoming |
| Peter O'M. Pierson
Santa Clara University | H. M. Scott
University of St Andrews, Scotland | Martin van Creveld
The Hebrew University of
Jerusalem, Israel |
| Daniel Pipes
<i>Middle East Quarterly</i> | Patricia Seed
Rice University | Hans J. van de Ven
University of Cambridge, England |
| Douglas Porch
Naval War College | Dennis E. Showalter
Colorado College | Hans Vogel
University of Leiden, Netherlands |
| Barbara Nevling Porter
Chebeague Island, Maine | Charles R. Shrader
Carlisle, Pennsylvania | Arthur Waldron
Naval War College |
| John Prados
Washington, D.C. | Neil Asher Silberman
Branford, Connecticut | Joanna Waley-Cohen
New York University |
| Paul Preston
The London School of Economics
and Political Science, England | John Masson Smith, Jr.
University of California, Berkeley | Geoffrey Ward
New York, New York |
| Theodore K. Rabb
Princeton University | Paul Sonnino
University of California,
Santa Barbara | Gerhard L. Weinberg
University of North Carolina,
Chapel Hill |
| Jeffrey T. Richelson
Alexandria, Virginia | Roger J. Spiller
U.S. Army Command and
General Staff College | Stanley Weintraub
The Pennsylvania State University |
| N. A. M. Rodger
National Maritime Museum,
England | Gale Stokes
Rice University | Bernard A. Weisberger
Evanston, Illinois |
| Clifford J. Rogers
United States Military Academy | Brian R. Sullivan
Falls Church, Virginia | James Scott Wheeler
United States Military Academy |
| Alex Roland
Duke University | Jon Sumida
University of Maryland,
College Park | Tom Wicker
New York, New York |
| Elihu Rose
New York University | Jon Swan
<i>Columbia Journalism Review</i> | Simon Winchester
New York, New York |
| Gideon Rose
Council on Foreign Relations | Tim Travers
The University of Calgary, Canada | J. M. Winter
Pembroke College, Cambridge,
England |

Editors' Note

We believe that *The Reader's Companion to Military History* is the most accurate reflection available of the current state of the art. In this book you will find what the foremost practitioners of military history, including our advisory board and the more than 150 authorities who have written entries, consider most important. The 570 entries are a distillation: here are the concepts, personalities, organizations, wars, battles, and general phenomena that seem both basic and indispensable.

The study of military history has undergone drastic changes in recent years. The old drums-and-bugles approach will no longer do. Factors such as economics, logistics, intelligence, and technology receive the attention once accorded solely to battles and campaigns and casualty counts. Words like "strategy" and "operations" have acquired meanings that might not have been recognizable a generation ago. Changing attitudes and new research have altered our views of what once seemed to matter most. For example, several of the battles that Edward Shepherd Creasy listed in his famous 1852 book *Fifteen Decisive Battles of the World* rate hardly a mention here, and the confrontation between Muslims and Christians at Poitiers-Tours in 732, once considered a watershed event, has been downgraded to a raid in force.

The subject matter of this book ranges from the origins of war to ethnic cleansing, from Thutmose III to H. Norman Schwarzkopf, from the War of the Triple Alliance in Paraguay to the Battle of Khalkin-Gol on the border of Mongolia and Manchuria. Here you will find the unexpected, the surprising. What is the only major engagement fought between Chinese and Arabs? The Battle of Talas River, 751. Who originated the

term No Man's Land? Ernest Swinton, 1909. What is the truth about Roland? The hero of legend was actually an incompetent leader. Who first used ironclad ships in battle? The Korean admiral Yi Sun-Shin, in the 1590s. Were the fearsome Amazons purely a myth? Perhaps, but remains of women warriors have been unearthed in the Black Sea region. What may have been the largest naval battle in history? Not Leyte Gulf, in 1944, but Ecnomus, in the First Punic War, 256 B.C.

Although the *Reader's Companion* runs to 542 pages, it does not — cannot — provide equal coverage for all countries and all centuries. To elucidate and explain all the wars that have taken place, absorbing the energies and resources of humankind for millennia, would be impossible in a single volume; this book does not pretend to be an encyclopedia. But how can military history be reduced to manageable proportions? Two obvious options, to deal only with the modern world or only with the West, immediately fell by the wayside, because they would have excluded many fascinating precedents and parallels. For example, the entry on "Drill" would have been confined to modern "square-bashing," instead of drawing attention to the remarkable coincidence that only two societies, China and the West, invented drill, and that both did so twice, at precisely the same time — in the fifth century B.C. and again, drawing on those classical precedents, in the sixteenth century A.D.

We therefore adopted two working principles in selecting entries and allocating relative lengths: (1) given that the Western way of warfare has come to dominate armed conflict all over the globe, we have "privileged" Western matters; and (2) given that many readers will be more interested in recent wars, we have also given more

weight to the conflicts, personalities, and developments that shaped warfare in the twentieth and, to a lesser degree, the nineteenth century. Thus we have two entries entitled "Korean War," one dealing with the conflict of the 1950s, the other with that of the 1590s. The first is far more substantial, however, and the leading participants have entries of their own, whereas the second is far shorter, and only the Japanese leader who launched the invasion and the Korean admiral who destroyed the invasion fleet receive separate notice. So although "non-Western" phenomena feature in our volume, they receive proportionately less attention. Likewise, although World War II and Rome's Punic Wars are both included, the former is one of the longest entries in the book, with separate treatments for each major battle and prominent commander, whereas the latter is much shorter, with separate treatment of only a few leading players.

Readers can find entries on subjects that interest them in one of three ways: by going straight to the relevant place in the main text, which is alphabetically arranged; by following up cross-references in those texts; and by checking the index for the location of additional topics. Inevitably, however, as stated at the outset, some will search in vain, since our selection, even though informed by a distinguished advisory board, could not include everything. We would be delighted to hear of any glaring omissions; perhaps gaps can be filled in a future edition. Meanwhile, we hope that every reader will find unfamiliar material — even on familiar subjects — that will provoke and challenge as well as inform, for as Sir Walter Raleigh observed in the early seventeenth century, "The ordinary theme and argument of all history is war."

ROBERT COWLEY
GEOFFREY PARKER

THE
READER'S COMPANION TO
MILITARY HISTORY

Contents

MAPS / vii

CONTRIBUTORS / ix

EDITORS' NOTE / xiii

ENTRIES / I

ILLUSTRATION CREDITS / 543

INDEX OF CONTRIBUTORS / 545

GENERAL INDEX / 547

Maps

American Civil War	17	Khalkin-Gol, Battle of	242
Amiens, Battle of	21	Korean War, 1950–1953	247
Antietam, Battle of	24	Kursk, Battle of	251
Austerlitz, Battle of	43	Lepanto, Battle of	262
Blenheim, Battle of	56	Leuthen, Battle of	263
Bulge, Battle of the	64	Leyte Gulf, Battle of	264
Cambrai, Battle of	67	Mexican War	301
Cannae, Battle of	70	Okinawa, Battle of	341
Caporetto, Battle of	71	Peloponnesian War	359
Chaeronea, Battle of	78	Wars of the Roses	406
Chancellorsville, Battle of	80	Russo-Japanese War	408
Chinese Civil War	86	Sedan, Battle of	420
Crusades	118	Somme, Battle of the	433
D-Day	122	Spanish Civil War	436
Dien Bien Phu, Battle of	132	Stalingrad, Battle of	443
El Alamein, Battle of	152	Teutoburg Forest, Battle of	469
English Civil Wars, 1642–1651	155	Verdun, Battle of	488
Gallipoli Campaign	176	Vicksburg, Campaign for	490
Gaugamela, Battle of	177	Waterloo, Battle of	510
Gettysburg, Battle of	184	Yorktown Campaign	536

A

Abd el-Krim

1881?–1963, *Moroccan Berber Leader*

Born the son of a Berber tribal leader, Abd el-Krim (Mohammed Abd el-Karim el-Khattabi, “Wolf of the Rif”) became a Muslim judge at Melilla, the chief town in Spanish Morocco, where he also edited a newspaper. A quarrel with a Spanish officer landed him in prison, but he escaped and, joined by his tribesmen, launched a revolt against Spanish rule. Throughout 1921–1922, he led raids on Spanish outposts and ambushed Spanish patrols. On July 21, 1921, he scored a victory over a Spanish army under General Fernández Silvestre in the Battle of Anoual and then advanced to the outskirts of Melilla.

In 1923 he declared a republic of the Rif and created a modern army, equipped it with machine guns and mountain howitzers, and hired numbers of mercenaries, including deserters from the French Foreign Legion.

When the French advanced against him, he successfully attacked them too, advancing almost to Fez before he was defeated in 1925 by French general Louis Lyautey. Harassed by French and Spanish forces, he surrendered on May 26, 1926, to the French and was exiled to the Indian Ocean island of Réunion. He was released in 1947 and went to Egypt, where he continued his anti-French campaign until his death.

BYRON FARWELL

Accommodation for Troops

The accommodations made available for soldiers reflect the nature of armies and the resources of governments. Strong, centralized states prefer keeping at least the core of their armies well in hand. The camps of Rome’s legions (q.v.) tended to evolve into perma-

nent communities. The Ottoman Empire’s janissaries and some of its technical troops lived in barracks. In practice, however, such forces tended with time to acculturate to their civilian environments. In the field, the subsistence nature of preindustrial economies, whether Asian, European, or African, guaranteed that large forces seldom stayed long in any one place. Quartering was correspondingly ad hoc, usually involving soldiers lodged with civilians or in public buildings at community expense.

The rise of large, permanent standing armies in Europe during the late sixteenth and seventeenth centuries created new problems. No state was willing to spend its limited military budget on infrastructure. The result was a systematic extension of billeting. Soldiers were assigned to private homes, taverns, empty buildings, and stables — usually in small groups and usually on a temporary basis, to prevent both affinities and hostilities from developing between the soldiers and their unwilling hosts. In theory, the men were supposed to receive rations or subsistence allowances; however, “free quarters” tended to be the rule. Under this system, property owners received receipts that could later be redeemed from the appropriate authorities, though delay and discounting often soured relations between the state and its subjects.

The worst effects of billeting were modified by the common practice of allowing soldiers to seek jobs in their extensive off-duty hours. From a military point of view, however, the negative effects on training, discipline, and unit cohesion outweighed the system’s advantages. In the aftermath of the Seven Years’ War (q.v.), Europe’s armies were increasingly concentrated in barracks financed by governments’ steadily improving ability to tax and borrow. By modern standards the accommodations were primitive, with men sleeping two to a bed, latrine facilities consisting of a

tub somewhere on the floor, and married quarters defined by blankets hung from ropes. These conditions, however, did not differ significantly from the standard lifestyles of the peasants and casual laborers who made up the armies.

Risks of contagious diseases were more than balanced by the utility of having concentrations of reliable men in case of civic disorder or natural catastrophes. At the same time, troops in barracks were initially kept isolated, as much to protect middle-class sensibilities from the sights, sounds, and smells of a "brutal and licentious soldiery" as to seal off the soldiers from the revolutionary ideas that swept Europe in the late eighteenth and early nineteenth centuries. Success in both endeavors was limited. During the revolutions of 1848 in particular, units often refused to act against civilian crowds that included sweethearts and drinking companions.

As short-term conscription became the principal means of recruitment, barracks life was accurately perceived as the only way to socialize draftees into military systems in an acceptable period of time. One result was a steady improvement in living conditions. By 1914 the average European soldier ate and slept about as well as he could expect to at home when times were good. This fact contributed not a little to the relative acceptability of military service among young adults.

World War I (q.v.) and its aftermath changed significantly the pattern of military accommodations. During the war, billeting made a temporary comeback, particularly in Britain. Permanent facilities, however, were so overcrowded that they deteriorated significantly. After 1918 funding for repair and replacement was limited. The result was a growing gap between living conditions in the army and those in civilian life. The German Wehrmacht owed a good part of its initial popularity to the new buildings that sprang up after 1935 to house the new generations of conscripts.

Post-World War II affluence combined with the growing importance of long-service volunteers, even in ostensibly conscripted forces, led armies in the 1970s increasingly to abandon Western communal barracks in favor of accommodations more like college dormitories or efficiency apartments. The Soviet Union retained the traditional system — a decision that contributed to the growing disaffection that led to its collapse. In increasingly privatized societies,

where separate rooms and separate televisions are becoming norms for adolescents, barracks may become as obsolete as billets.

DENNIS E. SHOWALTER

Reginald Hargreaves, "Bivouacs, Billets, and Barracks," *Army Quarterly* (January 1963): 231–242.

Actium, Battle of

September 2, 31 B.C.

At Actium, Octavian (the future Roman emperor Augustus) and his general Marcus Vipsanius Agrippa defeated Mark Antony and Cleopatra VII of Egypt, ending the Roman Civil War. In the name of the republic, Octavian declared war in 32 B.C. on Cleopatra, to whom Antony was both husband and ally. Each army numbered thirty legions. Antony enjoyed a superiority in cavalry furnished by eastern allies, but Octavian possessed more veteran legions; at sea, Octavian's fleet of six hundred quinqueremes outclassed the five hundred belonging to Antony. Antony blundered in allowing himself to be besieged on the Actium promontory in western Greece. During the summer of 31 B.C., hungry Antonian soldiers deserted in droves. On September 2, 31 B.C., Antony risked a desperate breakout with his remaining two hundred seaworthy quinqueremes, and it ended in fiasco. Cleopatra's squadron of sixty ships escaped, followed by Antony in his flagship; but the rest of the fleet, pursued by Agrippa, fled in disorder to Actium's harbor. On the next day, Antony's army and fleet surrendered.

Actium closed a century of revolution that had wracked the Roman world. In 30 B.C. Octavian annexed the eastern provinces after Antony and Cleopatra, each in turn, committed suicide. In naval warfare, Actium was the last clash of great warships in classical antiquity. For the next four centuries, the Roman navy faced no rival, and so concentrated on transports, river flotillas, and swift coastal craft to suppress piracy.

KENNETH W. HARL

Aerial Weapons

The advantages of discharging missiles from a height were understood from the dawn of time, and apprecia-

tion of the military potential of aerial weaponry predated human-carrying flying vehicles. Visionary schemes foresaw destruction raining down from balloons, and Austrian forces suppressing a rebellion actually attacked Venice with unmanned balloons carrying incendiary bombs in 1849.

But as a practical matter, aerial weaponry had to await the development of the airplane and dirigible. Rifles and machine guns were carried aloft almost from the beginning and were used with limited effect by Italian aviators against Ottoman forces in Libya in 1911. The Italians also dropped crude bombs, which showed more promise.

Aerial weaponry came of age during World War I (q.v.), following a brief period in which aircraft were used almost exclusively for reconnaissance (q.v.); the aviators defended themselves with pistols and rifles. Pusher aircraft, with the crew seated ahead of the engine and propeller for a clear forward field of fire, were armed with machine guns even before the war, but these airplanes were slower than “tractor” scouts with forward-mounted engines. The seminal event, the development of synchronization gear, made it possible to mount a machine gun to fire through the propeller arc ahead of the pilot, making the entire aircraft a gun mount and vastly simplifying aiming. Defensive machine guns on flexible mounts soon followed. Machine gun-armed aircraft were used to strafe ground troops, and from 1917, the Germans and then the Allies fielded specialized ground-attack aircraft. After experiments with steel flechettes, highly explosive bombs fitted with fins and impact fuses became the staple of aerial bombardment. In 1915, the Germans launched zeppelins capable of carrying two tons of bombs, and by war’s end the largest conventional bombers carried bomb loads of more than a ton. Such aircraft, however, were exceptional, and primitive aiming and navigation systems limited their effectiveness. Zeppelin raids were briefly effective as a terror weapon, and attacks on London by conventional bombers in 1917 forced the British to hold back large numbers of aircraft from the Western Front for defense — but bombing had little effect on the war. Aerial reconnaissance, artillery spotting, and denying the enemy use of the air remained far more important than bombardment. Techniques and technologies developed in World War I reached maturity during the interwar period and played important roles in World War II (q.v.), notably dive-bombing, torpedo attacks on

ships, and cannon- and rocket-armed fighters. On fighters, ring-and-bead gun sights gave way to an illuminated display projected on a ground glass plate in front of the pilot, controlled by a gyroscopic mechanism that automatically computed the lead angle; these would revolutionize air-to-air combat by making average fighter pilots adequate marksmen.

In 1918, rifle-caliber machine guns were the standard aircraft armament — twin synchronized guns on fighters for attack and manually aimed flexible guns for defense. By 1939–1940, British fighters carried as many as eight rifle-caliber machine guns, the Americans were standardizing .50-caliber weapons, German fighters carried 20-mm shell-firing cannon, and newer American and British bombers had hydraulic and electrically powered multiple-gun turrets. Radar, first used to direct ground-controlled intercepts of attacking bombers and then mounted in night fighters and bombers to permit attacks in darkness and through clouds, completely reshaped the face of aerial warfare from 1940 to 1945.

Ground and naval forces proved vulnerable to aerial attack from the beginning of World War II, and air superiority became an essential ingredient of victory. Carrier-based dive-bombers and torpedo-bombers replaced the guns of capital ships as arbiters of naval combat. Fighters carried heavier cannon; rockets supplemented guns for ground attack and, in German service, for attacks on bomber formations. German aircraft dropped radio-controlled, visually guided bombs and missiles in attacks on ships from 1943, and the Americans used radio-controlled bombs against bridges in 1944–1945. American forces introduced napalm (jellied gasoline) firebombs as an antipersonnel weapon.

Advances in aircraft speed, range, and load-carrying capability made long-range aerial bombardment a major factor in World War II, although problems in accuracy and navigation had to be solved before attacks on cities, transportation nets, and industry could have strategic impact. The destruction by firestorm of Guernica at the hands of German and Italian bombers in the Spanish civil war (q.v.) provided a foretaste of the vulnerability of cities to incendiary bombs. Japanese attacks on Chinese cities from 1937 and German raids during the Battle of Britain (q.v.) hinted at the potential of long-range strategic bombardment; however, only the British Royal Air Force and the U.S. Army Air Forces realized that potential,

and then not until 1943–1945. By war's end, heavy bombers routinely carried two to seven tons of bombs, and the British on occasion employed enormous bombs of twelve thousand and twenty-two thousand pounds, known as “blockbusters.” The defining expression of strategic bombardment came with the atomic bombs, which destroyed Hiroshima and Nagasaki in August 1945, though, ironically, incendiary attacks on cities — notably Hamburg, Dresden, and Tokyo — caused far more deaths.

The appearance of jet aircraft late in World War II introduced unprecedented speed to aerial combat, demanding air-to-air weapons with increased range and single-shot lethality. In response, guided missiles began to enter service in the middle to late 1950s. The first to achieve combat success was the U.S. Navy's heat-seeking Sidewinder in 1958; with progressive improvements, it remains in service. Radar-guided missiles offered the advantage of being able to attack through clouds, but they were more complex than heat-seekers and took longer to mature technically. The replacement of vacuum tubes with transistors from the 1970s in the West — but, significantly, not in the Soviet Union — enormously improved reliability and introduced an ongoing revolution in miniaturization. The first heat-seekers homed in on engine heat and flew up the tailpipe to achieve a kill; current infrared missiles are all-aspect — that is, they can acquire the target from the front or sides as well as from the rear, homing in on the jet exhaust plume and using sophisticated lead-computing gyros to determine target location and laser proximity fuses to detonate the warhead.

Radar missiles have undergone comparable improvement and now encompass several basic types, each with its particular advantages: active homing missiles, which carry their own transmitters and receivers; semiactive homing missiles, which carry only a receiver and depend on the launching aircraft's radar to illuminate the target; and passive homing missiles, which lock onto enemy radar transmissions. Active missiles operate autonomously once launched, that is, they require no external commands, but are comparatively large and complex. Semiactive missiles are smaller and simpler, but require the launching aircraft to continue transmitting and remain pointed generally toward the target until missile impact. Passive radar missiles operate autonomously, but can home in only so long as the enemy

radar is transmitting. Active radar homing is widely used in antiship missiles, often with infrared terminal homing. Semiactive radar missiles are the most common type of air-to-air missile next to infrared. Passive radar missiles are widely used to attack radar-controlled, surface-based antiaircraft guns and missiles.

Air-to-ground weaponry was revolutionized by the development in the United States of television, laser, and autonomously guided aerial munitions in the late 1960s. These munitions proved enormously effective in destroying discrete targets such as bridges and power plants late in the Vietnam War (q.v.). The lesson was reinforced in the Gulf War (q.v.) of 1990–1991. Although laser-guided bombs took most of the plaudits in the Persian Gulf, autonomously guided Tomahawk cruise missiles, using on-board, terrain-mapping radar for orientation, demonstrated that air-breathing cruise missiles could evade sophisticated antiaircraft defenses and inflict significant damage on small, high-value targets.

More exotic aerial weapons include aerially sprayed defoliants, used extensively by the United States in Vietnam; fuel-air bombs, in which an aerosol-sprayed explosive agent such as butane detonates in combination with atmospheric oxygen; and aerially dispensed micotoxins, highly lethal organisms related to fungi, used by Soviet and Soviet client forces in the Middle East and Southeast Asia.

JOHN F. GUILMARTIN

Christopher Campbell, *Air Warfare: The Fourth Generation* (1984); Charles H. Gibbs-Smith, *Aviation: An Historical Survey from Its Origins to the End of World War II* (1970); John H. Morrow, Jr., *The Great War in the Air: Military Aviation from 1909 to 1921* (1993).

Agincourt, Battle of

October 25, 1415

Had Henry V of England been less strong-willed, the Battle of Agincourt — thanks to Shakespeare, probably the most famous clash of the Hundred Years' War (q.v.), although it was less politically significant than Poitiers (q.v.) and far less innovative in terms of tactics and weaponry than Crécy (q.v.) — would never have taken place. During the five-week siege of the Norman port of Harfleur, which opened the fifteenth-century phase of the war, Henry's army suffered heav-